The National Flood Insurance Program: Successes and Challenges of Federal Flood Mitigation Policy

Ben Sperl[253]

Abstract: *The National Flood Insurance Program (NFIP) is the guiding force behind much of the nation's flood mitigation activities. Set forth from the realization that the federal government cannot carry the entire financial burden of alleviating flood losses, the NFIP has attempted to balance flood relief expenditures with an income that is produced by the collection of flood insurance premiums. In this regard, a balance has been successfully achieved for most of the NFIP's history. However, the program has recently lost this balance owing in large part to a few catastrophic flood events taking place in coastal regions, namely Hurricane Katrina, but most recently Hurricane Sandy. Although the NFIP remains a powerful tool for encouraging mitigation, the debt that has been incurred over the past decade raises serious questions regarding its sustainability. The aim of this research paper is to provide a general overview of how the NFIP operates under the administration of the Federal Emergency Management Agency (FEMA) while discussing its successes and highlighting some of the major obstacles that threaten the sustainability of the program.*

[253] Ben Sperl is a graduate student at IUPUI pursuing a Master's degree in geographic information science (GISc) as well as a certificate in emergency management/homeland security. The focus of his studies revolves mostly around the applications of GIS in the fields of hydrology and emergency management. Over the past couple of years he has worked as an intern for a number of organizations including the Indiana Department of Natural Resources, Indiana Geological Survey, and The Polis Center. The projected date for Ben's graduation is May 2014.

HISTORY

Developing nearby water has innumerable benefits for society. It is no coincidence that so many communities throughout the world have been established along rivers and coastlines. Such benefits do not come without risk though as coexisting with the environment also entails safeguarding from its hazards. Hence, throughout history and at present, humans have sought structural engineering solutions to protect themselves from natural hazards. In the United States, the Army Corps of Engineers (USACE) has epitomized structural mitigation since the passage of the Flood Control Act of 1936, which enabled them to control hydrologic systems through structural means such as dams and levees.[254] But in the 1960's, the U.S. government acknowledged that these structures alone were not enough.[255] Flood losses were not going down despite the impressive engineering of the USACE. Generally speaking, this was the result of society's unrestricted encroachment into floodplains and the federal government's obligation to provide flood relief.

To address the issue of rising flood costs, and in the absence of a private flood insurance market (private insurers are discouraged by the reality that floods can generate a lot of claims in a short period of time), the federal government created the NFIP under the National Flood Insurance Act of 1968.[256] Its purpose was not to accumulate a surplus of capital as would be expected of a private insurer, but rather to generate just enough income to cover its own operational costs while alleviating flood losses without the direct usage of tax dollars. In

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[254] "Flood Insurance and Hurricane Katrina." *CPCU eJournal*. 59. no. 9 (2006): 1-21. http://www.cpcusociety.org (accessed September 15, 2012).
[255] "Flood Insurance and Hurricane Katrina." *CPCU eJournal*. 59. no. 9 (2006): 1-21. http://www.cpcusociety.org (accessed September 15, 2012).
[256] "Flood Insurance and Hurricane Katrina." *CPCU eJournal*. 59. no. 9 (2006): 1-21. http://www.cpcusociety.org (accessed September 15, 2012).

addition, certain provisions of the NFIP make it more than just a repository for flood relief funding. It is also a tool for nonstructural mitigation, a much needed complement to structural engineering solutions. The subsequent section discusses how nonstructural mitigation is promoted through the NFIP.

PARTICIPATION

Communities whose members desire the option of federal flood insurance for their homes and businesses can participate in the NFIP if they agree to abide by the regulations set forth under Section 60.3 of Title 44 in the Code of Federal Regulations.[257] In this sense, the program is not being forcibly imposed on communities, but it incentivizes responsible stewardship of floodplains and pursuit of flood mitigation measures. Such measures include, but are not limited to: adoption of flood insurance rate maps (FIRMs) provided by FEMA unless more accurate or detailed studies can be furnished by the community, construction permits for proposed developments in flood-prone areas, mandatory flood proofing (e.g. anchored foundations, raising of lowest level to height above the 100-year flood elevation) of those developments, and prohibited development in areas where alteration of the environment will cause the base flood elevation (i.e. 100-year flood) to increase by a foot or more.[258]

In addition to the required mitigation measures, FEMA also provides suggestions for responsible community planning. These considerations are not mandatory, but strongly encouraged. For example, it is recommended that communities refrain from building public facilities in floodplains unless absolutely necessary.[259] Another suggestion is the purchase of

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[257] "Criteria for Land Management and Use." *Code of Federal Regulations*. Title 44, sec. 60 (1979). http://www.ecfr.gov (accessed October 15, 2012).
[258] "Criteria for Land Management and Use." *Code of Federal Regulations*. Title 44, sec. 60 (1979). http://www.ecfr.gov (accessed October 15, 2012).
[259] "Criteria for Land Management and Use." *Code of Federal Regulations*. Title 44, sec. 60 (1979). http://www.ecfr.gov (accessed October 15, 2012).

flood-prone land via public funds for the purpose of creating recreational green-space as opposed to allowing development. This is a particularly effective mitigation strategy as it preserves the much needed ecosystem services of riparian habitat while avoiding flood-induced property damages, not to mention the benefits of public green-space. Wherever possible, land acquisition of floodplains is an overall positive community investment.

Suggestions such as these have been embraced by many communities participating in the NFIP, while some communities only abide by the minimum requirements. How actively a community mitigates depends on their local circumstances, but most often it is the result of how recent a flood event lingers in memory. What is constant though, is the heightened awareness of flood hazard that communities experience as members of the NFIP. Awareness of flood hazard has a large spatial aspect to it. As such, flood hazard mapping is a staple component of the NFIP and will now be discussed.

MAPPING

Flood insurance rates are baseless without the geographic delineation of flood hazard. That is, mapping zones according to their probability of inundation provides NFIP administrators with knowledge necessary for assigning premiums that are not arbitrary. The detail with which flood hazard zones are mapped has much to do with the availability of resources. A guiding principle in the field of emergency management is that preparedness and mitigation activities should be risk-based — commit resources where they are needed most. In the case of flood mapping, the most detailed studies are needed where the most is at stake in terms of people and

their property. In contrast, areas where the consequences of inundation are less usually receive analysis involving more approximate methods.

Communities are permitted to delineate flood hazard zones by their own means (i.e. contracting of a private engineering firm or government agency such as the U.S. Geological Survey or USACE) so long as they submit to FEMA thorough documentation of the methods and data used during analysis.[260] However, it is often beyond the means of communities to finance their own studies. In such cases, FEMA funds a formal process of FIRM production known as a Flood Insurance Study (FIS), but is not actively involved in the actual hydrologic and hydraulic analyses.[261] Rather, it is most often the case that another federal agency such as the USACE or the State agency responsible for NFIP management receives project funding to accomplish the objective of furnishing reliable FIRMs for the community under study. Community members are not excluded from the process though. The initial phase of a FIS is to hold a Consultation Coordinated Officer's (CCO) meeting where all relevant actors are represented — community members, the study contractor, State agency responsible for NFIP management, and FEMA personnel.[262] During CCO meetings community members have the opportunity to express which areas they are most concerned about or where they would like to have the most accurate flood elevation data.[263] As mentioned previously, high-risk areas demand more detailed analysis.

The distinction between a detailed and approximate study lies in the quality and availability of data being used as input for hydraulic computer models that predict flood elevations, whether geared towards coastal or riverine scenarios. In a riverine hydraulic model,

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[260] "Criteria for Land Management and Use." *Code of Federal Regulations*. Title 44, sec. 60 (1979). http://www.ecfr.gov (accessed October 15, 2012).
[261] Federal Emergency Management Agency. *Flood Insurance Study Number 18005CV001A.*
[262] Federal Emergency Management Agency. *Flood Insurance Study Number 18005CV001A.*
[263] Federal Emergency Management Agency. *Flood Insurance Study Number 18005CV001A.*

for example, the difference between a detailed and approximate analysis might be the presence or absence of parameters such as stream channel geometry (i.e. width and depth of the channel at a series of cross-sections) or roughness coefficients that represent how much friction is being imposed on the flow of the river by vegetation or other surfaces.[264] Measurement of these parameters requires field inspection and it may not be feasible to survey every stretch of stream throughout a particular study area.

As is the case with all environmental modeling efforts, some degree of error resides in the flood elevation data depicted by FIRMs. Predicting the spatial extent of a flood for any given magnitude (e.g. 50-year, 100-year, or 500-year recurrence intervals) is no simple task. It involves a multi-step procedure beginning with data collection, then conducting hydrologic and hydraulic analyses, interpolating flood elevation values between cross sections along a stream channel or coast, and ultimately extending those flood elevation values outwards, perpendicular from the direction of the water body such that any areas where the topography is the same elevation as the flood or below it will be "filled" with the modeled water.

Being that FIRMs are the authoritative source for establishing insurance rates and regulating floodplains, it is imperative that a system exists for updating FIRMs should communities discover erroneous flood boundaries.[265] When a community seeks to revise the boundary of a floodplain as depicted by the standing FIRM, they can do so themselves, but must submit their revised delineations to FEMA for approval along with full documentation of why the original delineation was wrong or why it has since changed, the new data that was used as

[264] Federal Emergency Management Agency. *Flood Insurance Study Number 18005CV001A.*
[265] U.S. Federal Emergency Management Agency. *Managing Floodplain Development Through the NFIP*. FEMA Library, IS-9, 2007.

input for models, methodology, and a payment for revision.[266] Upon review, FEMA will then respond to the Chief Executive Officer of the community with either a denial for revision or if accepted, a Letter of Map Revision (LOMR) that includes a formal approval and an updated version of the FIRM.[267]

The efficiency of the revision process has been greatly improved by advancements in information technology such as geographic information systems (GIS) and digital data that can be disseminated with ease. New technologies such as these have also improved operational cost savings within the NFIP, although miniscule when compared to the massive debt that the program owes to the U.S. Treasury.

REFORM

The 2005 hurricane season (Katrina, Wilma, and Rita) abruptly forced the NFIP into a deficit of roughly $21 billion dollars that it will never repay.[268] Prior to this record-breaking hyperactive season — it recorded the highest accumulated cyclone energy (ACE) index in U.S. history — the most that had previously been borrowed from the Treasury to reimburse flood claims was $300 million in 2004, which was also a historically hyperactive season.[269] [270] With many climatologists pointing to the steady increase of sea surface temperatures as cause for

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[266] "Criteria for Land Management and Use." *Code of Federal Regulations*. Title 44, sec. 60 (1979). http://www.ecfr.gov (accessed October 15, 2012).
[267] "Criteria for Land Management and Use." *Code of Federal Regulations*. Title 44, sec. 60 (1979). http://www.ecfr.gov (accessed October 15, 2012).
[268] Grannis, Jessica. Georgetown Climate Center, "Analysis of How the Flood Insurance Reform Act of 2012 (H.R. 4348) May Affect State and Local Adaptation Efforts." Last modified August 14, 2012. Accessed October 20, 2012. http://georgetownclimate.org.
[269] U.S. Department of Commerce, "NOAA Reviews Record-Setting 2005 Atlantic Hurricane Season." Last modified April 13, 2006. Accessed October 15, 2012. http://www.noaa.gov/newsarchive.html.
[270] "Flood Insurance and Hurricane Katrina." *CPCU eJournal*. 59. no. 9 (2006): 1-21. http://www.cpcusociety.org (accessed September 15, 2012).

concern of a future that holds increasingly more frequent hyperactive hurricane seasons, the shortcomings of the program need to be resolved if it is to be considered a practical vehicle for mitigating flood losses. What these shortcomings have collectively amounted to is the inability of the program to accumulate ample reserve funds to cover catastrophic events such as Katrina, and now Sandy.[271]

Repetitive loss properties have been particularly problematic for the program's financial well-being. It has been estimated that these properties which are repeatedly exposed to flood waters comprise approximately 1% of all the NFIP's policy holders yet receive around one-third of the flood relief expenditures.[272] Similarly, homes and businesses that were constructed before the program began and thus before FIRMs were drawn have been pardoned of paying the full premium rates that they would otherwise be obligated to pay if construction had taken place after passage of the National Flood Insurance Act of 1968.[273] Many of the program's policyholders have reaped the benefits of coverage while paying subsidized rates as low as 35% of what would normally be charged.[274] These provisions were originally necessary to encourage participation while the program was still in its infancy.[275] However, much time has elapsed and subsidies have lost their merit.

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[271] U.S. Government Accountability Office. *National Flood Insurance Program: Continued Actions Needed to Address Financial and Operational Issues.* Washington, D.C.: Government Printing Office, 2010.
[272] Ntelekos, Alexandros, Michael Oppenheimer, James Smith, and Andrew Miller. "Urbanization, climate change and flood policy in the United States." *Climatic Change*. 103. (2010): 597-616. 10.1007/s10584-009-9789-6 (accessed October 27, 2012).
[273] Ntelekos, Alexandros, Michael Oppenheimer, James Smith, and Andrew Miller. "Urbanization, climate change and flood policy in the United States." *Climatic Change*. 103. (2010): 597-616. 10.1007/s10584-009-9789-6 (accessed October 27, 2012).
[274] U.S. Government Accountability Office. *National Flood Insurance Program: Continued Actions Needed to Address Financial and Operational Issues.* Washington, D.C.: Government Printing Office, 2010.
[275] Adelle, Thomas. "Adaptation through insurance: lessons from the NFIP." *International Journal of Climate Change Strategies and Management*. 3. no. 3 (2011): 250-263. 10.1108/17568691111153401 (accessed October 15, 2012).

The Act has undergone numerous amendments since its beginning, each provoked by an alarming flood event. Most recently, the Biggert-Waters Flood Insurance Reform Act of 2012 enacted major reforms addressing the most pressing structural flaws of the program. The impacts of the bill will not be immediate, but it has laid out a course for reform that includes the gradual removal of subsidies for repetitive loss properties, enforcement of premiums that more accurately reflect risk, revamped mapping initiatives that anticipate the effects of climate change and urbanization, establishment of a reserve fund, and a long-term plan for debt repayment, among other items.[276]

SUMMARY

Despite its glaring financial woes, the NFIP has historically been a success with benefits that, like most mitigation efforts, are obvious yet somewhat difficult to quantify. Protective measures aroused out of NFIP compliance have benefitted society by helping communities to evade potential losses. Inevitable extreme weather events and an expanding society will assuredly increase the risks associated with flooding in the future. As such, stakeholders in the arena of flood mitigation will need to collaboratively seek solutions, preserving the integrity of existing physical structures while implementing effective policy that dissuades development in floodplains better left alone. The NFIP can help in this regard as it shifts towards a more efficient and self-sustaining model, while maintaining the regulatory powers that come with governance. Whether the necessary reforms will take effect soon enough to avoid another plunge into deficit will be told with time, but as of now the program has been extended through 2017.

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[276] Grannis, Jessica. Georgetown Climate Center, "Analysis of How the Flood Insurance Reform Act of 2012 (H.R. 4348) May Affect State and Local Adaptation Efforts." Last modified August 14, 2012. Accessed October 20, 2012. http://georgetownclimate.org.