

Policy Nook

Published 20 January 2017

Federal Funding for Flood Risk Reduction in the US: Pre- or Post-Disaster?

Carolyn Kousky and Leonard Shabman
Resources for the Future, USA
kousky@rff.org; shabman@rff.org

This note documents the spending patterns, requirements, and limitations of the major federal programs funding flood risk reduction in the US. The majority of these funds are appropriated post-disaster through emergency supplemental legislation in response to specific floods and storms. Far less funding comes from programs to reduce risk before a flood. Post-disaster funding has two advantages: (1) it provides dollars for “building back better,” which can be more cost-effective than retrofitting undamaged building stock; and (2) people are more willing to invest in risk reduction when a recent flood makes the risk more salient. However, the chaotic, post-disaster environment may hinder spending funds effectively and efficiently with careful prioritization and scrutiny. In addition, only communities damaged by the disaster receive funds. Since flood and coastal storm risks are projected to increase as the climate warms and development continues, it will be imperative to fund effective, efficient risk reduction and help communities adapt to changing conditions. This may warrant changes to the current funding model. While we focus on US programs, the challenge of when and how much funding to allocate to flood risk reduction is faced by many nations around the world.

1. Introduction

Globally, the annual direct costs of natural disasters averaged around \$100 billion between 2000 and 2012 (Kousky 2014). Of all natural disasters, floods are the

costliest (Miller *et al.* 2008) and have affected the most people (Stromberg 2007). This is also true in the US where, of all natural hazards, floods accounted for the most lives lost and the highest amount of property damage over the 20th century (Perry 2000). Climate change appears likely to increase losses from flooding and coastal storms (IPCC 2012), necessitating higher financial outlays on adaptation (e.g., Parry *et al.* 2009).

Several US federal government programs provide funding for flood risk reduction.¹ Although some programs provide funding pre-flood, the vast majority of funding comes from programs triggered by a presidential disaster declaration tied to the occurrence of a severe flood. These post-disaster funds are often budgeted through emergency supplemental appropriations and targeted almost exclusively at the affected area. Risk reduction funds allocated post-disaster are not subject to the levels of evaluation and prioritization required for the pre-disaster programs. That said, post-disaster funding does allow, in principle at least, for incorporating risk reduction into rebuilding, which can be cost-effective, and targets communities where the flood risk has become salient and caught the attention of residents and local leaders. In this note, we review the federal funding programs for flood risk reduction, documenting their requirements and spending patterns. Although we focus on the US, the challenge of allocating risk reduction dollars in the calm before a disaster or as a part of a response strategy is one faced around the world.

2. Current Funding for Flood Risk Reduction

In this review, we focus on the risk reduction programs that account for the vast majority of federal spending without being exhaustive of all dollars spent. The primary programs are administered by the Federal Emergency Management Agency (FEMA), the US Army Corps of Engineers (the Corps), and the Department of Housing and Urban Development (HUD). We also note some other programs as relevant.² FEMA provides funding for flood risk reduction for households and communities; almost 90% of dollars spent are tied to a presidential disaster declaration. The Corps provides funding for flood hazard reduction infrastructure for communities or regions, but it, too, receives much funding from supplemental legislation. The primary HUD program for household, business, and community flood risk reduction is only funded after a disaster declaration.

¹We use *flood* to include coastal storms, and we use *flood risk reduction* to include *flood hazard mitigation*, a component of *flood risk management*.

²All spending data is reported in fiscal years, which run from October to September (e.g., fiscal year 2015 runs from 1 October 2014 to 30 September 2015).

2.1. Pre-disaster funding

The principal pre-disaster funding programs are run by FEMA and the Corps, with some assistance available through other agencies.

2.1.1. FEMA programs

FEMA administers two pre-disaster funding programs: the Pre-Disaster Mitigation (PDM) program and the Flood Mitigation Assistance (FMA) program. Table 1 provides annual spending in each. The table also shows funding for the Severe Repetitive Flood Claim and the Repetitive Flood Claim grant programs (combined totals shown), which were rolled into the FMA program in 2012.

The PDM program began on a pilot basis in 1997 and was codified in 2000. Eligible projects include retrofitting buildings and relocating structures out of flood-prone areas. Grants are also given to create state and local mitigation plans. To receive PDM funds, the state has to provide 10–25% of the total project cost. In 2003, the US Congress legislated that the funds be awarded on a competitive basis, but a few years later required that each state also receive some minimum grant

Table 1. FEMA Spending on Flood Risk Reduction by Program (millions of 2015 USD)

	Pre-disaster			Post-disaster
	PDM Program	FMA Program	(Severe) Repetitive Flood Claim Program	Hazard Mitigation Grant (HMG) Program
2002	3.3	13.6	—	247
2003	2.1	5.9	—	127
2004	82.2	4.5	—	794
2005	141.8	33.5	—	3,810
2006	89.1	43.8	—	133
2007	46.5	41.9	—	377
2008	38.3	21.3	52.9	2,070
2009	38.1	40.7	83.6	355
2010	30.9	24.6	49.7	467
2011	36.7	72.1	163.7	1,050
2012	41.9	32.8	10.8	2,130
2013	12.4	6.8	—	267
2014	36.7	115	—	55
TOTAL	600	456.5	360.7	11,882

Notes: The table shows spending on flood-related disasters only. Both the PDM and HMG program can also fund other types of disasters and those are not included in the table. PDM grants for which the hazard was unclear or the project addressed multiple hazards are not included here. Dollars are associated with the year of the disaster for HMG funds and the year approved for pre-disaster programs, not the year funds were actually spent.

Source: FEMA's Open Data initiative.

(McCarthy and Keegan 2009). In 2015, \$30 million was available, with each state eligible to receive 1% of the total funding (conditional on having eligible projects or plans) and the rest distributed through a competition.

The FMA program was created in 1994 to reduce flood insurance claims to the federal National Flood Insurance Program. Housed in FEMA, the National Flood Insurance Program is the primary provider of flood insurance nationally. Communities voluntarily join the program, adopting minimum floodplain management regulations; their residents then become eligible to purchase flood insurance policies. Currently, more than 22,000 communities participate, covering the vast majority of at-risk communities nationwide. FMA grants are available only within participating communities and only for properties that have flood insurance. The grants are for projects such as elevation, relocation, or flood-proofing of utilities.³ “Repetitive loss” properties and “severe repetitive loss” properties are prioritized.⁴ FMA is funded from the National Flood Insurance Fund. Proposals are reviewed for engineering feasibility and subjected to a benefit–cost analysis (for severe repetitive loss properties, a “greatest savings to the fund” test can be used, evaluating projects by their ability to reduce flood claims). In fiscal year 2014, \$89 million was available for FMA, and in fiscal year 2015, \$150 million was made available. The local cost-share depends on the loss history of the property.⁵

2.1.2. *Army Corps of Engineers’ programs*

The Army Corps of Engineers provides the bulk of federal funding for flood control planning and infrastructure investments. Its main program in this area is the Flood and Coastal Storm Damage Reduction program, which funds a share of construction costs for flood control projects and studies for prospective projects.⁶ Corps projects typically involve construction of levees, floodwalls, and river channelization. A non-federal entity (typically a state or local government) is responsible for future operations, maintenance, and repair. A project may also contain flood warning systems, flood-proofing, elevation, and buyouts of some structures.

³Small planning grants are also available.

⁴“Repetitive loss” properties have had two or more claims of more than \$1,000 in any rolling 10-year period, and “severe repetitive loss” properties have had four or more claims, with some claims over \$5,000 and with cumulative claims exceeding \$20,000 or two claims exceeding the value of the property. Prior to 2012, separate grant programs targeted mitigation of these two groups of properties.

⁵For severe repetitive loss properties, the program will fund 100% of costs; for repetitive loss properties, it will fund 90%; and for all other insured properties, it will fund 75%.

⁶Mississippi River Valley mainline levees are 100% federally funded.

The Corps spends far less on structural flood control today than it did historically. In inflation-adjusted terms, Corps funding for flood risk management in the 1960s was three times the amount spent in 2010 (Scodari 2014). In 2006, \$713 million was appropriated for such activities, but in 2010 the amount was less than \$554 million (Scodari 2014). Despite the decline, the amount of funding is still an order of magnitude higher than what FEMA spends on flood risk reduction. That said, the dollars are spread across hundreds of projects around the country.

A second, much smaller Corps' program, Floodplain Management Services, provides information on flood hazards, technical services, and planning assistance to other agencies at their request. Under this authority, the Corps has produced reports on flood hazards, hurricane evacuation, flood damage reduction options, and stormwater management, among other topics. The Corps receives more requests than it can fill with the authorized budget for this program. Appropriations for this program ranged from \$5.7 million in 2006 to \$10 million in 2007; the 2010 amount was \$7 million (Scodari 2014).

2.1.3. NOAA programs

The National Oceanic and Atmospheric Administration (NOAA) also has a relatively small, planning-focused program: Coastal Resilience Grants. This program promotes regional resilience in coastal communities and aims to reduce the damage of extreme weather by funding activities that improve preparation, response, or recovery. Available to universities, regional groups, non-profits, businesses, and state, local, and tribal governments, the grants range from \$500,000 to \$1 million; a cost-share is required. Proposals are judged by the extent of regional coordination, how well resources are leveraged, and whether the project creates environmental and economic benefits. The first round of grants were given in February 2016; since then, the program has dedicated \$9 million to 12 projects spanning 19 states and 200 coastal communities.

2.2. Post-disaster funding

When a disaster is severe enough to exceed a state's capacity to respond, a governor can request a disaster declaration from the president. When a declaration is issued, it authorizes FEMA to spend money on certain disaster assistance programs, one of which is targeted entirely at risk reduction. For years where there are multiple disasters or particularly severe events, Congress will appropriate additional funding for FEMA in supplemental legislation and also usually appropriate funding for post-disaster programs in other agencies, as well, such as HUD and the

Corps. This will include funds, not just for immediate recovery, but also for broader investments in risk reduction, as discussed here.

2.2.1. FEMA programs

A disaster declaration authorizes one or both of two FEMA assistance programs: Individual Assistance and Public Assistance. While Individual Assistance is authorized in just under half of declarations on average, Public Assistance is authorized in just over 90% of declarations. The Individual Assistance program provides small grants to households for immediate recovery and repairs and Public Assistance goes to local governments to help with activities such as debris clean up, emergency protective measures, and repair of public buildings. Individual Assistance funds are limited and not for implementation of risk reduction measures. Public Assistance funds can be used for risk reduction,⁷ but repair and recovery account for the primary use of the dollars. FEMA funds all these programs from the Disaster Relief Fund, which receives annual appropriations, but which requires additional funding from Congress in high loss years.

Once a disaster declaration is issued, FEMA also is required to fund risk reduction through the Hazard Mitigation Grant Program (HMGP). This program dedicates a percentage of total disaster assistance funding to risk reduction activities in the impacted areas.⁸ HMGP projects must advance a state's hazard mitigation plan, meet environmental and historical regulations, be cost-effective, and not involve temporary solutions (e.g., sandbagging) (GAO 2015). Examples of funded projects include property acquisition and conversion to open space, elevation, localized flood control, and disaster retrofitting. HMGP funding from 2002 to 2014 is shown in Table 1. In all years except 2014, HMGP spending exceeded pre-disaster spending, with outlays up to 25 times the total for FEMA's pre-disaster programs. Across all these years, post-disaster spending is 89% of the total dollars FEMA spent on flood risk reduction through these programs.

For property owners with a flood insurance policy through FEMA's National Flood Insurance Program, there is post-flood funding to bring a structure into compliance with current building codes. Through the Increased Cost of Compliance coverage, \$30,000 is available to properties in mapped 100-year floodplains when

⁷For example, after Hurricane Sandy, Public Assistance dollars helped build a flood wall and relocate critical equipment at the largest wastewater pumping station in New Jersey (GAO 2015). The available data do not distinguish between funding for risk reduction versus immediate repair and recovery.

⁸HMGP shares are 15% of the first \$2 billion of federal aid given, 10% for aid between \$2 billion and \$10 billion, and up to 7.5% for amounts exceeding \$10 billion (not more than \$35.3 billion). There is a 25% required state cost-share.

the home is substantially damaged (more than 50% of the home value) by a flood or for any repetitive loss property. This can be used to elevate structures, relocate them, or floodproof them (floodproofing is only for non-residential properties).

2.2.2. HUD programs

Another potentially large source of post-disaster funds is the Community Development Block Grant — Disaster Relief (CDBG-DR) program, administered by HUD (Kousky and Shabman 2013). CDBG-DRs are funded entirely by supplemental legislation after a disaster. HUD determines how much to give each recipient (usually a state), and the funds are often disbursed in phases, based on an assessment of damage and need. An eligible state or local government must submit an action plan for HUD’s approval, detailing how it will spend the money. Local governments have considerable flexibility. Eligible activities include replacement or repair of housing, activities that foster economic development, debris cleanup, infrastructure repair and improvement, and the prevention of future damage to affected areas. Like the non-disaster CDBG program, a portion of the funds (as much as 70%) must primarily benefit low- or moderate-income households. For the disaster relief grants, the percentage is often lowered (for Sandy it was 50%).

Funding for CDBG-DR began in 1992 and has increased over the years (Fig. 1). The spike of \$16.7 billion in 2006 was for victims of Hurricanes Katrina, Rita, and

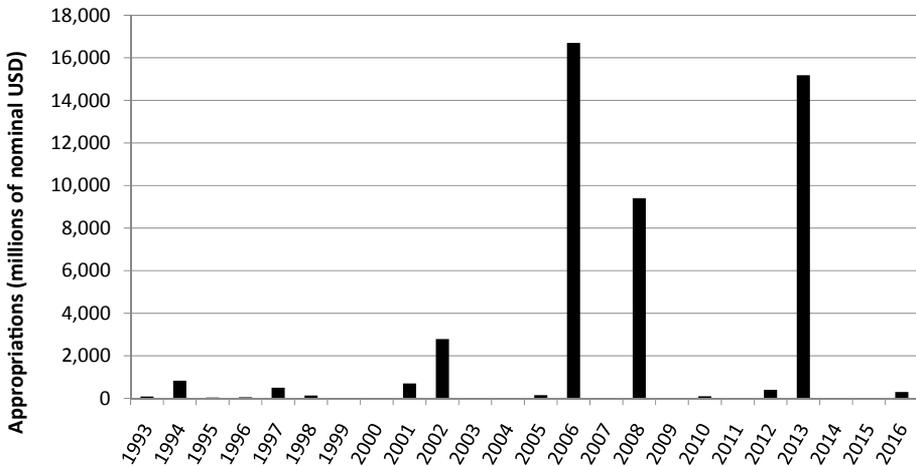


Figure 1. Annual CDBG-DR Appropriations (Millions of Nominal USD)

Notes: This is funding for all disasters, not just floods. The bulk of funding, though, has been for large storms, such as the 2005 hurricanes, Hurricane Ike, and superstorm Sandy. (Appropriations may be in the fiscal year following the disaster.)

Source: HUD’s CDBG-DR website.

Wilma. In 2008, \$6.1 billion was appropriated for Hurricanes Ike, Gustav, and Dolly. In 2013, just over \$15 billion was appropriated for superstorm Sandy.⁹ While CDBG-DR dollars can be used for recovery, often a large share of the dollars fund risk reduction. For example, after floods on the Missouri and Mississippi rivers in 1993, CDBG-DR funds were used in combination with FEMA HMGP funds to acquire floodplain property and convert it to open space (Boyd 2010). CDBG-DR dollars were also used for such buyouts after Hurricane Sandy, as well as other types of hazard mitigation. Indeed, HUD sought to promote risk reduction investments in its announcement of the Sandy CDBG-DR funding, stating that it “strongly encourages grantees to incorporate preparedness and mitigation measures into all rebuilding activities, which helps to ensure that communities recover to be safer, stronger, and more resilient” (78 Fed. Reg. 14335, 2013). However, the data are not available to determine the funding split between short-term recovery and longer-term risk reduction in CDBG-DR spending.¹⁰

2.2.3. *Army Corps of Engineers’ programs*

The Corps of Engineers administers the Emergency Management Program to help flooded communities return to pre-flood conditions. This program is funded through disaster supplemental appropriations. Most funds are used to repair structures and for flood-fighting activities (Scodari 2014). However, the program has occasionally funded “build back stronger” projects, such as after Hurricane Katrina. Funding for these Corps activities has skyrocketed in recent years. Total supplemental appropriations between 2005 and 2010 (\$11.5 billion) were more than regular appropriations (\$9.5 billion). This is a further evidence of the growing role of supplemental legislation in funding US disaster risk reduction.

2.2.4. *Other agency programs*

Occasionally, some one-off programs fund flood and coastal risk reduction after a disaster. For example, as part of the \$50 billion supplemental legislation passed in response to Hurricane Sandy, the Department of Transportation received nearly \$11 billion for relief, recovery, and resilience investments. As another example, the US Department of Agriculture’s Emergency Watershed Protection program received \$99 million for conservation easement purchases after Hurricane Sandy.

⁹Congress appropriated \$16 billion, but this was reduced to \$15.18 due to the sequester.

¹⁰Neither HUD nor the recipients provide this information. When examining individual programs funded by CDBG-DR, we were still unable to isolate risk reduction from recovery spending because many programs fund both.

3. Discussion

The vast majority of US federal funding for flood risk reduction is provided *after* a flood has occurred, is generally limited to the recovering area, and is paid for through emergency supplemental appropriations. For FEMA, almost 90% of flood risk reduction funding comes after a big flood and the HUD CDBG-DR funding is only after a major disaster. Across agencies, absent a severe flood, very few dollars for risk reduction are available.

A post-disaster approach for investing in future risk reduction has two advantages. First, it can be more cost-effective to incorporate retrofits and other hazard mitigation measures into rebuilding than to make changes to an otherwise sound structure. The aftermath of a disaster also creates an opportunity to reconsider development patterns where structures are damaged or destroyed. Second, communities and individuals often have the most interest in reducing the risk of natural hazards after a disaster has made the risk more salient. Before a disaster has occurred, the risk is often dismissed or simply not a priority. A flood draws attention to a risk and creates political will to address it. For example, homeowners and communities that have been flooded or experienced a hurricane in the past are more likely to implement risk reduction measures (e.g., [Laska 1986](#); [Pynn and Ljung 1999](#); [Sadowski and Sutter 2008](#)).

A post-disaster funding approach, however, also has downsides. One is the haphazard nature of extreme events. By simply funneling money to the impacted area, funds are not necessarily targeted at areas of greatest risk for future flooding. If the same level of flood risk reduction dollars were allocated in the calm before a disaster hits, projects could be prioritized by cost-effectiveness, risk level, equity, or other important considerations. This could achieve greater national risk reduction at less cost, for more people, and for those who need it most. Indeed the unmet requests for the PDM dollars that are available suggest that there are at-risk places that do not need a severe flood to make them willing to invest in lowering risk.

A second downside of the post-disaster approach is that enormous sums of money right after a disaster can overwhelm local governments, which are expected to allocate these funds wisely amid the chaos of recovery. Many post-disaster programs, from Louisiana to New York, have faced accusations of wasted money, failure to meet goals or expectations, or outright mismanagement (e.g., [Warner 2015](#); [Gelinias 2016](#)). Problems after Hurricane Sandy included failure to consider household needs and preferences in approving projects and limitations in the size and scope of projects that could be funded, potentially undermining overall cost-effectiveness and compromising overall risk reduction ([GAO 2015](#)).

The current model may also cause perverse incentives, since federal funding tends to flow to communities that have done little to manage their risk and thus face higher losses when a flood occurs. “Good actors” that have invested their own dollars in risk reduction may be less likely to receive a presidential disaster declaration if their actions have effectively reduced damages, or if one is issued, they may get less funding.

Finally, because most federal funds for flood risk reduction are appropriated post-disaster and are outside the normal budgetary process, they often escape rigorous scrutiny and analysis. In contrast, before a disaster hits, there is time for careful program planning and development. But the political reality is that presidential administrations and the Congress have been reluctant to increase budgets for flood risk reduction plan development and funding on sunny days. In absence of a triggering event, funds have been limited. The large expenditures post-flood, however, demonstrate that this federal funding model does not keep spending down over time.

We recommend a conscious reallocation of federal funds, based on historical spending, in order to increase pre-flood risk reduction program budgets. Post-flood spending could then be limited to immediate recovery and risk reduction that can be cost-effectively incorporated into rebuilding. Additionally, more guidelines on using and funding risk reduction post-disaster could help allocate these funds more effectively. This could enable new investments in flood risk management to benefit from pre-flood planning and analysis, focusing federal dollars on the highest risk areas in a cost-effective way.

Acknowledgment

We would like to thank Brett Lingle for excellent research assistance.

References

- Boyd, E (2010). Community Development Block Grant Funds in Disaster Relief and Recovery. Washington, DC: Congressional Research Service.
- Gelinas, N (2016). The real scandal of New York City’s Sandy recovery. *New York Post*, 25 September.
- Government Accountability Office (GAO) (2015). Hurricane Sandy: An investment strategy could help the federal government enhance national resilience for future disasters. Washington, DC.
- Intergovernmental Panel on Climate Change (IPCC) (2012). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. Cambridge: Cambridge University Press.

- Kousky, C (2014). Informing climate adaptation: A review of the economic costs of natural disasters. *Energy Economics*, 46, 576–592.
- Kousky, C and L Shabman (2013). A new era of disaster aid? Reflections on the Sandy Supplemental. Issue Brief 13-05. Washington, DC: Resources for the Future.
- Laska, SB (1986). Involving homeowners in flood mitigation. *Journal of the American Planning Association*, 52(4), 452–456.
- McCarthy, FX and N Keegan (2009). FEMA’s Pre-Disaster Mitigation Program: Overview and issues. Washington, DC: Congressional Research Service, 10 July.
- Miller, S, R Muir-Wood and A Boissonnade (2008). An exploration of trends in normalized weather-related catastrophe losses. In: *Climate Extremes and Society*, HF Diaz and RJ Murnane (eds.), pp. 225–247. Cambridge: Cambridge University Press.
- Parry, M, N Arnell, P Berry, D Dodman, S Frankhauser, C Hope, S Kovats, R Nicholls, D Satterthwaite, R Tiffin and T Wheeler (2009). *Assessing the Costs of Adaptation to Climate Change*. London: Imperial College, Grantham Institute for Climate Change.
- Perry, CA (2000). Significant floods in the United States during the 20th century—USGS measures a century of floods. USGS Fact Sheet 024–00. Lawrence, KS: US Geological Survey.
- Pynn, R and GM Ljung (1999). Flood insurance: A survey of Grand Forks, North Dakota homeowners. *Applied Behavioral Science Review*, 7(2), 171–180.
- Sadowski, NC and D Sutter (2008). Mitigation motivated by past experience: Prior hurricanes and damages. *Ocean and Coastal Management*, 51(4), 303–313.
- Scodari, P. (2014). Appendix D: U.S. Army Corps of Engineers Flood Risk Management Programs. In: *From Flood Damage Reduction to Flood Risk Management: Implications for U.S. Army Corps of Engineers Policy and Programs*. P Scodari and L Shabman (eds.) Alexandria, VA: Institute for Water Resources, US Army Corps of Engineers.
- Stromberg, D (2007). Natural disasters, economic development, and humanitarian aid. *Journal of Economic Perspectives*, 21(5), 199–222.
- Warner, J (2015). The long road home. *International Business Times*, 26 August.