

FEMA to Play Long-Term Role in Recovery from Harvey

By Rachel Brasier and Jesse Thompson

ABSTRACT: Federal disaster assistance following Hurricane Harvey has emphasized immediate recovery costs but will likely shift its focus to infrastructure improvements. The timeline for FEMA's aid program appears to be evolving while increasingly frequent extreme weather events test local disaster-management planning.

Hurricane Harvey, the second-costliest storm to strike the U.S., slammed into Port Aransas and Rockport, Texas, around 10 p.m. on Aug. 24, 2017. It spent the next days meandering over the central and southeastern Texas Gulf Coast, inundating the Houston and Port Arthur-Beaumont metropolitan areas with as much as 51 inches of rain.

The storm overwhelmed flood control infrastructure with an estimated total water volume approaching 11 trillion gallons. Of the 277,000 Texas homes affected, about 148,000 were damaged and 11,000 destroyed.¹ Individuals and state and local agencies turned to many sources of funding in their search for assistance, chief among them the Federal Emergency Management Agency (FEMA).

The massive scale of a megastorm such as Harvey complicates the assessment of overall costs, especially for FEMA, an agency that handles both immediate impacts and preparedness for possible future events through individual assistance, public assistance and hazard mitigation grant programs.

Individual assistance provides survivors with funding for housing and other disaster-related expenses. Public as-

sistance, FEMA's largest grant program, reimburses a share of public works projects' costs to reduce the burden on state and local governments. Hazard mitigation grants fund community efforts to minimize the long-term risks of natural disasters to people and property.

Harvey recovery is far from completed. FEMA has told Congress it plans to approve \$6.4 billion for Harvey disaster relief, including individual assistance, public assistance and mitigation, by Sept. 30, 2018 (*Table 1*).²

More broadly, amendments to the 2018 federal budget—the fiscal year that began Oct. 1, 2017—added \$42.2 billion to the initial \$12.8 billion authorized for FEMA disaster relief programs.³

There can be a wide variance in the timeline for recovery from large storms: \$30.5 billion was committed in the year following Hurricane Katrina in 2005, \$13.4 billion of which supported individual assistance efforts.⁴ The agency awarded about \$6.5 billion in 2012 following Hurricane Sandy.⁵

Once grants are allocated for hurricanes, it has historically taken about eight years for the expenditure process to run its course. For example, FEMA approved eight hazard mitigation grants totaling \$60 million to Harris County in

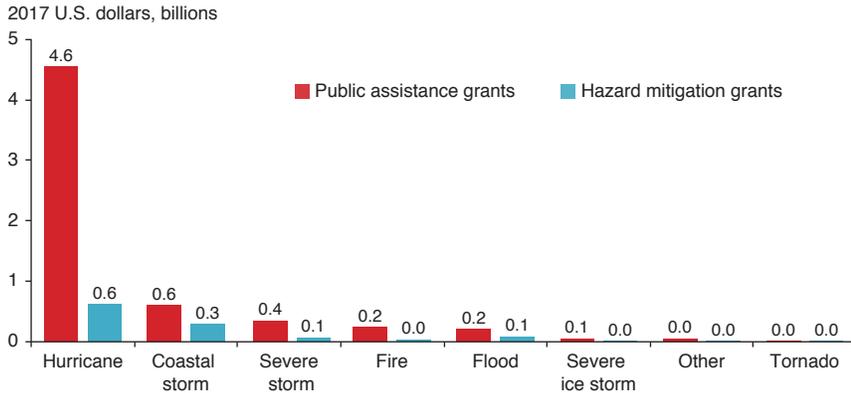
TABLE 1 Harvey Individual Assistance to Grow Modestly, Public Assistance to Double by September 2018

	Actual obligations through March 31, 2018 (in millions)	Projected totals through Sept. 30, 2018 (in millions)
Individual assistance	\$2,804	\$2,969
Public assistance	\$638	\$1,269
Hazard mitigation	\$17	\$43
Operations	\$188	\$264
Administrative	\$1,477	\$1,806
Total	\$5,124	\$6,351

SOURCE: Federal Emergency Management Agency May 2018 Disaster Relief Fund Report.

CHART
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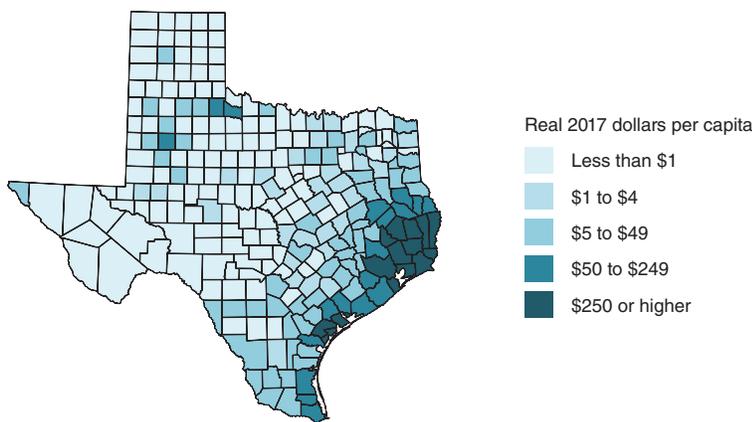
Majority of FEMA State Aid Funding in Texas Allocated to Hurricanes



NOTES: Records begin August 1998 and include obligated grants for disasters declared through December 2017. Totals reflect rounding. The chart excludes other types of Federal Emergency Management Agency (FEMA) grants, including for individuals.
SOURCES: Bureau of Labor Statistics; FEMA; authors' calculations.

MAP
1

Hurricane-Related State Aid Funding Saturates Coast



NOTES: Records begin August 1998 and include obligated grants for disasters declared through December 2017. Hurricane-related funding includes public assistance grants distributed in response to hurricane and coastal storm events.
SOURCES: Bureau of Labor Statistics; Census Bureau; Federal Emergency Management Agency; authors' calculations.

response to Hurricane Ike, which struck the Houston–Galveston area in September 2008. Of those, only three projects with a combined federal share of \$7.5 million have been closed out.⁶

Providing Aid to Texas

Public assistance, FEMA's largest grant program, provides funds to aid communities' recovery from major disasters or emergencies declared by the president. The program funds emergency assistance to save lives and protect property and, separately, for perma-

nent restoration of infrastructure.

More public assistance grant money in Texas is attributable to hurricanes than to all other disaster types combined (*Chart 1*).⁷ Longer-term hazard mitigation grants for improvements to existing infrastructure, often tied to specific storm events, are more evenly distributed across disaster types, although hurricanes and coastal storms garner the largest share.

Hurricanes and coastal storm events, mostly in southeastern Texas, since 1998 have generated \$5.2 billion in public

assistance grants (in real 2017 dollars) out of the \$6 billion sent to Texas. Harris County, the state's most-populous county, received \$1.8 billion, followed by Galveston County (\$511 million), Jefferson County (\$243 million), Chambers County (\$88 million) and Orange County (\$70 million) (*Map 1*).

By comparison, non-hurricane-related grants—for disasters such as the inland flooding during the Memorial Day 2015 storms or the 2011 Bastrop area wildfires—totaling \$809 million were awarded to 240 of Texas' 254 counties. The largest recipients were McLennan County (\$34 million), Travis County (\$24 million) and Bastrop County (\$24 million).⁸

Hazard Mitigation Grants

The FEMA Hazard Mitigation Grant Program works with local jurisdictions to prevent disruption of basic services. Grants are awarded on a competitive basis nationally to shore up infrastructure. These expenditures have not entirely followed traditional storm paths. Notably, New York and Louisiana together received nearly half of all public assistance grants largely due to Sandy and Katrina, but just over 2 percent of all pre-disaster mitigation grants (*Chart 2*).

Conversely, California received 13 percent of all pre-disaster mitigation money—mostly for retrofitting public structures to withstand earthquakes—but less than 3 percent of all public assistance grants. Texas received roughly equivalent shares.⁹ Relatively low amounts in Texas, Florida and Puerto Rico likely reflect incomplete data following the 2017 hurricane season.

FEMA grant assistance relative to overall disaster cost varies widely. Katrina, the nation's costliest hurricane at an estimated \$164 billion in real 2017 dollars, prompted \$24 billion in FEMA public assistance and hazard mitigation funding—about 14 percent of the total cost.¹⁰

The second-costliest hurricane, Harvey, with an estimated price tag of \$76 billion, led to appropriation of \$655 million in FEMA public assistance and hazard mitigation grants as of March 30, 2018, though the amount will

likely increase with review of pending projects.¹¹ Meanwhile, Sandy, the third-costliest hurricane at \$72 billion, generated \$18 billion for recovery and mitigation public works projects from FEMA, or 26 percent of the total cost. Ike, with estimated damages of \$35 billion, garnered \$3 billion, or 10 percent.¹²

What Comes Next

Harvey's record flooding followed two other Houston-area water disasters, the Memorial Day flood in 2015 and the Tax Day floods in 2016. These events, which were preceded by drought and heat waves across the state, have brought increased attention to the probable effects of climate change and to applications for project grants to help mitigate future extreme events.

Houston-area officials are taking a hard look at a variety of measures to control inland flooding.¹³ Among them are upgrades to the Addicks and Barker reservoirs in the western suburbs and creation of a new reservoir to improve rain water retention and limit downstream flooding.¹⁴

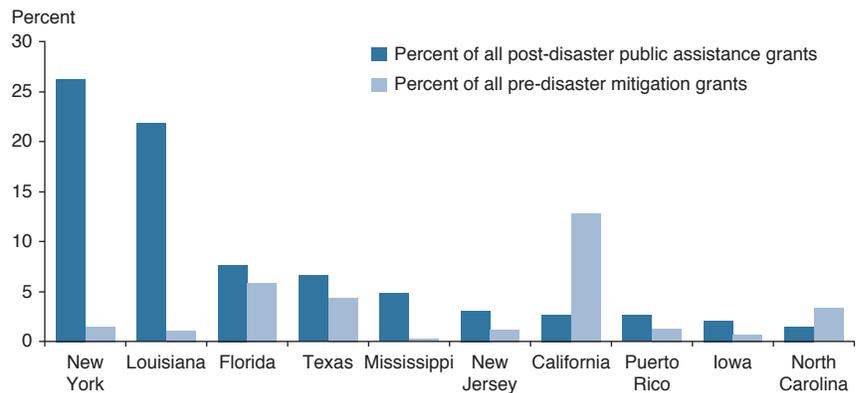
Another measure involves leveraging plans to expand green space along the bayous—the relatively small and typically slow-moving streams that carry rainwater to the Gulf of Mexico—to expand their capacity while providing increased green space for residents.¹⁵

One of the more ambitious mitigation plans aims to reduce catastrophic damage from storm surge during hurricanes. The “coastal spine” is a 17-foot-tall barrier to prevent major storm surges from breaching Galveston Bay and the Houston Ship Channel where critical refining, petrochemical and transportation infrastructure could be at risk. While Harvey did not inflict such damage, Hurricane Ike did, and 10 years later, no new protections have been built.¹⁶

Other suggestions include increased buyouts of properties that repeatedly flood. Houston was identified as an outsized source of repetitive flood-related losses as far back as 1998. Severe repetitive flood-loss claims in Texas totaled more than \$200 million prior to Harvey; the figure increased by \$111 million after Harvey.¹⁷

CHART 2

Pre- and Post-Disaster State Aid Funding Varies Between States



NOTES: Records begin August 1998 and include obligated grants for disasters declared through December 2017. The chart shows the percent of all Federal Emergency Management Agency (FEMA) grants (inflation-adjusted) awarded to U.S. states and territories during that period.

SOURCES: Bureau of Labor Statistics; FEMA; authors' calculations.

Whatever measures are selected, the Houston area's major recent flooding events underscore the importance of a local response in addition to federal grant funding. While there is interest in public works projects to limit storm risk, surveys by the University of Houston and Rice University found that less than half of respondents were willing to pay higher taxes to aid the adoption of flood prevention proposals.¹⁸

Plans for Future Calamities

As the Texas Gulf Coast considers what preparations might best help it weather future hurricanes, FEMA evaluates its funding policies in terms of the agency's long-term financial health.¹⁹

Hazard mitigation grants are intended to reduce the total cost—and therefore the federal public assistance cost—of subsequent disasters. However, FEMA has awarded \$90.7 billion (real 2017 dollars) in public assistance grants since 1998. This begs the question of whether local residents, businesses and governments may systematically underestimate the investment necessary to protect themselves from flood- and storm-related losses, in part because they believe the federal government will cover the majority of costs.

If FEMA tightens its standards for grant eligibility to reduce its spending, building resilience through investing in

mitigation may prove to be a more cost-effective safeguard for local businesses and residents.

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Notes

¹ Data from “DSO Spreadsheet 17-0021 Harvey 2017 112917,” Texas Division of Emergency Management, Nov. 29, 2017.

² “May 2018 Disaster Relief Fund Report,” Federal Emergency Management Agency, May 5, 2018, www.fema.gov/media-library/assets/documents/31789.

³ See note 2.

⁴ “Oversight of Gulf Coast Hurricane Recovery: A Semiannual Report to Congress,” President's Council on Integrity and Efficiency and Executive Council on Integrity and Efficiency, October 2006, www.ignet.gov/sites/default/files/files/hksemi0906.pdf.

⁵ “Disaster Relief Fund: Fiscal Year 2013 Report to Congress,” Federal Emergency Management Agency, Oct. 21, 2013, www.fema.gov/media-library/assets/documents/31789.

⁶ Data from OpenFEMA Dataset, Hazard Mitigation Assistance Projects—V1, Federal Emergency Management Agency, accessed April 17, 2018, www.fema.gov/openfema-dataset-hazard-mitigation-assistance-projects-v1.

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⁷ Data from OpenFEMA Dataset, Public Assistance Funded Projects Details–V1, Federal Emergency Management Agency, accessed April 23, 2018, www.fema.gov/openfema-dataset-public-assistance-funded-projects-details-v1.

⁸ See note 7.

⁹ See note 6.

¹⁰ Data from National Centers for Environmental Information, Billion-Dollar Weather and Climate Disasters: Table of Events, National Oceanic and Atmospheric Administration, accessed April 23, 2018, www.ncdc.noaa.gov/billions/events/US/1980-2017. Also see note 7.

¹¹ We use Moody's Analytics' estimate for Hurricane Harvey damages. The National Oceanic and Atmospheric Administration, whose estimates we use for all other storms, estimates damages of \$125 billion. See "U.S. Disaster Costs Come Into Clearer Focus," by Adam Kamins, *Today's Economy*, Moody's Analytics, Oct. 27, 2017, [www.economy.com/dismal/analysis/](http://www.economy.com/dismal/analysis/todays-economy/298539/US-Disaster-Costs-Come-Into-Clearer-Focus)

[todays-economy/298539/US-Disaster-Costs-Come-Into-Clearer-Focus](http://www.economy.com/dismal/analysis/todays-economy/298539/US-Disaster-Costs-Come-Into-Clearer-Focus).

¹² See note 10.

¹³ See "On the Record: A Conversation with Judge Ed Emmett," Federal Reserve Bank of Dallas *Southwest Economy*, Fourth Quarter, 2017.

¹⁴ For more information, see "Strategies for Flood Mitigation in Greater Houston, Edition 1," Greater Houston Flood Mitigation Consortium, April 10, 2018, <http://houstonconsortium.org/p/report>.

¹⁵ See "Houston's City-Beautification Efforts Might Also Fight Future Flooding," by Stephen Paulsen, *Grist*, Jan. 11, 2018, <https://grist.org/article/houstons-city-beautification-efforts-might-also-fight-future-flooding>.

¹⁶ See "Protecting the Houston–Galveston Region from Coastal Flooding: A Systems Approach (H-GAPS)," by Larry Dunbar, Severe Storm Prediction, Education and Evacuation from Disasters Center, Rice University, Feb. 22, 2018, http://sspeed.rice.edu/sspeed/downloads/2018_Conference/presentations/D2-16.%20Dunbar.pdf.

¹⁷ "Flood Insurance Policies Grow in Texas after Hurricane Harvey," by Mark Collette, *Houston Chronicle*, Feb. 22, 2018, www.chron.com/business/article/Flood-insurance-policies-grow-in-Texas-after-12653753.php.

¹⁸ "Flooding Is Seen as a Regional Problem. What About Its Solutions?" by Leah Binkovitz, Kinder Institute Research, Rice University, April 23, 2018, <https://kinder.rice.edu/2018/04/17/flooding-seen-regional-problem-what-about-its-solutions>; "Hobby School Survey Details Houston's Harvey Experience," by Jeannie Kever, Hobby School of Public Affairs, University of Houston, Feb. 12, 2018, www.uh.edu/news-events/stories/2018/february-2018/02122018Hobby-School-Harvey-Survey.php.

¹⁹ Electronic Code of Federal Regulations: Title 44, Chapter I, Subchapter D, Part 206, Subpart B 48, Office of the Federal Register; "Federal Disaster Assistance After Hurricanes Katrina, Rita, Wilma, Gustav and Ike," Federation of American Scientists, May 1, 2018, Congressional Research Service Report for Congress R43139, www.hsdl.org/?abstract&did=810267.



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