

Rebuilding for Resilience  
by Julia Piraino



Hurricane Florence floods Trenton, NC, Sept. 16, 2018<sup>1</sup>

Steve Hebler/AP

In the wake of Hurricane Florence, FEMA (the Federal Emergency Management Agency) is poised to pay out millions in insurance claims to residents of Virginia and the Carolinas, the states hit hardest by the tropical cyclone. Houses will be rebuilt, critical infrastructure will be restored, and buildings along the coast will be stilted to higher elevations based on the latest floodwaters. But is such reconstruction the best use of federal funds?

Certainly, it allows people to return to their homes and businesses to quickly resume the vital functions of their daily lives. But simply rebuilding things as they were adds no resilience to the communities to prepare them for the next storm. And the next storm *will* come: bigger, badder, and more destructive than the last. Precipitation modeling is becoming increasingly difficult as the planet warms and weather patterns shift, but there is a clear trend toward more severe tropical cyclones—which could mean big trouble for much of our nation’s infrastructure.

Engineers design structures to withstand hypothetical events like the 25-year, 50-year, or 100-year storm. Engineers base these “design storms” on regional precipitation data from the past several decades, but predictions made from historical data can’t account for the rapid atmospheric changes caused relatively recently by climate change. According to a study by researchers at MIT and Princeton, a road designed for a 100-year storm could actually be facing that level of precipitation as frequently as once per decade.<sup>2</sup> This increased precipitation is one reason the impacts of recent hurricanes have been so severe. For many whose livelihoods are damaged by tropical cyclones, the National Flood Insurance Program (NFIP), which is managed by FEMA, offers much-needed relief. But the program has some major flaws.

For one thing, the flood maps FEMA uses to determine insurance rates are quickly becoming outdated, due to both the inability of design storms to account for climate change as well as simple human error. Although FEMA attempts to limit these errors by updating its maps every five years, a 2017 investigation by the Department of Homeland Security's Inspector General found that 58% of FEMA's flood maps are inaccurate or out-of-date.<sup>3</sup>

More importantly, FEMA spends billions just to keep things as they are. Even after the Treasury forgave the \$16 billion debt incurred in the aftermath of Hurricanes Harvey, Irma, and Maria, the NFIP remained over \$20 billion in debt.<sup>3</sup> FEMA has several programs dedicated to mitigation, but those programs have spent just \$15.5 billion since their inception—a paltry sum when compared to the \$16.9 billion spent recovering from Hurricane Sandy in New York alone.<sup>5,6</sup> And it has spent \$5.5 billion rebuilding (and re-rebuilding) what are called “severe repetitive loss properties”—over 30,000 buildings which flood an average of five times every two to three years.<sup>7</sup>

What would happen if we were to spend that money preventing flood damage from occurring in the first place? Engineered solutions for long-term flood prevention are not beyond our grasp. Such measures have been implemented successfully around the world. Take, for instance, the Thames Barrier, a flood barrier that stretches 520 meters across the Thames to protect London from high tides and surges from the North Sea.<sup>8</sup> Flood barriers are large and costly pieces of infrastructure, but they're vital for protecting high-density areas that would cost even more to relocate or elevate. The US already has one major flood barrier—the IHNC Lake Borgne Surge Barrier in New Orleans—but there are a number of other cities that could be similarly protected. Proposed barriers, like the one across New York's East River or the “Ike Dike” in Texas' Galveston Bay, are worth more serious consideration. Each would require a significant commitment of time and funding, but it beats sinking money into properties that will continue to flood.

Flood infrastructure like seawalls, flood barriers, and artificial dunes can be effective in the short term, but they're only delaying the inevitable. As sea levels rise, the ocean will erode our defenses (and may even overtop dams and floodgates, depending on how long we allow polar ice to go on melting).<sup>9</sup> The most permanent solutions aren't those that keep the water out—they're the ones that give the water a place to *go* when it comes raining down or rising up from the ocean.

One way to provide space for water is to create reservoirs, which can detain water during times of high rainfall and gradually release them to an adjoining body of water. This approach has succeeded in Glasgow, Scotland, where the City Council opted to manage floodwaters from the River Cart by constructing three storage reservoirs with a cumulative capacity of 2.6 million cubic meters.<sup>10</sup> Alternatively, infiltration basins can detain water and release it gradually into the

ground, where it joins with the area's existing groundwater. Urban stormwater systems are also capable of storing floodwaters, but a lot of those are due for an upgrade. For instance, an increase in the capacity of Boston's separated stormwater system could prevent floods like the ones brought on by Nor'easters in January and March of 2018.<sup>11</sup>

The best option is to develop floodplains where rivers can flood safely and naturally. The Netherlands' "Room for the River" project accomplished this by moving back dikes and relocating residents to create a riparian buffer in select sections of the Rhine river delta.<sup>11</sup> Now the river can swell and shrink as needed. In the US, where so many communities encroach severely on the floodplains of major rivers, such a project might require thousands of people to relocate. Such an effort may not be practical in the short-term, but FEMA could at least invest more in buying people out of homes in the most flood-prone areas of the country. As it stands, FEMA spends just \$1.72 relocating people for every \$100 it spends rebuilding homes.<sup>7</sup>

Our nation has many options for managing floods. But whichever combination of strategies we choose, we'd better choose it quickly. Each new storm reveals more plainly that the current system simply isn't working. We can no longer afford to balk at the price tag of lifesaving infrastructure when its feasibility is proven by successful projects around the world, nor can we afford to sustain repetitive loss properties. Disaster gives us the rare opportunity to rebuild things better than they were before. We need to stop playing catch-up to fix what floods break and start building thoughtful, lasting solutions that prevent that damage from happening at all.

## References

1. WUNC News. PHOTOS: Florence Leaves Inundated Streets As Rivers Continue To Rise Across NC. WUNC. 2018 Sep 17 [accessed 2018 Oct 19]. <http://www.wunc.org/post/photos-florence-leaves-inundated-streets-rivers-continue-rise-across-nc#stream/0>
- 2.. Chu J. 'Storm of the Century?' Try 'Storm of the Decade'. MIT News. 2012 Feb 13 [accessed 2018 Oct 19]. <http://news.mit.edu/2012/storm-of-the-decade-0213>
3. Scata J. FEMA's Outdated and Backward-Looking Flood Maps. NRDC. 2017 Oct 12 [accessed 2018 Oct 19]. <https://www.nrdc.org/experts/joel-scata/femas-outdated-and-backward-looking-flood-maps>
4. National Flood Insurance Program Borrowing Authority. 2018 Sep 10 [accessed 2018 Oct 19]. <https://fas.org/sgp/crs/homesec/IN10784.pdf>
5. FEMA Mitigation Grants Program Eclipses \$15 Billion in Helping Communities Rebuild, Recover and Avoid Future Losses. FEMA Mitigation Grants Program Eclipses \$15 Billion in Helping Communities Rebuild, Recover and Avoid Future Losses | FEMA.gov. 2018 Mar 6 [accessed 2018 Oct 19]. <https://www.fema.gov/news-release/2018/03/06/fema-mitigation-grants-program-eclipses-15-billion-helping-communities#>
6. FEMA aid reaches \$16.9 billion for New York's Hurricane Sandy Recovery. FEMA aid reaches \$16.9 billion for New York's Hurricane Sandy Recovery | FEMA.gov. 2015 Oct 21 [accessed 2018 Oct 19]. <https://www.fema.gov/news-release/2015/10/21/fema-aid-reaches-169-billion-new-yorks-hurricane-sandy-recovery>
7. Moore R. Seeking Higher Ground: Climate Smart Solutions to Flooding. NRDC. 2017 Aug 3 [accessed 2018 Oct 19]. <https://www.nrdc.org/experts/rob-moore/seeking-higher-ground-climate-smart-solutions-flooding>
8. The Thames Barrier. GOV.UK. 2014 Apr 25 [accessed 2018 Oct 19]. <https://www.gov.uk/guidance/the-thames-barrier>
9. Coping with Rising Sea Levels. World Ocean Review. 2017 [accessed 2019 Apr 5]. <https://worldoceanreview.com/en/wor-5/improving-coastal-protection/coping-with-rising-sea-levels/>
10. Catchment management approach to flash flood risks in Glasgow (2017). Climate Adapt. 2017 [accessed 2019 Oct 19]. <https://climate-adapt.eea.europa.eu/metadata/case-studies/catchment-management-approach-to-flash-flood-risks-in-glasgow>
11. Ellis R. Boston streets flooding as nor'easter pounds New England. CNN. 2018 Mar 3 [accessed 2019 Apr 5]. <https://www.cnn.com/2018/03/02/us/boston-flooding/index.html>
12. Ruimte voor de Rivier. Ruimte voor de Rivier. Rijkswaterstaat. [accessed 2019 Apr 5]. <https://www.ruimtevoorderivier.nl/english/>