Testimony for the U.S. House Committee on Transportation & Infrastructure Hearing on "Building a 21st Century Infrastructure for America"

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Why Resilience is Important?

Thank you to the distinguished members of the House Transportation and Infrastructure Committee for inviting me to testify on this important topic of the resilience of our nation's infrastructure systems. My name is Jessica Grannis. I manage the adaptation program for the Georgetown Climate Center, an institute based at Georgetown University Law Center that supports state and local efforts to reduce carbon pollution and prepare for the impacts of climate change. Much of my work focuses on how federal programs – such as federal disaster recovery programs and the National Flood Insurance Program – can either help or hinder the important climate preparedness work that is happening at the state and local government levels.

The Georgetown Climate Center has worked to capture the challenges communities have faced in rebuilding resiliently after recent disasters, including writing case studies of recovery efforts in New Orleans after Hurricane Katrina,[1] Vermont's efforts to rebuild transportation systems after Hurricane Irene,[2] and lessons from the Rebuild by Design competition after Hurricane Sandy.[3] We also worked with the White House State, Local and Tribal Leaders Task Force on Climate Preparedness and Resilience to develop recommendations for reforming federal programs to support state and local efforts to prepare for the impacts of climate change.[4] Through this research, we have identified a number of common-sense reforms that Congress could enact to help communities rebuild to be more resilient in the face of impacts from climate change, including sea-level rise and more extreme weather.

As we watch with heartache the devastation wrought by hurricanes hitting Texas, Florida, Puerto Rico and the Virgin Islands, while California and the Pacific Northwest struggle with raging wildfires, we must consider what this year of record-breaking extreme weather means for our infrastructure and our communities—now and in the future. Among recent examples:

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[1] http://www.georgetownclimate.org/reports/reimagining-new-orleans-post-katrina.html

[2] http://www.georgetownclimate.org/reports/lessons-learned-from-irene-climate-change-federal-disaster-relief-and-barriers-to-adaptive-reconstruction.html

[3] http://www.georgetownclimate.org/reports/rebuilding-with-resilience-lessons-from-the-rebuild-by-design-competition-after-hurricane-sandy.html

[4] http://www.georgetownclimate.org/reports/preparing-our-communities-for-climate-impacts-recommendations-for-federal-action.html

- Houston received a record-breaking 51 inches (more than 4 feet) of rainfall over a couple of days (more than the state sees in typical year and the most rainfall ever from a single storm in the continental U.S.).[5]
- Hurricane Irma was one of the strongest storms ever recorded in the Atlantic Ocean.[6]
- This summer, the Southwest U.S. experienced a record-breaking heatwave, with temperatures exceeding 120 degrees in some parts of the country. It was so hot in Arizona that planes could not take off.
- And the West has been experiencing devastating wildfires, 7.8 million acres have already burned and wildfire season is not yet over.

In just the past couple of weeks, over a hundred of people have been killed, thousands have been displaced, and whole communities have been devastated. And 2017 is likely to break another record as the most costly year for natural disasters that this nation has ever experienced.

So what should we take away from this record-breaking year? These extreme events give us a preview of what we will see with greater frequency and intensity in the coming decades as the climate changes. Storms fueled by warmer oceans and combined with additional sea-level rise will cause greater damage to coastal communities. More extreme rain events will overwhelm aging infrastructure systems not designed to carry these large volumes of water. And more extreme heat will degrade roads and runways, buckle railroad and subway lines, and create dangerous conditions for outdoor workers who maintain and repair these essential services—and indeed for anyone without access to cooling facilities. Failing to acknowledge these changing threats will leave too many communities unprepared.

These events also have significant economic impacts. One in four businesses affected by a major disaster never reopens. And the costs to the country of these extreme weather events will take an increasing toll on government resources. The exposure of the federal government to these economic losses from extreme weather has caused the U.S. General Accountability Office to add climate change to its high-risk list.[7] Before Harvey and Irma, the National Flood Insurance Program was already $24.6 billion debt and too few people carry insurance to help them recover from these damaging flood events.[8] According to NOAA, from 2012 to 2016, we saw a doubling of the number of extreme weather events, causing losses in excess of a billion dollars.[9] And 2017 may literally be "off the charts" in terms of economic losses.

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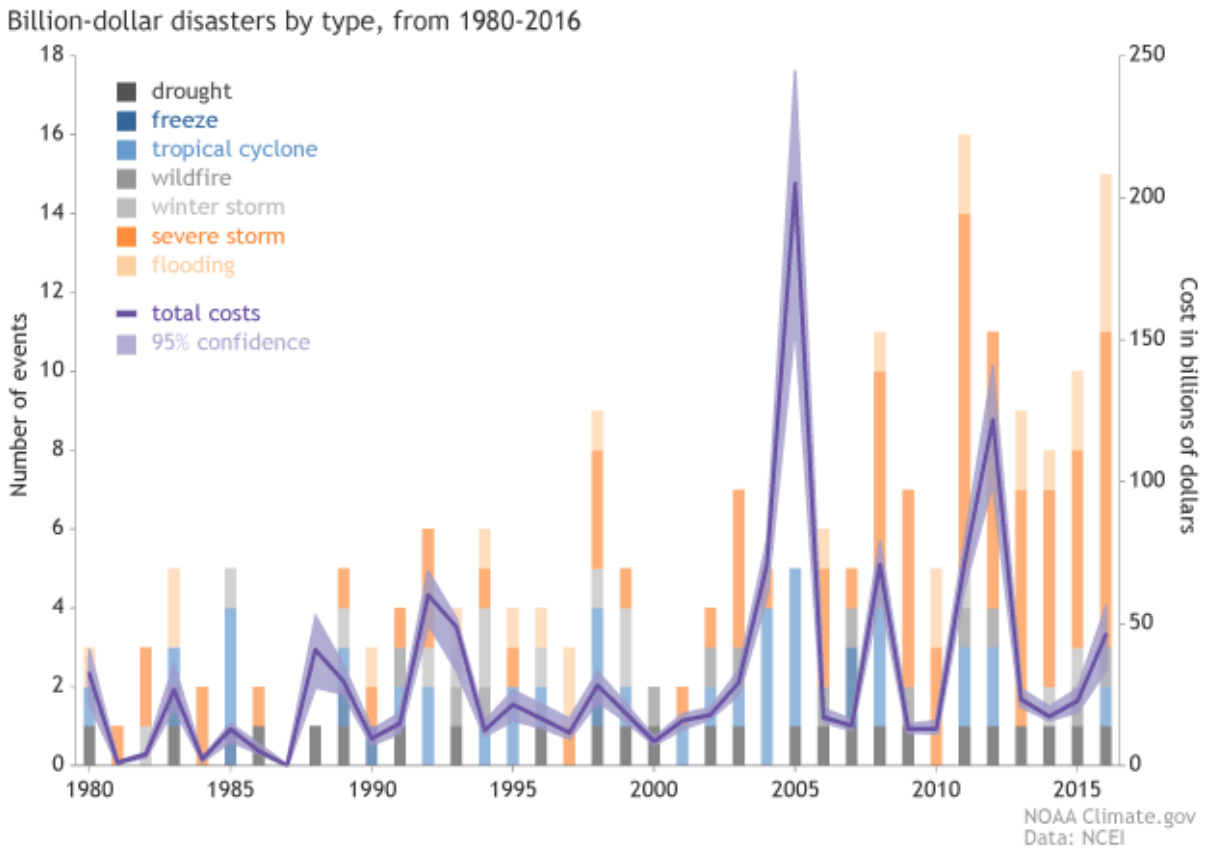
[5] https://www.washingtonpost.com/news/capital-weather-gang/wp/2017/08/29/harvey-marks-the-most-extreme-rain-event-in-u-s-history/?utm_term=.9fe3f921a3aa

[6] https://www.nytimes.com/interactive/2017/09/09/us/hurricane-irma-records.html?mcubz=1&_r=0

[7] US Government Accountability Office, *High Risk Series: Progress on Many High-Risk Areas While Substantial Efforts Needed on Others* at 150-179, (Feb. 2017, GAO-17-317) *available at:* http://www.gao.gov/assets/690/682765.pdf.

[8] https://www.gao.gov/products/GAO-17-425.

[9] https://www.climate.gov/news-features/blogs/beyond-data/2016-historic-year-billion-dollar-weather-and-climate-disasters-us



It is essential to talk about resilience now, as Congress makes billion-dollar decisions about how to fund long-term recovery programs for disaster-affected communities. To be both fiscally and morally responsible, we must ensure that the investments we are making today are designed to withstand future extreme weather. We owe it to the survivors of these storms to make scientifically sound recovery decisions about how to best protect people from these extreme weather events, which we know will occur with greater frequency and intensity in the future. Rebuilding to replace exactly what was damaged or destroyed is both misguided and irresponsible.

What is it to be Resilient?

The Department of Homeland Security defines resilience as "the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions."[10] Community resilience can be increased using better land-use practices and stronger building codes. Strong and redundant infrastructure systems are also critical components of a community's ability to withstand and rebound from disasters. And resilience pays off: a 2005 National Institute of

[10] https://www.dhs.gov/topic/resilience

Building Science study calculated that every dollar spent on hazard mitigation results in $4 of avoided losses.[11]

The good news is that there are proactive, fiscally responsible options for responding to the changes we are seeing. Many cities and states across the country are already taking practical steps to enhance the resilience of their infrastructure systems and to prepare their communities. Communities are considering future extreme weather in their local plans. For example, Baltimore, Maryland, considered climate change in its local hazard mitigation plan[12] and Chattanooga-Hamilton County in Georgia considered climate change in its long-range transportation plan.[13] Other cities are dedicating funds to retrofit infrastructure systems. Miami Beach, Florida, has developed and begun to implement a $500 million capital investment plan to elevate roads and install new pumping systems, which the mayor reported helped the city hold back some flooding during Irma.[14] Other communities have used disaster recovery funds to rebuild more resiliently. After impacts from Hurricane Sandy, Ft. Lauderdale rebuilt Highway A1A to provide additional flood protection.[15] You can find these and other examples of how leading cities and states are taking actions to enhance the resilience of transportation and other infrastructure systems in the Georgetown Climate Center's Adaptation Clearinghouse. The Clearinghouse contains thousands of resources – including more than 150 case studies focused on transportation, developed in partnership with the Federal Highway Administration.[16]

Under the last administration, federal agencies began developing common-sense measures to ensure that taxpayer dollars are not being wasted. With Hurricane Sandy recovery funds, state and local grantees were required to be build back stronger (with at least a foot of additional elevation or floodproofing). Federal agencies worked with New York City to roll out updated floodplain maps with information about sea-level rise to inform rebuilding efforts.[17] 2015 guidance put out by the Federal Emergency Management Agency (FEMA) requires states to consider future climate change when updating hazard mitigation plans, which govern expenditures of Hazard Mitigation Grant Program funding after disaster events. The Federal Highway Administration (FHWA) is requiring state departments of transportation to develop asset management plans that consider future conditions and extreme weather events as part of lifecycle and risk-management planning.[18] Congress should support and encourage more of these types of proactive federal agency actions that support risk-based decisionmaking.

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[11] Multihazard Mitigation Council of the National Institute of Building Science, *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities* (2005), *available at:* http://www.floods.org/PDF/MMC_Volume1_FindingsConclusionsRecommendations.pdf.

[12] http://www.adaptationclearinghouse.org/resources/baltimore-s-disaster-preparedness-and-planning-project-dp3.html

[13] http://www.adaptationclearinghouse.org/resources/chattanooga-hamilton-county-north-georgia-2040-regional-transportation-plan.html

[14] http://www.miamiherald.com/news/local/community/miami-dade/miami-beach/article41141856.html

[15] http://www.adaptationclearinghouse.org/resources/fdot-rebuild-of-highway-a1a-in-fort-lauderdale.html

[16] http://www.adaptationclearinghouse.org/sectors/transportation/case-studies-b.html

[17] http://www.adaptationclearinghouse.org/resources/sea-level-rise-tool-for-hurricane-sandy-recovery.html

[18] https://www.federalregister.gov/documents/2016/10/24/2016-25117/asset-management-plans-and-periodic-evaluations-of-facilities-repeatedly-requiring-repair-and#sectno-citation-%E2%80%89515.7

Opportunities for Promoting Resilience

Although promising resilience practices are being developed at all levels of government, much more needs to be done to help our communities respond to increasing threats, and Congress is well-positioned to be a leading part of the solution.

Reform and Modernize Federal Disaster Recovery Programs

Congress will be allocating tens—if not hundreds—of billions of dollars to help disaster-affected communities rebuild from just the catastrophic storm events of 2017. Congress can and should enact needed reforms to modernize federal disaster recovery programs to enable affected communities to rebuild with resilience. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) authorizes disaster or emergency declarations that allow for the allocation of funds to help communities recover and rebuild.[19] But the problem is that the program was designed to put buildings and infrastructure back in place the way it was before the disaster event (i.e., to the pre-disaster design and footprint), and the program limits the ability of affected communities to rebuild in ways that will ensure they can withstand the next storm. The Georgetown Climate Center has worked with many disaster-affected communities to capture the challenges they faced in trying to build back stronger and to identify opportunities for federal reforms. For example, in Vermont after Hurricane Irene, municipalities across the state had to fight to get reimbursed under the Public Assistance program when they replaced antiquated pipe-culverts with larger bottomless culverts that were designed to better manage the increased rainfall and streamflow already being experienced in the region. These types of common-sense, cost-savings approaches should be encouraged, not made more difficult.

Additionally, Congress often allocates disaster recovery dollars through a variety of different federal programs administered by different federal agencies. State and local grantees often struggle to patch together the different funding streams to help them rebuild stronger infrastructure systems. Different administrative requirements, environmental review requirements, and timing for the allocation of funds all hinders the ability of grantees to combine funding streams to fund comprehensive recovery projects affecting multiple different assets. As one example, federal agencies use different methods for calculating the benefits and costs of a project (benefit-cost analysis or BCA), which means that applicants must prepare different BCAs for different agencies, sometimes for the same projects, and BCA methods do not account for the increasing risks posed by climate change.

Congress can reform and modernize disaster recovery programs to facilitate resilient rebuilding in the following ways:

- Congress can require recipients of disaster recovery funds to use the best available science about future climate change when reconstructing infrastructure and public facilities with disaster recovery funds.
- Congress could reinstate and codify the Federal Flood Risk Management Standards, which would require grantees to consider future sea-level rise and changing precipitation patterns

[19] https://fas.org/sgp/crs/homesec/RL33053.pdf

when designing and siting projects funded with federal dollars. To do so, state and local governments need sound science. Congress should also fund the science and technical assistance programs that help state and local governments understand their risks and design assets to be more resilient to future changes. For example, Congress should fully fund FEMA's floodplain mapping program and enable map updates to include information about future conditions and sea-level rise, which will be critically important to helping communities understand their changing flood risks.

- Congress could prioritize investments that restore and enhance natural and nature-based flood protection. "Nature's infrastructure"—such as barrier islands, wetlands, and dune systems—provide natural flood defenses that absorb flood waters and dampen storm surges. Preserving and enhancing these natural features is a cost-effective way of reducing impacts.
- Congress could harmonize methods of conducting benefit-cost analysis across funding programs and BCAs should use the best available science to account for future conditions when assessing the flood-risk-reduction benefits of a project.
- Congress could support and provide funding to stand up federal coordinating teams to facilitate coordination across agencies allocating disaster recovery funds and conducting environmental review and permitting. For the Sandy recovery, coordinating teams helped the agencies expedite project delivery, reduce duplication of effort, and streamline permitting and environmental review. These teams were so successful that federal agency leaders in the region want to maintain the teams even after recovery efforts are completed.
- Congress could require federal agencies to simplify and harmonize the planning and administrative requirements they impose on grantees. By trimming red tape, Congress can help ease the ability of grantees to combine funding streams and enable them to enhance the resilience of assets and deliver projects that provide multiple benefits. For example, FEMA could allow grantees to calculate their state and local match requirements across all projects funded with Public Assistance (PA) money, rather than requiring grantees to provide match for every individual project (similar to how FEMA administers the Hazard Mitigation Grant Program).[20] Congress could also specify that the rules and regulations (including NEPA rules) of the primary funding agency should satisfy and override the rules of any secondary funding agencies. This would allow funding streams to be more easily combined and would reduce transactional costs on both grantees and administering agencies. More discussion and other practical ideas for improving disaster recovery are detailed in a recent report published by Holly Leicht, the director for New York and Jersey for the U.S. Department of Housing and Urban Development during the Sandy recovery.[21]
- Over the longer term, it will be important to quantify the benefits of the actions that we are taking. Currently, we only have the 2005 National Institute of Building Science's study with the oft-cited finding that $1 spent on mitigation results in $4 of avoided losses. However, this study does not look across the full range of different flood-risk-reduction approaches,

[20] Holly M. Leicht, *Rebuild the Plane Now: Recommendations for Improving Government's Approach to Disaster Recovery and Preparedness* at 13 (July 2017), *available at*: http://communityp.com/new-report-ex-obama-official-makes-recommendations-improving-governments-approach-disaster-recovery-preparedness/.
[21] Id.

such as nature-based approaches which provide multiple societal and environmental benefits. This study needs to be updated to help policymakers better understand the range of mitigation options available to them and the return on investment from different approaches in consideration of future climate change. A National Academies or other study could be commissioned to update and refine this analysis.

Fund and Encourage Pre-Disaster Mitigation

A more proactive approach that encourages communities to take actions to reduce their risks *before* a disaster strikes is needed. Our current approach to disaster recovery and mitigation is reactive: after a storm hits, we send billions of dollars to rebuild communities. Although we need to continue to help communities in need, this approach does not facilitate smart rebuilding and does not encourage communities to proactively take steps to reduce their risks. The instinct after a disaster strikes is to return to the status quo—to get things back to "normal" as quickly as possible, rather than preparing for a "new normal." Very few communities have plans or rules on the books that enable them to rebuild more resiliently after a disaster. As a result, structures and people are often put back in harm's way.

Congress could encourage communities to proactively implement measures that will reduce their risks to natural hazards and reduce the exposure of the federal government to these costly catastrophic events.

- Congress could provide more money upfront to help communities develop plans, update building codes and land-use regulations, and construct projects that will reduce community risks to natural hazards. FEMA's pre-disaster mitigation program and flood mitigation assistance programs are currently oversubscribed. Congress should also consider how to provide funding to help communities address other hazards, such as extreme heat, drought, and wildfires. Funding for these types of pre-disaster mitigation programs should be increased, not cut.
- Congress could consider a legislative option for implementing a FEMA proposal to require a disaster deductible.[22] FEMA's approach would require state and communities to set aside funds to support their own recovery or take proactive steps to reduce risks. It would create incentives for communities to adopt stronger building codes and floodplain regulations, which can significantly decrease flood losses. This could reduce the total costs to the federal government for paying disaster recovery costs over time.

Create and Fund Infrastructure Banks

Even without catastrophic disaster events, infrastructure systems in the United States are in desperate need of modernization and investment. The American Society of Civil Engineers gives U.S. infrastructure a D+ grade and has estimated that $1.1 trillion will be needed by 2020 to bring our infrastructure up to a state of good repair.[23] Aging, undersized, and under maintained infrastructure systems have not kept up with growing populations, increased

[22] https://www.regulations.gov/document?D=FEMA-2016-0003-0150.

[23] American Society of Civil Engineers, *2017 Infrastructure Report Card* (2017), *available at*: https://www.infrastructurereportcard.org/.

development, and new technologies. As we spend to update antiquated infrastructure systems, we must ensure that the systems we are building are designed for a future that will look very different from the past.

Current federal programs for financing infrastructure are underfunded given state and local needs. They allocate funding in silos, hindering the development of cross-sector, multi-benefit projects that deliver the greatest return on investment. And they fail to encourage investments to enhance the resilience of interdependent infrastructure systems. For example, financing for the water infrastructure is allocated through the State Revolving Funds, while transportation financing is supported through the Transportation Infrastructure Financing and Innovation Act (TIFIA). This siloed approach to funding and financing limits the opportunity for state and local governments to combine different funding streams to design and construct more ambitious infrastructure projects that deliver multiple community benefits, such as projects to retrofit highways and incorporate green infrastructure to manage stormwater runoff or incorporate other multi-modal improvements.

Congress could create and fund infrastructure banks to enable private sector investment in upgrading and enhancing the resilience of U.S. infrastructure systems.

- Projects funded through an infrastructure bank should be designed to be resilient to future climate change;
- Retrofits to existing infrastructure should be prioritized over creation of new infrastructure; and
- An infrastructure bank should enable blending of funds from other financing mechanisms, such as funds from state revolving funds and transportation and water financing programs.

Conclusion

This year of record-breaking weather and related devastating impacts provides a sobering preview of what we can expect with greater frequency and intensity as the climate changes. A fiscally-responsible approach to rebuilding that does not put communities back in harm's way requires that we account for anticipated future conditions and that we encourage communities to take proactive steps to reduce their own risks. My testimony identifies some of the many opportunities for Congress to direct disaster assistance and hazard mitigation funding in ways that reduce the long-term fiscal exposure of the nation to these types of extreme weather events. Thank you for the opportunity to discuss some proactive actions that Congress can take to build the resilience of our communities and our nation, and I welcome your questions.