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AMERICAN FLOOD COALITION

REPORT

The Local Economic Impact of Flood-Resilient Infrastructure Projects

By Matthew E. Kahn, Mac McComas, and Vrshank Ravi
Johns Hopkins University's 21st Century Cities Initiative

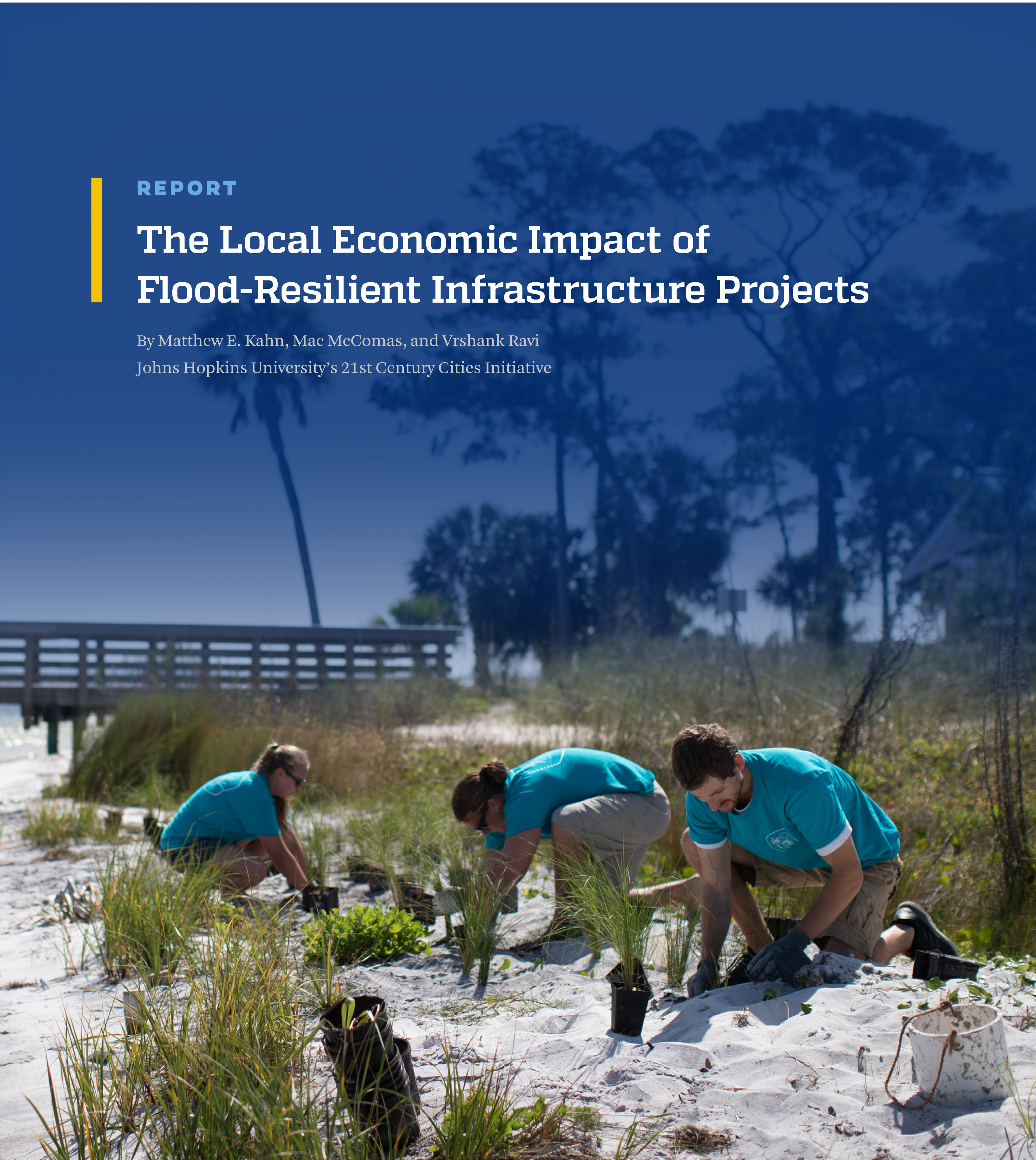

Table of Contents

AMERICAN FLOOD COALITION

The American Flood Coalition is a nonpartisan group of cities, elected officials, military leaders, businesses, and civic groups that have come together to drive adaptation to the reality of higher seas, stronger storms, and more frequent flooding through national solutions that support flood-affected communities and protect our nation's residents, economy, and military installations. The coalition is a registered 501(c)(3) member-driven nonprofit organization created to provide a platform for communities to advocate with a unified voice for solutions. The Coalition has over 240 members across 19 states.

The 21st Century Cities Initiative (21CC) at Johns Hopkins University is the campus hub for research, teaching, and outreach related to urban economic growth and urban quality of life. 21CC supports cities committed to opportunity, inclusion, and innovation. Our goal is to help cities transform neighborhoods and communities so that all urban residents can thrive in the 21st century. Through rigorous data analysis and policy evaluation, our center focuses on how to align the incentives of the private sector and federal, state, and local governments to unlock the full potential of cities including Baltimore, U.S., and international cities. We work closely with more than 200 Johns Hopkins faculty members across disciplines who are interested in issues related to cities.

PREFACE

This year has brought compounding disasters and devastation that previously would have been unimaginable. Between a record-breaking hurricane season, the COVID-19 pandemic, and an economic recession, countless communities across the country—especially those hit by major storms like Laura and Sally—are experiencing tragedy and hardship. Given the moment that we're in, we must ask: What can we do to protect our communities today while preparing these communities for the future? These challenges, when viewed holistically, outline the clear need for investments in resilience. We must meet these unprecedented times with an unprecedented investment in flood-resilient infrastructure, an investment that saves lives, creates jobs, and builds lasting, sustainable communities.

The American Flood Coalition brings together and amplifies the voices of more than 200 stakeholders across the country, from local, state, and federal officials to military leaders to business groups. In the face of extreme flooding and rising sea levels, it's never been more clear that we need on-the-ground solutions and proactive policy. With communities struggling with multiple disasters this year and grappling with the range of crises coming their way, now is the time to act. We must support communities across the country, and we can build resilience and boost the economy at the same time through federal investment in resilience.

We already know that investing in flood resilience makes good financial sense. Flood-resilient projects—elevating roadways, improving stormwater infrastructure, upgrading flood barriers—protect people and save money. Decades of research from the National Institute of Building Sciences shows that every $1 spent on disaster mitigation saves $4 to $7 on the back end.

Despite this, we've never known what matters most—exactly how this spending creates jobs, supports local businesses, or boosts our regional economy—until now. This study, from Johns Hopkins University's (JHU) 21st Century Cities Initiative, calculates the number of jobs created through investment in flood infrastructure and investigates how flood-resilient projects bring additional benefits. Through three in-depth case studies—focusing on coastal Louisiana; Cedar Rapids, Iowa; and Meriden, Connecticut—the research also explores the impact of resilient investment on local economies and the additional benefits that communities investing in resilience often experience. The research finds that:

- Investing in flood-resilient infrastructure creates jobs: JHU's research finds that a $1 million increase in funding for flood infrastructure projects in a metropolitan statistical area is associated with an increase in 40 jobs; 25 jobs in the construction industry and 15 jobs in retail trade. To achieve the necessary scale of infrastructure investment, however, we need not millions, but billions of dollars. Given these findings, we estimate that 10 billion dollars invested could be associated with up to 400,000 new jobs across the country.

PREFACE

- Investing in resilience helps create new businesses: An infusion of $1 million in funding for flood infrastructure is associated with an increase of 4 construction businesses in the year of the award.
- Economic benefits of reducing flooding are local: Flood infrastructure stimulates economies close to home, providing business for local contractors. An analysis of projects in Louisiana found that 80% of subcontracts went to businesses located in Coastal Louisiana parishes and 99% of subcontracts went to businesses in Louisiana.
- Benefits extend far beyond flood reduction and include added recreational and green space: Many communities have invested in green infrastructure, such as rain gardens or parks with stormwater retention basins, as a way to reduce flooding and create green space for residents to enjoy. This study confirmed previous research that found that these amenities can increase property values, in addition to reducing flood risk.

Over the past 15 years, the federal government has spent $450 billion in federal disaster assistance. This year, for the second time in recorded history, storms were named using the greek alphabet after the initial list of alphabetical names was exhausted. Despite this, flood-resilient infrastructure is still underfunded. We need to break this cycle of devastating storms and post-disaster spending. This research by JHU points us in a new direction, one that can create jobs in a time when they are desperately needed, save money over time, and most importantly, protect lives and livelihoods.

Melissa Roberts
Executive Director
American Flood Coalition

Water, and proximity to water, has driven economies for centuries. Water provides us with substantial benefits and economic well-being, including trade through ports; jobs in tourism, entertainment, fishing, and resource extraction; and recreation for local residents. Living and working close to water, however, also brings with it risks, such as loss of life and property through flooding from hurricanes, sea level rise, storm surge, and heavy rainfall.

Flooding is the most common, deadliest, and costliest natural disaster in the United States. Severe flooding has tragic consequences: It endangers public health, disrupts livelihoods, and exacerbates existing inequalities. In addition to the devastating effects on individuals and communities, flooding also strains resources and damages economies. From 1980 to 2019, the U.S. experienced 32 flooding events where estimated damages exceeded $1 billion, with total losses at $146.5 billion.[1] People and places can protect themselves against this risk by investing in flood-resilient infrastructure, such as living shorelines, stormwater bioretention systems, wetlands restoration, elevating properties, seawalls, levees, and flood barriers.

> From 1980 to 2019, the U.S. experienced **32 flooding events** where estimated damages exceeded $1 billion, with total losses at **$146.5 billion.** [1]

Despite increasing investment in flood-resilient infrastructure by localities, many flood infrastructure projects remain unfunded or underfunded. Compared to other types of infrastructure spending, the federal government spends little on water infrastructure.[2] Amid the ongoing economic depression onset by the COVID-19 pandemic, new federal investments in flood-resilient infrastructure can serve more than one purpose. In the short term, these investments can create new jobs in areas where investment takes place. In the medium term, these areas can reduce risk from future natural disasters and extreme weather events.

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[1] Note: This does not account for losses from tropical cyclones or severe storms. Smith and Adam 2020

[2] Congressional Budget Office 2013 and 2015.

INTRODUCTION

Much of the existing research on investing in flood-resilient infrastructure focuses on the costs and benefits of such investments. Their role as local economic stimulus projects is often overlooked. As capital-intensive construction projects, flood infrastructure projects can be associated with large employment gains at the local level. The local economic impact of investments in flood infrastructure projects can bring short-, medium-, and long-term gains in increased employment, increased property values, flood insurance savings, decreased lost days of work, and protections against future loss of life and property. The projects can also bring medium- and long-term improvements in neighborhood quality of life, leading to access to green amenities, improved health outcomes, and increased resilience to future floods. This report's core findings focus on the impact of flood-resilient infrastructure projects on short-term local economic development, but the report also discusses medium- and long-term gains.

> As capital-intensive construction projects, flood infrastructure projects can be associated with **large employment gains** at the local level.

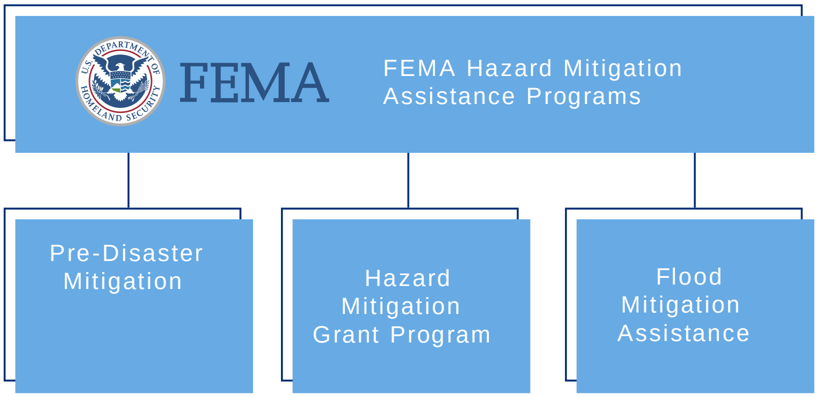
Using data from 2003 to 2018 on flood infrastructure investments from the Federal Emergency Management Agency (FEMA) and several local case studies, we explore how past investments in flood-resilient infrastructure projects were associated with local economic development and improvements in neighborhood quality of life. Recognizing the importance and impact of these investments, more local governments across the U.S. have started investing in flood-resilient infrastructure. To illustrate these investments, we examine the strategies and outcomes of three communities: Meriden, Connecticut; Cedar Rapids, Iowa; and Coastal Louisiana.

Finally, using historical estimates of flood infrastructure projects and job creation, we explore what areas might benefit most from increasing federal spending on such projects.

What is a “flood-resilient” infrastructure project?

Flood-resilient infrastructure projects are any type of infrastructure that reduces the risk of flooding, keeping people and property safe. In some cases, such as building a seawall, reducing flood risk is the primary purpose of a project. In other cases, such as building a public park, flooding may not be the primary purpose of the piece of infrastructure, though flood reduction benefits can still be incorporated into the project. Examples of flood infrastructure projects include wetlands restoration, marsh (re)nourishment, coral reef restoration, stormwater bioretention, riparian buffers, living shorelines, rain gardens, trees, public parks and green space, floodwalls, culverts, levees, berms, combined sewer overflow (CSO) tunnels, dams, flood gates, water pump stations, structure elevation, and at-risk building acquisition and demolition.

Estimating the local economic impact of a federal flood-resilient infrastructure program



Since 2000, the Federal Emergency Management Agency (FEMA) has invested billions of dollars in flood-resilient infrastructure projects through its Hazard Mitigation Assistance (HMA) programs. The three HMA programs—Pre-Disaster Mitigation (PDM),[3] Hazard Mitigation Grant Program (HMGP), and Flood Mitigation Assistance (FMA)—provide funding to states that allocate subawards to local business entities and governments for flood risk reduction projects. According to FEMA, the funding should go to areas with the greatest flood risk and economic need, as well as those areas with the highest rates of National Flood Insurance Program (NFIP) participation. Such capital-intensive projects may significantly affect local economies, providing an economic benefit beyond flood risk reduction.

Award amounts

As shown in Figure I, funding for flood infrastructure projects increased significantly from the mid-2000s to the mid-2010s. The largest project funded by HMA was over $388 million in 2015 for the Suffolk County (New York) Coastal Resiliency Initiative. That project eliminated almost 7,000 cesspools and septic systems in low-lying areas inundated by Superstorm Sandy and reduced nitrogen pollution to nearby wetlands.[4] The second-largest project was over $212 million in 2012 for a power plant in New Orleans. That project retrofitted the power plant to be more flood resilient after Hurricane Katrina damaged the plant in 2005.

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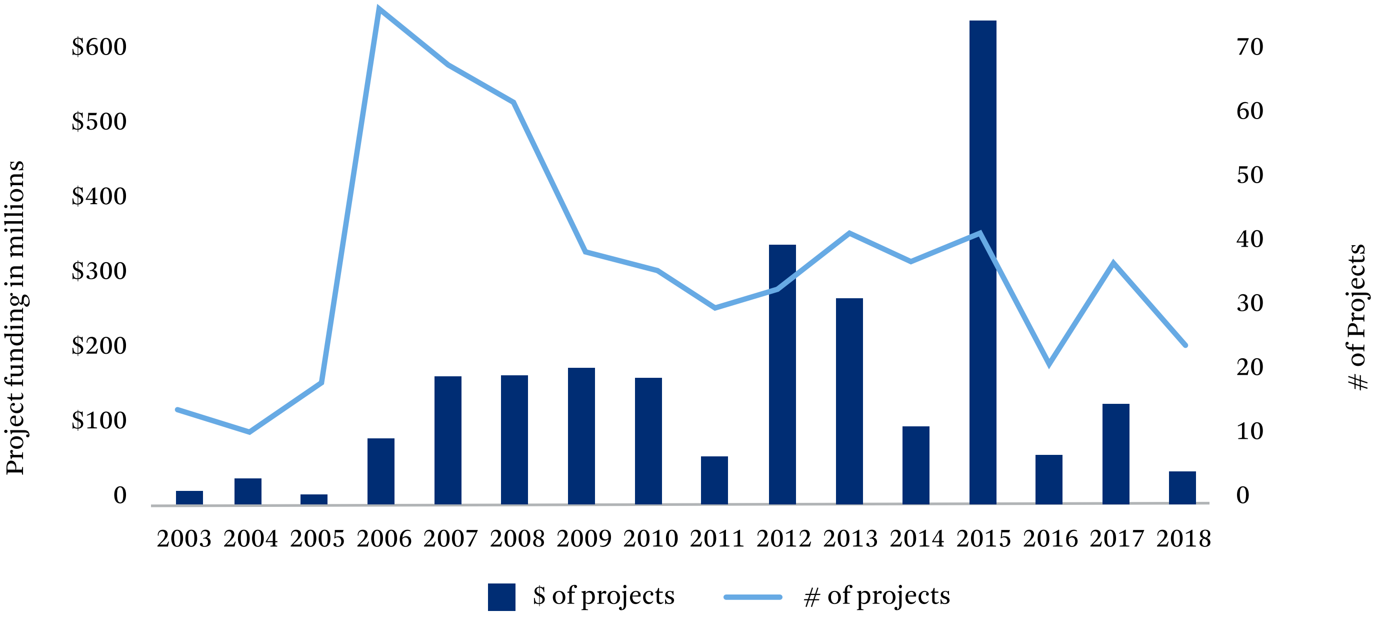
[3] FEMA replaced the Pre-Disaster Mitigation program with the Building Resilient Infrastructure and Communities program in 2020, announcing $500 million in available funding for the new program.

[4] Suffolk County, New York.

In total, we identified 593 FEMA awards for flood infrastructure projects between 2003 and 2018, for a total of $2.4 billion (in 2019 dollars).[5] We excluded projects for other types of natural disasters and projects limited to planning and design. See Appendix I for our full methodology and Appendix II for a full list of included project types.

Figure I

FEMA HMA flood infrastructure project funding by dollar amount (in 2019 dollars) and number, 2003-2018



Note: Total project funding includes the 25 percent minimum local cost share.

Award distribution

The Suffolk County and New Orleans projects also highlight the regional focus of FEMA awards. Over half the number and dollar amount of awards went to projects in southern states, while over 20% of the number of awards and 30% of the dollar amount went to northeastern states. Midwestern and western states received a similar number and amount of FEMA awards. This could raise concerns that the unique characteristics of places that received more FEMA awards may be responsible for the results and that a more geographically balanced and randomized allocation of funding would result in lower associated job gains. As more projects are completed and if better data on these projects are available, these concerns could be lessened.

Figure II

FEMA Awards by Region

Region	Number of Projects	Total Dollar Amount (in millions, 2019 dollars)
Northeast	63	$753
Midwest	37	$94
South	150	$1,213
West	41	$94

[3] Note: For our analysis, we aggregate these data from the county level to the MSA level.

The average award amount was around $3.5 million, and the median award amount was just over $750,000. Around 43% of all awards were over $1 million. Projects at this award amount include Fargo, North Dakota's $1 million HMGP award in 2006 for constructing a stormwater detention/retention basin and the Native Village of Fort Yukon, Alaska's $1 million HMGP award in 2018 for the elevation of nine structures on stilts. Projects under $100,000, such as Claremont and Lebanon, New Hampshire's $25,000 HMGP award in 2007 for the Thrasher Road culvert improvement project, account for 14% of all awards.

Pictured above is the schoolhouse in Fort Yukon, Alaska. In 2018, $1 million in HMGP was used to raise 9 structures onto stilts. Source: Alaska Public Media

Woodhaven in Fargo, North Dakota, has a large stormwater retention pond that collects stormwater runoff and drains it into an underground aquifer slowly, filtering the water in the process. Source: Alaska Public Media

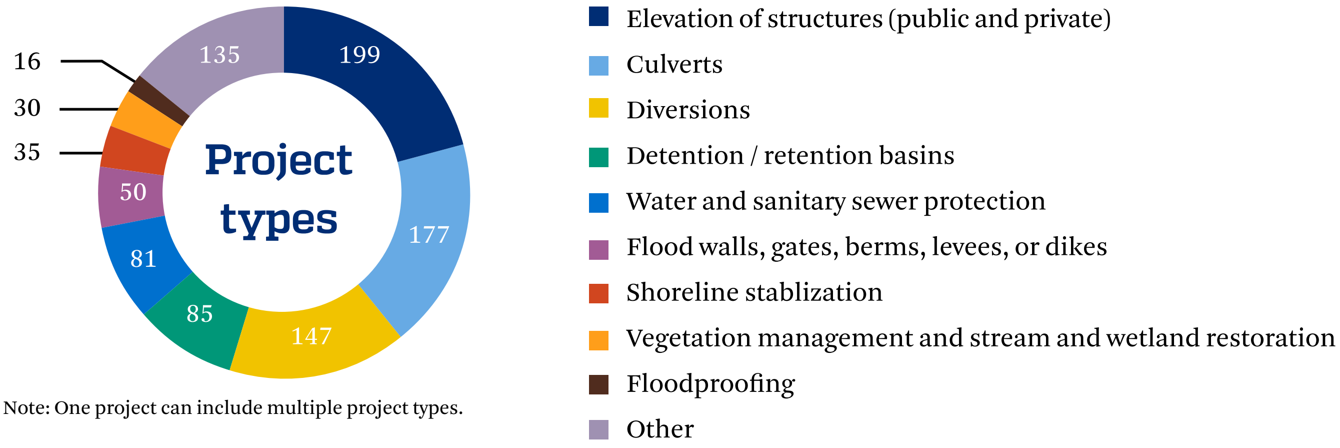
The Warren Brook & Cold River Habitat restoration in 2010. In 2007, another culvert at Thrasher Road received an HMGP award. Source: U.S. Fish and Wildlife Service

Project types

As shown in Figure III, 21% of projects included the elevation of public and private structures. The construction of culverts and diversions account for 34% of all project types. Nine percent of projects included the construction of detention or retention basins, like in Fargo, North Dakota, while 5% included the construction or improvement of flood walls, gates, berms, levees, or dikes.

Figure III

Flood-resilient infrastructure projects

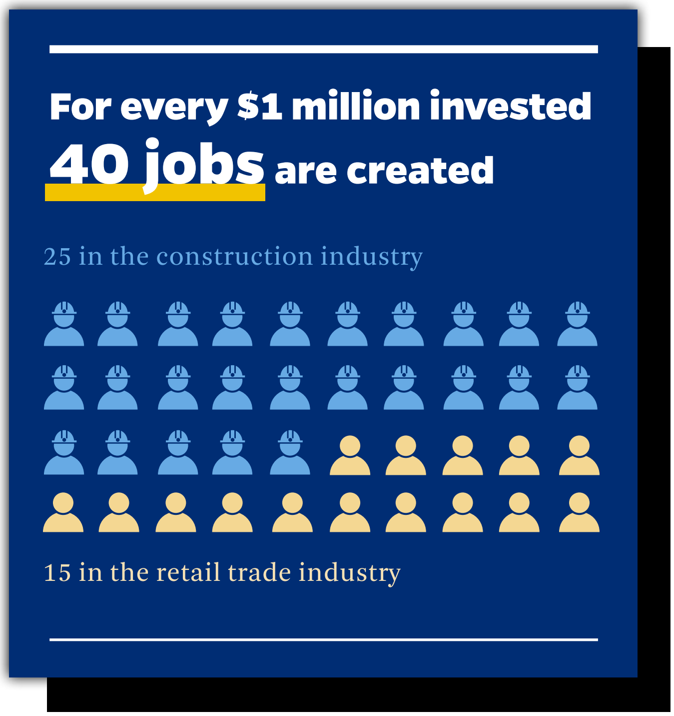


Note: One project can include multiple project types.

Job creation

To understand the impact of FEMA funding on local economies, we looked at the ratio of employment to population. If the ratio rises, more people are employed in a metropolitan area. For this analysis, we observe how employment levels change when communities receive funding for flood infrastructure projects.[6]

Overall, we find that increasing funding for flood infrastructure projects in a metropolitan statistical area by $1 million is associated with an increase of 40 jobs in the construction and retail trade industries, with 25 in the construction industry and 15 in retail trade. Given our results, we can estimate that $1 billion invested could be associated with up to 40,000 new jobs across the U.S.



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[6] For a full explanation of our data and methodology, see Appendix I. For full regression results, see Appendix III.

> The relatively large number of new jobs associated with an increase in $1 million in infrastructure project spending suggests the possibility of a local multiplier effect, where the **creation of new jobs in one sector** leads to the creation of new jobs in **another sector** in that same city.

For jobs in the construction industry, we did not find similar job increases in the second and third years following the award, suggesting that these were short-term job gains. We find significant regional heterogeneity, with stronger associated job gains in the construction industry in the southern and western states. This follows a national trend of recent increased population growth and construction activity in those regions. These regional differences could also be explained by state laws: Southern and western states tend to be right-to-work states with lower wages.

In Appendix IV, we report future estimates for job growth at the Congressional District level. We estimated how associated job growth changed across a variety of demographic variables and found statistically significant associations with education and unemployment. Congressional Districts with higher shares of unemployment and adults over 25 with a bachelor's degree or higher were associated with higher amounts of job growth. We estimate that a place such as Georgia's 14th Congressional District, which had both relatively low unemployment (3.8%) and a low share of adults over 25 with a bachelor's degree or higher (13.3%) in 2018, may see the creation of up to 12 jobs associated with a $1 million increase in flood infrastructure spending compared to a place such as Illinois' 5th Congressional District, which had relatively high unemployment (6%) and a high share of adults over 25 with a bachelor's degree or higher (24%) in 2018, may see the creation of up to 91 jobs.

Increasing investment in flood infrastructure projects by $1 million (in 2019 dollars) is associated with an increase in 20 jobs in the retail trade industry in the year of the award. When we account for pre-growth trends, associated growth falls to 15 jobs and borders on being statistically significant. Unlike the construction industry, the job gains are robust in the second and third years following the award, suggesting these jobs might be more permanent. We also find more job gains in the retail industry in the northeastern states and less jobs gains in midwestern and southern states.

The relatively large number of new jobs associated with an increase in $1 million in infrastructure project spending suggests the possibility of a local multiplier effect, where the creation of new jobs in one sector lead to the creation of new jobs in another sector in that same city. Enrico Moretti found that every manufacturing job created in a given city also creates 1.6 jobs in the non-tradable sector; additionally, a skilled job in the tradable sector creates 2.5 jobs in local goods and services.[7] A similar effect could be happening for flood infrastructure investments.

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[7] Moretti 2010.

Public investment in flood-resilient green infrastructure may also signal to the private sector that it is now safe to invest in previously risky areas. That means housing prices could also be affected by increased investment in flood-resilient infrastructure. While findings vary, past studies have largely found that proximity to such infrastructure was associated with higher property values. One study, for example, found increases of 0.75%–2.52% associated with tree canopy cover and an increase of 19%–35% associated with suburban forest preserves.[8] Another study found that the construction of 1,666 flood defenses in England was associated with a rise in urban house prices between 12.6%–16.7%, with a small decrease in rural house prices. This could suggest that the perceived risk of redirected flooding in certain locations outweighs the general benefit.[9]

Business establishment creation

We also find similar growth in construction business establishments. Increasing FEMA funding by $1 million in a Metropolitan Statistical Area (MSA) is associated with an increase of four construction business establishments in the year of the award. When we include a three-year employment growth trend, the number of construction businesses falls to 2.6. Associated increases in construction business establishments are robust in the second and third year after the award. We again find evidence of regional heterogeneity, with stronger gains in construction businesses in southern and western states and weaker gains in all other regions of the country.

An increase in $1 million (in 2019 dollars) in FEMA flood infrastructure funding in a metropolitan statistical area is associated with an increase of **four construction business establishments** in the year of the award.

The Louisiana National Guard constructs a diversion system to protect wetlands. Source: Tarell J Bilbo, U.S. Army

APC Construction is an example of an establishment whose start corresponded with increased FEMA funding. Founded after Hurricanes Katrina and Rita in New Orleans, APC Construction has since worked on two flood-resilient projects for the Louisiana Coastal Protection and Restoration Authority alongside several other flood infrastructure projects. In 2015, the company of several hundred employees received the 2015 U.S. HUBZone Contractor of the Year award by the Department of Agriculture.

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[8] Venkataramanan, Packman, Peters, Lopez, McCuskey, McDonald, Miller, Young 2019.

[9] Beltran, Maddison, Elliott 2018.

Limitations and unknowns

The associated increase of 40 jobs for every $1 million awarded is significantly larger than those found in similar studies—one study on the 2009 American Recovery and Investment Act found that spending $1 million on "green" projects was associated with an increase of 15 jobs.[10] While a large local multiplier might explain some of the difference, other forces are likely at play.

If FEMA funding went to places already experiencing economic growth, this could be a case of picking winners. For example, economically booming New York City received over $580 million in FEMA funding for flood infrastructure after Superstorm Sandy in 2013, more than double the amount any other region received and over 27% of total FEMA funding for flood infrastructure projects from 2003 to 2018. If FEMA funding mostly went to places already experiencing economic growth, other inputs may show similarly strong associations with job growth.

A bulldozer levels sand in Rockaway Beach in Queens, New York, after Superstorm Sandy. Source: John D'Ambrosio, U.S.ACE NY

Petaluma Payran Reach Flood Control and Floodways received a FEMA grant of $2.9 million. Source: FEMA

In analyzing the characteristics of metropolitan areas with flood risk, we found that metropolitan areas that received at least one FEMA flood infrastructure award were on average significantly more populous, wealthier, whiter, and more highly educated than metropolitan areas that received no FEMA awards (See Figure IV). They also had a higher share of properties with flood risk. There were not significant differences in the poverty or unemployment rates between areas that did and did not receive FEMA funding. Given these demographic differences, we do not know if future investment in areas that had not previously received a FEMA award would experience similar average job growth to those that did receive an award.

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[10] Popp, Vona, Marin, Chen 2020.

Another issue is the allocation of FEMA funding. FEMA awards flood infrastructure funding to states, which then distribute funding where they think it would be most impactful. In this method of allocation, funding may only reach places with the local capacity to plan and oversee infrastructure projects, and those communities without the experience and staff capacity to implement flood infrastructure projects may miss out. This allocation of funding can be further influenced by politicians aggressively lobbying Congress for state funding, as we will see in the case of Cedar Rapids.

We also lack a good counterfactual. That is to say, we don't know how job growth looks if certain areas that received funding hadn't received funding. We can address some of these concerns with our three-year employment growth trend variable, which allows us to control for what employment growth might have been if no funding was received. Given the small number of flood-resilient infrastructure projects funded by FEMA, many additional projects that would benefit local economic development likely exist.

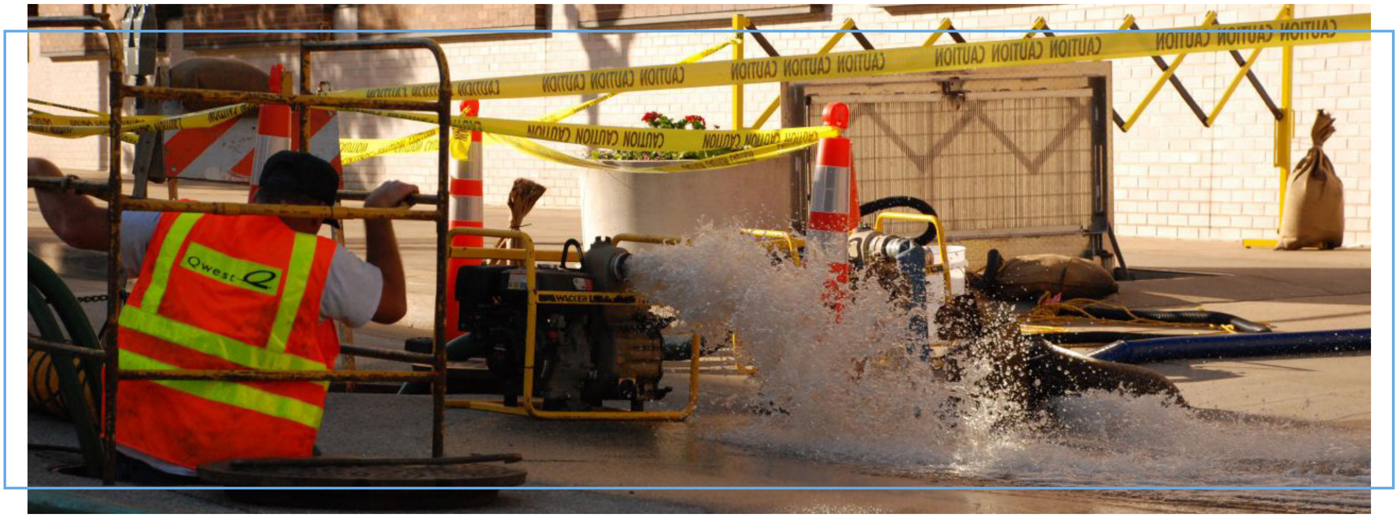
Figure IV

Metropolitan statistical areas (MSA) with flood risk that did and did not receive FEMA flood infrastructure funding, 2018 demographic data

Region	MSAs with Projects	MSAs without Projects
Number of MSAs	116	260
Population	162,646,671	112,272,259
Percent with a bachelor's degree or higher	36%	30%
Percent unemployed	6%	6%
Percent below poverty line	13%	14%
Percent white	76%	72%
Mean individual earnings	$71,562	$60,664
Percent of properties with flood risk	11%	8%

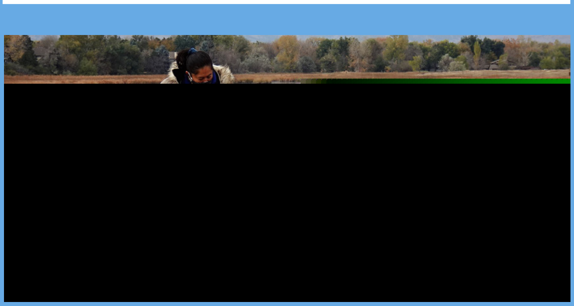
Note: Flood risk data is from the First Street Foundation county level risk data. Flood risk data was not available for Alaska, Hawaii, Puerto Rico, and the Harrisonburg and Staunton metro areas in Virginia. As such, those areas are not included in the above table. Their inclusion would not significantly change the reported demographics.

Below: Workers unleash storm pumps on the flooded streets of Cedar Rapids during the flood of 2008. Source: CRartist Flickr



Additional benefits of flood infrastructure

In this report, we explore several other potential benefits of flood infrastructure projects, including more recreational and green space, increased resilience to floods for local economies, new industries and techniques, and reduced cost of building flood-resilient infrastructure in the future.



A Wildlands Restoration worker smooths land at the Sombrero Marsh Revegetation near Boulder, Colorado. Source: Wildlands Restoration Volunteers

Recreational and green space

Flood-resilient infrastructure projects have traditionally been gray infrastructure projects, such as floodwalls, levees, combined sewage overflow tunnels, culverts, floodgates, and pump stations. However, in recent decades, more communities have invested in green infrastructure, such as rain gardens, bioretention and detention parks, marsh nourishment, wetland restoration, and tree wells.