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21ST CENTURY CITIES INITIATIVE

AMERICAN FLOOD COALITION

SUMMARY

The Local Economic Impact of Flood-Resilient Infrastructure Projects

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Introduction

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]

Over the past 40 years, the U.S. experienced 32 flooding events where estimated damages exceeded $1 billion.

A view of the damage around the site aftermath of the Hurricane Laura in Lake Charles, Louisiana, United States on August 30, 2020. Source: Getty Images

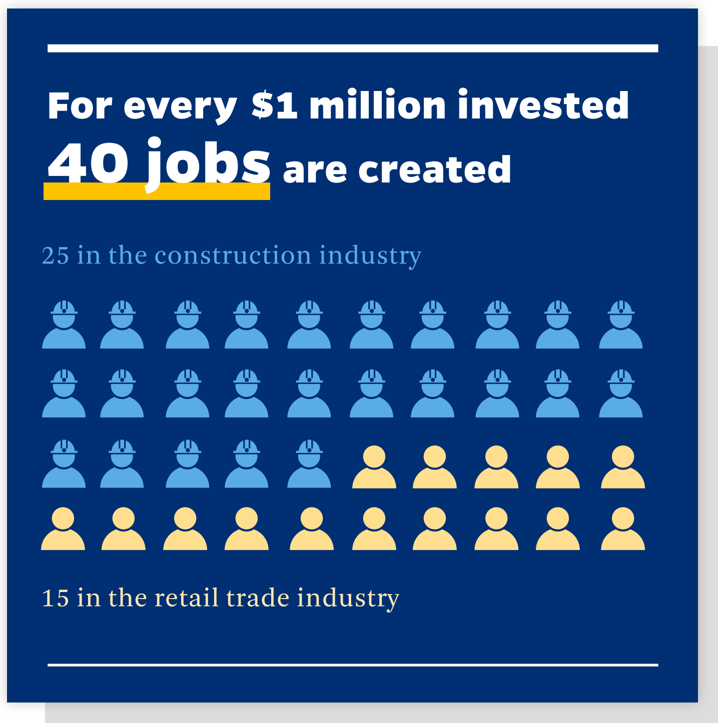
[1] Smith, Adam, "2010-2019: A landmark decade of U.S. billion-dollar weather and climate disasters." Climate.gov. January 8, 2020.

People and places can adapt to flooding. Proactive steps to minimize the effects of flooding will save money—and lives. **These projects are wide-reaching: They can create local jobs, stimulate employment growth, appreciate property value, bring about flood insurance savings, reduce lost days of work, and reduce future loss of life and property.** The projects can also bring medium- and long-term improvements in neighborhood quality of life, through improved health outcomes, increased resilience to future flood events, and in some cases, access to green amenities.

Using historical data on flood infrastructure investments from the Federal Emergency Management Agency (FEMA), as well as local case studies, we explore how past investments in flood-resilient infrastructure projects have been associated with local economic development and improvements to neighborhood quality of life. Recognizing the importance and impact of these investments, a growing number of communities across the U.S. have used different strategies to start investing in flood-resilient infrastructure. To illustrate the diversity of these investments and strategies, the full report will examine the communities of Meriden, Connecticut; Cedar Rapids, Iowa; and Coastal Louisiana. These communities have worked with local, state, and federal government agencies to build flood-resilient infrastructure, with direct benefits to their local economies.

Flood-resilient infrastructure is associated with jobs creation

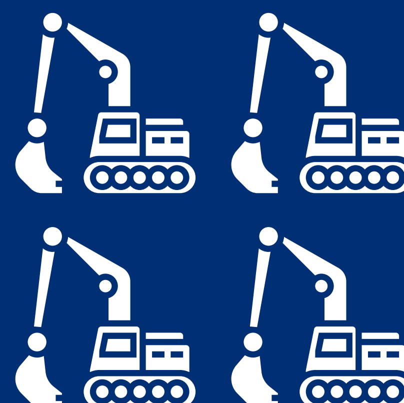
Our analysis focuses on metropolitan areas that received funding for flood infrastructure projects through FEMA Hazard Mitigation Assistance programs from 2003 to 2018. For this analysis, we compare the ratio of employment to population in the same geographical areas over time, controlling for year and place fixed effects, and observe trends in employment levels in years that the areas receive funding for flood infrastructure projects. Overall, we find that a $1 million increase in funding for flood infrastructure projects in a metropolitan statistical area is associated with an increase in 40 jobs in the construction and retail trade industries, with 25 in the construction industry and 15 in retail trade. When we think of the scale of infrastructure investment that is needed, we're clearly talking in billions of dollars that are needed. **Extrapolating from our results, we can estimate that a billion dollars invested could be associated with up to 40,000 new jobs across the U.S.**



In regards to our finding that, on average, an increase of $1 million in flood infrastructure projects is associated with an increase in 15 jobs in the retail trade industry in the year of the award, we found that when we account for pre-growth trends at the metropolitan area level, the results border on significant. Unlike the construction industry, the job gains are robust in the second and third years following the award, suggesting these might be longer-term job gains. We also find evidence of significant regional heterogeneity, with higher gains in the retail trade industry showing in the Northeast and weaker gains in the Midwest and South.

A bulldozer levels sand on Rockaway Beach, Queens, New York, after Superstorm Sandy.
Source: John D'Ambrosio, USACE NY

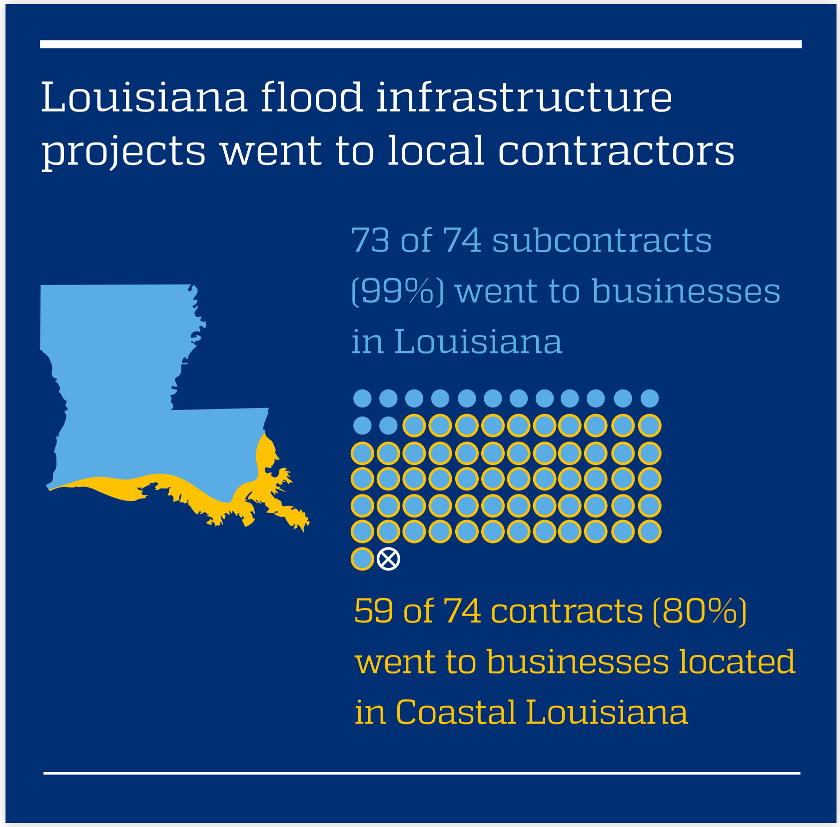
An increase in $1 million (in 2019 dollars) in FEMA flood infrastructure funding in a metropolitan statistical area is associated with an increase of **four construction business establishments** in the year of the award.



Flood-resilient infrastructure creates new businesses

We also find associated positive effects on the formation of new businesses: **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.** We find that associated increases in construction business establishments are robust in the second and third year after the award, suggesting that there could be longer-term gains. This could mean that flood infrastructure funding is associated with local construction booms that have positive effects on business establishment creation in the long term. We again find evidence of regional heterogeneity, with stronger gains in construction businesses in the South and West and weaker gains in all other regions of the country.

The relatively large number of new jobs associated with every $1 million spent on flood infrastructure projects may be due to a local multiplier effect, where direct job creation from infrastructure projects is associated with job growth not directly related to the projects.[2] The associated job gains may also be a case of picking winners. In this case, FEMA and state offices in charge of funding criteria may have awarded mitigation infrastructure funds to places already thriving and optimistic about their future. After Superstorm Sandy, for example, New York City received over $580 million in FEMA funding for flood infrastructure—more than double the amount any other region received. The job gains may also be a case of politics and priority. In this case, FEMA funding may have gone to the most impactful and shovel-ready flood infrastructure projects, where local leaders aggressively lobbied Congress. For projects that do not have these same conditions, flood infrastructure funds may have less of a positive spillover effect.



Flood-resilient infrastructure stimulates local economies

Investing long term in flood-resilient infrastructure can have a local-market effect that helps create a regional water management sector. We can quantify this impact by looking at the location quotient, a measure of industry concentration in a given area. **A location quotient greater than 1 indicates that the industry is more heavily concentrated in the area than at the national level. Research on Southeast Louisiana found that from 2004 to 2014 the local water management sector maintained a location quotient greater than 1.** Additionally, since 2010, the industry has outperformed national growth rates, ranking eighth-highest in the nation.[3] **We analyzed 25 infrastructure projects in Coastal Louisiana and identified subcontractors awarded a total of $186 million from 2006 to 2019. We found that 59 of 74 subcontracts (~80%) went to businesses located in Coastal Louisiana parishes and that 73 of those 74 (~99%) subcontracts went to businesses in Louisiana.** The case of Coastal Louisiana shows that sustained, high levels of funding for flood infrastructure projects can create sufficient demand to support and grow local businesses.

[2] Moretti E. (2010). Local Multipliers. American Economic Review. 100(2): 373-377.

[3] The Data Center. The Coastal Index: The Problem and Possibility of Our Coast. April 2014.

The Meriden Green, a 14-acre flood-control park in Meriden, Connecticut. Photo source: Marcus Balcher, Meriden resident

Flood-resilient infrastructure investment enhances quality of life

Green flood infrastructure investments provide benefits beyond flood resilience. **Communities from Meriden, Connecticut to Minot, North Dakota have built public parks that double as stormwater retention basins and function as part of a broader stormwater management plan and flood infrastructure. These investments not only improve community resilience; they offer new public goods.** Philadelphia's Green City, Clean Waters program is a substantial investment in green infrastructure, such as rain gardens and stormwater planters, that raises quality of life through both increased resilience and beautification.

Flood resilient infrastructure makes communities stronger

40

new jobs are associated with each $1 million invested in funding for flood infrastructure projects in a metropolitan area.

40K

new jobs across the country could potentially be created by a $1 billion investment.

4

new construction business establishments are associated with an increase of $1 million in flood infrastructure funding in a metropolitan area.

99

percent of subcontracts for flood infrastructure projects in Louisiana were awarded to businesses within the state.

Flood-resilient infrastructure projects are wide-reaching: They can create local jobs, stimulate employment growth, appreciate property value, bring about flood insurance savings, reduce lost days of work, and reduce future loss of life and property.

New York City's Hudson River Greenway offers flood protection, park space, and serves as a bicycle/scooter highway.
Source: Theturducken Flickr

Public investment in flood-resilient green infrastructure may also signal to the private sector that investment in previously risky areas is now safe. Several studies associate changes in housing prices with green flood infrastructure. While findings vary, most studies find that proximity to such infrastructure was associated with an increase in property values: one study on tree canopy cover shows property value increases of 0.75% to 2.52%; another study on suburban forest preserves shows property value increases of 19% to 35%.[4] A study of floodplain conservation efforts in St. Louis County, Missouri, finds that increases in nearby home prices were three times larger than avoided flood damages and that these proximity benefits alone exceeded the opportunity costs of developing the land.[5]

Flood-resilient infrastructure has a high return on investment

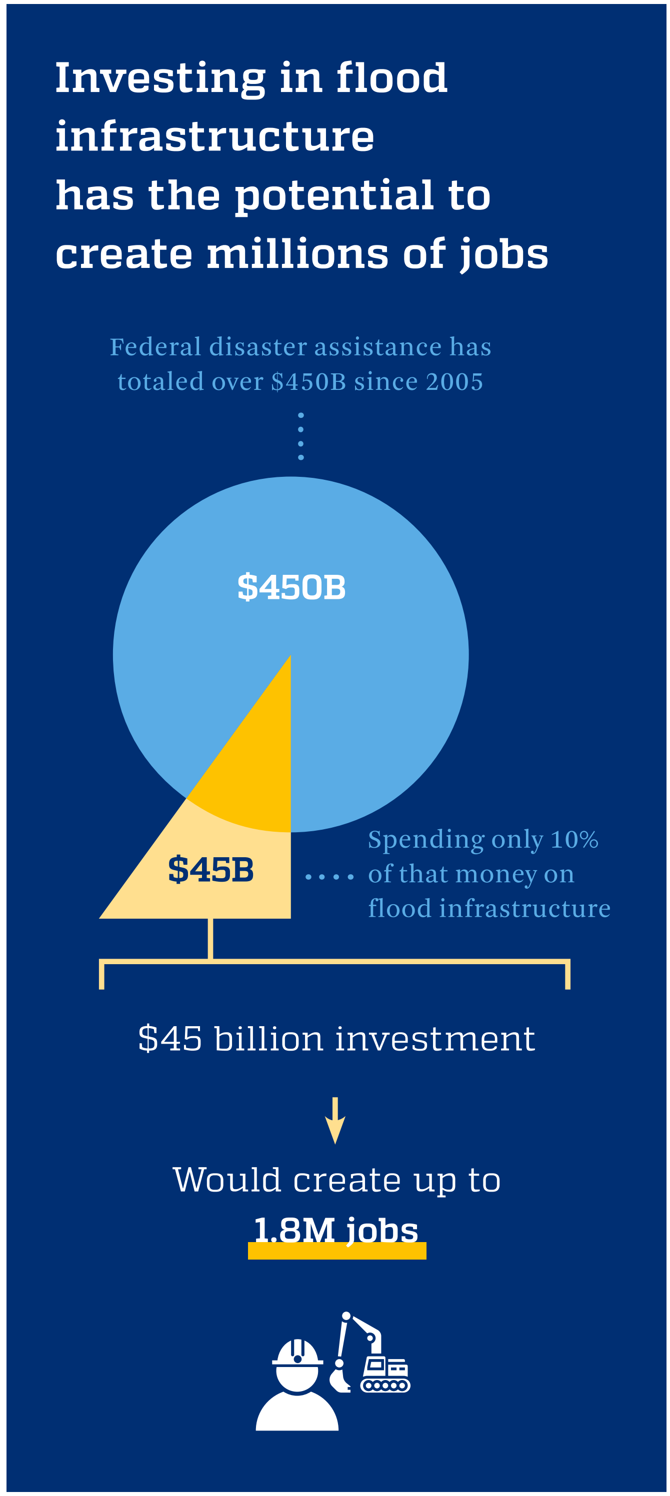
Investing in flood-resilient infrastructure not only has positive economic impacts—it saves money in the long term. In 2016, Lafayette Parish in Louisiana was awarded $2.4 million by FEMA for the acquisition and elevation of 14 properties with high flood risk. The agency estimated that the project would have a net-value benefit of $15.7 million for a benefit-cost ratio of 6.7 to 1. A 2019 report by the National Institute of Building Sciences finds that federal riverine flood mitigation grants provided a 6 to 1 benefit-cost ratio, with a majority of benefits derived from property loss prevention and price appreciation.[6]

Unprecedented investment is needed

The COVID-19 pandemic has pushed the U.S. into an economic recession, the depths of which we are only beginning to understand. **Federal investments in flood-resilient infrastructure projects, however, would combine job creation in the private sector with cost-effective flood infrastructure. This investment could have additional positive spillovers, such as reducing NFIP liabilities, payouts, and the price of flood insurance.** Based on our historical estimates, if future investments in flood infrastructure were made in similar places under similar conditions, we expect that every $1 billion in flood infrastructure spending could be associated with up to 40,000 new jobs in the construction and retail trade industries.

[4] Venkataramanan, V., Packman, A., Peters, D., Lopez, D., McCuskey, D., McDonald, R., Miller, W., Young, S. (2019). A systematic review of the human health and social well-being outcomes of green infrastructure for stormwater and flood management. Journal of Environmental Management, 246: 868-880.
[5] Kousky, C., Walls, M. (2014). Floodplain conservation as a flood mitigation strategy: Examining costs and benefits. Ecological Economics, 104: 119-128.
[6] Multi-Hazard Mitigation Council (2019). Natural Hazard Mitigation Saves: 2019 Report. National Institute of Building Sciences.

How does this play out at the local level? Despite the increase in localities investing in flood-resilient infrastructure in recent years, many communities still face increasing flood risk. As the federal government spends comparatively little on water infrastructure, countless flood-infrastructure projects remain unfunded or underfunded.[7] Our analysis highlights several counties that have received a large share of National Flood Insurance Program (NFIP) payouts since 2000 but only a small share of FEMA flood and hazard mitigation program dollars. For example, Hancock County, Mississippi, has the 16th-highest amount ($783 million) of NFIP payouts of any county since 2000, but has received no money from FEMA for flood-resilient infrastructure since 2003. Since 2000, 10 counties received over $4 billion in NFIP payouts, but no FEMA flood infrastructure funding. **If, instead of spending on recovery after disaster strikes, this $4 billion had been invested in flood infrastructure projects designed to reduce risk before disasters hit, based on our analysis and assuming similar characteristics of the average FEMA flood infrastructure project, it could have been associated with an increase of 160,000 new jobs in the construction and retail industries and prevented tens of millions in losses.**



Since 2005, federal disaster assistance has totaled over $450 billion.[8] **Spending only 10% of that money on flood infrastructure would not only prepare us for future disasters, but could be associated with up to 1.8 million new jobs in the construction and retail trade industries.** Cities and states across the country would greatly benefit from federal investment to help fund their local resilience plans. For instance, in New Jersey, funding Jersey City's $2 billion adaptation master plan could be associated with 80,000 new jobs, while in Virginia, funding Norfolk's Coastal Resilience Strategy—which lays out over $1 billion in projects such as floodwalls, elevated roadways, improved stormwater pumps, culverts, and dune restoration—could be associated with up to 40,000 new jobs. Our analysis shows that the country has an opportunity to blunt the economic effects of the COVID-19 pandemic by creating millions of jobs, while improving resiliency and safety in communities that experience flooding.

[7] Value of Water Campaign (2017). The Economic Benefits of Investing in Water Infrastructure.

[8] Government Accountability Office (2019). Disaster Recovery: Recent Disasters Highlight Progress and Challenges.

APPENDIX I

Methodology and Data

Our main source of data on flood infrastructure project investments is the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance projects dataset from OpenFEMA. We do not use projects without award dates, nor do we use projects with award dates before 2003 or after 2018. This selection aligns with our three year pre-growth trend controls. We pull data from four program areas: Flood Mitigation Assistance (FMA) grant program, Hazard Mitigation Grant Program (HMGP), Legislative Pre-Disaster Mitigation (LPDM) grant program, and Pre-Disaster Mitigation (PDM) grant program. Finally, we use projects with codes related to flood-resilience infrastructure. For example, we do not use projects that engaged only in planning or design. For a full list of project codes and descriptions, see Appendix II. We aggregate this data from the county level to the Metropolitan Statistical Area (MSA) level to create observations at the MSA/year level. If multiple projects in the same MSA exist in a given year, we combine funding amounts and observe the total amount of funding that an MSA received for flood infrastructure projects each year. We adjust for inflation to 2019 dollars using the Bureau of Labor Statistics' (BLS) Consumer Price Index for urban areas.

We include data on 369 metropolitan areas in our estimates, 120 of which had at least one FEMA-funded project. MSAs that did not have an awarded project in a given year had their award amount coded to zero, not blank.

Data on employment and business establishments is from the BLS Quarterly Census of Employment and Wages (QCEW). To define industries, we use the North American Industry Classification System (NAICS) industry code in the QCEW data. Demographic data is from the Census Bureau's five-year ACS for the corresponding year. Data on Gross Domestic Product (GDP) by MSA is from the Department of Commerce's Bureau of Economic Analysis.

We estimate employment growth in the following regressions. Our main specification is equation (2), for which we report our main findings:

1. $\text{Employment}_{ymt} = a*\text{Award} + b*\text{Year}_{t-ti}$
2. $\text{Employment}_{ymt} = a*\text{Award} + b*\text{Year}_{t-ti} + c*\text{Employment Growth Trend}$
3. $\text{Employment}_{ymt} = a*\text{Award} + b*\text{Year}_{t-ti} + c*\text{Lag1} + d*\text{Lag2}$
4. $\text{Employment}_{ymt} = a*\text{Award}*\text{i.region} + b*\text{Year}_{t-ti}$
5. $\text{Employment}_{ymt} = a*\text{Award}*\text{i.region} + d*\text{Lag1} + e*\text{Lag2} + b*\text{Year}_{t-ti}$

In all regressions, the dependent variable is employment per 100,000 people in industry y, MSA m, and year t. In equation (1), this is regressed on Award and the total award amount in dollars per 100,000 in population and includes both a control, b*Yeart-ti, for time-fixed effects and place-fixed effects. We cluster standard errors by MSA.

The remaining equations include additional controls and robustness checks. In equation (2), we add a three-year employment growth trend control to the regression. In equation (3), we include Lag1 and Lag2, which observe job growth in the year. In equation (4), we include an interaction between the award amount and a regional dummy for the Northeast, Midwest, West, and South regions of the U.S.

Establishment growth is estimated in the same method, where employment in an industry per 100,000 people is replaced by the number of establishments in an industry per 100,000 people.

APPENDIX II

Code	Description
201.1	201.1: Relocation of Private Structures - Riverine
201.3	201.3: Relocation of Public Structures - Riverine
201.4	201.4: Relocation of Public Structures - Coastal
202.1	202.1: Elevation of Private Structures - Riverine
202.2	202.2: Elevation of Private Structures - Coastal
202.3	202.3: Elevation of Public Structures - Riverine
202.4	202.4: Elevation of Public Structures - Coastal
203.1	203.1: Wet Floodproofing Private Structures - Riverine
203.3	203.3: Wet Floodproofing Public Structures - Riverine
203.4	203.4: Wet Floodproofing Public Structures - Coastal
204.1	204.1: Dry Floodproofing Private Structures - Riverine (Commercial)
204.2	204.2: Dry Floodproofing Private Structures - Coastal (Commercial)
204.3	204.3: Dry Floodproofing Public Structures - Riverine
300.1	300.1: Vegetation Management - Natural Dune Restoration
300.4	300.4: Vegetation Management - Non Coastal Shoreline Stabilization
300.6	300.6: Vegetation Management - Erosion
301.1	301.1: Shoreline Stabilization (Riprap, etc.)
303.1	303.1: Wetland Restoration/Creation
303.2	303.2: Floodplain and Stream Restoration
401.1	401.1: Water and Sanitary Sewer System Protective Measures
403.1	403.1: Stormwater Management - Culverts
403.2	403.2: Stormwater Management - Diversions
403.3	403.3: Stormwater Management - Flapgates/Floodgates
403.4	403.4: Stormwater Management - Detention/Retention Basins
403.5	403.5: Floodwater Storage and Diversion
404.1	404.1: Localized Flood Control System to Protect Critical Facility
405.1	405.1: Other Minor Flood Control
500.1	500.1: Flood Control - Floodwall
500.2	500.2: Flood Control - Berm, Levee, or Dike
500.3	500.3: Flood Control - Dam