

Request for Federal Assistance  
for Disaster Recovery

# Build Back Better Puerto Rico

November 2017

Ricardo Rosselló  
Governor of Puerto Rico



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# ACKNOWLEDGEMENT



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In preparing our document the Government of Puerto Rico is greatly appreciative of the support of the New York Governor's Office of Storm Recovery (GOSR) and other agency experts who provided technical capabilities for our analysis of the sectors and estimation of damages, along with advising on the preparation of the report. In the interest of supporting the recovery strategy and its impact on PR, the Rockefeller Foundation, The Ford Foundation, Open Society Foundations and Rockefeller 100 Resilient Cities provided funding for Deloitte to aid in this project. Deloitte, in addition to providing their technical assistance and expertise, provided consultation on the information gathered in preparation of the report.

This document represents an aggregation of the best available disaster damages and is an initial assessment of the cost to rebuild a stronger, more resilient Puerto Rico. Over the next few months as more data becomes available from our efforts and those of our federal partners, we will refine and rework our estimates of the impact of this disaster.



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# LETTER FROM THE GOVERNOR



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November 13, 2017

The Honorable Donald J. Trump  
The President of the United States  
The White House  
1600 Pennsylvania Avenue, NW  
Washington, DC 20500

Dear Mr. President:

I thank you again for your leadership and action on the emergency supplemental package that you signed into law on October 26th, 2017. That package represented a critical first step by your Administration and Congress to address the most immediate emergency needs in Puerto Rico. As you are aware, much more remains to be done in order to stabilize Puerto Rico and set the island on a path to full recovery and reconstruction.

The scale and scope of the catastrophe in Puerto Rico in the aftermath of Hurricane Maria knows no historic precedent. The island-wide devastation presents an extraordinary challenge to the American citizens of Puerto Rico, our local government and to the Federal government. A challenge that I am certain we can overcome together, as the United States is the undeniable world leader in disaster response and the resolve of the people of Puerto Rico is strong.

As you know, the devastation in Puerto Rico has strained resources beyond FEMA's Disaster Relief Fund (DRF) and associated programs. To support the resiliency and mitigation efforts necessary for the reconstruction phase of Puerto Rico, we are calling upon your administration to request an emergency supplemental appropriation bill that addresses our unique unmet needs with strength and expediency.

Specifically, the people of Puerto Rico respectfully request that Congress provide \$30 billion within the FEMA DRF to recover critical infrastructure; \$46 billion to restore housing and economic viability through the Community Development Block Grant - Disaster Recovery (CDBG-DR) program; and \$17.9 billion in other Federal grant programs for long term recovery with the intent to reconstruct a stronger, more resilient Puerto Rico.

In addition, based on the per capita financial impacts of our recovery efforts across the island, consistent with the historical precedents of Hurricanes Andrew and Katrina, Puerto Rico requests Congressional authorization of 100% funding for Stafford Act Programs. With the required use of the Section 428 of the Stafford Act for Permanent Work under FEMA, the overall Public Assistance funding will be capped to the mutually agreed upon estimates. Furthermore, additional funding will be needed through the Community Disaster Loan Program (CDL) to overcome the liquidity needs of the Government of Puerto Rico and our local municipalities. Data on the amounts needed from this funding source will be provided to your Administration and to Congress as soon as it becomes available.

This is a transformative moment in the history of Puerto Rico. We recognize that your leadership, along with that of leaders from both parties, will be essential to our recovery, and the future economic and fiscal health of the island. To that end, we are committed to fully engaging leaders from the private sector and Non-Governmental Organizations in the design and implementation of this rebuilding program. We will Build Back Better, not just in terms of the physical and economic reconstruction of the island, but through a true public-private partnership with a process that is open, transparent and accountable to our community, to the Federal government and the American people, who are showing such tremendous and heartfelt support for our efforts.

With sustained federal assistance and your leadership and support, I am confident that in time the people of Puerto Rico will recover and grow stronger than ever.

Sincerely,

**Ricardo Rosselló**  
Governor of Puerto Rico

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# EXECUTIVE SUMMARY

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Hurricanes Irma and Maria devastated Puerto Rico, bringing sustained winds well in excess of 150 miles per hour, heavy rains, and catastrophic flooding the likes of which the island had never seen before. The storms caused nearly complete devastation, including the catastrophic failure of the Island's power grid, water and wastewater infrastructure, and communications networks. The economy of the island ground to a halt in the face of physical damages, loss of supporting infrastructure, and the absence of power and water. Roads and bridges failed or were blocked by debris across the island, leaving communities stranded and unable to obtain life-saving aid, food, water and medicine for a period of weeks. More than 472,000 housing units were destroyed or experienced major damages, forcing hundreds of thousands of Puerto Ricans to seek refuge in shelters and the homes of family and friends. The agricultural sector was devastated, with near total destruction of the sector's infrastructure and loss of almost 80% of planted crops. Even today, approximately 60% of the island is still without power, and until recently 70% of the potable water is either unavailable or has yet to be certified as safe to drink, hundreds of schools have yet to reopen, and thousands of businesses are closed or have limited operations including the pharma manufacturing industry, which may cause serious shortages of drugs supplies in the US inasmuch as pharmaceutical products made in Puerto Rico account for nearly 10 percent of all drugs consumed by Americans.

Needless to say, these numbers do not capture the depth and breadth of the Puerto Ricans' suffering. Power outages and the decimation of cell tower capability prevent regular communication or access to wireless internet services. Damage to roads and bridges and blockages caused by debris continue to render the hardest-hit areas of the island virtually inaccessible. Hospitals operate at a reduced capacity at a time when health services are most needed. Hundreds of thousands of Puerto Ricans are displaced and most children have not yet returned to school. All levels of government, as well as the police and fire departments, are hampered by the destruction of their buildings and infrastructure. The hurricanes also robbed thousands of Puerto Ricans of their livelihoods. Manufacturing, agriculture and tourism, pillars of the Puerto Rican economy, will be devastated for years. And the fabric of Puerto Rico's communities has been torn, as tens of thousands of Puerto Ricans left the island to escape their post-hurricane hardships.

The task ahead is as daunting as it is urgent, and recovery cannot be accomplished unless Puerto Rico receives substantial federal assistance. In this Request for Supplemental Appropriations, Puerto Rico is requesting a total of \$94.4 billion, targeted in the areas where assistance is most needed.

# EXECUTIVE SUMMARY

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## Requested Amount by Category

Housing	\$31,068,532,671
Power Grid and Resiliency	\$17,789,375,000
Health and Healthcare	\$14,946,507,962
Agriculture	\$2,076,500,000
Social Services	\$288,262,193
Economic Development	\$3,194,677,600
Communications Infrastructure	\$1,500,000,000
Roads & Bridges	\$4,497,725,000
Ports and Airports	\$1,345,700,000
Public Building Revitalization	\$153,100,000
Water and Water Control Facilities	\$1,280,822,003
Sanitary Sewer and Storm Drainage	\$1,409,716,413
Education and Schools	\$8,413,208,822
Environment and Natural Resources	\$1,581,050,000
Public Safety & First Response Coordination	\$486,990,571
Long-Term Recovery Management and Coordination	\$9,000,000
Cost Share	\$4,358,445,905
<b>Grand Total:</b>	<b>\$94,399,614,140</b>

# EXECUTIVE SUMMARY

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## Requested Amount by Funding Source

CDBG-DR	\$46,052,313,558
DOL	\$55,000,000
DOT	\$1,696,925,000
EDA	\$228,750,000
EPA	\$300,000
FAA	\$540,000,000
HHS	\$11,364,232,225
HM	\$2,150,000,000
HSGP	\$4,866,000
PA	\$28,237,727,357
SSBG	\$126,000,000
USACE	\$1,830,000,000
USDA	\$2,080,500,000
USFWS	\$33,000,000
<b>Grand Total</b>	<b>\$94,399,614,140</b>

# ENSURING TRANSPARENCY AND STRONG FINANCIAL CONTROLS

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In the aftermath of Hurricanes Irma and Maria, Puerto Rico recognizes that the commitment of funding from Congress necessitates an equal commitment from Puerto Rico to manage those funds with great efficiency, transparency, and accountability. The Governor and his entire Administration are dedicated to delivering on this promise, and the appropriate organizational structures, controls and processes are being put in place to protect the federal investment in the recovery.

An extraordinary demonstration of this commitment is found in the recent creation of the Central Recovery and Reconstruction Office of Puerto Rico. The need to coordinate across the traditional agencies of government and the commitment to strengthen financial controls and the oversight of the recovery process led the Governor to issue an Executive Order establishing the Office that has been established with all necessary authority, powers and capability to: (a) identify, procure and administer all state, federal and/or private resources for recovery; (b) direct and coordinate efforts and activities of the Government of Puerto Rico related to the recovery; (c) fund and execute recovery and related infrastructure projects; and (d) advise the Governor and provide technical assistance to other entities across the Government related to recovery efforts, as required. This new office will provide the centralized oversight and financial controls that the Government of Puerto Rico and the U.S. taxpayer expect for the recovery effort. It will also ensure the Government can implement reconstruction efforts with efficiency and transparency, and capitalize on opportunities to build back in a manner that makes Puerto Rico better, smarter, stronger, and more resilient.

The operation of this Office will also centralize the recovery procurement activities of the Government so that additional controls can be implemented to ensure those actions will be in full compliance with Federal and state requirements, approached with consistency, occur under the watchful eye of procurement experts, and are consistent with purchasing process best practices. It will ensure that all procurements are performed in a manner that achieve full and open competition and will make public information about procurement decisions available to the public.

Puerto Rico is committed to implementing specialized tools, expanding the use of expert consultants and accounting support, utilizing proven grants management systems to support the program and financial management funding requirements that provide accountability to the island's recovery investment. A program that provides technical assistance to state agencies, municipalities, and other recipients of recovery funds is being implemented to increase awareness of financial and programmatic requirements and to assist with documentation management. Puerto Rico has engaged and is leveraging best practices from states such as Louisiana, New Jersey, New York, and Florida from past disasters. The Government will continue engaging with FEMA and other federal agencies, including with their respective Offices of Inspectors General, as it designs and implements programs and spends resources. Puerto Rico will also be developing and implementing processes, procedures, and protocols designed to manage the significant funding that is expected to be made available in the aftermath of the hurricanes to permit the Government to monitor those implementation efforts, ensure legal, regulatory, and policy compliance and ensure the appropriate use of funds.

Finally, Puerto Rico is planning to create a Recovery Transparency Portal that will track the status of recovery and provide information to the public about how and where funds are being used. This will provide transparency related to the recovery effort, and will support a regimen and culture of accountability.

# DISASTER SUMMARY

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Hurricanes Irma and Maria dealt a devastating blow to Puerto Rico, resulting in the largest and most complex disaster response and recovery effort in U.S. history. Hurricane Irma skirted the northern coast of the Island from September 6-7, 2017 as a Category 5 storm, causing significant flooding, regional power and water outages, and other significant impacts. Before response operations had even concluded however, an even more devastating Hurricane Maria slammed into Puerto Rico on September 20, making a direct strike as a strong Category 4 storm and causing widespread devastation and destruction the likes of which the island has never seen.

Maria represented a “worst case scenario” for Puerto Rico, tracking east-to-west across the island and leaving no one and no thing untouched. Within a matter of hours, 100% of Puerto Rico’s population, economy, critical infrastructure, social service network, healthcare system, and even the government became casualties of the storm. All power was lost across the Island as a direct result of the catastrophic failure of the Puerto Rico Electric Power Authority’s (PREPA’s) transmission and distribution infrastructure to the point that experts estimate it could take as long as a year to bring even temporary power back to all Island households and businesses. This produced a cascading effect that impacted critical infrastructure and services that relied on power to operate (such as airports, seaports, hospitals, water systems, communications networks, hotels, traffic and street lights, etc.), plunged homes and businesses across the Island into darkness, and caused a devastating blow to Puerto Rico’s fragile economy – an impact that continues to be felt throughout the island even today and that is expected to last for many years.

The powerful winds, storm surge and localized flooding from Hurricane Maria caused significant damage or even complete destruction of over 472,000 housing units across Puerto Rico. This has forced hundreds of thousands of island residents to seek shelter in hotels, with friends and family or in congregate shelters. The magnitude of housing losses produced a housing emergency throughout the island due to the insufficient remaining housing stock to shelter all of those who have lost or have been forced out of their homes. This reality, added to the power and water outages, forced tens of thousands of Puerto Rico residents to flee to the continental United States, further impacting the island’s ability to recovery and rebuild its communities and economy.

In addition, both storms also created a severe threat to public health and safety – a condition that continues to this day. Hurricane Maria produced more than 6.2 million cubic yards of both vegetative and construction and demolition debris across Puerto Rico, impacting transportation, restricting access to hard-hit areas, and creating an environment that is ideal for rodent infestation and the spread of disease. Nearly all of the water and wastewater treatment plants in Puerto Rico were rendered inoperable, resulting in the release of millions of gallons of untreated waste into the environment. Furthermore, many hospitals and primary care facilities were forced to close, nursing homes were left without power or resources, the social service “safety net” fell apart, and basic resources such as clean and potable water, food and medicine became scarce and turned the emergency on the island into a humanitarian crisis.



# DISASTER SUMMARY

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More than six weeks after Hurricane Maria struck the island, both Puerto Rico and its federal counterparts remain heavily focused on response activities to protect public health and safety and meet basic needs. In fact, the Irma and Maria disasters represent the longest period of joint federal and state life saving and sustaining response operations to a natural disaster in U.S. history. But there is light at the end of the tunnel. Emergency assistance is having an impact, and the provision of generators and temporary work is beginning to stabilize conditions on the island.

As the focus turns from response to recovery, the scale of the devastation also provides Puerto Rico and the United States Government with an unprecedented opportunity to rebuild portions of the island's infrastructure, housing, and economy in a way that makes Puerto Rico stronger, smarter, safer, better, and more resilient than before. Due to the unparalleled and widespread devastation, the disaster recovery period in Puerto Rico represents a chance to "begin again" and rethink the design of major components of the Island's critical infrastructure, invest in the quality and survivability of its housing stock and public buildings, and restructure, modernize and reform how it delivers basic services to its residents. Puerto Rico can also improve its resiliency and sustainability to protect the federal and state investment in the recovery and produce benefits for the island's residents for generations to come. To achieve these goals, however, the people of Puerto Rico will need assistance above and beyond that available from FEMA. This is the basis for this Request for Supplemental Appropriations.

# OVERVIEW OF PUERTO RICO AND RECONSTRUCTION APPROACH

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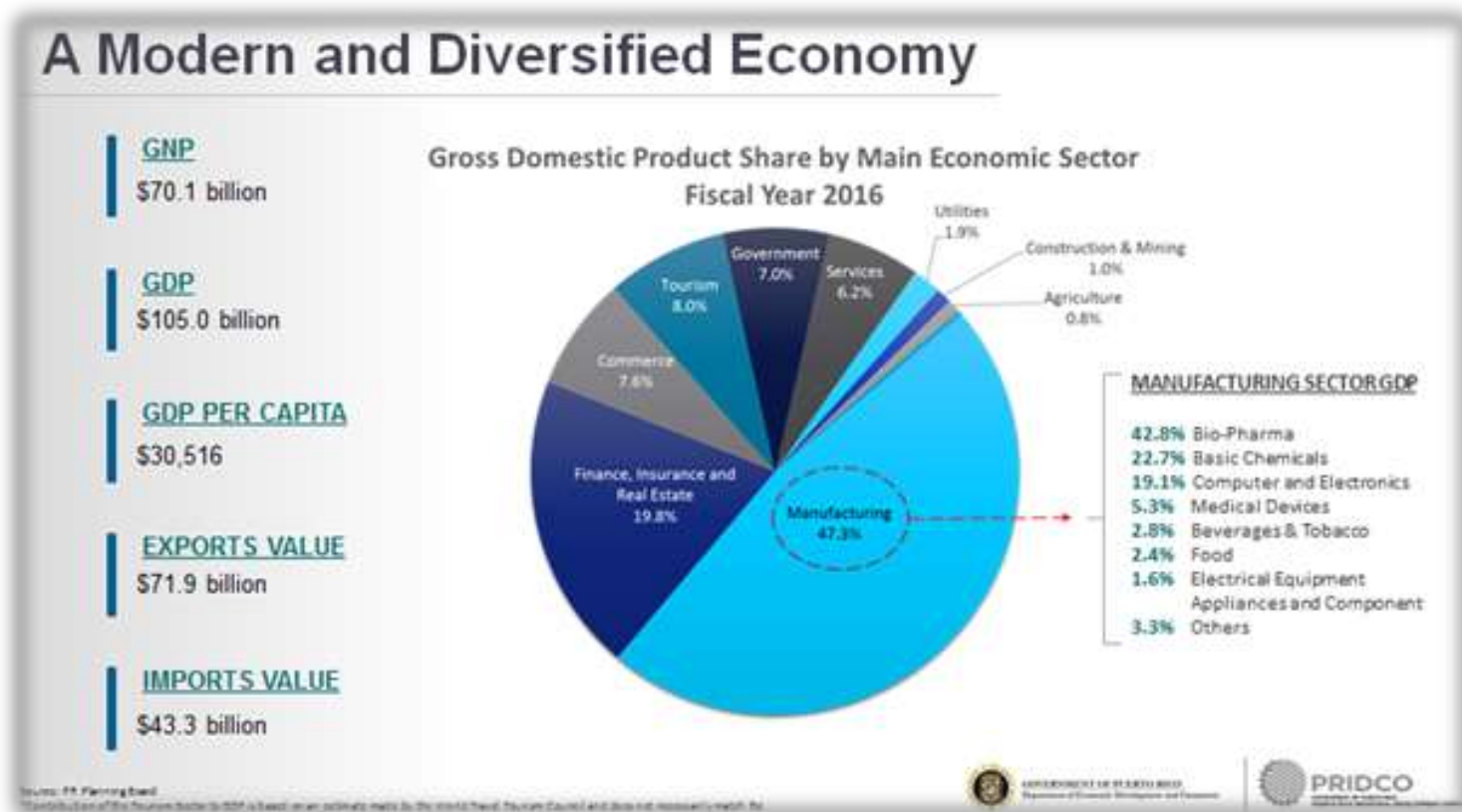
Puerto Rico is a territory of the United States located in the Caribbean approximately 1,030 miles southeast of Miami, FL. Puerto Rico has an area of approximately 3,500 square miles and a population estimated at 3.41 million by the United States Census Bureau as of July 1, 2016.

Puerto Rico, one of the largest economies in the Caribbean, offers a stable legal and regulatory framework where major U.S. and foreign multi-national corporations have historically operated, benefiting from its favorable investment environment. The economy includes a sophisticated financial system, has a high concentration of pharmaceutical and life sciences manufacturing, biotechnology, medical devices, agriculture, rum, aerospace, and electronics and contains strong consumer, retail and service sectors.

KEY PUERTO RICO FACTS 2016	
Population	3.41 million
Land Area	8,959 sq. km
Currency	US Dollar (USD)
Language	Spanish, English
GDP Per Capita (USD, Current terms)	\$30,516

However, the Government of Puerto Rico, its agencies, public corporations and instrumentalities (the “Government”) are currently facing the unprecedented devastation caused by Hurricanes Irma and Maria. In addition, the Government had embarked on profound fiscal adjustments that limits the amount of reconstruction funds from its own government sources.

# OVERVIEW OF PUERTO RICO AND RECONSTRUCTION APPROACH



The Government of Puerto Rico has a strong foundation to effectively receive and deploy infrastructure funds and capital. The devastation of Hurricanes Irma and Maria places the highest level of urgency on the need to effectively fund and invest in critical infrastructure. For this, the Government's aligned policies to encourage infrastructure investment together with coordinated Federal efforts conform a solid foundation for infrastructure reconstruction. Puerto Rico's strong Private Public Partnership ("P3") framework, one of the most comprehensive in the U.S., together with close inter-agency coordination, and effective and transparent funds monitoring promises to be a powerful combination to accelerate and deliver transformative reconstruction in Puerto Rico's infrastructure. In fact, no other state has offered innovative infrastructure delivery tools such as P3s to be part of the entire 'tool box' to fund, invest, deliver and monitor infrastructure reconstruction like Puerto Rico is proposing.

Although the recent natural disasters represent a devastating blow to Puerto Rico, the Government is committed to maximize funding opportunities with a comprehensive framework which will effectively deploy, fund, invest in and execute much needed infrastructure projects.

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# SECTORAL IMPACTS AND PROJECTS



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# IMPACT TO HOUSING



# HOUSING

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Hurricane Irma and Maria took a huge and unprecedented toll on the island's home and housing stock. It is estimated that over 472,000 housing units have received major damage or been destroyed by the hurricanes. This forced tens of thousands into congregate shelters and hundreds of thousands more into hotels or into the homes of family and friends. As of early November, more than 1 million Puerto Rican households have applied for FEMA individual assistance, with many more expected to apply in the coming months.

While damage was widespread and impacted people of all economic and social strata, many of the most severely damaged or destroyed housing units sheltered lower-income populations, were of poor quality and/or were not constructed to modern building code requirements and resiliency standards. The loss of power, water, and access challenges across the island have further complicated matters, making housing that otherwise could be occupied uninhabitable.

One of the major challenges in Puerto Rico is that a substantial portion of housing stock was made uninhabitable or taken off-line, reducing supply at the same time that demand for safe and decent housing increased due to the storm effects. This has created a situation in which there are insufficient housing resources to support the needs of displaced populations. This problem is particularly acute for individuals and families of low-income or who have special needs. Because Puerto Rico is an island, this situation has left tens of thousands of Puerto Ricans with no other option but to leave for the mainland United States to secure safe and habitable housing.

Given the extent of housing losses, Puerto Rico is looking to build back a more resilient housing stock that can correct some of the deficiencies and problems that contributed to the massive damages. Substantially-damaged structures located in the 100-year floodplain will need to be reconstructed, elevated, or bought out (of the total occupied housing units, approximately 58% are situated in mapped floodplains). Puerto Rico will be adopting an updated hazard resistant building code that will ensure that housing repairs and reconstruction will result in safer and more secure housing across the island. As required by FEMA, the Government of Puerto Rico will use the recovery period to address the problem of "informal housing" – a term used to describe homes built by people on government land without permission and without following building code requirements – by supporting the development of safe and decent replacement housing away from government land where these individuals and families can be relocated. Puerto Rico will also implement programs for single-family, multi-family, and public housing repair, restoration, and reconstruction to facilitate replacement of the housing stock.

The Puerto Rico Department of Housing manages existing public housing projects and offers housing assistance to more than 40,000 low-income housing units housing over 100,000 households. The Department of Housing is currently assessing the damage to the affordable housing stock. Low-income households have fewer options in securing safe and decent housing especially in times after a major disaster given their limited resources. Considering the magnitude of damage caused by the hurricanes, it is anticipated that temporary housing solutions for those affected by the hurricanes will be needed for months or, in some cases, years. This produces a temporary recovery need for residents that includes rental assistance as well as repair and mitigation.



It is critical for the island’s recovery that there be adequate funding for housing resources that can meet the needs of all its residents and permit those who have been displaced and who were forced to leave Puerto Rico to return to their communities. Currently, the FEMA Individual Assistance program inspections are not representative of the damages as the total inspections are predominately in the metropolitan area and only include 7% of the overall housing inspections required. At this time, it is estimated that Puerto Rico suffered almost \$37.41 billion worth of damage to its owner-occupied and rental housing stock. After taking insurance into account, the estimated unmet need based on damage estimates and the need for mitigation is approximately \$31 billion.

Owners units by damage	Number of units	Estimated Cost
Destroyed	57,482	\$6,926,596,954
Major	254,564	\$8,909,730,522
Minor	205,293	\$3,079,399,950
Affected	205,293	\$1,026,466,650

Tenants units by damage	Number of units	Estimated Cost
Destroyed	29,612	\$3,568,246,915
Major	131,139	\$4,589,861,178
Minor	105,757	\$1,586,357,550
Affected	105,757	\$528,785,850

This estimate was based on information regarding the housing stock prior to the hurricanes, open source housing data, FEMA Individual Assistance data, US census data, insurance info, and assumptions based on local knowledge. Below are the assumptions made in developing the housing estimate:

- The percentage of damage level (Destroyed, Major, Minor, Affected) were based on Hurricane Hugo and Georges
- Cost for repair/rehabilitation by category (i.e. 120,500; 35,000; 15,000; 5,000) based on median home prices and input from PR housing agency.
- Puerto Rico insurance industry provided insurance rate of 31%
- The mitigation factor of 30% is based on the HUD standard of 30% of Major and Destroyed properties

For additional information on the methodology, please see the appendix.

CATEGORY	ESTIMATED COST
Housing	\$31,068,532,671

# REPAIR AND RECONSTRUCTION OF PUERTO RICAN HOMES



Estimated Cost

**\$31,068,532,671**

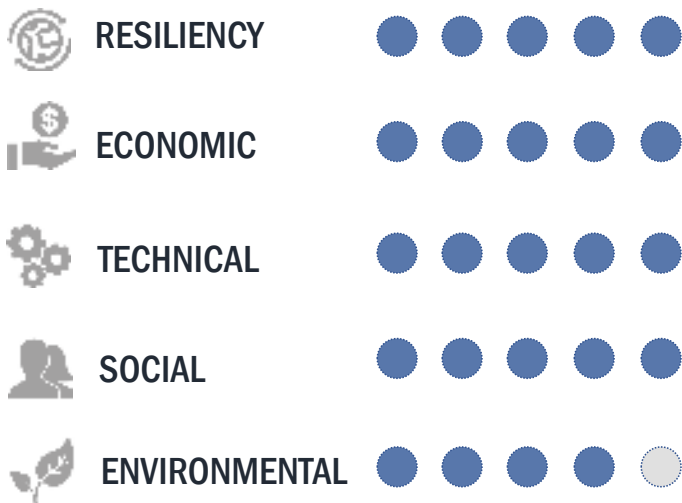
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**FEMA, SBA, SSBG**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Repair and rebuild a more resilient house stock for single-family, multi-family, and public housing residents. Develop programs that improve resiliency of the larger community such as buyouts and implementing a hazard resistant building code.

## IMPACT

Damage was widespread across the island. Over 472,000 homes received major damage or been destroyed by the hurricanes. As of early November, more than 1 million Puerto Rican households have applied for FEMA individual assistance.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Hundreds of thousands of Puerto Ricans have been displaced by the hurricanes with many more living in damaged homes. Recovery will get households back into safe and decent housing quickly as well as providing mitigation options that can reduce impacts in future storms. These efforts will create more resilient housing stock and make communities stronger.

# IMPACT TO POWER GRID



# POWER GRID AND RESILIENCY

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Hurricanes Irma and Maria caused the complete failure of Puerto Rico's power grid. Generating facilities include 6 fossil and 21 hydroelectric power plants, owned and operated by the Puerto Rico Electric Power Authority (PREPA), as well as privately owned facilities including 2 cogeneration plants, 2 windfarms and 5 solar farms. The transmission and distribution system consists of 2,478 miles of transmission lines, 31,485 miles of distribution lines, and 344 substations. The storms decimated both transmission and distribution lines across the island, with 847 poles and transmission towers destroyed, and nearly 900 conductor and insulator failures system-wide. 74% of substations, both primary and secondary control centers and all power generation plants incurred moderate to severe flooding and varying levels of wind damage. These systemic failures caused the longest sustained power outage in U.S. history that continues to this day on approximately 60% of the island. According to the PREPA and the U.S. Army Corps of Engineers (USACE), it may take considerable time to provide temporary power to all points on the island and several years to rebuild the entire grid. This cataclysmic failure of the power grid has produced some of the most costly and impactful consequences of the hurricane disasters, creating ripple effects throughout the housing sector, communications, critical infrastructure, health care and economy.

The failure of the grid provides both Puerto Rico and the United States the unique opportunity to rebuild the power infrastructure and rethink how power is generated and distributed across the island to make the system more efficient, resilient, and sustainable. The system can be modernized to include state-of-the-art technologies while incorporating renewable energy sources such as wind and solar along with energy storage to reduce system costs, improve resiliency and decrease "last mile" costs of the distribution system. The grid can be built with smaller generation units that are distributed so as to provide redundancy and a series of micro-grids that are multi-directional (vs. one-way). The system can also be sized to meet the forecasted decreases in load over the next decade, which will allow PREPA to modernize the system in order to provide stable energy at a low cost. This model could also serve as a laboratory for the future development of power production, transmission and distribution systems and the incorporation of renewable resources.

The rethinking of the power grid has broad implications for Puerto Rico's citizens, businesses and government. Our summary for estimating the need was as follows:

# POWER GRID AND RESILIENCY

Power & Grid Resiliency Investments	Qty	Unit Cost	Total Cost	Comments
Substation Rebuild and Hardening	340	\$15,000,000	\$5,100,000,000	Replacement control buildings, flooding protection, a few substation relocations, upgrade structures and insulators to 158mph, replace end of life circuit breakers.  Harden and upgrade relay protection systems, T/D SCADA, and security
<b>TRANSMISSION LINE RECONSTRUCTION AND HARDENING</b>				
115kV & 230kV replacement	1000	\$400,000	\$400,000,000	Includes hardware upgrade on 1000 poles
38kV poles replacement	1000	\$20,000	\$20,000,000	Includes hardware upgrade on 1000 poles
Distribution line reconstruction and hardening	1200	\$2,000,000	\$2,400,000,000	1200 feeders * \$200k/mile * 10 miles/feeder = \$2.4B  Including addition of distribution automation
<b>CONTROL CENTERS REBUILD AND HARDENING</b>				
Primary Control Center rebuild and hardening			\$10,000,000	
Backup Control Center relocation, rebuild and hardening			\$24,000,000	
Spares inventory	10	\$800,000	\$8,000,000	Transformers
IT/OT systems			\$50,000,000	EMS, ADMS/DERMS, GIS, AM, Cybersecurity
Comms/Fiber/Wireless			\$400,000,000	
<b>GENERATION</b>				
Generation rebuild and hardening			\$2,059,500,000	Six gen plants; one replacement; T&I, Rebuilds, Spares replacement
Fuel infrastructure rebuild			\$1,000,000,000	
DER build out			\$1,040,000,000	Assuming microgrid investment to get 10% of peak load (comes to 260 MW) on microgrids at \$4/W. The \$4/W breakdown is: ~\$0.5/W for generator, ~\$1/W for storage, ~\$1.5/W for PV, ~\$1/W for software, controls, and comms

CATEGORY	ESTIMATED COST
Power Grid and Resiliency	\$17,789,375,000

# POWER GRID AND RESILIENCY INVESTMENTS



Estimated Cost

**\$15,639,375,000**

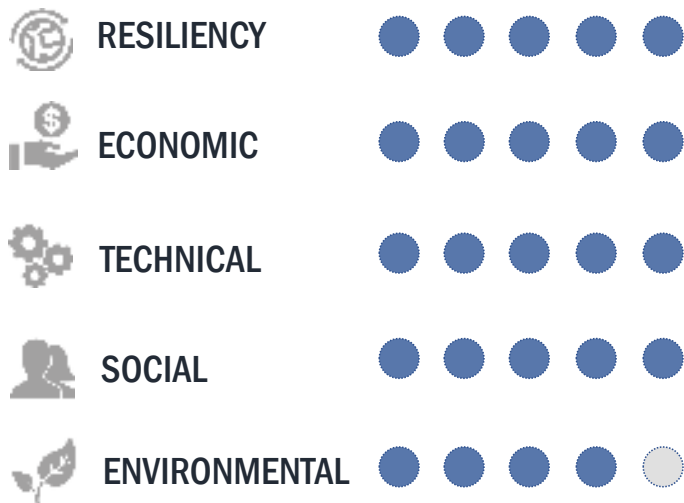
Proposed Funding Source

**PA/HM**

Other Possible Funding Sources

**CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Modernize and harden the electric system including: substations reconstructions and flood protection; transmission and distribution lines hardening, control center rebuilding, with upgrades to the operation and IT; power generation, and fuel supply hardening, and distributed energy resources build out for customers..

## IMPACT

Hurricane Maria hit Puerto Rico directly landing as a Category 4 hurricane with sustained winds of up to 155 mph (250 km/h) that knocked out the primary and secondary electrical transmissions lines, generation stations and other essential infrastructure. This resulted on the largest blackout in U.S history.

## LONG-TERM BENEFIT AND OPPORTUNITIES

With this project the Island will be provided with a more resilient electrical system that will prevent the recurrence of the catastrophic situation caused by the aftermath of Maria. 100% of the population, and 100% of the business and communication Island wide will benefit from the project. On the technical side the system will have lower transmission losses and will have lower maintenance costs.

# OFF GRID ENERGY PROJECTS



Estimated Cost

**\$150,000,000**






Proposed Funding Source

**HM**

Other Possible Funding Sources

**CDBG-DR, EDA**

## EVALUATION CRITERIA

 RESILIENCY	● ● ● ● ●
 ECONOMIC	● ● ● ● ●
 TECHNICAL	● ● ● ● ●
 SOCIAL	● ● ● ● ●
 ENVIRONMENTAL	● ● ● ● ●

## LOCATION



## DESCRIPTION

Development and installation of renewable energy sources that will ensure that water and energy can continue to be provided during emergency stations.

## IMPACT

Approximately 90% of the Island water system collapsed due to damages of the electrical grid.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Critical water facilities will be resilient to blackout allowing the distribution and sewer services to function properly even in future hurricane scenarios.

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# IMPACT TO HEALTH



# HEALTH AND HEALTHCARE

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The damage to Puerto Rico's existing healthcare system was significant. Each of the 68 hospitals and 107 health clinics across the island experienced significant structural damages and power loss, and in many cases pre-existing generator back-up systems were either damaged or destroyed due to the storms or the duration of the power outages. One hospital in Vieques was completely destroyed. The island's network of primary and critical care centers all but closed down due to power and damage issues, requiring the expenditure to date of over a hundred million dollars by the Federal Government to activate the National Disaster Medical System, a Combat Army Surgical Hospital and other temporary medical facilities, provide air-lift support for critical patients, and even mobilize the U.S. Navy Hospital Ship Comfort to fill the gaps. Nearly six weeks after the storms, twelve (12) hospitals remain on back-up generator power, and many are operating at reduced capacities due to power and water limitations and damage. Only 72 of the original 107 health clinics are known to be operating: 33 of which are on generator power.

Puerto Rico is now facing a public health crisis. Vector control remains a significant concern, as does the potential for disease outbreak due to contaminated or compromised water supplies, and the presence of nearly 6.2 million cubic yards of debris that can serve as an ideal breeding ground for rodents and other disease-carrying vermin. There is an unknown number of people potentially affected by ingestion of contaminated water and the secondary effects of infection and long-term toxicity from ingesting dissolved or suspended toxins. Puerto Rico should also expect increased morbidity and mortality of those suffering from chronic diseases such as asthma, hyperglycemia/diabetes, kidney failure requiring dialysis, hypertension, chronic depression, and those who have more limited access to healthcare providers and medications. The chronic impacts of the disaster on the population's health may take years to manifest.

One of the most significant and immediate challenges faced by the Government of Puerto Rico is the impact that the storms has had upon its already fragile Medicaid program. After many years of structural underfunding, the Medicaid program has been further hobbled due to the hurricanes causing widespread public health impacts that are expected to generate significant increases in usage of Medicaid by program participants. These impacts include health problems associated with hazardous conditions, insect-borne disease, health and safety issues associated with debris and damaged facilities, and increased risk of infections. The increase in unemployment and other social factors is expected to increase the population eligible to participate in the program. This situation is further complicated by the exodus of tens of thousands of Puerto Ricans to the mainland because of the lack of safe and decent housing on the island; these individuals will be seeking medical services in their adopted homes at costs that run 4-5 times higher than that of similar care in Puerto Rico. The Government must either expand coverage under Medicaid to assume these unanticipated costs, or strand its residents away from home without access to necessary health care services.

# HEALTH AND HEALTHCARE

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In the aftermath of these events, the Government of Puerto Rico needs sufficient funding resources to implement its Medicaid program to address the immediate and longer-term healthcare needs of the island’s population. The Government of Puerto Rico is planning to restructure its health care delivery system to permit a more rapid assessment and response to health crises and disease outbreaks, and build a modern and resilient healthcare system that can sustain the load from crises. The goal is to regionalize response to health issues in the future by establishing regional healthcare “hubs” to provide high levels of care and to serve as a regional resource centers for other health facilities to ensure they always have access to critical supplies, medicines, equipment, and surge capacity support. Puerto Rico seeks to “harden” hospitals and other critical healthcare facilities to make them more resilient, ensuring their availability immediately before, during and after a disaster occurs.

The government has identified specific restoration projects that total the amount specified below. The following projects illustrate a few of the ways in which Puerto Rico is planning to implement measures designed to achieve these objectives.

CATEGORY	ESTIMATED COST
Health and Healthcare	\$14,946,507,962

# MEDICAID ASSISTANCE



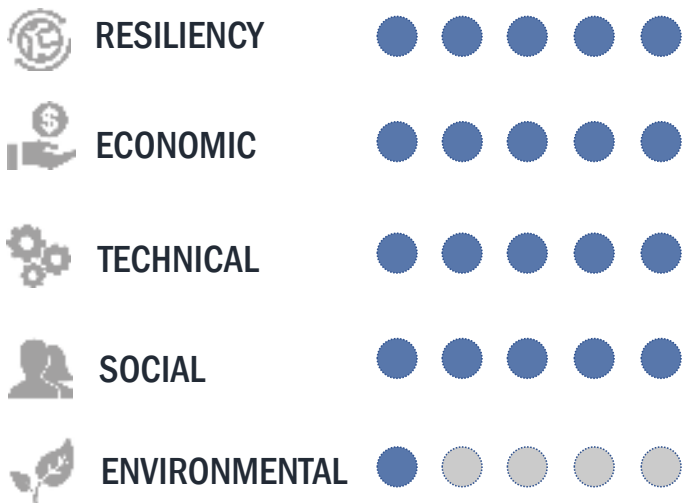
Estimated Cost

**\$11,350,000,000**

Proposed Funding Source

**HHS**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Obtain necessary funding to augment the existing Medicaid program in Puerto Rico to address disaster-related costs and reduce the burden of structural financial burdens that impede recovery.

## IMPACT

The hurricanes produced significant unanticipated costs for medical care for participants in the Medicaid program due to expected increases in program usage as well as increased system costs as displaced Puerto Ricans access much more expensive care on the mainland (4-5 times the cost on island). Also, the structural underfunding of Puerto Rico's Medicaid program combined with the massive disruptions to economic activity and tax / fee collections make alleviating the structural financial burden of Medicaid in Puerto Rico necessary.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Providing additional funding for Medicaid over the coming five years will improve the health of many hurricane survivors who will need increased medical care. Also, the financial relief from providing this assistance will free up resources to help the Government of Puerto Rico pursue recovery in an expeditious and effective manner.

# HOSPITALS IMPROVEMENTS

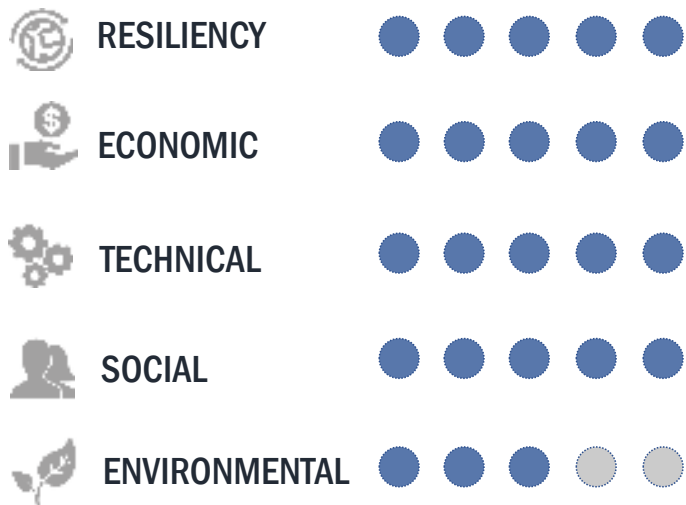


Estimated Cost  
**\$141,906,000**

Proposed Funding Source  
**CDBG-DR**

Other Possible Funding Sources  
**EDA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Puerto Rico is planning to build a modern and resilient healthcare system that can sustain the load during and after crises. Hardening of hospitals and other critical healthcare facilities will be undertaken as well as other mitigation efforts. This project will maximize the use of renewable power generation which will be able to better withstand storms and flooding and modernize equipment and services.

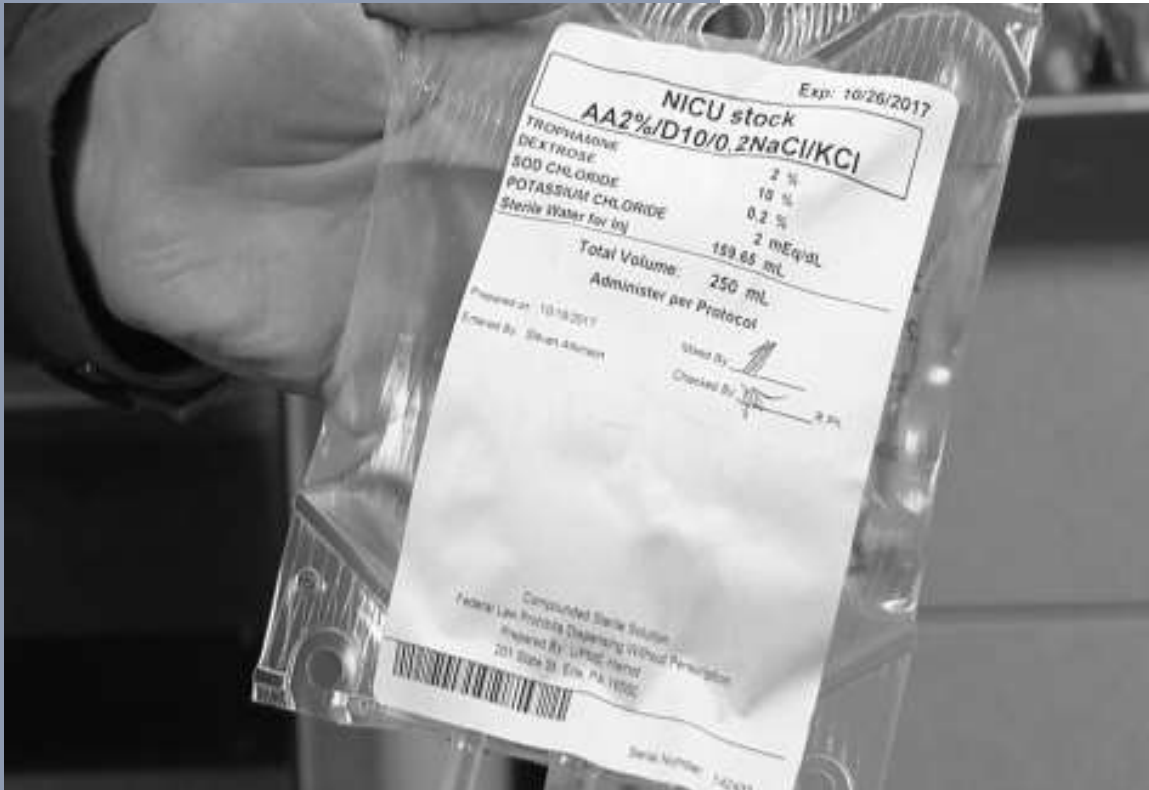
## IMPACT

One hundred percent of the 68 hospitals and 107 health clinics experienced significant structural damage and lost power. In many instances, pre-existing generator systems were either damaged, destroyed, or failed. The National Disaster Medical System was activated and utilized a Combat Army Surgical Hospital and other temporary medical facilities, provided air-lift support for critical patients, and even mobilized the US Navy Hospital Ship Comfort to fill the gaps in need.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Making the island's healthcare facilities and services more resilient will permit for more rapid response to health issues and improve continuity of services especially in times of disaster and reduce the need for extraordinary measures to ensure the residents of Puerto Rico have access to healthcare.

# STATE EMERGENCY STOCKPILE

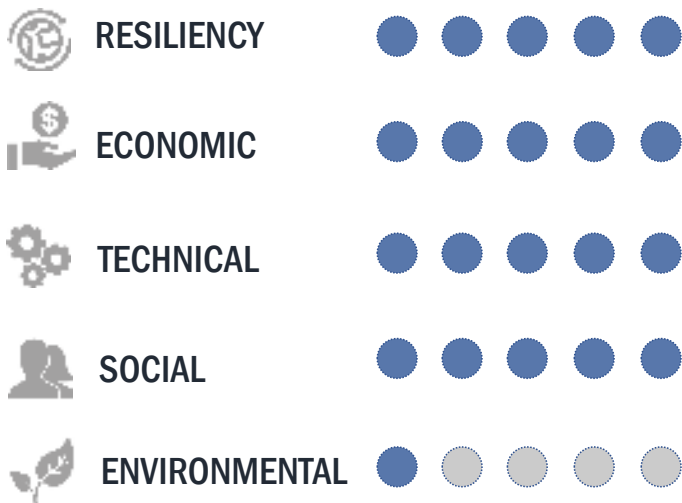


Estimated Cost  
**\$5,000,000**

Proposed Funding Source  
**CDBG-DR**

Other Possible Funding Sources  
**HLS**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Funding to ensure that medical personnel have immediate local access to critical medical supplies even if the island's transportation network is disrupted in an emergency.

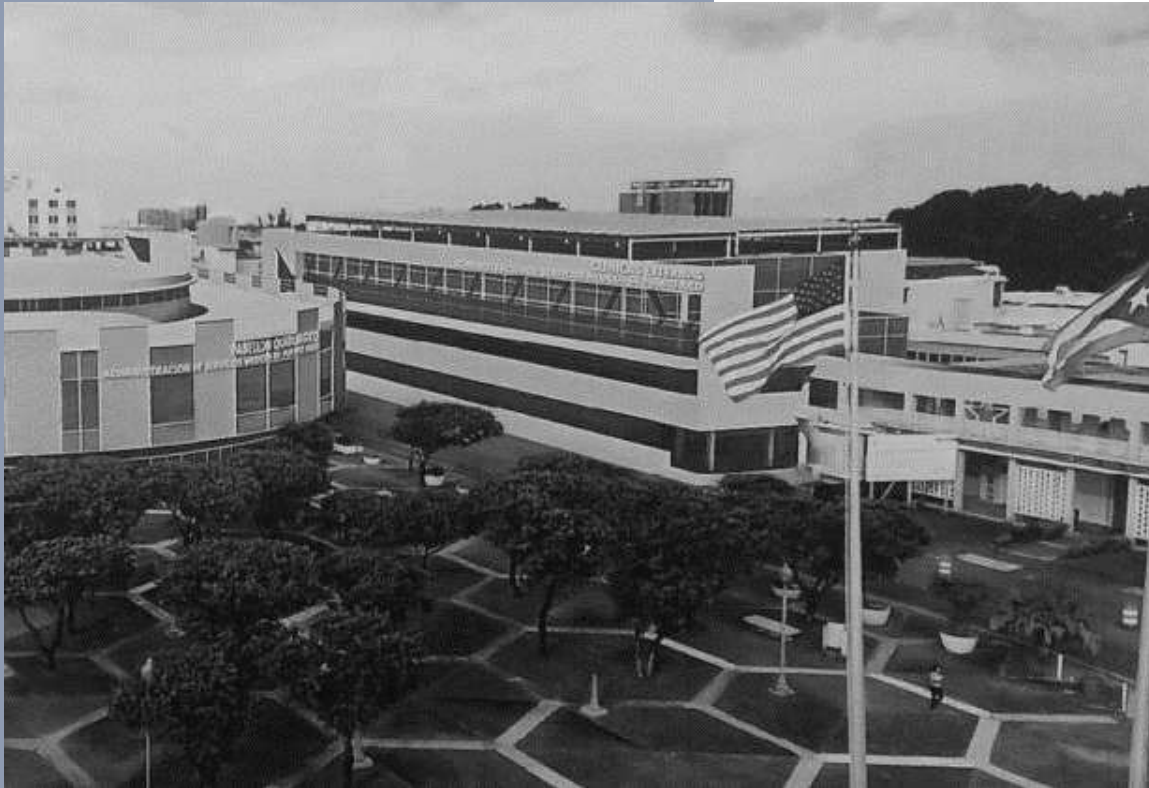
## IMPACT

In the immediate aftermath of Maria, clinics and hospitals did not have efficient access to critical medical supplies and medicines due to the disruption of the medical supply chain. These disruptions delayed treatment to injured and sick citizens, exacerbating the already difficult conditions.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Well stocked and well managed localized supply stockpiles of essential medical supplies and medicine will ensure prompt medical treatment in the event of future disasters.

# HOSPITAL REPAIR & REFURBISHMENT



Estimated Cost

**\$3,445,735,962**

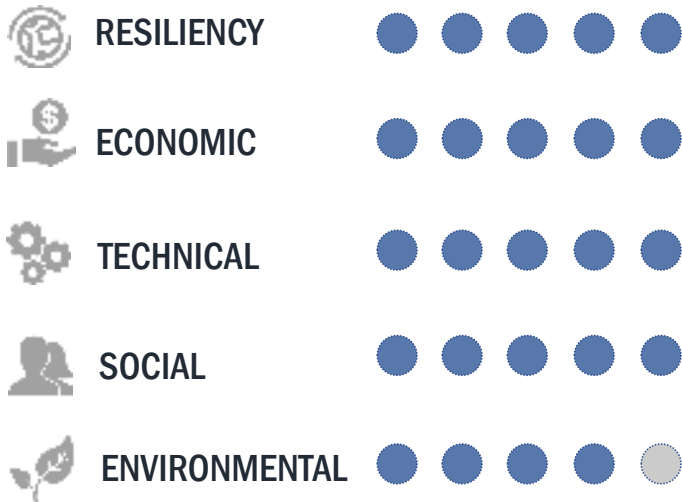
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**EDA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Funding to rebuild, repair, and modernize storm-impacted or destroyed hospitals and medical clinics across Puerto Rico.

## IMPACT

Each of the 68 hospitals and 107 health clinics across the island experienced significant structural damage, including destruction of existing back-up power supply systems. These damages significantly degraded or fully obstructed the ability of these critical facilities to provide basic medical care to Puerto Rico's citizens, including the elderly and children.

## LONG-TERM BENEFIT AND OPPORTUNITIES

A fully operational health care system is a cornerstone in any modern society. When significant capital investments are made to repair health care facilities, these facilities should be upgraded in accordance with current health care design practices and up-to-date medical technologies.

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# IMPACT TO AGRICULTURE



# AGRICULTURE

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The agricultural sector in Puerto Rico was severely impacted by the rains and winds from Hurricanes Irma and Maria. Agriculture holds an important aspect of the island's culture and history. Roughly a quarter of Puerto Rico's land is divided into over 13,000 farms that employ many workers and supply food to the communities nearby and across the island. Most farms are small, family-owned operations that have been completely devastated by both the destruction of their planted crops and the physical losses of equipment and buildings. Approximately 80% of the crop value on the island has been destroyed, representing a loss of nearly \$250 million to the Puerto Rico economy and far more in the years to come given the time it takes for some crops to reach maturity. This impact is further spread across the island due to the loss of locally-grown foods in the marketplace, which has limited nutritional options and driven up costs to consumers. The loss to livestock and other animals is equally as devastating, with over 2.2 million animals lost due to the storm, representing an animal mortality rate between 45-50%. Feed, water, and energy necessary to maintain and manage the remaining herds is in short supply due to the loss of power in many rural areas and the disruption to supply chains. Also, agricultural infrastructure such as buildings and machinery experienced damages in excess of \$1.8 billion, which represents 40% of the total value of such infrastructure in all of Puerto Rico (using data from the National Agricultural Statistics Service). Greenhouses, controlled-environment facilities, and production and processing buildings all experienced catastrophic losses.

Hurricanes Irma and Maria demonstrated that Puerto Rico needs to promote a higher level of food security and more efficient production of agricultural goods on the island through the restoration and strengthening of the agricultural sector. Puerto Rico will promote the hardening of agricultural infrastructure (particularly buildings), strengthening farm-to-market connectivity, and facilitating the incorporation of new technologies to increase productivity and decrease costs. Making available the necessary capital to allow farmers and others in the agricultural sector to re-establish operations and attract new providers to the field is also a top priority.

The Government of Puerto Rico is expecting to initiate a variety of projects that total the amount specified below, including the examples that follow:

CATEGORY	ESTIMATED COST
Agriculture	\$2,076,500,000

# AGRICULTURE



Estimated Cost

**\$1,826,500,000**

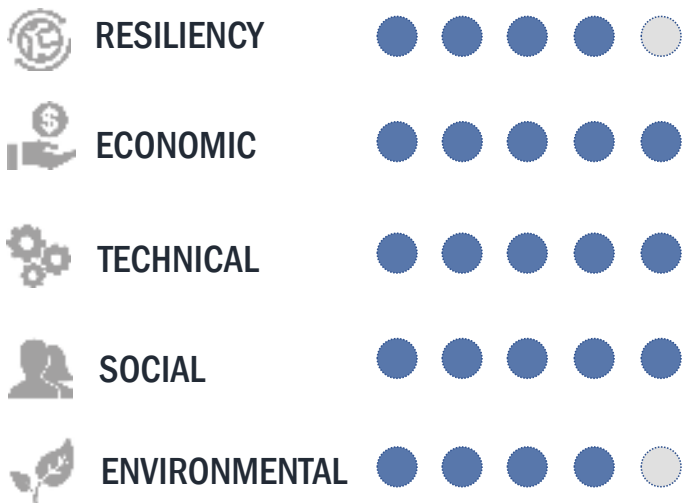
Proposed Funding Source

**USDA**

Other Possible Funding Sources

**CDBG-DR, SBA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Agriculture is vulnerable to disasters yet one of the industries that can make the speediest recovery. Puerto Rico will repair and develop programs to promote a higher level of food security and more energy and water efficient production of agriculture goods. This includes hardening of agriculture infrastructure, strengthening farm-to-market connectivity, and incorporation of new technologies to increase productivity and decrease costs.

## IMPACT

Within hours, Hurricane Maria wiped out 80% of the crop value in Puerto Rico. The loss of locally-grown foods has limited nutritional options for the island's residents and driven up costs to consumers. The loss of livestock and other animals is equally as devastating.

## LONG-TERM BENEFIT AND OPPORTUNITIES

This assistance will allow farmers and other in the agriculture sector to reestablish operations. The agriculture industry can become more profitable and can export Puerto Rican products by using more efficient and modern agriculture practices.

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# SOCIAL IMPACT



# SOCIAL SERVICES

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The effects of the 2017 hurricanes in Puerto Rico go beyond the physical and economic impacts on the island; they also produced a humanitarian crisis that places significant added stress and costs on the island’s public and private-non-profit social service providers. Beyond physical damage to their facilities, many agencies and organizations are experiencing significant increases in demand for their services, which is straining budgets and available resources at the very time that they are most needed. This is particularly true for organizations that provide food and sheltering services to at-risk populations, early childhood education, indigent medical care, aid to children and families, senior care, sexual assault and domestic abuse response services, support for special needs populations, and other critical services. Despite the fact that the hurricanes occurred over six weeks ago, it is expected that the need for social services has not reached its peak – recent major studies indicate a 5-15% increase in need for mental health and other social services in the aftermath of major disasters.

Now that the hurricanes have passed, providing ongoing support to social services providers is a critical need that must be addressed. Puerto Rico also hopes to assist agencies both at the governmental and non-profit level in rebuilding their facilities and technology systems in a manner that produces added resiliency, reduces future losses and ensures the continued availability of critical services in the immediate aftermath of similar events. In addition, Puerto Rico seeks to build capacity to provide both ongoing and emergency support to the “independent elderly” across the island – a population whose needs require priority attention during times of crisis.

A selection of projects and initiatives are provided below as examples of the types of efforts that Puerto Rico wants to initiate in support of the social services sector:

CATEGORY	ESTIMATED COST
Social Services	\$288,262,193

# FAMILY INTEGRATED SERVICES PROGRAM



Estimated Cost

**\$90,000,000**

Proposed Funding Source

**SSBG**

Other Possible Funding Sources

**CDBG-DR**

## EVALUATION CRITERIA



## DESCRIPTION

Develop a center for integrated services for the elderly population will receive services that currently they cannot obtain at home: food, clothing, potable water, counseling, health, independent life tools, and daily activities. In addition, any direct services with the family will be coordinated through the Department of the Family, as well as with any other agency. These centers will need to use self sufficient and sustainable energy.

## IMPACT

Hurricane Maria caused widespread devastation that exposed vulnerabilities in the social services network that supports children, low-income families, the elderly, and other at-risk populations.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The federal investment will prevent the recurrence of the emergency situation that delayed the response of the services to the most vulnerable population. It will benefit the elderly population as well as the caregivers who will have a safe place to provide services.

## LOCATION



# ASSISTANCE FOR HOMELESS YOUTH



Estimated Cost

**\$30,000,000**

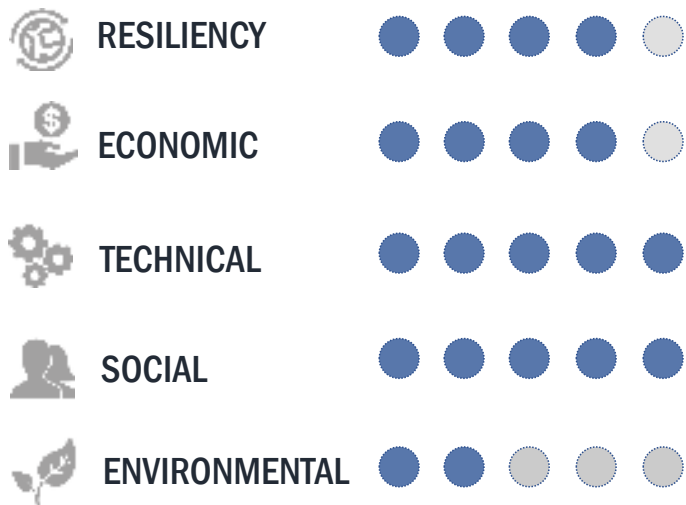
Proposed Funding Source

**SSBG**

Other Possible Funding Sources

**HUD-CoC**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

This program will assist schools serving homeless children and at risk youths displaced by Hurricane Maria, including identification, enrollment assistance, assessment and school placement assistance, transportation, coordination of school services, supplies, referrals for health, mental health, and other needs.

## IMPACT

Of the more than 1,100 public schools on the island, a high number were badly damaged, many are serving as community centers and dozens others are used to shelter families who lost their homes.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Dedicating resources to youth programs will reduce potential generational impacts of this storm event and improve chances for a full recovery from the storm.



# RELOCATION OF HEAD START/CHILD CARE, ACF REGIONAL SERVICE FACILITIES TO CLOSED SCHOOL IN ISABELA

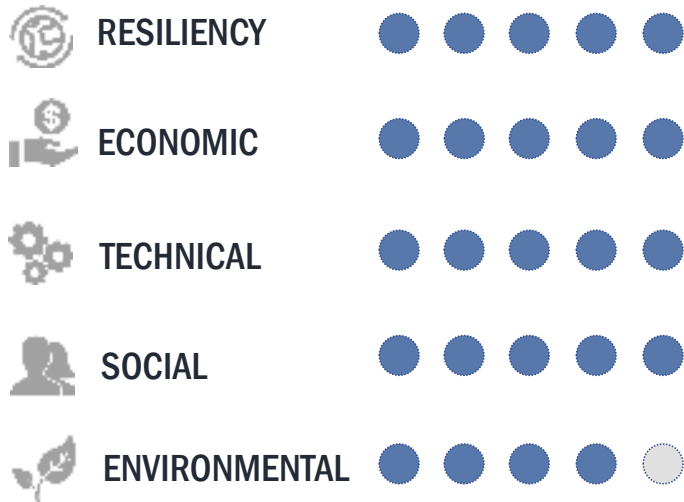


Estimated Cost  
**\$6,900,000**

Proposed Funding Source  
**CDBG-DR**

Other Possible Funding Sources  
**HHS**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Relocation of Head Start center to renovated bunker type school structures to serve as possible shelters for weather events.

## IMPACT

The municipality of Isabela is located in the northwest of the island. Over half of the residents live below the poverty line. During Hurricane Maria, the north shore of the island was ravaged by high wind, storm surge and rain. This resulted in damages including coastal erosion and cracks in the Guajataca Dam, forcing residents to evacuate. The storm caused major damage to the local head start center preventing its use.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Quickly rehabilitating facilities that provide essential early education programs will provide greater opportunities for the young children whose lives have been disrupted by this massive storm. These vital facilities will also allow working parents to have reliable child care as they contribute to Puerto Rico's economic recovery.

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# IMPACT TO ECONOMY

# ECONOMIC DEVELOPMENT

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One of the biggest casualties of Hurricanes Irma and Maria is the devastating impact on Puerto Rico's economy. Facing major challenges due to eleven straight years of economic depression, the economy of the island was further impacted by the combination of physical damage to industrial and commercial facilities, the long-term loss of power and water, the damage to transportation infrastructure, and the impact on the customer base on which they rely. This has caused thousands of businesses in Puerto Rico to either close or reduce operations, resulting in a substantial loss of jobs and increase in the island's unemployment rate.

Small businesses have been particularly impacted from the inability to open their businesses due to the loss of power. With limited ability to remain a viable concern after a prolonged period of closure, this will have a lasting impact on both economic activity and the associated labor force on the island. Since the Department of Labor reopened its offices on October 6, at least 10,000 people have applied for unemployment benefits due to the hurricanes. That number is expected to keep growing. In just one week, from October 19-26, the total number of unemployment claims doubled. Unemployment is currently above 10%.

The impacts to the Puerto Rico economy are also confirmed through same-store sales, which are down 30% in September. The decline predominately includes Irma impacts with the most severe impacts coming in the last 10 days of the month with Hurricane Maria.

According to the US Census Bureau, in 2014 Puerto Rico's private sector consisted of 44,169 businesses, mostly small and medium enterprises. In the case of manufacturing, approximately 1,600 out of roughly 1,800 manufacturing business in Puerto Rico employs 200 individuals or less. The extensive damage to the power grid, infrastructure, social services, and facilities across Puerto Rico have caused severe disruption to all business sectors on the island, including manufacturing (life sciences, aerospace, electronics, food processing, etc.), retail, trade, tourism, banking and finance, insurance, and real estate among others. Nearly all businesses in the Commonwealth closed their doors in the aftermath of the hurricanes, with many still out of operation even today; in fact, as many as 50% of all small and medium sized businesses are either unable to open or are operating at a significantly reduced capacity, and 15% of the large multi-national companies in the life sciences and aerospace industries remain out of operation. For many, product supply chains have been disrupted and the ability of companies to obtain the capital needed to support recovery has dried up. The storms caused the loss of tens of thousands of jobs, and while it is not yet known how many of them will eventually be restored some major employers have already moved production off the island and each passing day makes it less and less likely that pre-existing businesses will ever be able to reopen their doors. Furthermore, this damage and disruption have put Puerto Rico in a disadvantaged position when it comes to attracting foreign direct investment in sectors such as manufacturing and commerce because of the real and perceived added risk of making such a decision. As a demonstration of this challenge, a number of companies that had previously announced expansion plans in Puerto Rico are re-evaluating their future capital investments on the island.

In addition, the highly visible consequences of the hurricanes have resulted in dramatic reductions in the island's tourism, which before the storms was a primary economic engine in Puerto Rico that provided an estimated \$1.8 billion annually to the Puerto Rico economy and accounted for almost 8% of the island's gross national product. Approximately 40% of the island's lodging inventory is now unavailable due to a combination of physical damage and the loss of power and water; in addition, many of the existing available units – mainly occupied by

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recovery workers – sustained damages that will require them to be taken out of the marketplace for repairs sometime in the months ahead. Puerto Rico’s well-publicized disaster has also stalled new bookings to visit the island.

A comprehensive approach needs to be taken to begin addressing these challenges. During the recovery period, Puerto Rico plans to develop and implement new and innovative economic incentives to attract investment, including those designed to target infrastructure investments where they can produce the maximum “spin-off” value to the economy, as well as those that can reduce the cost of establishing operations and producing jobs on the island. Training programs need to be developed and implemented to provide residents with the skills and experience needed to fill jobs both in support of recovery and to capitalize on longer-term employment opportunities in growth sectors. Programs to provide low or no-cost capital to small and medium-sized businesses looking to re-establish operations on the island will be a key component of this effort, given the duration and severity of business closures across the island. Puerto Rico plans to assist thousands of storm-impacted small businesses by providing robust grants or loans for working capital assistance, inventory losses, equipment and fixture replacement costs, storm repairs, and most importantly, mitigation projects to increase small business resiliency in the event of future storms. A small business mentoring program can improve existing small business practices by providing training on improved accounting, fiscal management, marketing, and disaster planning. New investment must be encouraged both in the manufacturing and tourism sectors to increase jobs and improve facilities and infrastructure. Puerto Rico also hopes to utilize the recovery period to reintroduce the world to what the island has to offer, implementing new outreach and marketing efforts to regenerate consumer interest and increase awareness.

The projects listed below are just a sample of the initiatives of the Government of Puerto Rico will implement to promote job creation, generate capital investment and attract tourism to replace what was lost and strengthen the economy in the years to come:

CATEGORY	ESTIMATED COST
Economic Development	\$3,194,677,600

# SMALL BUSINESS GRANTS



Estimated Cost

**\$2,651,227,600**

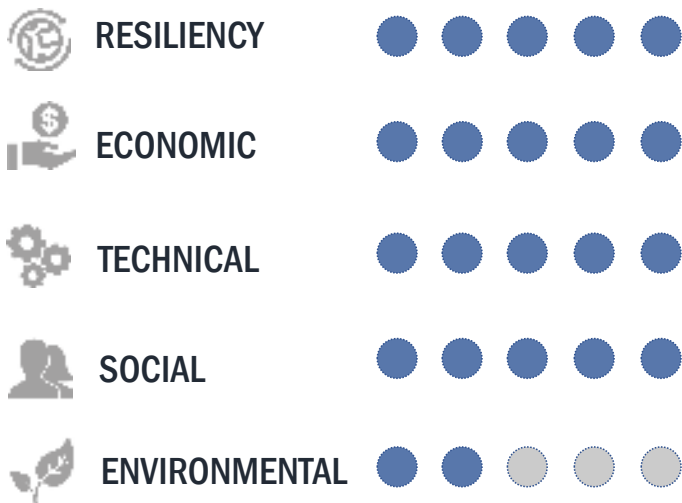
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**SBA, EDA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Programs would be created to assist thousands of storm-impacted small businesses by providing grants for working capital assistance, inventory losses, equipment and fixture replacement costs, storm repairs, and, importantly, mitigation projects.

## IMPACT

The economy of the island was crippled by the combination of physical damages, the long-term loss of power and water, the damage to transportation infrastructure, and the impact on the customer base on which they rely. Small businesses are a particularly vulnerable population when it comes to recovery from a disaster and impacts from sustained closures. As many as 50% of all small and medium sized businesses are still either unable to open or are operating at significantly reduced capacity.

## LONG-TERM BENEFIT AND OPPORTUNITIES

This program will allow businesses to re-establish operations, rebuild, recover, and grow. In addition, providing much needed assistance to help these businesses stay open will also help communities recover and continue to have access to goods and services.

# FISHING INDUSTRY RECOVERY AND RESTORATION



Estimated Cost

**\$60,000,000**

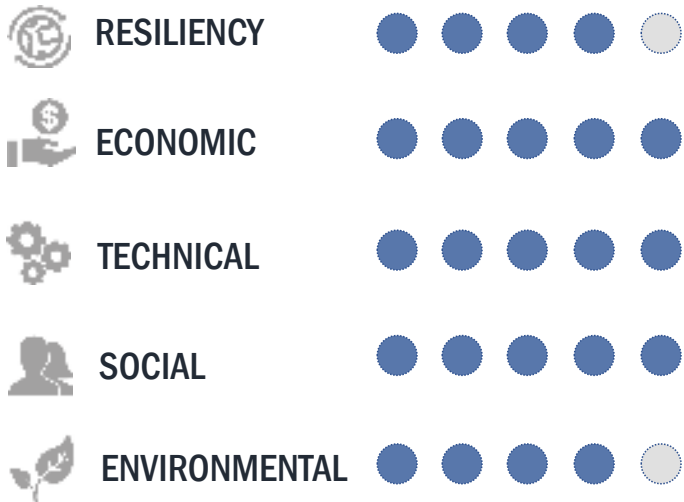
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**EDA, SBA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Construction and restoration of fisherman's dwarfs, docks, fishing centers and equipment supply.

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## IMPACT

The hurricanes destroyed docks, buoys, boats, and fishermen equipment essential to the fishing industry on the island.

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## LONG-TERM BENEFIT AND OPPORTUNITIES

This project will provide restoration to the items essential to the fishing industry as well as provide resources in order to keep this industry on the island.

# ENTREPRENEURSHIP INITIATIVE



Estimated Cost

**\$50,000,000**

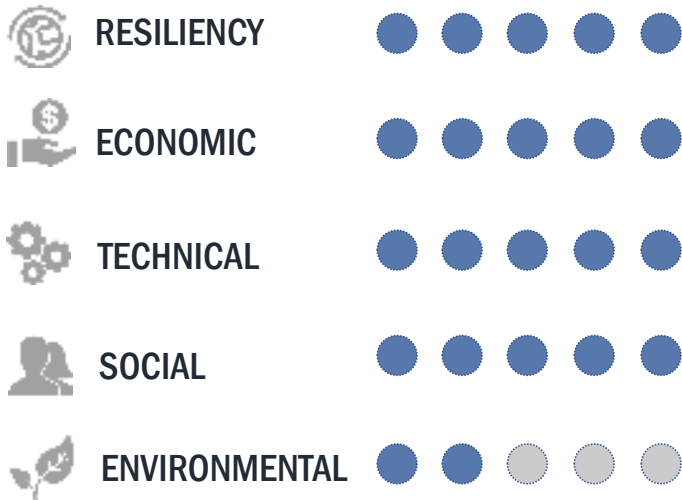
Proposed Funding Source

**EDA**

Other Possible Funding Sources

**CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Encourage entrepreneurship among unemployed or displaced workers who were affected by the hurricanes. Participants who complete the program will have the skills necessary to create and manage their own business.

## IMPACT

The devastation left by hurricanes forced some workers out of their jobs. This number may increase as it is not known yet how many businesses will eventually re-open or restore operations to the size they were prior to the hurricanes.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Providing job skills and opportunities can curb an increase in the island's unemployment rate due to the hurricanes. Residents whose employment was affected by the effects of the hurricanes will be provided with skills and training that can be utilized in long-term employment.



# ESPERANZA BOARDWALK REHABILITATION (WATERFRONT)



Estimated Cost

**\$10,000,000**

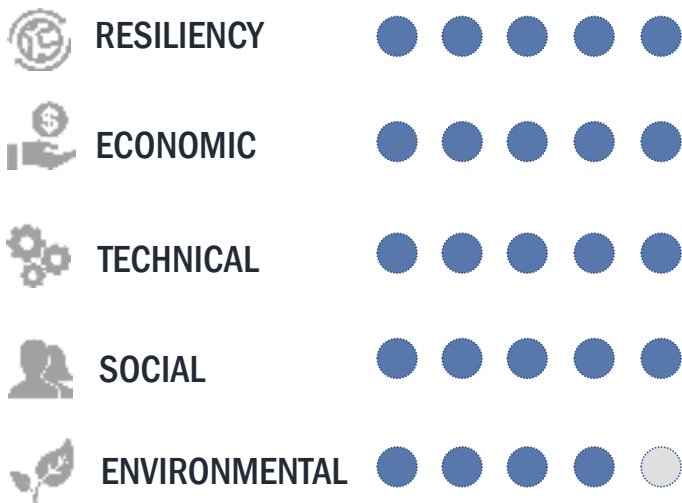
Proposed Funding Source

**EDA**

Other Possible Funding Sources

**SBA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Revitalization of the waterfront as well as providing assistance to the neighboring businesses to re-open their business and build them to be more resilient and to better protect against future storms.

## IMPACT

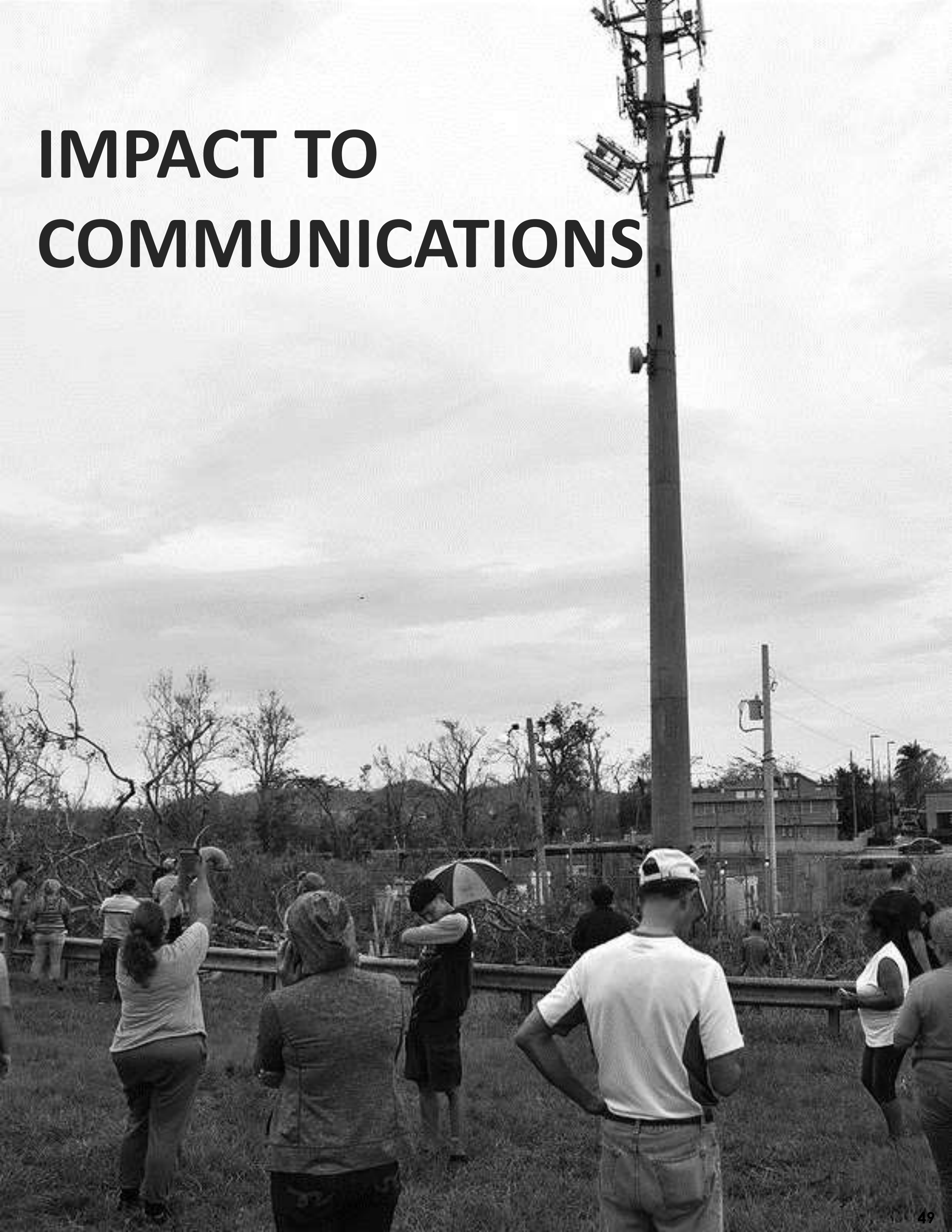
After Hurricanes Irma and Maria hit the island of Vieques, the famous waterfront ( the "Malecón") in Esperanza received significant damage. Most visitors to the island of Vieques enjoyed this waterfront and after Hurricane Maria, it is no longer open for visitors. Most restaurants and businesses were also damaged.

## LONG-TERM BENEFIT AND OPPORTUNITIES

An area that is enjoyed and has a lot of traffic from both locals and visitors will be able to re-open and be better protected against future storms. Businesses will be built back better and will benefit from the visitors to the popular waterfront.

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# IMPACT TO COMMUNICATIONS



# COMMUNICATIONS INFRASTRUCTURE

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The failure of the communications network across the entirety of Puerto Rico was one of the most consequential impacts of Hurricanes Irma and Maria. The two storms destroyed communications towers, repeaters, and communications centers across Puerto Rico, and the infrastructure that remained was hobbled by the loss of the power grid that supports its operation. This situation caused nearly a complete failure of the emergency communications needed for public safety and disaster response operations. The fiber network that supports cell sites and communications towers across the island was decimated, which along with physical tower and equipment failures and power loss resulted in approximately 91% of the cellular towers were lost due to damages or loss of power, 45% of which remain inoperable even today. Other public communications channels such as television and radio were similarly affected, disrupted by losses at towers that contained its communications equipment. Reconstruction of the fiber network and the replacement of damaged cell sites alone is estimated to cost \$1.5 billion.

The experience of the hurricanes has led Puerto Rico to rethink how the communications network is built and managed. The island needs to identify the means to restore its communications services more quickly after a disaster and take aggressive actions to implement initiatives to ensure this happens. The permanent restoration of Puerto Rico's communications system will need to involve a substantial investment of resources to increase the functionality and capability of the emergency communications networks in the face of future storms. Back-up power with battery back-up will also be needed to ensure that critical public safety networks remain functional.

The challenges that Puerto Rico encountered to receive replacement parts and supplemental equipment to improve the communications capacity from the mainland due to the lack of logistics planning and production lead-time means that the Government must have more robust stockpiles of inventory that can be more easily and rapidly accessed during times of emergency. Finally, the restoration will require a detailed study of how to deploy communications infrastructure faster and more efficiently in the future, taking into account the unique geography and terrain of Puerto Rico, including funding for initial implementation.

The government has identified specific restoration projects that total the amount specified below. The following projects are the types of initiatives that Puerto Rico plans to pursue to restore, protect and improve the island's communications network:

CATEGORY	ESTIMATED COST
Communications Infrastructure	\$1,500,000,000

# COMMUNICATION SYSTEMS IMPROVEMENTS



Estimated Cost

**\$1,500,000,000**

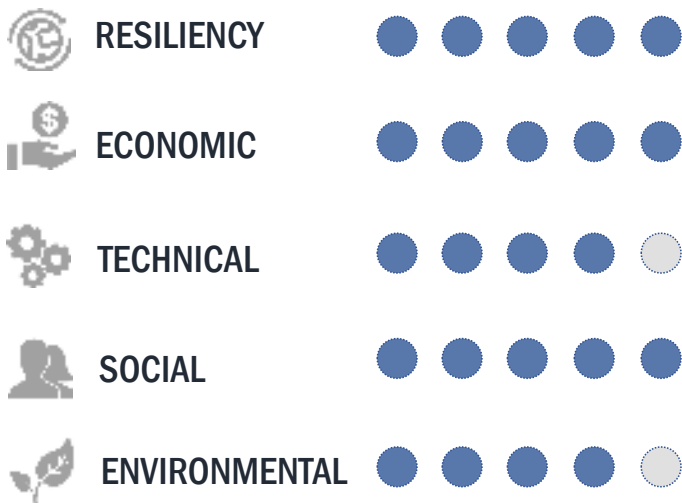
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**USDA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

A fully functional and improved telecommunications network is absolutely essential for public safety, economic recovery, and the restoration of day-to-day life in Puerto Rico. This project envisions replacing the existing storm-devastated telecommunications network (e.g., distribution systems, towers) with modern technology, such as fiber optic.

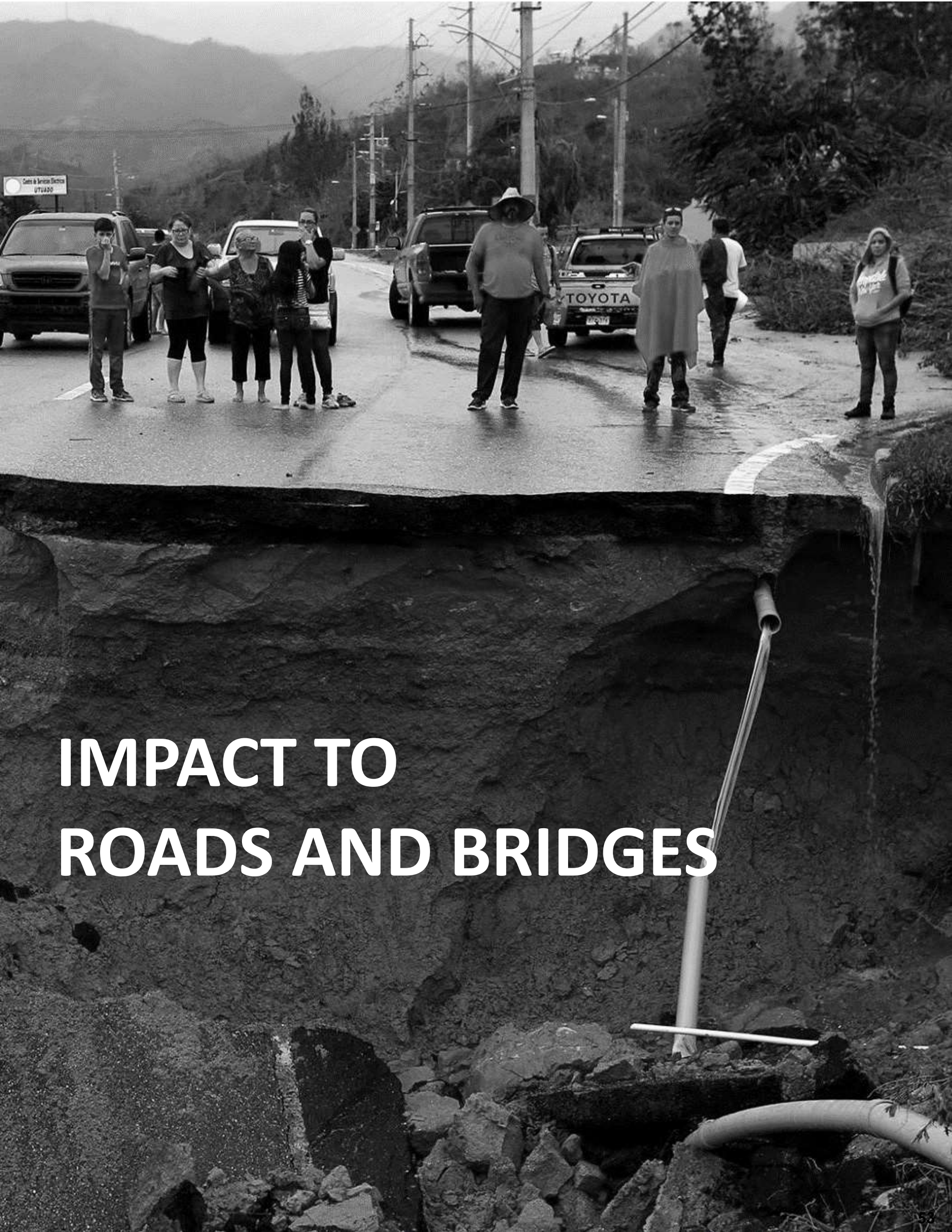
## IMPACT

The telecommunications network was rendered completely non-functional by Maria. This widescale communications "blackout" significantly increased the risk to public safety, hampered emergency response and recovery efforts, and shutdown Puerto Rico's economy.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Repairing and modernizing Puerto Rico's telecommunication network will have a direct impact on the life of every Puerto Rican citizen and business. Building this system in a more resilient manner will reduce the risk of widespread outages in the future.

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# IMPACT TO ROADS AND BRIDGES

# ROADS & BRIDGES

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Puerto Rico's transportation infrastructure was one of the more significant casualties of the hurricane disasters. The combination of debris, flooding, downed power lines and mudslides caused by the hurricanes severely impacted roads and bridges across the island's nearly 16,700 mile transportation network, restricting ingress and egress to some communities and limiting access to critical island infrastructure and resources. At its peak, only 392 miles of Puerto Rico's roadways were open. More than a dozen bridges remain closed to traffic as a result of the complete structural failure or significant scour caused by Hurricanes Irma and Maria. Assessments are not yet completed so it is anticipated that significant damage will be further identified. These failures resulted in significant threats to public health and safety that continue to this day, triggering tens of millions of dollars of additional response costs and the need to temporarily rebuild and repair damaged bridges and roadways to permit the passage of emergency vehicles and aid convoys. Nearly all of the traffic signaling across the island was destroyed. Public transportation in the San Juan metropolitan area has been halted since Hurricane Maria, as the Tren Urbano System, which serves as the backbone that links the Buses, Paratransit, BRT's and Ferries has not been operational due mainly to the loss of power. This impacts over 50,000 users that have since been unable to access their jobs, universities, medical services, schools, or commercial establishments on their everyday lives. Bus terminals suffered damages that subject patrons to degraded service levels on an already fragile system. The ferry service which serves as the only link between Puerto Rico and the Islands of Vieques and Culebra had to be discontinued the night before the Hurricane and could not be reestablished for 4 days after the storm and damages have limited the service as of today.

In the aftermath of these disasters, Puerto Rico intends to rebuild its transportation network in a manner that ensures the interconnectivity and vitality of the entire island to, amongst other things, boost economic activity. However, to accomplish this Puerto Rico must construct them to be more resilient in the face of future disasters of all kinds (hurricane, flood, earthquake, etc.), and build them to current best practices and design standards. This should also include investments designed to improve drainage, strengthen and/or elevate bridge abutments, expand culverts and pursue erosion protection. Additional infrastructure also needs to be built or improved to better guarantee access to communities that experienced access problems during Irma and Maria so that Puerto Rico can avoid the humanitarian crisis and response costs associated with the delivery of medicine, food and water to inaccessible areas.

The government has identified specific restoration projects that total the amount specified below. The projects listed below are representative of the type of work that is needed during the recovery period:

CATEGORY	ESTIMATED COST
Road and Bridges	\$4,497,725,000



# BRIDGE RECONSTRUCTION AND IMPROVEMENTS, INCLUDING ADEQUATE SCOUR PROTECTION



Estimated Cost

**\$1,900,000,000**

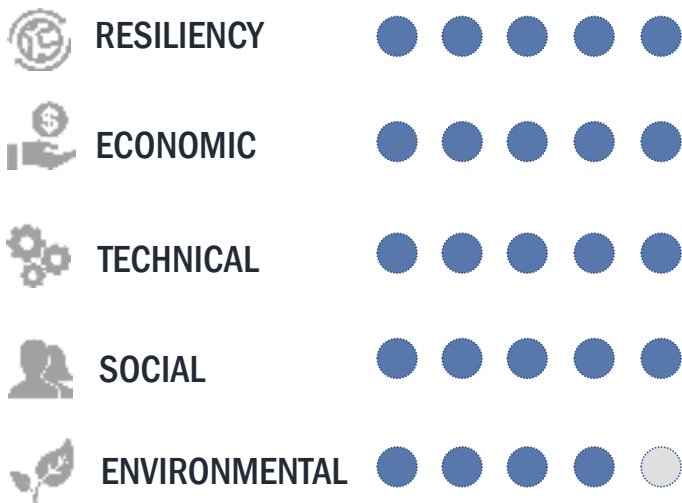
Proposed Funding Source

**PA/HM**

Other Possible Funding Sources

**DOT, CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Projects will include bridge repairs and preservation. The first 25% of projects are anticipated to start construction within one year of receiving funding and the total program is expected to have started construction within five years.

## IMPACT

Floods generated by the hurricane affected road and bridge network island wide. A large number of bridges were destroyed by the water. Water also eroded state roads disrupting communication and access between towns and communities.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The repair of bridges and roads will help communicate isolated towns and communities promoting the recovery and the restart of the economy island wide.

# EXTENSION OF PR-22 HIGHWAY



Estimated Cost

**\$1,000,000,000**

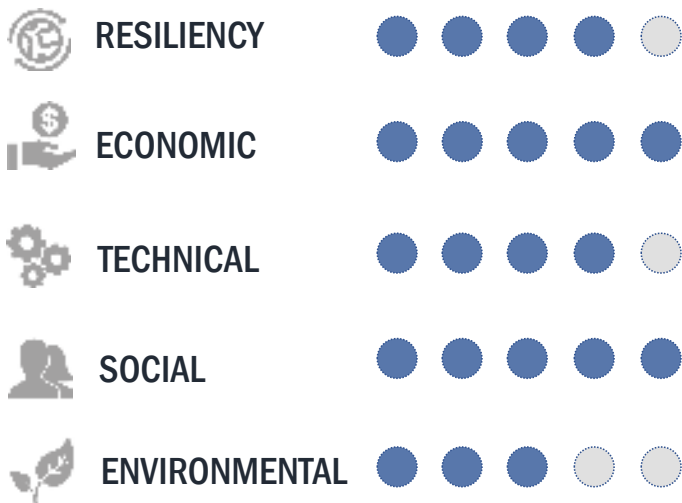
Proposed Funding Source

**DOT-FHA**

Other Possible Funding Sources

**CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Establish a partnership with the private sector to enable the design, build, finance, operation and maintenance of the extension of PR-22 between Hatillo and Aguadilla. The project should proceed once the best alignment of the project and construction strategy has been defined.

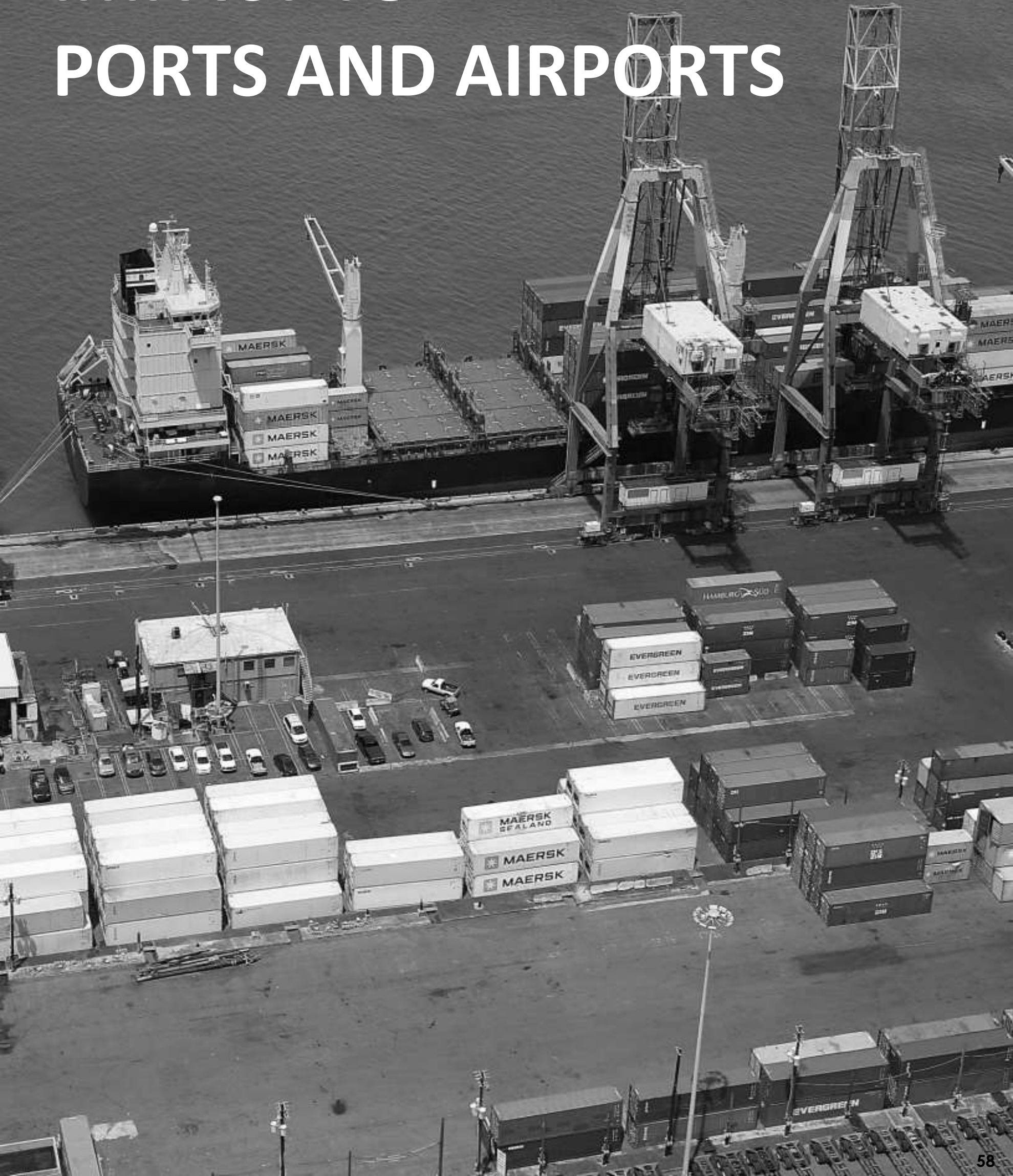
## IMPACT

The western region of Puerto Rico suffered from lack of major highways for the distribution of food, and basic needs of the persons affected by the hurricane. Although the Aguadilla International airport became a Hub for aerial cargo the delivery of assistance was delayed due to improper highway system.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The proposed project will provide the western region of the island with an adequate and resilient highway system that can be used as an evaluation route as well as to provide access to emergency vehicles during times of disasters.

# IMPACT TO PORTS AND AIRPORTS



# PORTS AND AIRPORTS

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The Puerto Rico Ports Authority (PRPA) owns and operates nine regional airports and seaports around the island. Ports and airports were severely impacted, suffering both physical damage and disruption of operations. Most of the warehouses, piers, hangars and other seaports and airports were damaged by the force of the wind. Furthermore, the absence of power and the loss of radio communications resulted in the suspension of services and reduced operational capacity in many locations, including airports which were forced to halt operations for a period of days, making it impossible for Puerto Ricans to leave the island. In addition, wave action, storm surge and marine debris have created a need for dredging most of the island's seaports. This limited the PRPA's ability to properly operate according to the federal standards and regulations. The disaster also demonstrated the vulnerability of Puerto Rico's port operations, showing that capacity could easily be exceeded by the requirements of response operations. In fact, the restoration of commercial operation at some ports and airports has been slowed because of the competing needs to bring in equipment and resources from the mainland for the recovery.

Due to this experience, Puerto Rico recognizes the opportunity to optimize its infrastructure and reduce its vulnerability to future storms. The importance of the island's transportation (private / commercial shipping and flights) networks for both people and commodities is crucial to the island's sustainability. The Government seeks to rebuild and repair damaged facilities in a manner that makes them less susceptible to wind and wave action by incorporating hazard mitigation measures into every facility whether damaged or undamaged. Puerto Rico will invest in its seaports and airports around the island to provide alternate means of port and airport traffic, thereby reducing reliance on the San Juan port and airport and reducing the risk of "bottlenecks" negatively impacting future recovery efforts. The redevelopment of the Roosevelt Roads property will increase shipping and air capacity while also producing significant economic benefit on the island. Puerto Rico seeks to improve road access to ports outside of San Juan to permit their expanded use. Also, Puerto Rico will dredge those ports to both alleviate damage caused by the storm and to increase capacity of channels and ports.

The projects below are included in the list of those that Puerto Rico is planning to pursue to address the challenges and needs of the island's seaports and airports in the aftermath of the hurricanes:

CATEGORY	ESTIMATED COST
Ports and Airports	\$1,345,700,000

# RAFAEL HERNÁNDEZ INTERNATIONAL AIRPORT (BQN) REHABILITATION



Estimated Cost

**\$540,000,000**

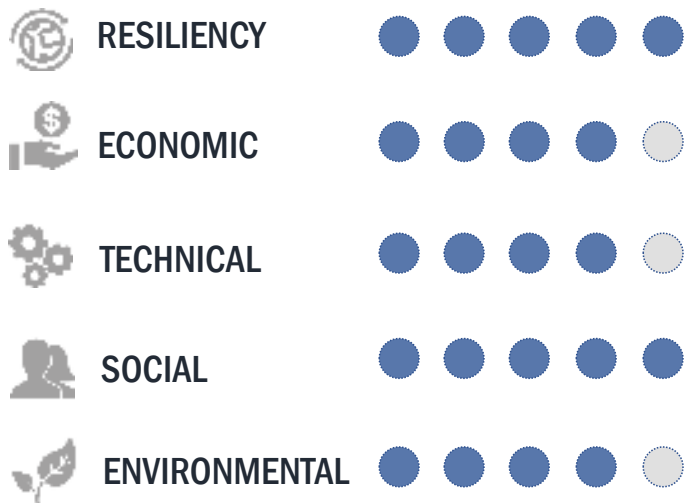
Proposed Funding Source

**FAA**

Other Possible Funding Sources

**DOT, CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Runway Reconstruction to comply with current FAA regulations and codes. Rehabilitation of the structures damaged by the wind including: terminals, Boarding Bridges, Cargo Apron at the South Area, and Hangars.

## IMPACT

Accumulated water from the hurricane created water ponding that resulted in severe physical damage to the airfield pavement, lighting, navigational aids, fences, and others airport equipment. Buildings at the facility suffered damaged from wind.

## LONG-TERM BENEFIT AND OPPORTUNITIES

This will restore the airport capacity and readiness to accommodate larger simultaneous operations and ability to respond during emergencies, while guaranteeing a more secure operation.

# REHABILITATION OF BERTH 2, 3 & 7 AT PONCE PORT



Estimated Cost

**\$100,000,000**

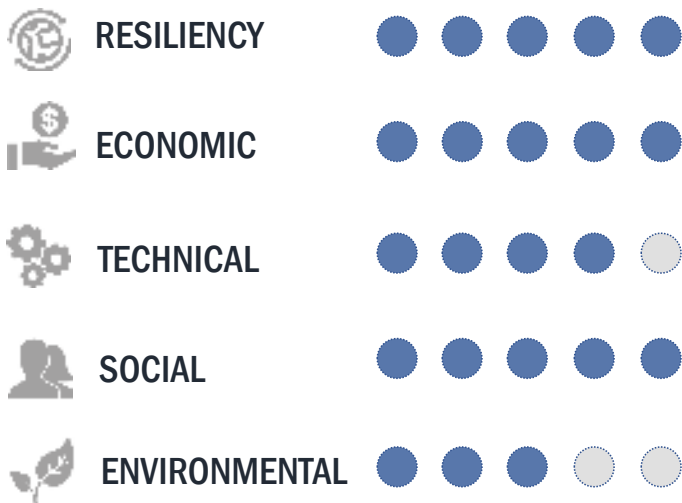
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**DOT, HM**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Realignment and reconstruction of the Berths 2 & 3 and reconstruction of Berth 7 and their dredging to 50 feet making the port capable of manage more that one vessel at the same time.

## IMPACT

The Port of San Juan is currently the only entrance for containerized cargo in Puerto Rico, creating a bottleneck and potential single point of failure during a crisis. During the hurricane, the Port of San Juan was overly congested and critical supplies could not reach some parts of the island.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The principal long term recovery benefit is to provide the island with an alternative containerized fully operational cargo port (supply chain entrance point) to support any emergency response in case that the San Juan Port is not available.

# REGIONAL AIRPORTS OPTIMIZATION

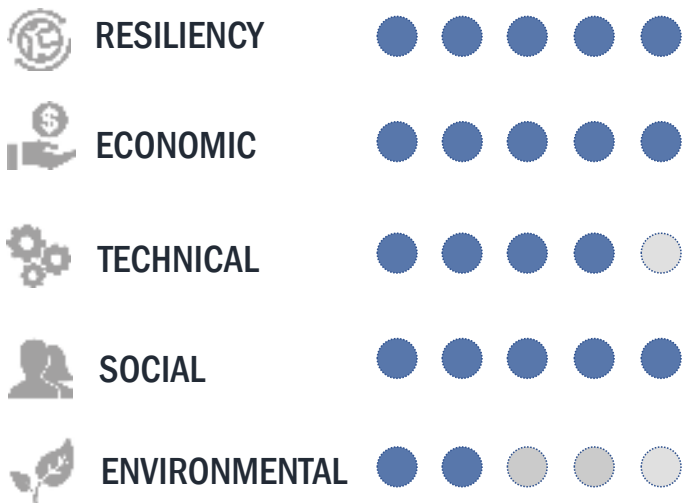


Estimated Cost  
**\$24,500,000**

Proposed Funding Source  
**CDBG-DR**

Other Possible Funding Sources  
**FAA, HM**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Terminal and Runways Improvements to regional airports island wide. In addition the airports will be provided with alternate and redundant power during emergency situations.

## IMPACT

Hangars and terminals at regional airports were damaged by the wind and water generated by the Hurricane. The emergency caused an increase in cargo movement and demand for these services, as well as commercial, relief and passenger flights, which prompted the need to rebuild the hangars and terminals.

## LONG-TERM BENEFIT AND OPPORTUNITIES

This will increase the level of aircraft category and operational service, and will represent an alternative to provide emergency assistance to deliver food and goods to residents in the Islands of Vieques, Culebra and the Virgin Islands.

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# IMPACT TO PUBLIC BUILDINGS

# PUBLIC BUILDING REVITALIZATION

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Puerto Rico expects to have hundreds of storm damaged older buildings will no longer be needed, are in disrepair, or are outdated in design and function. The sheer number and distribution of these facilities across Puerto Rico create an unacceptable risk of contributing to the creation of slum and blighting conditions around the island. These conditions will be addressed as part of the recovery.

The majority of the damaged facilities that will need to be repurposed are schools, which are distributed throughout the 78 municipalities and are ideally located to serve as community centers, social service facilities, business incubators or support other economic and community interests. Other buildings and sites, such as the Department of Justice building in San Juan, are no longer suitable for their intended governmental purpose. These properties could be redeveloped to meet other needs and they will require significant investment.

Puerto Rico hopes to keep these damaged facilities and redevelopment sites from falling into progressive disrepair through an aggressive redevelopment program that includes direct investment, infrastructure improvements and other measures designed to restore these facilities to productive use and/or redevelop the property for new construction. This will not only avoid the blighting of Puerto Rico communities, but it will also contribute to the public welfare and serve as an economic driver across the island.

CATEGORY	ESTIMATED COST
Public Building Revitalization	\$153,100,000

# REHABILITATION/RECONSTRUCTION OF COMMUNITY BASED INFRASTRUCTURE PROJECTS



Estimated Cost

**\$100,000,000**

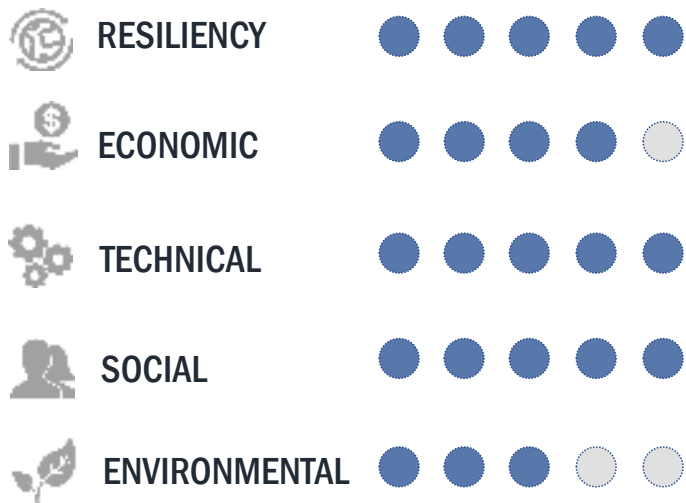
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**USDA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

CDBG-DR funds will be used to reconstruct 752 rural and low income communities water and sewer infrastructure system including, pipes, pumps, small water tanks (reservoirs).

## IMPACT

Hurricane Maria had a great impact on rural infrastructure projects putting at risk sanitation, drinking water, and transportation services. Damage to sanitation facilities and infrastructure has created health issues to 752 Low Income communities Statewide.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Reconstruction of the infrastructure will protect 543,000 individuals and the environment by reducing the possibility of sewage releases to buildings and streets. The projects will be rebuilt to 21st century codes and will include power generators with sufficient fuel supply to last for 7 days in case of power interruption.

# REHABILITATION/RECONSTRUCTION OF COMMUNITY CENTERS AT LOW INCOME COMMUNITIES



Estimated Cost  
**\$9,000,000**

Proposed Funding Source  
**CDBG-DR**

Other Possible Funding Sources  
**USDA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

This project consists of the rehabilitation/reconstruction of 300 community centers statewide. After the rehabilitation or reconstruction, each of the centers will be capable of providing shelter, limited medical services, and internet services, in addition to the regular uses. Each center will be provided with backup generators.

## IMPACT

The hurricane impacted 300 community centers statewide. Most of the centers were used as a multipurpose facilities, such as shelters and food distribution centers during the emergency.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Create stronger, resilient and self sufficient communities. These projects represent an array of facilities that will be retrofitted to continue operating during severe storm events and other emergencies.

# REHABILITATION/RECONSTRUCTION OF COMMUNITY TECHNOLOGY CENTERS STATE WIDE



Estimated Cost  
**\$10,800,000**

Proposed Funding Source  
**CDBG-DR**

Other Possible Funding Sources  
**USDA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Funds will be allocated to reconstruct resilient structures and provide them with computers and access to the internet. Each center will be provided with backup generators. This project would establish technology centers with resilient lighting and power, the ability to distribute supplies, coordinate efforts with government agencies, and host trainings and capacity building initiatives.

## IMPACT

Technology Centers statewide (172) were severely impacted by the hurricane. The natural event damaged the structures and the computer equipment located inside the facilities.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The purpose of the program is to create or expand community technology centers to provide residents of the affected communities with access to information technology. The Centers will permit the reconstruction of the facilities making them resilient.

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# IMPACT TO WATER AND WATER CONTROL FACILITIES



# WATER AND WATER CONTROL FACILITIES

Nearly 97% of the water supplied on the island is provided by the Puerto Rico Aqueduct and Sewer Authority (PRASA), which is responsible for 126 water treatment plants, 8 dams, and provides over 646 million gallons of potable water per day. Due to a combination of direct damages and the loss of power, over 70% of Puerto Rico's potable water treatment and distribution system was affected. This resulted in over 70% of the island's water being either unavailable or supplied in violation of federal safety and quality standards. In many areas, people were forced to obtain drinking water from unsanitary and untreated sources. This situation served as the precursor for one of the largest water distribution efforts in U.S. history, with more than 5.6 million gallons of potable water in gallon containers and 35.1 million liters of bottled water distributed to date. While progress has been made to restore water flow in many areas through temporary repairs and/or the provision of generators to provide power, approximately 17% of those served by PRASA still have no access to water through the system as of November 9, and 5 drinking water filtration plants still remain out of service. For non-PRASA sites (accounting for 3% of the water user base), 114 of the 237 potable water systems remain inoperable.

One of the most visible and widely known challenges faced by Puerto Rico involves the Guajataca Dam. The hurricanes produced massive rainfall that caused the dam to crack and overflow, resulting in significant erosion, scouring, and the failure of one of the dam's spillways. Efforts continue to stabilize the dam, but at present the facility remains compromised and the 70,000+ people who live downstream remain at high risk.

PRASA's already aging infrastructure suffered damages so extensive that Puerto Rico not only needs to implement a widespread repair program, but must also rethink the entire system's design to make it more efficient, reliable, and protected from hurricanes and other natural disasters in the future. This involves both an aggressive assessment and repair process, as well as investments in the system to:

- Relocate infrastructure out of flood zones whenever possible;
- Redesign infrastructure that must be near or within waterways to make them more robust and resistant to high flow events;
- Improve structural safety of dams and reservoirs;
- Improve potable water service zones' transfer capabilities, a feature that has helped restore service rapidly in the San Juan / Metro area;
- Incorporate cutting-edge technologies and sensors into the system while making repairs to provide improved system monitoring capability and enhance operations;
- Remove key systems from the power grid using renewable energy systems to enhance and protect against future power losses; and
- Improve water treatment capabilities at plants to better handle high turbidity events caused by heavy rains.

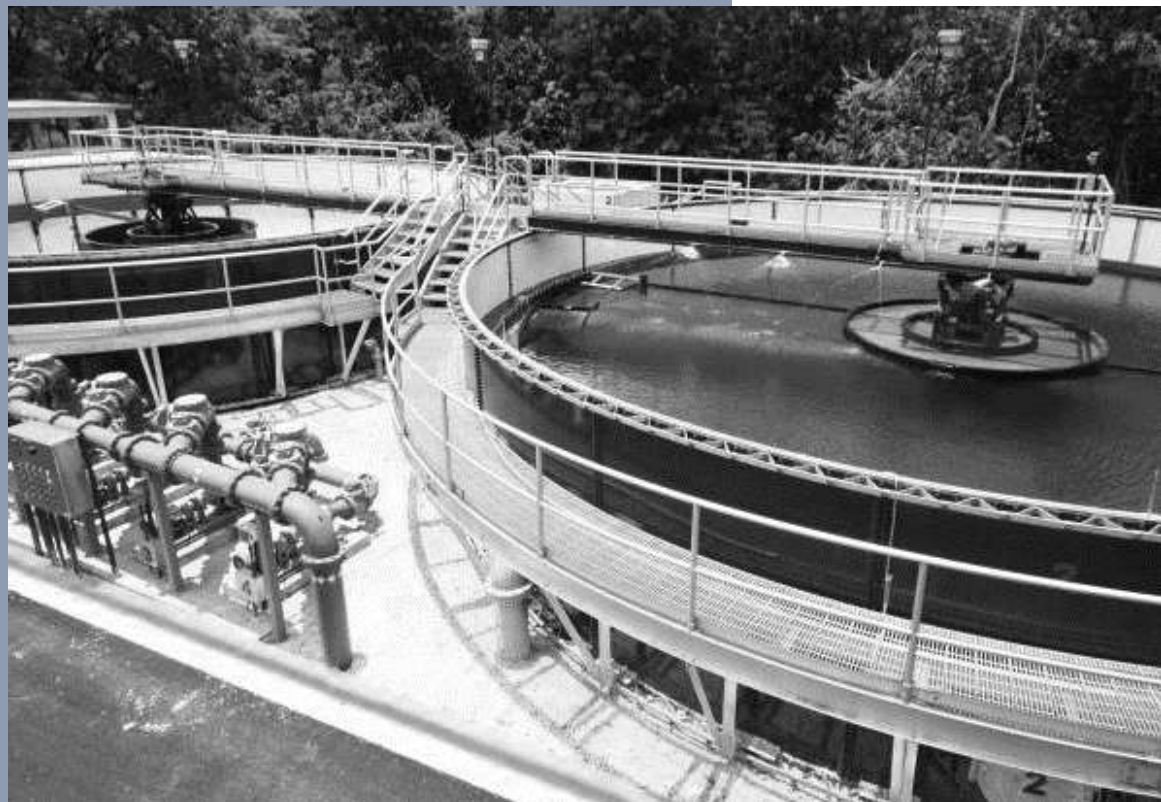
In the course of restoring its damaged facilities, PRASA will also rethink system design based on demographic changes in order to develop a system that is less costly to operate as well as more efficient, reliable, and capable of meeting current and future requirements.

The government has identified specific restoration projects that total the amount specified below. Some representative projects that Puerto Rico is planning to pursue to realize this vision are shown below:

CATEGORY	ESTIMATED COST
Water and Water Control Facilities	\$1,280,822,003



# WATER INFRASTRUCTURE REHABILITATION



Estimated Cost

**\$90,000,000**

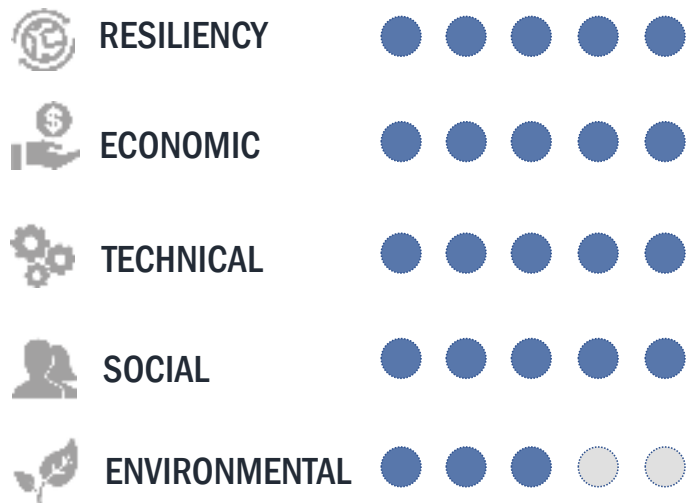
Proposed Funding Source

**PA, HM**

Other Possible Funding Sources

**CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Provide planning/design and construction for the restoration and resilient rebuilding of damaged water infrastructure in compliance with current code requirements and regulations.

## IMPACT

As a result of heavy rains and hurricane-force winds, water infrastructure was heavily damaged. Flood control and storm water management facilities, wastewater treatment systems, water conservation infrastructure and reservoirs were all seriously impacted, threatening public health and safety.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The project will build more resilient water infrastructure that will protect against future failures in water supplies and water usage and protect against flooding. This will provide the residents and property of Puerto Rico with access to potable water and protect against flooding.

# GUAJATACA DAM RESTORATION

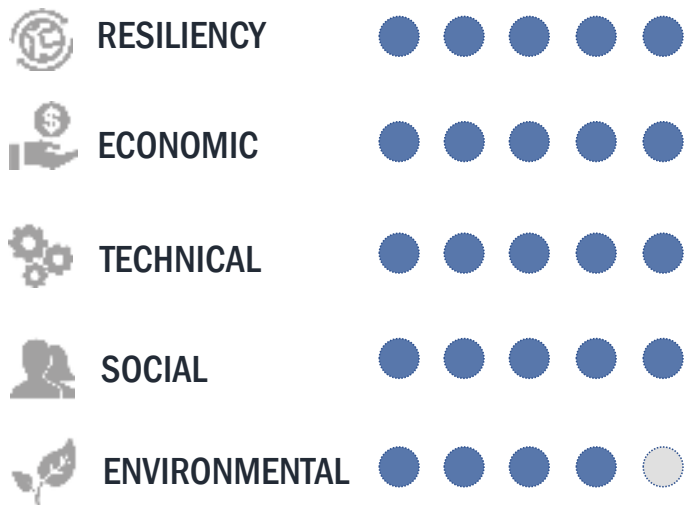


Estimated Cost  
**\$200,000,000**

Proposed Funding Source  
**PA, HM**

Other Possible Funding Sources  
**CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Reconstruction of spillways and bringing the facility up to modern codes and design standards.

## IMPACT

As a result of the heavy rains the Guajataca dam in northern Puerto Rico suffered a major breach in its emergency spillway exposing it to a possible structural collapse and threatening more than 70,000 island residents downstream.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The non-hydropower earthen dam is located in Northwest Puerto Rico, will continue to provide flood-risk management and water supply to more than 350,000 residents.

# CASEY RESERVOIR AND WATER TREATMENT PLAN



Estimated Cost

**\$552,518,544**

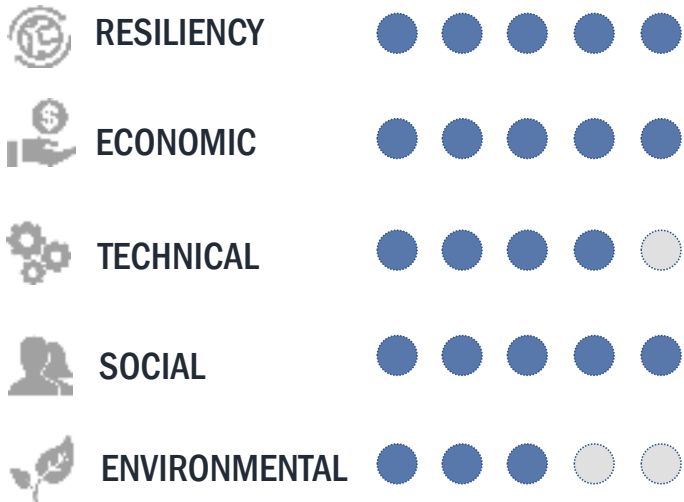
Proposed Funding Source

**PA, HM**

Other Possible Funding Sources

**CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

New reservoir, new filter plant and transmission systems to Añasco, Aguadilla, San Germán and other areas currently served by Guajataca.

## IMPACT

Damages to the Guajataca Dam jeopardized the water source that serves the municipalities in the western region of the island, highlighting the need for increased redundancy and infrastructure resiliency.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Increased reliability of water service for the Western region of the Island.

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# SANITARY SEWER AND STORM DRAINAGE



# SANITARY SEWER AND STORM DRAINAGE

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The Puerto Rico Aqueduct and Sewer Authority (PRASA) serves 1.3 million customers and the sanitary sewer and storm drainage system consists of 51 wastewater treatment plants, 1,723 pump stations, 2,186 tanks, 299 water supply wells, over 20,000 miles of pipelines, 13 levees, and 6 ocean outfalls. Much of this infrastructure experienced either power outages that crippled the operation of this critical infrastructure or direct damage that severely compromised system operations. The debilitated sanitary and storm drainage infrastructure triggered system failures that caused the uncontrolled and untreated release of millions of gallons of untreated sewage and contaminated water into the environment, a problem that continues to this day in some areas due to the lack of sufficient temporary generator power to restore full service. Much of the network within the system is clogged, in whole or in part, by storm-related debris. In addition, the weakened infrastructure, including levee systems, increases the likelihood of future flooding, even during relatively minor events that would not otherwise have caused flood conditions previously. While significant progress has been made to bring wastewater treatment facilities back online, there continue to be four PRASA wastewater treatment plants out of operation in Puerto Rico, all 13 of the levee systems require reconstruction and hundreds of drainage sites across the island remain damaged, inoperable, and/or clogged with debris.

During the recovery period, PRASA is planning to rebuild and improve the sanitary sewer and storm drainage systems to minimize flooding, reduce maintenance demands, and adapt to rapidly-evolving post-disaster demographic changes. This will involve rethinking the design and operation of the systems, utilizing modern means and methods, applying enhanced codes and standards during reconstruction, elevating and otherwise protecting critical system infrastructure from the impacts of natural hazards, and incorporating technology and sensors into the repaired or replaced infrastructure. PRASA is also hoping to incorporate renewable energy systems with associated power storage capability to provide back-up power, and in some cases primary power, to key water control infrastructure in order to lower costs and enhance system resiliency.

The government has identified specific restoration projects that total the amount specified below. Projects like those listed below will help ensure that the catastrophic hurricane damages from Irma and Maria are not experienced again:

CATEGORY	ESTIMATED COST
Sanitary Sewer and Storm Drainage	\$1,409,716,413

# ELIMINATION OF DORADO WWTP



Estimated Cost

**\$276,600,000**

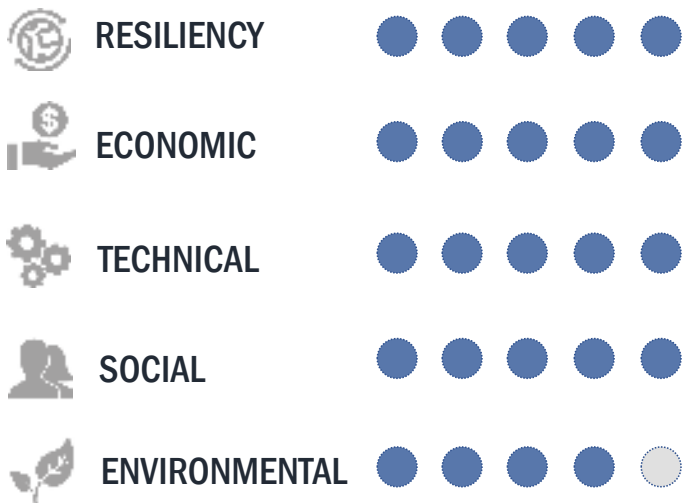
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**HM, USDA**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Relocation of existing Wastewater Treatment Plant located on a flood zone into a new location that is not flood prone.

## IMPACT

As a result of the floods generated by Hurricane María the Dorado WWTP was affected putting at risk the health and safety of the persons residing near the facility.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The new project will provide Increased reliability of wastewater treatment and will not expose citizens to contaminated water.

# LEVEES DESIGN COMPLIANCE AND REPAIRS



Estimated Cost

**\$100,000,000**

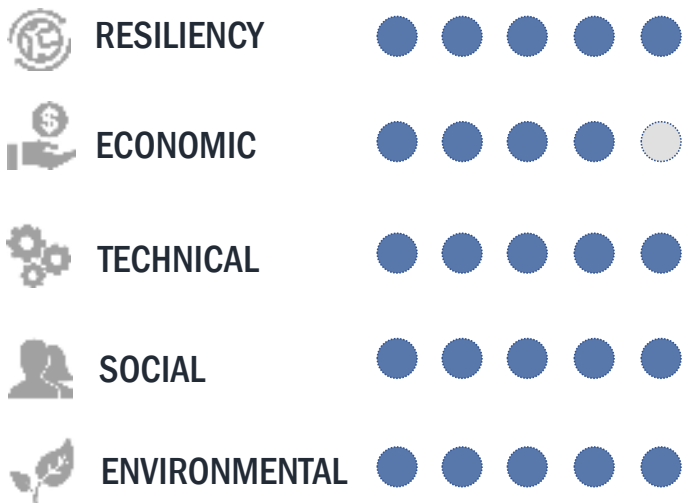
Proposed Funding Source

**USACE**

Other Possible Funding Sources

**CDBG-DR, HM**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Assessment and reconstruction of levee infrastructure to comply with design codes and current regulations.

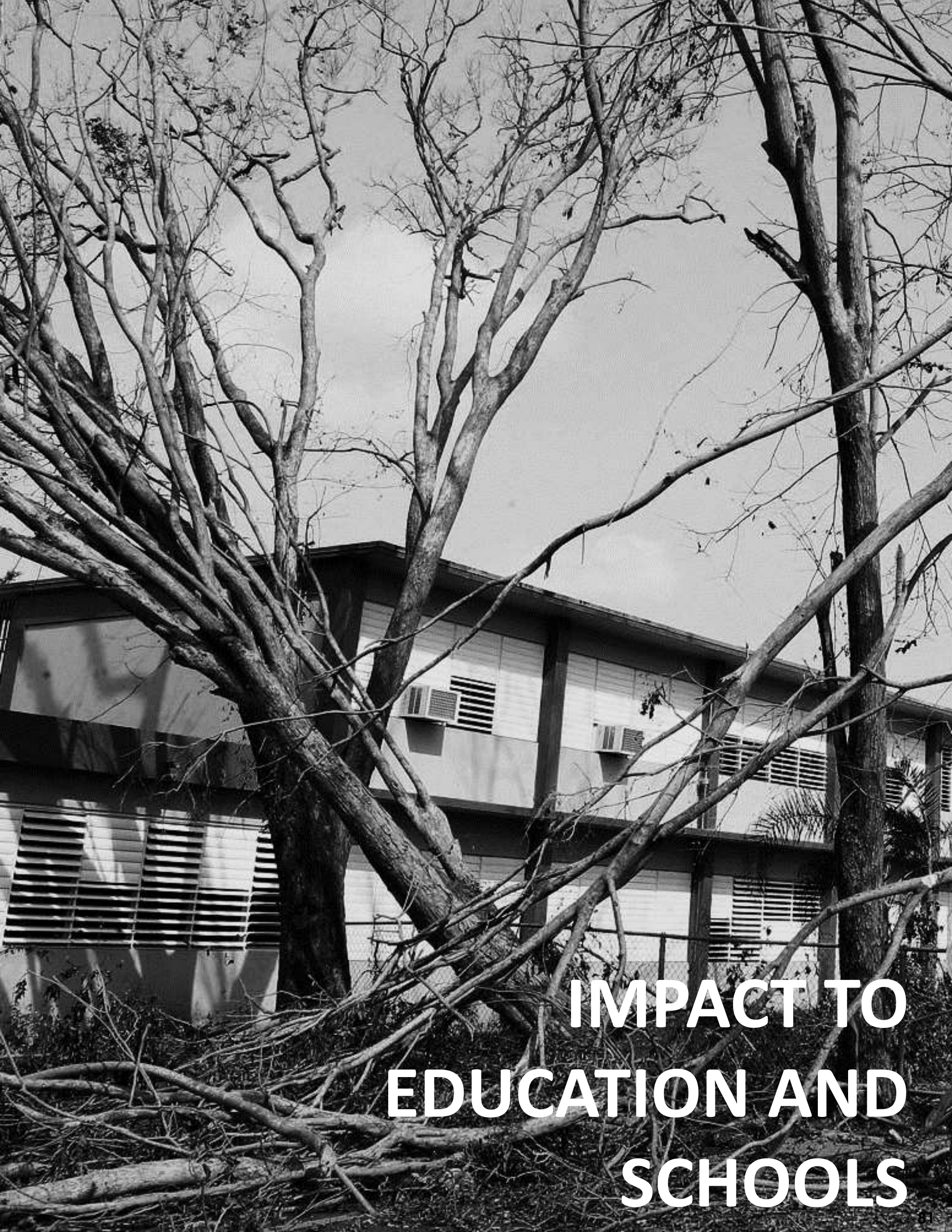
## IMPACT

Levees were damaged by the hurricanes exacerbating riverine flooding in many communities.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Levees control flooding along rivers providing life, infrastructure, and property protection. This project will ensure protection and economic development opportunities to areas benefiting from this work.





# IMPACT TO EDUCATION AND SCHOOLS

# EDUCATION AND SCHOOLS

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At the time of the Hurricanes the Puerto Rican educational system consisted of approximately 1,113 public primary; secondary school campuses (5,000 buildings – 400,000 students); 750 private primary and secondary school campuses (2,000 buildings – 150,000 students); community colleges/technical schools serving approximately 65,000 students; and 24 Universities that serve over 250,000 students. During the hurricane, several thousand of these island’s educational facilities were damaged, with the worst impacts at the primary and secondary school levels. As of November 6, more than six weeks after the storm, 598 public schools had yet to reopen, 200 still do not have water service restored, and at least 70 school campuses may never reopen due to the severity of damage. In addition, thousands of students and teachers left the island for the mainland after the storm hit, potentially impacting the demographics of the educational system once the education sector is restored.

In light of the disasters, Puerto Rico now has the opportunity to consolidate campuses, modernize facilities, and improve and expand the use of technology so as to adapt the educational system to the unique needs of Puerto Rico and its economy. The Government will consider the size and number of schools needed at the primary, secondary, and post-secondary levels when making decisions on reconstruction, with an eye toward achieving efficiencies, consolidating facilities based on current and projected demographic trends, and improving education delivery. As it rebuilds and repairs, Puerto Rico now has the opportunity to consolidate campuses, modernize facilities, and improve and expand the use of technology so as to adapt the educational system to the unique needs of Puerto Rico and its economy.

Achieving this vision will be complex and challenging, but it is clear that substantial funding above and beyond available FEMA resources will be necessary to accomplish this vision. The projects listed here provide insight into the types of initiatives that will be implemented in Puerto Rico to restore the island’s educational system and capitalize on the opportunity to enhance and improve it as part of reconstruction efforts:

CATEGORY	ESTIMATED COST
Education and Schools	\$8,413,208,822

# OPTIMIZATION AND REINVESTMENT IN SCHOOL SYSTEM INFRASTRUCTURE



Estimated Cost

**\$300,000,000**

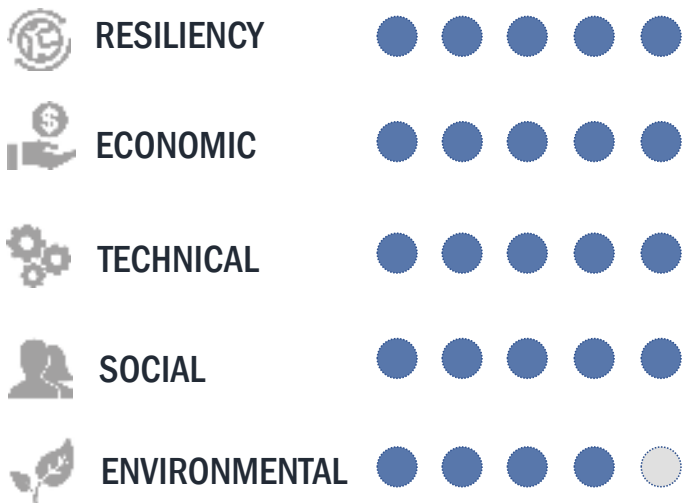
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**ED**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Renovate one public school per municipality. Right-sizing the school system together with simultaneous re-investment. Improve the quality of school infrastructure for thousands of students by aligning education with the conditions of the 21st century.

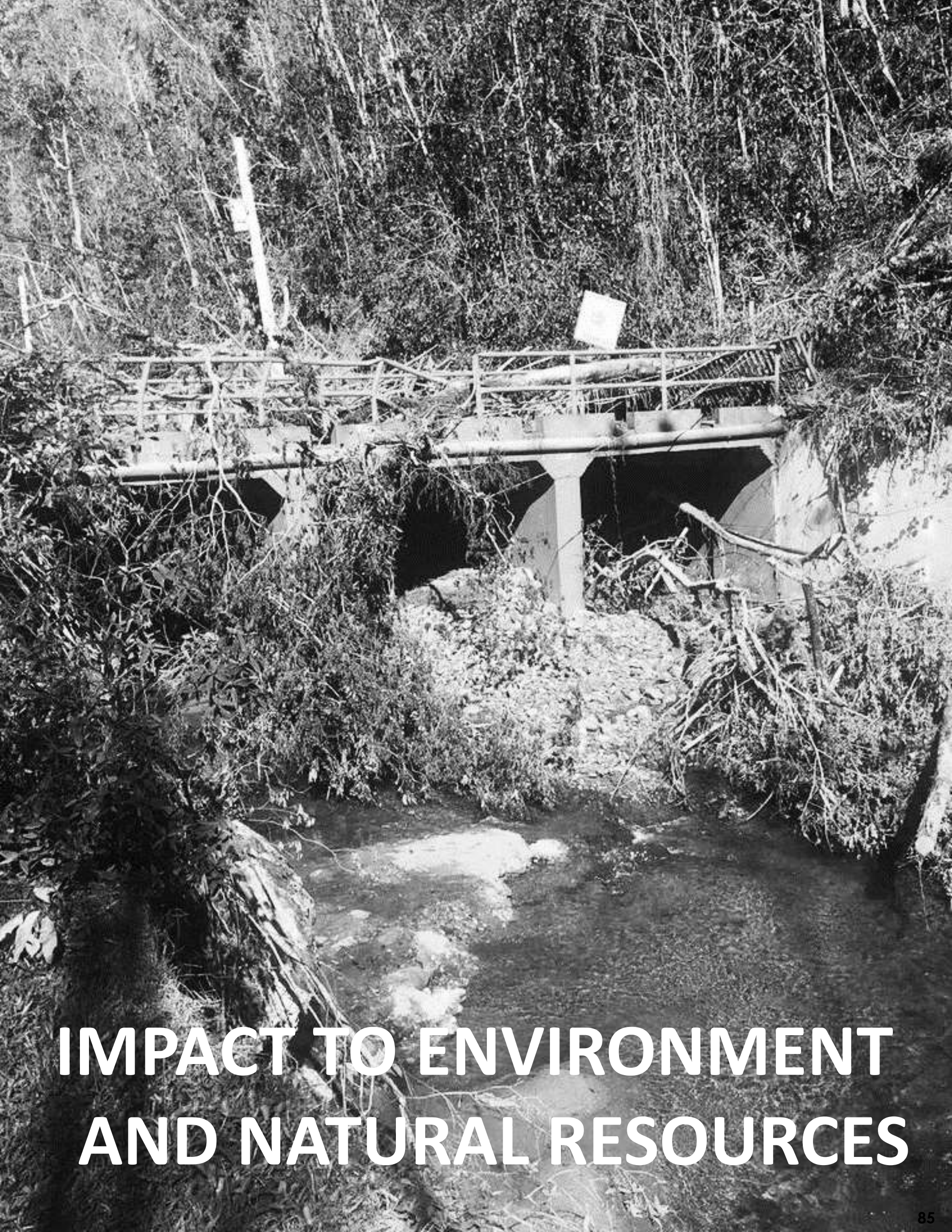
## IMPACT

Severe impact and damages across school infrastructure. Presently, numerous public schools remain closed.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Significantly improve the resiliency of school infrastructure and enhance the academic performance.

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# IMPACT TO ENVIRONMENT AND NATURAL RESOURCES

# ENVIRONMENT AND NATURAL RESOURCES

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Hurricanes Irma and Maria caused widespread impacts on the natural resources of Puerto Rico, ranging from the devastation of the rainforest canopy, to massive production of debris, the release of chemicals and untreated sewage into the environment, the devastation of coral reefs and sea grasses, and the severe erosion and destruction of the coastline and associated biomes. In forty-two of the island's coastal municipalities, damage to beaches, dunes and bluffs that normally provide a natural barrier to coastal flooding has been severe, significantly increasing the risk of future damages in those areas. Landscape and biological corridors conservation and connectivity, as well as habitat for endangered species has been impacted by the devastation of the rainforest and the existence of storm debris. These and other impacts are what is known, but the long-term impacts on Puerto Rico's environment and natural resources will take months or even years to fully evaluate, mitigate and repair.

As an urgent matter, Puerto Rico must address the challenges related to storm-generated debris, which threatens public health and safety and overwhelms the available infrastructure of the island for its disposal. It is estimated that the hurricanes created debris is equivalent to 4-5 years of landfill capacity at the island's 27 existing landfills, which is an amount that would significantly deplete available space for waste disposal on the island.

To tackle these problems, Puerto Rico will pursue a comprehensive strategy to evaluate and assess the short, mid- and long-term impacts of the storm, plus monitor impacts over time and track progress related to restoration efforts. Special focus will be placed on the restoration of habitat in the rainforest as well as the creation of coral farms to restore damaged reefs. Puerto Rico will also need to pursue a program involving replanting and reforestation, the removal of invasive species, and restoration of fisheries to both enhance the environment and strengthen the economy.

The government has identified specific restoration projects that total the amount specified below. To implement this strategy, Puerto Rico is hoping to execute initiatives like those shown below to help assess environmental impacts of the hurricanes and begin the process of restoring the island's natural habitat:

CATEGORY	ESTIMATED COST
Environment and Natural Resources	\$1,581,050,000

# CAÑO MARTÍN PEÑA RESTORATION AND RESILIENCY PROJECT



Estimated Cost

**\$1,000,000,000**

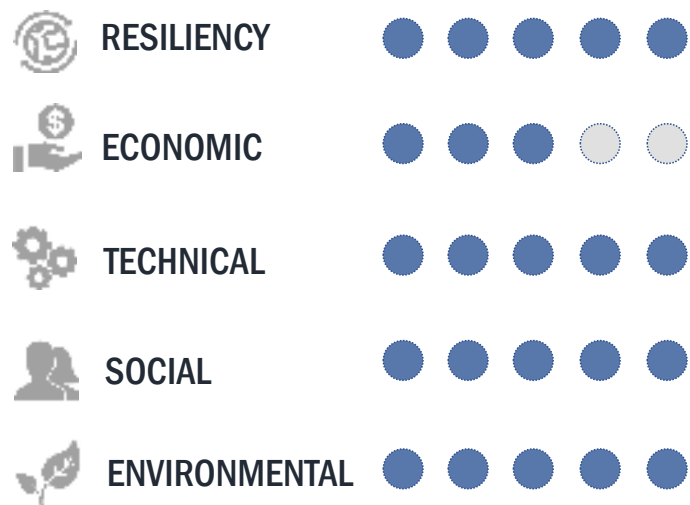
Proposed Funding Source

**USACE**

Other Possible Funding Sources

**HM, CDBG-DR**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Caño Martin Peña Ecosystem Restoration Project (dredging of 2.2 miles of the eastern channel) authorized under WRDA 2007, including LEERDs and other non federal components; wastewater and storm water sewers with green infrastructure components, potable water distribution system, and the Paseo del Caño; and associated relocation of approximately 1,000 families, construction of new resilient homes in available lots and improvements to homes and public facilities.

## IMPACT

70% of the communities flooded with wastewater during several days, around 1,000 homes lost part or all the roof, or were destroyed, trees fell into the tidal channel further blocking the channel, which affects San Juan Bay Estuary Area.

## LONG-TERM BENEFIT AND OPPORTUNITIES

The main benefit of the project is the improvement of the health conditions of 15,000+ persons that are frequently exposed to contaminated water and diseases. On the economic side partial estimates point to benefits of \$587 million to the Puerto Rican economy.

# COASTAL ZONE EROSION RECOVERY



Estimated Cost

**\$50,000,000**

Proposed Funding Source

**USACE**

Other Possible Funding Sources

**NOAA, DOI**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

Assessment and recovery of coastal areas that are subject to erosion and coastal flooding. Includes immediate repair of existing coastal erosion protection structures.

## IMPACT

Puerto Rico's coastlines were severely eroded by the Hurricanes causing catastrophic coastal flooding. Infrastructure in 42 coastal communities was damaged by the coastal flooding.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Prevention of future coastal erosion and flooding, protecting life, infrastructure and property near the coast. The coast provides a majority of the tourist economy for Puerto Rico.



# LANDFILL CLOSURE AND MODERNIZATION



Estimated Cost

**\$200,000,000**

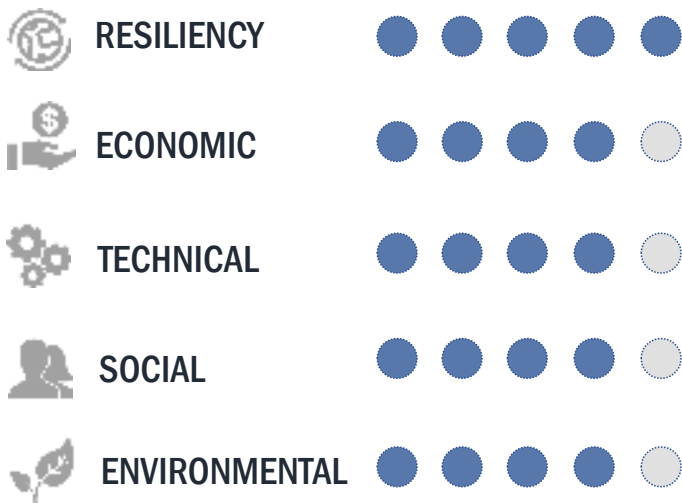
Proposed Funding Source

**CDBG-DR**

Other Possible Funding Sources

**USDA-RD**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

The project includes the closing of existing noncompliant landfills to modernize and improve overall environmental conditions and protect aquifer water quality. This includes systematic evaluation of both operating and inactive landfills for impacts on existing drinking water sources and availability of and distribution of sewer collection systems for transmission and treatment of landfill leachate and ensure that today's and future solid waste is going to compliant landfills and that the old contaminating open dumps are effectively closed.

## IMPACT

Massive volumes of vegetative debris along with other disaster debris was generated that clogged streets and impacted effective operation of sewer systems resulting in discharge of untreated sewage to our receiving waters, and clogged streams contributing to significant flooding that only generated more disaster debris that needs to either be effectively processed or disposed of.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Continued protection of our drinking water is directly tied to the need to close the island's inactive and noncompliant dumps.

# FLOOD CONTROL DEBRIS AND OBSTRUCTION REMOVAL

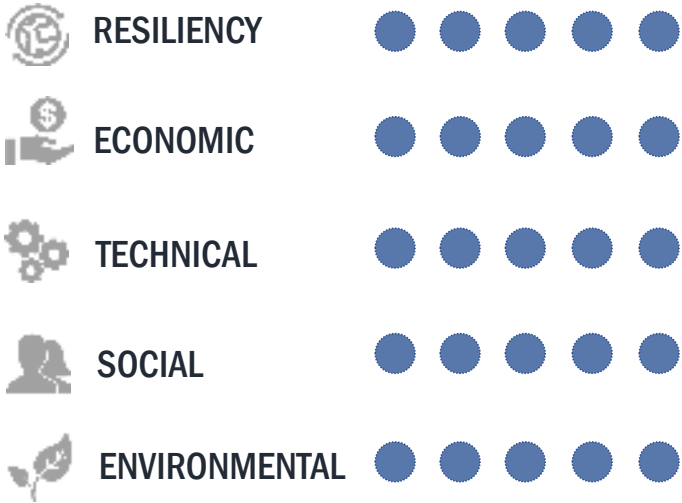


Estimated Cost  
**\$200,000,000**

Proposed Funding Source  
**PA**

Other Possible Funding Sources  
**CDBG-DR**

## EVALUATION CRITERIA



## DESCRIPTION

Removal of debris from rivers and water bodies in approximately 400 locations throughout the island which can damage infrastructure and threaten life safety.

## IMPACT

The hurricanes caused debris accumulation in rivers and water bodies throughout the island impacting natural water flow and threatening the stability of bridges and communities.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Quick and efficient removal of the massive amounts of debris accumulated in rivers and water bodies will protect against damage and instability that the debris can cause to infrastructure. The cleaning out of debris from the water will also protect the health and safety of Puerto Ricans.

## LOCATION



# FOREST RESTORATION AND DAMAGES MITIGATION



Estimated Cost

**\$20,000,000**

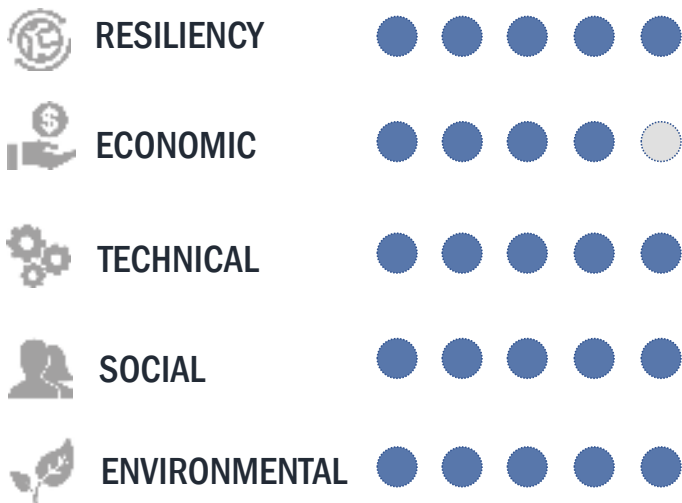
Proposed Funding Source

**USFWS**

Other Possible Funding Sources

**DOI**

## EVALUATION CRITERIA



## LOCATION



## DESCRIPTION

This project provides re-forestation and mitigation efforts of natural protected areas including reconstruction of forests, tree nurseries, and plant materials.

## IMPACT

Hurricane Maria devastated multiple forests, including America's only tropic rain forest in the US Forest Service system, wildlife, tree nurseries, and equipment. Damage includes deforestation and defoliation of trees and loss of wildlife. The rainforest, which is popular to visitors and provides 20% of the islands potable water, remains closed.

## LONG-TERM BENEFIT AND OPPORTUNITIES

Without any intervention it could take decades for the forests and wildlife to return to pre-hurricane size and numbers. The forests play an important role to the environment and livelihood of Puerto Rico. This project will provide the recovery of important natural resources which will enhance and strengthen the environment quickly.

# PUBLIC SAFETY AND FIRST RESPONSE COORDINATION

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The impact of the hurricanes on Puerto Rico’s public safety and response coordination capabilities was significant. The loss of communications and damage to response assets such as vehicles and facilities caused a significant degradation of command and control over assets being sent into the field and the inability of deployed personnel to coordinate in real-time. This situation was further complicated by the fact that many military and civilian communications systems could not communicate with each other even when limited service was restored. Many public safety facilities, including fire, police, emergency management, and National Guard facilities experienced damages that forced them to relocate or operate at reduced capacity or efficiency. The deployment of initial response resources, including water and food for impacted populations, were insufficient to meet the needs of the citizens. In addition, the initiation and pace of resources coming in from off-island left a substantial time-gap during which impacted populations were left wanting.

Puerto Rico lost use of five of the island’s 34 facilities, serving 2,500 inmates, from building damage, power outages and the loss of air conditioning and ventilation that created dangerous environmental conditions in the buildings. Unlike other populations, prisoners could not be rapidly or easily moved, creating a public safety crisis and forcing their eventual evacuation to the mainland at a substantial cost.

These public safety challenges demand that Puerto Rico adopt a strategy of improving the resiliency of both facilities and communications systems that support first responders. The Government of Puerto Rico seeks to invest in and build an interoperable communications network to allow responders of all kinds and across all agencies to coordinate during emergencies. A program to not just rebuild but strengthen public safety and first responder facilities will be a high priority during the recovery period. Puerto Rico’s 34 correctional facilities must to be enhanced to incorporate resiliency to improve air flow so that when ventilation is lost, unsafe environmental conditions are mitigated. In addition, the stockpiling of additional response resources and commodities is necessary to alleviate the logistical challenges faced by Puerto Rico due to its geographical location which is distant from the mainland.

The government has identified specific restoration projects that total the amount specified below. The examples below offer an indication of the types of projects that Puerto Rico wishes to pursue during the recovery period to help address the island’s public safety and first responder coordination needs:

CATEGORY	ESTIMATED COST
Public Safety and first Response Coordination	\$486,990,571

# ADDITIONAL NEEDS



# LONG-TERM RECOVERY MANAGEMENT AND COORDINATION

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Building Back Puerto Rico requires a structure that can plan, manage and coordinate the resources to create a resilient Island. The federal resources identified in this document need to be managed with strong financial controls and oversight to ensure that funds are used for authorized purposes and in a manner consistent with applicable laws, regulations, and policies. The responsibility for this important task has been assigned by the Governor to the Central Recovery and Reconstruction Office of Puerto Rico (CRRO).

This recovery office has been provided all necessary authority and capability to: (a) identify, procure and administer all state, federal and/or private resources for recovery; (b) direct and coordinate efforts and activities of the Government of Puerto Rico related to the recovery; (c) fund and execute recovery and related infrastructure projects; and (d) advise the Governor and provide technical assistance to other entities across the Government related to recovery, as required. This office will provide the centralized oversight and financial controls that the Government of Puerto Rico and the U.S. taxpayer expect for the recovery effort. It will also ensure the Government can implement reconstruction efforts with efficiency and transparency, and capitalize on opportunities to build back in a manner that makes Puerto Rico better, stronger, and more resilient.

CATEGORY	ESTIMATED COST
Long-Term Recovery Management and Coordination	\$9,000,000

# COST SHARE

The impact of the two hurricanes is creating a financial burden on Puerto Rico that is unsustainable without additional federal assistance. The Government is already having more than \$71 billion in debt, as well as a decrease in tax revenues and economic activity that will cripple the Government if it must also address unreimbursed costs such as cost-share from FEMA's programs. Historically, either FEMA or the Congress have authorized a 100% federal cost-share for large and catastrophic disasters such as Hurricane Andrew in Florida and Hurricane Katrina in Louisiana and Mississippi. The disaster in Puerto Rico is expected to be the largest and most costly disaster in U.S. history, and Puerto Rico has less financial capacity to address the cost-share requirements associated with these programs. The anticipated cost-share for FEMA Public Assistance, Hazard Mitigation, and Individual Assistance is expected to approach \$5-6 billion.

To address this need, Puerto Rico is requesting a cost-share adjustment for FEMA's programs under the Stafford Act to 100% federal. Puerto Rico seeks Community Development Block Grant-Disaster Recovery (CDBG-DR) funding to cover the cost-share match requirements of Stafford Acts programs. The following table reflects the current estimates of the non-Federal cost share requirements expected to be met by the Government of Puerto Rico:

Public Assistance	Federal Share	Non-Federal Share	Cost Share
<b>Category A &amp; B</b>			
Under 180 days		0%	\$ -
Over 180 days	\$ 2,000,000,000	10%	\$ 200,000,000
<b>Category C-G</b>		10%	\$2,787,960,658
<b>HAZARD MITIGATION</b>			
	\$ 4,481,940,987	25%	\$1,120,485,247
<b>INDIVIDUAL ASSISTANCE</b>			
ONA	\$ 1,000,000,000	25%	\$250,000,000
		<b>Total</b>	<b>\$4,358,445,905</b>

CATEGORY	ESTIMATED COST
Cost Share	\$4,358,445,905

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# APPENDICES

Project Evaluation Criteria  
Damage Assessment Data and Methodologies



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# PROJECT EVALUATION CRITERIA



# PROJECT EVALUATION CRITERIA

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The evaluation criteria that will be used to assess and rank the critical infrastructure projects is composed of five main categories: i) Resiliency, ii) Economic, iii) Technical, iv) Social, and v) Environmental. Sub-categories within each of these allowed an ordinal system of points to be allocated to each of the main categories. The project evaluation criteria were then employed in panels of experts to analyze and discuss the critical infrastructure projects needed to Build Back Better Puerto Rico.

## PROJECT EVALUATION CRITERIA

### RESILIENCY

- Redundancy – Does the project increase the redundancy of the system?
- Bounce-back – How easy will it be for the system to recover after an event?
- Interdependence – Is it a standalone asset or can it work independently?
- Vulnerability – Does the project reduce the vulnerability to future disasters?

### ECONOMIC

- Productivity improvement – Will the project promote job creation and long-term economic growth?
- Public-private interaction – Does the project allow the integration of the private sector?
- Non-linearity – Is the project dependent on other projects or can it be done by itself?
- Business interruption – Does the project minimize future business interruption?

### TECHNICAL

- Constructability – Is the project technically feasible and quickly performed ('shovel ready')?
- Remoteness – How close is the project to existing infrastructure and resources?
- Geography – Does the project geography increase the difficulty of site related activities?

### SOCIAL

- Legitimacy – Is society more broadly benefitted and empowered with this project?
- Dynamism – Does the project strengthen local communities?
- Quality of life – Does the project improve the quality of life of the society?

### ENVIRONMENTAL

- Sustainability – How does the project improve the use of natural resources (eg. land, water, energy)?
- Alignment – Does the project align with regulations and future developments of the area?

# **DAMAGE ASSESSMENT DATA AND METHODOLOGIES**



# DAMAGE ESTIMATION METHODOLOGY

## General

Cost estimates for this were generated using two methods:

- Direct bottom up project estimates developed by the Government of Puerto Rico agencies or,
- Use of damage assessment data from the Army Corps of Engineers, FEMA and or other official sources.

When specific data were not available or data was not complete, then certain assumptions were necessary to create the estimate. These assumptions are detailed in this document.

## Housing

The housing estimates were based on a combination of open source housing data, FEMA Individual Assistance data and US census data. The 1,244,202 households is based on total occupied housing units derived from the U.S. Census American Community Survey (ACS) 2015 5 Year Estimates for Puerto Rico. Current FEMA Registration data as November 9, 2017 was also considered in using the total occupied housing units, which is 86% of all occupied housing units. Currently, only 7.1% of housing inspections have been completed and predominately only inspections have been completed in the San Juan metropolitan area, which is not representative of the housing damages across the island. Based on the best available information, we have made the following assumptions in quantifying the housing damage:

Owners units by damage	Number of units	Per unit damage (\$)	Estimated Unmet Need
Destroyed	57,482	\$120,500	\$6,926,596,954
Major	254,564	\$35,000	\$8,909,730,522
Minor	205,293	\$15,000	\$3,079,399,950
Affected	205,293	\$5,000	\$1,026,466,650

Renters units by damage	Number of units	Per unit damage (\$)	Estimated Unmet Need
Destroyed	29,612	\$120,500	\$3,568,246,915
Major	131,139	\$35,000	\$4,589,861,178
Minor	105,757	\$15,000	\$1,586,357,550
Affected	105,757	\$5,000	\$528,785,850

# DAMAGE ESTIMATION METHODOLOGY

The level of damages for destroyed and major damages were derived from damage estimates from both Hurricane Georges (Cat 3) and Hurricane Hugo (Cat 4), which resulted in approximately 7% destroyed and 31% major damage, respectively.

Year	Hurricane	Hurricane Category	Municipalities Declared for IA	Shelters Open	Shelter Population	PDA (Destroyed)	% of Total (Destroyed)	PDA (Major)	% of Total (Major)	PDA (Minor)	% of Total (Minor)	PDA (Affected)	% of Total (Affected)	Total PDA	IHP Applications 09 Nov 17
1995	Marilyn (Cat 3)	3	12			120	0.5%	330	1.4%	499	52.6%		0.0%	949	23,468
1989	Hugo (Cat 4)	4	57	300	16,000	4,500	6.8%	20,500	31.1%	41,000	62.1%		0.0%	66,000	103,863
1998	Georges (Cat 3)	3	78	429	26,732	28,500	7.6%	128,500	34.3%	157	0.0%	217,109	58.0%	374,266	406,063
2017	Maria (Cat 4)	4	78	202	12,000	87,094	7.0%	385,703	31.0%						1,244,202

The level of damages per category of damage (i.e. Destroyed, Major, Minor, Affected) were provided by the Puerto Rico Department of Housing. The estimate for cost of repair for destroyed units is derived from the ACS estimates of median housing value (on a county and block group level) while the other categories were based on qualified estimates from the Puerto Rico Department of Housing.

Levels of insurance coverage were based on data from the Government of Puerto Rico's Insurance Commissioner's website. The number was reduced by 31% to account for insurance coverage and then adjusted for a 10% estimate of those underinsured.

For the purpose of this analysis, and consistent with HUD's allocation methodology for other recent disasters (including Public Law 113-2), mitigation costs are assumed to equal 30% of total damage costs to owner-occupied and rental housing units that were deemed to be destroyed or experienced major damage.

# METHODOLOGY FOR DETERMINING ESTIMATED UNMET NEED

## School Repair/Rebuild Estimates

For the damaged schools assessed, the Army Corp damage percentage below were used. Data was available for student counts, the following was used to compute square footages and repair cost per square foot:

TYPE	SQ FOOT PER PUPIL	REPAIR COST PER SQ FOOT
PRIMARY	136	\$195.00
MIDDLE	194	\$225.00
HIGH	174	\$250.00
OTHER	174	\$225.00

The repair calculation was:  $\text{Damage Percent} * \text{Pupil Count} * \text{Average Sq Foot per pupil} * \text{Cost per square foot}$ .

The number of destroyed schools was identified at 74 from Army Corp Inspections. The overall proportion of schools in Puerto Rico was used to break these schools down by Primary, Middle, and High school. The following information was then used to estimate school size and reconstruction costs:

SCHOOL TYPE	SCHOOL COUNT	AVG STUDENTS	SQ FOOT PER STUDENT	RECONSTRUCTION COST PER SQ FOOT
HIGH	11	500	174	\$ 500
MIDDLE	13	369	194	\$ 450
PRIMARY	49	266	136	\$ 390

The reconstruction calculation was:  $\text{School Count} * \text{Avg Students} * \text{Square Foot Per Student} * \text{Cost per square foot}$ .

## Fire Station Repair Estimates

The average damage for the zip code was used. Fire stations were estimated at 10,000 sq feet due to a lack of reliable data on actual size. Fire station repair per square foot costs were estimated at \$45.

The repair cost calculation was:  $\text{Zip Code Damage Percent} * 10,000 * \text{Cost per square foot}$ .

## Hospital Repair Estimates

The average damage for the zip code was used. Hospital bed counts were available, and a cost of \$1,500,000 per bed was used as an estimate.

The repair cost calculation was:  $\text{Zip Code Damage Percent} * \text{Bed Count} * \$1,500,000$ .



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"The people of Puerto Rico are amazing, just incredible people. The spirit they have, the strength they have. What they've gone through... We'll help you and we'll all do it together."

Hon. Donald J. Trump, President of the United States of America



"Our country will stand with those American citizens in Puerto Rico until the job is done."

General John Kelly, White House Chief of Staff



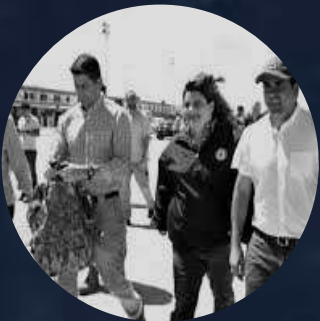
"Maria was especially devastating. We will work with the Administration and Puerto Rico. This will not be easy or quick... We are here to do our part."

Hon. Mitch McConnell (R-KY), Senate Majority Leader



"This is what we do as Americans...when one part has trouble the rest of the country reaches out and says: we're going to help you."

Hon. Charles Schumer (D-NY), Senate Minority Leader



"Our heart goes out to the people of Puerto Rico, what we have seen here today confirms that this is first and foremost a humanitarian disaster."

Hon. Paul D. Ryan (R-WI), Speaker of the House of Representatives



"Our fellow Americans in Puerto Rico and the Virgin Islands deserve to know that their government will be there for them, without question or hesitation."

Hon. Nancy Pelosi (D-CA), House Minority Leader



"Sometimes we don't know what's going to happen until the storm actually hits, and this is the worst I've ever seen."

Lt. Gen. Jeffrey Buchanan, Commander, United States Army North (Fifth Army)