



The Relationship Between Disaster Recovery and Displacement in Puerto Rico

Technical Summary | 2020

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Earth Economics acknowledges that we operate on the lands of the Coast Salish peoples, specifically the ancestral homelands of the Puyallup Tribe of Indians, and the 1854 Medicine Creek Treaty.

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1. INTRODUCTION

Ever since Hurricanes Irma and Maria hit Puerto Rico in 2017, households have been waiting for adequate funding and support for recovery. While Puerto Rico suffered an estimated \$167 billion in storm damages, government leaders have planned to spend \$50 billion on recovery efforts to build resilience and build back what was lost. These funding needs have been identified through the Community Development Block Grant for Disaster Recovery (CDBG-DR), which is administered by the Puerto Rico Department of Housing (PRDOH). The revised Puerto Rico Disaster Recovery Action Plan (Action Plan) for CDBG-DR funds identified a remaining \$31 billion in unmet housing needs following FEMA assistance and Small Business Assistance loans. To address these unmet housing needs, the Action Plan has implemented the Housing Repair, Reconstruction or Relocation (R3) Program. The R3 program prioritizes relocation from disaster-prone areas for households in FEMA flood zones *and* landslide risk areas. Currently, relocating people and property from risk areas serves as both a form of household recovery and disaster mitigation.

Current disaster recovery plans for households and communities, including the R3 program, will contribute to displacement for households needing repair, reconstruction, and relocation from risk areas. Displacement refers to processes that drive or expel people and families from their homes, livelihoods, and/or communities. Low-income residents and people of color are disproportionately impacted due to systemic racism and inequity. In Puerto Rico, displacement can occur in three ways and often results in out-migration. First, a person or family can be forced or coerced to move from their dwelling, for example, through evictions or land acquisition. Second, people may be pressured to move because they are priced out of an area by factors like gentrification or new developments, often in support of tourism. Third, families may be pressured or forced to move because they lack access to opportunities and services such as employment, education, or safety through disaster mitigation. Displacement results in additional costs and impacts for households and communities, compounding vulnerabilities leading to larger economic repercussions for the territory.

To better understand the risks of displacement from ongoing recovery efforts and propose alternative recommendations, Ayuda Legal Puerto Rico (Ayuda Legal) engaged Earth Economics (EE) to examine the economic considerations for households in designated high-risk areas. Ayuda Legal is a legal advocacy nonprofit that defends people and communities of low and medium income. Following 2017's Hurricanes Irma and Maria, Ayuda Legal has been addressing issues of social and environmental justice with a focus on meaningful community participation and a rights-based framework tied to the recovery efforts. EE assessed the policies, plans, and funding sources guiding disaster recovery processes, providing an economic analysis of Federal Emergency Management Agency (FEMA), Department of Housing and Urban Development (HUD), and Puerto Rico Department of Housing (PRDOH) programs.

This report summarizes the extent of disaster impacts, the context around existing drivers of displacement and the ways in which these factors are exacerbated by the status of recovery efforts in the territory. The report focuses on programs for household-level recovery in designated risk areas. Here, the report analyzes the risk of displacement from PRDOH's R3 program and outlines associated costs of displacement for households and the broader economy. The report concludes with recommendations for investing in community-driven recovery options, particularly for households and neighborhoods in or near risk areas. By discussing the costs and benefits of Puerto Rico's disaster response—and their manner of distribution—the report shows how different disaster recovery pathways can either strengthen or weaken community resilience. This report recommends supporting community-driven mitigation and resilience measures to prevent displacement for a just recovery.

2. BACKGROUND: SHOCKS AND STRESSORS

a. Hurricanes, Earthquakes, Drought, and COVID-19

Between September and December 2017, a total of 4,645 people in Puerto Rico died from Hurricanes Irma and Maria.¹ These deaths are attributed to the combination of the direct disaster impacts of flooding, landslides, and windfall and the effects of inadequate emergency response, namely, delayed and interrupted health care. FEMA identified damages to 357,492 homes, or 23 percent of the island's housing stock. The hurricanes also damaged infrastructure systems by disrupting electricity, water, communications, and transportation services. These conditions fueled a surge in out-migration by limiting opportunities for jobs and schooling, leading to a 4 percent population decline from 2017 to 2018.²

In addition to the 2017 hurricanes, the COVID-10 pandemic, earthquakes, and drought have exacerbated issues in Puerto Rico.

Earthquakes - Starting in 2019, a sequence of earthquakes in the southern portion of the island destroyed 2,500 homes and left 8,300 needing repairs. The United States Geological Survey (USGS) expects aftershocks from the January 2020 magnitude 6.4 event to continue for up to a decade.

Drought - The south and east regions of Puerto Rico face drought conditions. In July 2020, 32 percent of the territory faced severe drought resulting in water shortages and agricultural losses.

Pandemic - Since March 2020, the COVID-19 pandemic has led to 300,000 unemployment claims from a labor force of 1.05 million, increasing unemployment to 46 percent. The Financial Oversight and Management Board estimates that Puerto Rico's economy will shrink by 4 percent.

b. Vulnerable Regions

Certain *municipios* of Puerto Rico have received varying levels of FEMA aid following Hurricanes Irma and Maria. Residents face significant challenges to financial, housing, and employment security. Government-supported essential services like roads, clinics, and schools are vital. Puerto Rico's major towns, namely, San Juan and Ponce, have received more government aid and international support compared to smaller and/or more rural towns.

Guayama is a *municipio* located in the Southern Coastal Valley region. Guayama's location is especially vulnerable to extreme weather events. Hurricane Maria triggered extensive landslide damage from excessive rainfall and flooding. A large supermarket plaza in Guayama was reduced to rubble and remained closed for more than a year afterwards. Some pharmaceutical plants and corporate commercial chains have returned to normal, while other smaller businesses continue to struggle, overall unemployment remains high, and schools remain closed. Many residents have moved to the U.S. mainland due to inconsistent recovery in the town.

Loiza is an Afro-Caribbean town and *municipio* on the northeastern coast. Most households in Loiza are within the FEMA 100-year floodplain. Additionally, many homeowners do not have a home title due to histories of colonialism and slavery. As a result of this history and discrimination against people without formal title, residents in Loiza and surrounding Afro-Caribbean communities have been denied recovery

¹ Nishant Kishore et al., "Mortality in Puerto Rico after Hurricane Maria," *New England Journal of Medicine* 379, no. 2 (2018): 162–70, <https://doi.org/10.1056/NEJMsa1803972>.

² Patrick Sisson, "Puerto Rico Faces Uneven and Underfunded Recovery," *Curbed*, December 3, 2019, <https://www.curbed.com/2019/12/3/20984347/real-estate-puerto-rico-tourism-airbnb>; Flores Antonio and Jens Manuel Krogstad, "Puerto Rico's Population Declined Sharply after Hurricanes Maria and Irma," *Pew Research Center* (blog), accessed June 24, 2020, <https://www.pewresearch.org/fact-tank/2019/07/26/puerto-rico-population-2018/>; Carlos Vargas-Ramos, "Upwards of 175,000 People Have Fled Puerto Rico In The Year Since Hurricane Maria," *Center for Puerto Rican Studies*, September 27, 2018, <https://centropr.hunter.cuny.edu/events-news/news/upwards-175000-people-have-fled-puerto-rico-year-hurricane-maria>.

aid. Many in Loiza who wish to hold on to their land and cultural heritage will have to rebuild without government assistance.³

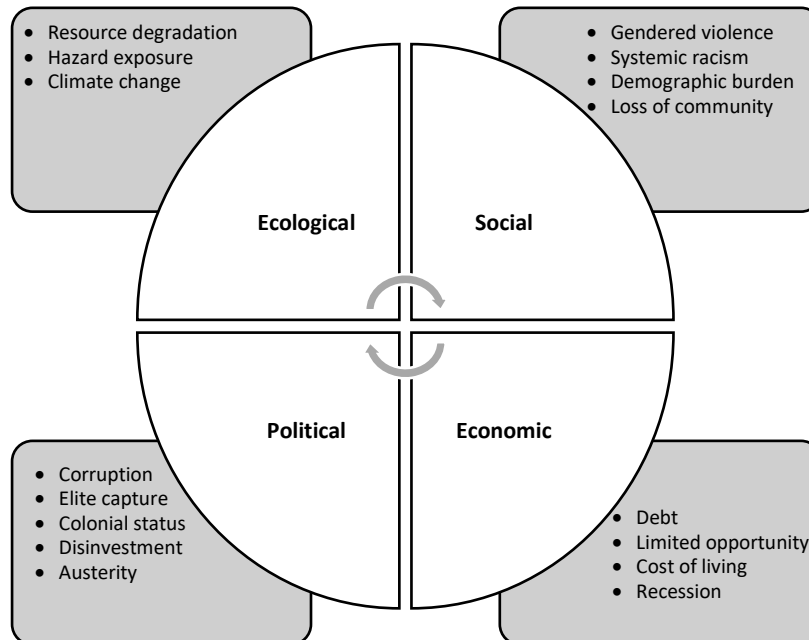
Salinas is a *municipio* located on the southern coast. Before Hurricane Maria, Salinas was experiencing a prolonged economic depression with an unemployment rate around 20 percent, already placing the region in an extremely vulnerable position prior to hurricane impacts. In the disaster’s aftermath, 75 percent of houses in Salinas have remained damaged or empty, with over 2,000 residents leaving Salinas because they were denied sufficient recovery aid and/or could not secure employment, resulting in a 7 percent population decline.⁴ Residents in Salinas report that electricity costs are too expensive, leading to shutoffs and delinquent charges.

The current strategy to remove households from high-risk areas may not reduce risk exposure; instead, households only trade one risk type for another. The prevalence and distribution of risk requires further investigation around building resilience and mitigating future impacts without relocation.

3. DRIVERS OF DISPLACEMENT RISK

This section contextualizes Puerto Rico’s displacement risks through the ecological, social, political, and economic systems that drive vulnerability and inequity (summarized in Figure 1). The intersection of these systems exacerbates displacement probability for certain households; as such, further consideration of these conditions in decision-making and planning could reduce displacement in recovery efforts.

Figure 1: Ecological, Social, Economic, and Political Drivers of Displacement Risks



³ Isabel Sophia Dieppa, Kari Lydersen, and Martha Bayne, “In Loiza the Fight for Property Rights Has a Long History,” Pulitzer Center (blog), January 3, 2019, <https://pulitzercenter.org/reporting/loiza-fight-property-rights-has-long-history>; Martha Bayne, “Puerto Rico’s New Zoning Map Strikes a Nerve with Fed-up Citizens,” The World, September 6, 2019, <https://www.pri.org/stories/2019-09-06/puerto-rico-s-new-land-use-zoning-map-strikes-nerve-fed-citizens>.

⁴ “U.S. Census Bureau QuickFacts: Salinas Municipio, Puerto Rico,” accessed August 19, 2020, <https://www.census.gov/quickfacts/fact/table/salinasmunicipioportorico/PST045219#PST045219>.

a. Ecological Systems

Climate Change Risks

Climate change exacerbates Puerto Rico's vulnerability to disasters. Puerto Rico's Department of Natural and Environmental Resources (DNER) through the Puerto Rico Coastal Zone Management Program (PRCZMP) established the Puerto Rico Climate Adaptation proposal in 2009 to assess these risks.⁵ As outlined below, the main climate concerns for Puerto Rico are sea level rise, storms, precipitation, temperature, and ocean acidification. High population density and development in areas susceptible to coastal and riverine hazards in addition to the loss of agricultural soils, water recharge, flora and fauna amplify these concerns. Climate change further compounds displacement risks when those with means apply displacement pressures to vulnerable communities who live in more climate-secure locations through the process of climate gentrification, an underlying theme running through the risks listed below.⁶

Sea-level rise inundates low lying coastal areas and contributes to coastal erosion and saltwater intrusion to freshwater karst aquifers. These impacts combined with changes to beaches from hurricane events threaten coastal cultural heritage sites, biodiversity, and amplify household displacement risk with damages to land and property from erosion and flooding. Repeated exposure to coastal hazards is costly and increases insurance premiums.⁷

Storm events will intensify and be more variable. Increased storm surges damage a greater extent of coastal areas. High wind speeds damage forests and built structures, from blowing off roofs to knocking over communication and energy infrastructure.

Precipitation and drought events will intensify. Heavy rains trigger landslides on unstable slopes and flooding. Landslides damage or destroy structures and cut off infrastructure, like critical transportation routes to interior mountainous regions. Heavy precipitation can lead to dam failure and riverine flooding, which threaten downstream communities.⁸ Remaining standing water can increase vector borne diseases⁹ among other health risks. Droughts reduce yearly water availability and limit water access and increase water costs. Water scarcity may be further compounded by saltwater intrusion. Changes in precipitation, including resulting changes in soil moisture from evapotranspiration, impact agricultural production and can increase food prices.¹⁰ Drought can stress and destabilize ecosystems in future climate events, thus decreasing socio-ecological resilience.

⁵Marie T. Mora, Alberto Dávila, and Havidán Rodríguez, "Migration, Geographic Destinations, and Socioeconomic Outcomes of Puerto Ricans during La Crisis Boricua: Implications for Island and Stateside Communities Post-Maria," *Centro Journal* 30, no. 3 (2018): 208–29.

⁶Jesse M. Keenan, Thomas Hill, and Anurag Gumber, "Climate Gentrification: From Theory to Empiricism in Miami-Dade County, Florida," *Environmental Research Letters* 13, no. 5 (April 2018): 054001, <https://doi.org/10.1088/1748-9326/aabb32>.

⁷Maritza Barreto-Orta et al., "The State of the Beaches in Puerto Rico after Hurricane Maria (2017)," *Shore and Beach* 87, no. 1 (2019): 16–23; PRCCC, "State of Puerto Rico's Climate 2010-2013 Executive Summary: Assessing Puerto Rico's Social-Ecological Vulnerabilities in a Changing Climate," 2013, 1–28; Kasey R Jacobs et al., "Working Group 1: Geophysical and Chemical Scientific Knowledge. Observed Trends and Future Projections" (Department of Natural and Environmental Resources – Coastal Zone Management Program, U.S. Department of Interior Southeast and Caribbean Climate Science Center at North Carolina State University, University of Puerto Rico - Mayagüez, Caribbean Coastal Ocean, 2010), 1, [http://pr-ccc.org/download/PR State of the Climate-WG1.pdf](http://pr-ccc.org/download/PR%20State%20of%20the%20Climate-WG1.pdf).

⁸Tania López-Marrero and Brent Yarnal, "Putting Adaptive Capacity into the Context of People's Lives: A Case Study of Two Flood-Prone Communities in Puerto Rico," *Natural Hazards* 52, no. 2 (February 1, 2010): 277–97, <https://doi.org/10.1007/s11069-009-9370-7>. Catherine Staes et al., "Deaths Due to Flash Floods in Puerto Rico, January 1992: Implications for Prevention," *International Journal of Epidemiology* 23, no. 5 (October 1, 1994): 968–75, <https://doi.org/10.1093/ije/23.5.968>.

⁹Michael A. Johansson, Francesca Dominici, and Gregory E. Glass, "Local and Global Effects of Climate on Dengue Transmission in Puerto Rico," *PLOS Neglected Tropical Diseases* 3, no. 2 (February 17, 2009): e382, <https://doi.org/10.1371/journal.pntd.0000382>.

¹⁰Eric W. Harmsen et al., "Seasonal Climate Change Impacts on Evapotranspiration, Precipitation Deficit and Crop Yield in Puerto Rico," *Agricultural Water Management* 96, no. 7 (July 1, 2009): 1085–95, <https://doi.org/10.1016/j.agwat.2009.02.006>.

Warming temperatures exacerbate the issues explained above, including soil degradation storm events, and create additional health hazards. Poor access to mechanical cooling or the ability to afford the additional energy expenses, particularly in urban areas, increases the risk of heat-related illnesses.

Ocean acidification from the absorption of atmospheric carbon dioxide into the ocean creates carbonic acid, which harms the formation of carbonate shells. Ocean acidification and warming stresses coral reefs, leading to a loss in marine biodiversity and reduced storm surge protection for coastal communities. Loss of coral reefs and associated marine ecosystems also impact fisheries management and oyster production, thereby harming the people who rely on marine resources for sustenance and livelihoods.

Extractive Industries

Puerto Rico faces pressures to develop a distribution center for liquified natural gas (LNG), as well as offshore oil and gas extraction.¹¹ The ongoing combustion of fossil fuels from coal, natural gas, and petroleum power plants generate air and soil pollution that disproportionately impact marginalized communities and lead to adverse health outcomes.¹²

Exposure to Hazards

The archipelago has 19 Superfund sites listed on EPA's National Priorities List (NPL), all of which function as legacy sources of persistent environmental pollution that present existing displacement risks. Superfund sites include closed industrialized pesticide factories built to support industrial agricultural operations. Nine sites have contaminated drinking water wells with no identified sources for the present industrial chemicals tetrachloroethene (PCE), trichloroethene (TCE), and dichloroethane (DCE). Four industrial operations have also leaked toxic chemicals, while the disposal of toxic materials in three landfills and two recycling facilities harm neighboring communities and ecosystems. Poor water access during droughts and disasters forces residents to use contaminated sources.¹³

Exclusion from Natural Amenities

While protected areas provide ecosystem services and economic opportunities from tourism for some communities, many people have been evicted or pushed out of these areas. Though the number of homes around protected areas increased by 32,300 between 2000 and 2010, the population around protected areas decreased by 28,868.¹⁴ Purchase of protected areas by private entities¹⁵ increases land prices and use restrictions decrease access for communities who rely on resource extraction.¹⁶ Proximity to places with touristic value and valuable natural resources presents similar displacement risks. Military presence also restricts areas of habitability and creates environmental hazards. For example, bombing

¹¹ Christopher J. Schenk et al., "Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of Puerto Rico and the Puerto Rico-U.S. Virgin Islands Exclusive Economic Zone, 2013," USGS Numbered Series, *Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of Puerto Rico and the Puerto Rico-U.S. Virgin Islands Exclusive Economic Zone, 2013*, vol. 2013-3101, Fact Sheet (Reston, VA: U.S. Geological Survey, 2013), <https://doi.org/10.3133/fs20133101>.

¹² "Meet Nelson Santos, Sierra Club Member in Puerto Rico," Sierra Club, 2002, <https://www.sierraclub.org/ecocentro/conoce-nelson-santos-socio-de-sierra-club-en-puerto-rico>.

¹³ Rachel Becker, "EPA Says Puerto Rico Residents Resorted to Contaminated Water at Dorado Superfund Site," The Verge, October 13, 2017, <https://www.theverge.com/2017/10/13/16474428/puerto-rico-hurricane-maria-superfund-site-water-shortage-epa-recovery>.

¹⁴ Jessica Castro-Prieto et al., "A Comprehensive Inventory of Protected Areas and Other Land Conservation Mechanisms in Puerto Rico," *General Technical Report 50* (2019), <https://www.fs.usda.gov/treeearch/pubs/58485>.

¹⁵ Castro-Prieto et al. 2019.

¹⁶ Ana C. Guzman. 2016. "A Study on Residents' Perceptions and Attitudes Towards the Vieques National Wildlife Refuge in Puerto Rico" (Master of Science in Environmental Studies, Miami, FL, Florida International University).

operations on the island of Vieques account for concerns about toxic pollution and unexploded ordinances.¹⁷

b. Social Systems

Colonialism

For over 500 years, Puerto Rico has been subject to colonization. Spanish rule led to population losses of the indigenous Taíno peoples who were enslaved as mining laborers. Colonial development displaced people from more desirable areas and also impacted their connections to lands, waters, non-human relationships, and their ancestry, thus disrupting people's ability and agency to respond to shocks and stressors.¹⁸

Discrimination

Racial segregation and racism creates or aggravates disaster vulnerability, displacement, and adverse health outcomes like the premature births and higher rates of infant mortality in Puerto Rico.¹⁹ Racism is rooted in colonialism and slavery, including the enslavement of African peoples brought to the island to support the production of export items like sugar cane, coffee, ginger, and tobacco.²⁰ Puerto Rico did not abolish slavery until 1873. In 1815, the Spanish Crown issued the Royal Decree of Graces, which fueled racial divides and privileged ideas of whiteness by offering non-Hispanic white Europeans incentives such as land and agricultural labor. By the end of the 1800s, white upper-class Puerto Ricans supported U.S. policies and industrialists that perpetuated anti-Afro-Puerto Rican sentiments and disregarded their civil rights. Racial stratification and failure to acknowledge the Puerto Rican people's diverse racial histories became evident when the U.S. 2000 Census began to collect racial data.²¹

Gender discrimination also puts those who reside outside the typical norms at greater risks of displacement. Women face physical and sexual violence, especially during stressful situations like disasters, putting both their own and their children's safety at risk.²² Patriarchal norms such as house- and child-care or lower pay also limit women's capacity to respond to shocks and stressors, including displacement.²³ Gender norms as displacement risks also lead to limitations in healthcare services for transgender and gender nonconforming individuals.²⁴

Social Fabric

The ability of community support systems in Puerto Rico to respond to and recover from disasters is limited because local and national decision-making practices undervalue and systematically disinvest in

¹⁷ Guzman. 2016.

¹⁸ Yarimar Bonilla and Naomi Klein, "The Trauma Doctrine: A Conversation Between Yarimar Bonilla and Naomi Klein," in *Aftershocks of Disaster: Puerto Rico Before and After the Storm*, ed. Yarimar Bonilla and Marisol LeBrón (Chicago, IL: Haymarket Books, 2019), 21–37.

¹⁹ Isar P. Godreau, *Scripts of Blackness: Race, Cultural Nationalism, and U.S. Colonialism in Puerto Rico* (University of Illinois Press, 2015).

²⁰ Laura Briggs, "La vida, moynihan, and other libels: migration, Social Science, and the making of the Puerto Rican welfare queen," *Centro Journal* XIV, no. 1 (2002): 75–101, <https://www.redalyc.org/articulo.oa?id=37711290004>.

²¹ Andrea González-Ramírez, "In Puerto Rico, an Epidemic of Domestic Violence Hides in Plain Sight," Medium, June 30, 2020, <https://gen.medium.com/in-puerto-rico-an-epidemic-of-domestic-violence-hides-in-plain-sight-c459d31ef616>; Gibrán Cruz-Martínez, "A Bottom-up Picture of Intra-National Welfare Regimes: The Case of Marginalised Communities in Puerto Rico," *Journal of International and Comparative Social Policy*, 2018, 1–25, <https://doi.org/10.1080/21699763.2018.1526696>.

²² Maura Toro-morn and Ivis García, "Gendered Fault Lines: A Demographic Profile of Puerto Rican Women in the United States," *Centro Journal* 29 (September 1, 2017): 10–35.

²³ Toro-morn and García.

²⁴ Jose J. Martinez-Velez, Kyle Melin, and Carlos E. Rodriguez-Diaz, "A Preliminary Assessment of Selected Social Determinants of Health in a Sample of Transgender and Gender Nonconforming Individuals in Puerto Rico," *Transgender Health* 4, no. 1 (2019): 9–17, <https://doi.org/10.1089/trgh.2018.0045>.

social infrastructure such as multi-family and multi-generational households.²⁵ A survey of 150 people from the municipalities of Guánica, Peñuelas, Guayanilla, and Yauco reported that 57.3 percent of households had at least one person over the age of 60; 28 percent of households had more than one family living within the house.²⁶ Puerto Ricans are more likely to turn to social capital to navigate a long-term recovery with limited home equity and access to financial capital, and residents are more likely to rely on wages.²⁷ Declining populations erode community support systems' capacity base and the critical benefits they provide in response to traumatic loss and disaster impacts. Not only are connections within a community critical, but cellphone mobility data assessed from before and after Hurricane Maria indicate that communities with strong connections from outside the community lead to faster recovery.²⁸

Puerto Rico's population has been declining since the islands' economic recession began in 2006, and by 2025, it is projected to fall below 3 million—this would be its lowest population since the 1970s.²⁹ This outmigration has been aggravated by the hurricanes and recent earthquakes—an estimated 130,000 Puerto Ricans left the island after Maria. Declining population levels contribute to defunding social services and delayed assistance, leaving the most vulnerable with limited access to basic services like safe shelter, health care, and transportation. Puerto Rico's social fabric and institutions are also impacted as more families and younger and skilled individuals leave in search of opportunities.³⁰

Health Services

Health care is vital to uphold physical and mental health, especially for communities that have been subject to systematic discrimination, yet these systems are deteriorating and closing without funding and staff.³¹ Displaced residents also have a challenging time accessing healthcare due to resulting limitations in coverage if they are displaced to the mainland U.S.³²

People with disabilities face unique risks. According to the U.S. 2010 Census, 21 percent of Puerto Rican residents report a visual, auditory, or ambulatory disability, compared with 12 percent of Americans overall. A survey of 150 people from the municipalities of Guánica, Peñuelas, Guayanilla, Yauco, and Ponce highlights the levels of vulnerable community populations. The survey found that 42 percent of these households had at least one person with a disability living with them.³³ People with disabilities may

²⁵ Cruz-Martínez, "A Bottom-up Picture of Intra-National Welfare Regimes"; Judith Landau, Mona Mittal, and Elizabeth Wieling, "Linking Human Systems: Strengthening Individuals, Families, And Communities in the Wake of Mass Trauma," *Journal of Marital and Family Therapy* 34, no. 2 (2008): 193–209, <https://doi.org/10.1111/j.1752-0606.2008.00064.x>.

²⁶ Dra. Marinilda Rivera Díaz, Dr. Yamil Ortiz Ortiz, Randy R. Tejada Duarte, Natalie Álamo Rodríguez. 2020. "La comunidad dice lo que quiere": Resultados de encuestapost terremotos en el sur de Puerto Rico sobre el derecho a la vivienda. Centro de Investigaciones Sociales de la Facultad de Ciencias Sociales de la Universidad de Puerto Rico.

²⁷ Froma Walsh, "Traumatic Loss and Major Disasters: Strengthening Family and Community Resilience," *Family Process* 46, no. 2 (2007): 207–27, <https://doi.org/10.1111/j.1545-5300.2007.00205.x>.

²⁸ Takahiro Yabe, Satish V. Ukkusuri, and P. Suresh C. Rao, "Mobile Phone Data Reveals the Importance of Pre-Disaster Inter-City Social Ties for Recovery after Hurricane Maria," *Applied Network Science* 4, no. 1 (2019), <https://doi.org/10.1007/s41109-019-0221-5>.

²⁹ Antonio and Krogstad, "Puerto Rico's Population Declined Sharply after Hurricanes Maria and Irma." <https://www.pewresearch.org/fact-tank/2019/07/26/puerto-rico-population-2018/>

³⁰ Clarisel Gonzalez, "Is There Really A Brain Drain Migration to the U.S.?", *Centro de Estudios Puertorriqueños* (blog), accessed July 12, 2020, <https://centropr.hunter.cuny.edu/events-news/news/there-really-brain-drain-migration-us>.

³¹ Joseph O. Prewitt Diaz, "Place-Based Psychosocial Interventions in the Aftermath of Hurricane Maria in Puerto Rico," *Disaster Recovery*, 2019, 307–20, <https://doi.org/10.1201/9781315102689-15>; Mariana T. Guzzardo et al., "'Half Here, Half There': Dialogical Selves Among Older Puerto Ricans of the Diaspora," *Journal of Constructivist Psychology* 29, no. 1 (January 2, 2016): 51–65, <https://doi.org/10.1080/10720537.2015.1016640>.

³² George Mellgard et al., "Hurricanes and Healthcare: A Case Report on the Influences of Hurricane Maria and Managed Medicare in Treating a Puerto Rican Resident," *BMC Health Services Research* 19, no. 1 (2019): 1–5, <https://doi.org/10.1186/s12913-019-4630-z>.

³³ Dra. Marinilda Rivera Díaz, Dr. Yamil Ortiz Ortiz, Randy R. Tejada Duarte, Natalie Álamo Rodríguez. 2020. "La comunidad dice lo que quiere": Resultados de encuestapost terremotos en el sur de Puerto Rico sobre el derecho a la vivienda. Centro de Investigaciones Sociales de la Facultad de Ciencias Sociales de la Universidad de Puerto Rico.

face mobility challenges, need accessible developments, or require greater medical support and necessities such as keeping medicines cold.

Puerto Rico has an aging population. Seniors in poverty face greater displacement risks, with 39 percent of seniors 65 and older living below the poverty line and 49 percent of those households with one or more seniors receiving SNAP benefits. Older residents also have more prevalent health concerns and rely heavily on social support networks.³⁴

Children are reliant on both family and community support and face adverse psychological risks from disasters.³⁵ Six out of ten children live in poverty, while 28 percent live in low-income households where neither parent is employed. \$150 million in cuts to schooling, with a 30 percent rate of school closures further aggravates displacement risks for children.³⁶ Cuts to school funding and the consolidation of schools are occurring with an increase in school privatization. Following the impacts of Hurricane Maria, privatizing schools to make up for slow repairs has been opposed by those residents who made repairs to reopen local schools. Both federal and territorial governments threaten to separate children from their families to move families out of public housing that is desirable for redevelopment by private interests.³⁷

Isolation

Because of lower population density, communities in rural and remote areas tend to be underfunded. People from rural and geographically isolated communities travel long distances for services, but disasters can block transportation routes. These communities are also often the last to receive disaster response support.

Informal Development

Informal housing is common throughout Puerto Rico; more than half the houses on the main island are considered informal due to lack of building permits and land titles. Many undocumented properties arose from land rent systems, where a landowner rented plots of land for development; these households pay taxes on the homes despite lacking land ownership. A 2002 survey found that many informal settlements were on average 70 years old, and a later survey of the municipalities of Guánica, Peñuelas, Guayanilla, Yauco, and Ponce found that 46 percent of households did not have ownership of their home or the underlying land.³⁸

The inability to prove or acquire ownership documentation disqualifies a homeowner from acquiring federal funds, thus placing the onus for property repairs entirely on personal savings and wages. Making an emergency home repair is less accessible to those without access to a second mortgage or financing tools. Limitations to making structural repairs are evident by the number of tarp roofs; in 2018, 60,000 homes had blue tarps, and by 2019, 30,000 homes had blue tarps. Families who are unable to afford

³⁴ Mariana T. Guzzardo et al., "Harmonizing Beliefs With Realities: Social Support Among Older Puerto Ricans With Disabilities," *SAGE Open* 7, no. 2 (April 1, 2017): 1–13, <https://doi.org/10.1177/2158244017715337>.

³⁵ Alison Salloum and Tara Powell, "The Impact of Hurricanes on Children and Families and Interconnected Systems," *Journal of Family Strengths* 19, no. 1/2 (2019): 1–7, <https://digitalcommons.library.tmc.edu/cgi/viewcontent.cgi?article=1415&context=jfs>. Salloum, A., Powell, T. 2019.

³⁶ "Puerto Rico Disaster Recovery Action Plan," For the Use of CDBG-DR Funds in Response to 2017 Hurricanes Irma and Maria (Government of Puerto Rico, September 1, 2020), <https://www.cdbg-dr.pr.gov/en/action-plan/>.

³⁷ Mirta Colón, "The Right to Stay, Return and Resist Displacement." (Summit, Towards a Just Recovery, San Juan, PR (virtual format via Zoom), August 13, 2020), <https://www.ayudalegalpuertorico.org/encuentro-anual-hacia-la-recuperacion-justa/>.

³⁸ Dra. Marinilda Rivera Díaz, Dr. Yamil Ortíz Ortíz, Randy R. Tejada Duarte, Natalie Álamo Rodríguez. 2020. "La comunidad dice lo que quiere": Resultados de encuestapost terremotos en el sur de Puerto Rico sobre el derecho a la vivienda. Centro de Investigaciones Sociales de la Facultad de Ciencias Sociales de la Universidad de Puerto Rico.

repairs are also unable to afford alternative housing and may need to live in substandard or hazardous conditions until repairs are complete or risk displacement.

Rent

Renters are particularly vulnerable. Renters rarely have legal protections and, as a result, face risks of unjustified forced displacement by property owners. Renters in public housing are especially vulnerable to displacement as these buildings are demolished for new development. Renters are also less comfortable in “negotiating with disaster recovery bureaucracies,” and encounter more obstacles to receiving recovery support.³⁹

c. Political Systems

Procedural Justice

Puerto Rico exists in a unique political position as a commonwealth, or as it is more commonly known, a territory of the United States. Puerto Rican people are U.S. citizens, but do not receive equal procedural justice as compared to other American citizens. Examples of this limited procedural justice include zero representation within the U.S. Senate and an overall lack of federal voting representation within the legislative branch of government, in spite of having a population larger than that of 17 states and Washington, D.C. With only one non-voting member in the House of Representatives and no representation in the Electoral College, Puerto Rican people are also excluded from presidential elections. As a result, the people of Puerto Rico have no direct representation to shape the administration and distribution of federal programs and funds for the territory.

The lack of procedural justice at the federal level, specifically as it relates to the administration of FEMA funding dispersal and qualification limitations for federal flood insurance, is an additional barrier. Often, the failure of governments or private entities to act responsibly and in a timely fashion leads to extensive litigation from community interests and to increased allocation of limited economic resources as well as rising chronic stress amongst those who are not being adequately served. These concerns all occur within the context of limited procedural justice and act as a displacement risk in light of the known critical importance of local voices in decision making and action.⁴⁰

Tax Incentives

Puerto Ricans must pay certain federal taxes yet have no say in how the federal government reallocates the tax funds these residents have paid. High local taxes are also used to cover costs from local governments which further impact affordability for residents. Further, tax structures are set up to benefit wealthy non-residents who relocate to the island through the Individual Investors Incentives Act, also known as Act 22. Neither are residents able to access the low tax rates offered to wealthy non-residents who relocate to the island through the Export Services Incentives Act, also known as Act 20. As a result of these tax structures and other Puerto Rican government incentives, wealthy people have relocated to the island.

³⁹Chenyi Ma and Tony Smith, “Vulnerability of Renters and Low-Income Households to Storm Damage: Evidence from Hurricane Maria in Puerto Rico,” *American Journal of Public Health* 110, no. 2 (2020): 196–202, <https://doi.org/10.2105/AJPH.2019.305438>. 8

⁴⁰Terry David Gibson et al., “Local Voices and Action: Concluding Discussion,” *Disaster Prevention and Management: An International Journal* 28, no. 1 (January 1, 2019): 126–42, <https://doi.org/10.1108/DPM-05-2018-0176>.

Corruption

Elected officials at the territorial and municipal level misused disaster recovery funding, hindering the disaster response process. So far, low- and middle-income communities, especially communities of color, have remained on the periphery of disaster recovery efforts, receiving less funding and support than other wealthier areas.

Austerity

Austerity measures imposed through federal oversight have resulted in higher proportions of territorial finances going towards debt repayment at the expense of available funds to meet residents' needs. Austerity measures have resulted in the loss of government jobs and pensions and have contributed to the unchecked deterioration of physical infrastructure and social services.⁴¹

d. Economic Systems

Economic Autonomy

Though Puerto Ricans are U.S. citizens, the islands' economic policy is largely dictated by the U.S. mainland government. Puerto Ricans pay certain federal taxes and in turn receive some federal benefits. However, residents of Puerto Rico have little say in how these benefits accrue. Ultimately, Puerto Rico's economic autonomy from the U.S. is minimal.

Debt and Depression

Puerto Rico has been experiencing a severe economic depression since the mid-1990s. This situation stems from the removal of favorable tax incentives for U.S. manufacturing firms originating in the 1950s that led to the island's rapid industrialization and subsequent economic decline. During this period, U.S. financial markets invested in extensive local public infrastructure (i.e. power, transportation, and water/sewer) and human capital (i.e. education and healthcare) while keeping wages low. Pressure from the U.S. mainland led to the phased removal of these tax incentives between 1996 and 2006 and resulted in rapid deindustrialization. Economic depression, decreased consumer spending,⁴² unsustainable territorial debt from excessive bond issuance, and shrinking tax revenues grew out of this context and worsened following the 2008 global financial crisis, further leading to upward trends in outmigration, unemployment, and poverty.

Disinvestment in Infrastructure

To address Puerto Rico's debt, the Federal Government passed the 2016 Puerto Rico Oversight, Management, and Economic Stability Act (PROMESA), which established the Financial Oversight and Management Board (FOMB), a body composed of unelected, federally appointed officials to control all the territory's finances. The FOMB has pursued extensive austerity measures ranging from privatizing energy utility and education systems, thus increasing costs for public services, to cutting pensions and vacation time. Puerto Ricans have protested the legitimacy of the debt as well as the federal response measures, particularly the failure to provide procedural justice.⁴³

⁴¹ Elise Meyer and Juliet S. Sorensen, "How Corruption Slows Disaster Recovery," *The Conversation*, accessed August 18, 2020, <http://theconversation.com/how-corruption-slows-disaster-recovery-96832>.

⁴² Bureau of Economic Analysis (BEA), "Prototype Economic Statistics for Puerto Rico, 2012–2017: Personal Consumption Expenditures, Private Fixed Investment, and Net Exports of Goods" (BEA, October 15, 2019), <https://www.bea.gov/system/files/2019-10/pr-econ-stats-10152019.pdf>.

⁴³ Teddy Ostrow, "Dropping the FOMB," *The Nation*, October 21, 2019.

After Hurricanes Maria and Irma devastated the island, the Federal Government insisted that Puerto Rico report all disaster aid spending to the FOMB for oversight and overrode minimum wage laws for recovery projects receiving federal aid. This created another approval hurdle, vastly slowing the dispersal of recovery funds to the island as plans for the funds must be assembled and approved by FOMB in addition to the usual regulatory processes for FEMA, HUD, and other agencies.

In addition to disinvestment in infrastructure, bureaucratic interference, and poor maintenance lead to disruption of services like energy, water, roadways, and flood control, among other services. Bureaucratic interference has delayed the reconstruction of public works, electrical, and water systems following recent disasters. As a result, there have been health and justice implications; for example, after recent disasters, many communities lost water service and were forced to consume contaminated water. Similarly, people and offices have been left without electricity post-disaster,⁴⁴ while the failure of hydroelectric dams created additional flooding hazards.⁴⁵ As a reflection of infrastructure disinvestment, the American Society of Civil Engineers has graded Puerto Rico's infrastructure as a D minus.⁴⁶

The territorial government has pushed for privatization of energy utilities, education systems, and water utilities, which is likely to increase service costs. Concerns over privatization combined with a lack of participation and representation in decision-making reduces public trust in the existing federal, territorial, and local governmental offices.

Disinvestment in Social Services and Communities

Disaster vulnerability combined with an aging population increases health care needs.⁴⁷ While demand for healthcare services is growing, facilities have greater expenses with less funding for the appropriate staff, space, and equipment to provide quality care. Outmigration of skilled workers, including those in healthcare, generates additional challenges for healthcare services. Patients not only have to wait longer and travel farther for services, but also must cover a higher percentage of service costs.

Disinvestment in education is apparent in the widespread closure of schools⁴⁸ and lack of funding and tax dollars to maintain schools or support school staff. Slow repair of schools has led some communities to invest their own time and resources to get their schools running again. While public schools are closing, private schools are opening with charter and voucher systems. Families with children and adults pursuing higher educational opportunities are leaving Puerto Rico for better educational opportunities.

Residents who have remained feel a "sense of abandonment" and have turned to each other for support through strong community networks.⁴⁹ Community groups have had to convert abandoned buildings into

⁴⁴ Alexis Kwasinski et al., "Hurricane Maria Effects on Puerto Rico Electric Power Infrastructure," *IEEE Power and Energy Technology Systems Journal* 6, no. 1 (2019): 85–94, <https://doi.org/10.1109/jpets.2019.2900293>; Nicholas Philip Simpson, "Accommodating Landscape-Scale Shocks: Lessons on Transition from Cape Town and Puerto Rico," *Geoforum* 102, no. December (2019): 226–29, <https://doi.org/10.1016/j.geoforum.2018.12.005>; Michiel de Nooij, Carl Koopmans, and Carlijn Bijvoet, "The Value of Supply Security: The Costs of Power Interruptions: Economic Input for Damage Reduction and Investment in Networks," *Energy Economics* 29, no. 2 (March 1, 2007): 277–95, <https://doi.org/10.1016/j.eneco.2006.05.022>.

⁴⁵ Luke Abaffy, "Assessing Damage in Puerto Rico: Corps of Engineers Races to Stabilize a Damaged Dam, While Much of Puerto Rico's Infrastructure Remains in Shambles," *ENR (Engineering News-Record)*, October 16, 2017, <https://www.enr.com/articles/43054-assessing-the-damage-in-puerto-rico>.

⁴⁶ Victor Marchezini, "The Power of Localism during the Long-Term Disaster Recovery Process," *Disaster Prevention and Management: An International Journal* 28, no. 1 (January 1, 2019): 143–52, <https://doi.org/10.1108/DPM-05-2018-0150>.

⁴⁷ Jennifer Hinojosa, Edwin Meléndez, and Kathya Severino Pietri, "Population Decline and School Closure in Puerto Rico," 2019.

⁴⁸ Rosa Alejandra and Patricia Mazzei, "Hurricane Maria, 2 Years Later: 'We Want Another Puerto Rico' - The New York Times," *The New York Times*, September 20, 2019, <https://www.nytimes.com/2019/09/20/us/puerto-rico-hurricane-maria.html>.

⁴⁹ Jaison R. Abel and Richard Deitz, "The Causes and Consequences of Puerto Rico's Declining Population," *The Federal Reserve Bank of New York* 20, no. 4 (2014), https://www.newyorkfed.org/research/current_issues/ci20-4.html.

mutual aid centers for food, shelter, and legal assistance, resulting in these organizations having to be reactive and assume government roles, which in turn limits their ability to be proactive and meet targeted community concerns.

Shrinking Tax Base

Depopulation from outmigration generates a smaller tax base,⁵⁰ which further compounds the challenges faced by a government managing recovery and reconstruction efforts under the austerity measures of PROMESA. The existing built infrastructure was funded and implemented but requires taxpayer support for continued maintenance and investment in necessary capital improvements. Additionally, with an aging and more impoverished population remaining, there is a greater need for government assistance and medical care. Depopulation and economic measures have constrained access and investment.

Employment and Income

Recent disasters, drought, and the COVID-19 pandemic have further compounded Puerto Rico's economic issues. In 2019, unemployment slowly declined to 8.4 percent (still approximately twice the unemployment rate in the U.S.), but it is currently on the rise as at least 29 percent of the island's 1.05 million civilian labor force has filed unemployment claims related to the pandemic. Precarious employment situations have been shown to impact mental health,⁵¹ increase physical pain,⁵² and augment substance abuse⁵³, thereby compounding displacement risk from employment impacts. Because a substantial portion of Puerto Rico's residents engage in an informal economy, they do not qualify for unemployment assistance. Although the recovery response has added some jobs in the governmental administrative sectors, cuts to education and other public sectors still outweigh recent temporary job gains. Reconstruction efforts across the island have contributed to positive jobs growth in logging and construction, with retail close behind.⁵⁴

Persistent low wages and associated low per-capita income limit workers' ability to meet all basic needs and respond to additional financial stressors. Low wages⁵⁵ add to rising poverty rates, household debt,⁵⁶ households living with vulnerable community members, and households living in repeat hazard areas. Limited accessibility to property insurance further limits homeowners' ability to endure increasing stressors. Housing costs such as mortgages and rental costs, for example, range from 30 percent to 80 percent of income in Ponce. Increasing food and utility prices also complicate the cost of living for households.

Income inequality is a major concern in Puerto Rico.⁵⁷ Tax breaks allow wealthy residents and non-permanent residents to receive the lowest tax rates in the country. As more wealthy people relocate to take advantage of these tax breaks, vulnerable communities along desirable coastlines face increasing

⁵⁰ Abel and Deitz. 2014.

⁵¹ F. Moscone, E. Tosetti, and G. Vittadini, "The Impact of Precarious Employment on Mental Health: The Case of Italy," *Social Science & Medicine* 158 (June 1, 2016): 86–95, <https://doi.org/10.1016/j.socscimed.2016.03.008>.

⁵² Eileen Y. Chou, Bidhan L. Parmar, and Adam D. Galinsky, "Economic Insecurity Increases Physical Pain," *Psychological Science* 27, no. 4 (April 1, 2016): 443–54, <https://doi.org/10.1177/0956797615625640>.

⁵³ Alejandra Rosa and Frances Robles, "Pandemic Plunges Puerto Rico Into Yet Another Dire Emergency," *The New York Times*, July 8, 2020, sec. U.S., <https://www.nytimes.com/2020/07/08/us/coronavirus-puerto-rico-economy-unemployment.html>.

⁵⁴ Tatiana L. Reyes Jové, "Clustering Around the Wage Floor: The Effects of the Federal Minimum Wage on Employment in Puerto Rico" (Master of Public Policy, Washington, D.C., Georgetown University, 2017), <https://repository.library.georgetown.edu/handle/10822/1043930>.

⁵⁵ Reyes Jové.

⁵⁶ Joaquín Villanueva, Martín Cobián, and Félix Rodríguez, "San Juan, the Fragile City: Finance Capital, Class, and the Making of Puerto Rico's Economic Crisis," *Antipode* 50, no. 5 (2018): 1415–37, <https://doi.org/10.1111/anti.12406>.

⁵⁷ Bayne, "Puerto Rico's New Zoning Map Strikes a Nerve with Fed-up Citizens." 2019.

gentrification. Many of these coastal communities were once pushed out of rural areas or were seeking access to economic opportunities in Puerto Rico's urban areas, and a new influx of the wealthy threatens further displacement.

Opportunity Zones

The Investing in Opportunity Act has institutionalized Opportunity Zones as a development solution for low-income census tracts that are lacking in investment. The idea came from public-private collaborations with the intention of applying private funds that are currently held by investors in stocks and mutual funds to low-income communities to support economic revitalization in exchange for temporary tax deferrals and exclusion from taxable income of capital gains. With 865 census tracts or 91 percent of all territory's census tracts designated, almost all of Puerto Rico is an Opportunity Zone. Communities have opposed pressures to rezone land for Opportunity Zone development.⁵⁸ Opportunity Zones risk creating gentrification and development that do not align with existing communities and economies.⁵⁹

4. DISASTER RECOVERY

a. Funding for Household-level Recovery

The PRDOH, under the U.S. Department of Housing, is responsible for administering the CDBG-DR grant program in collaboration with the Central Office of Recovery, Reconstruction and Resilience (COR3) and in coordination with FEMA. The CDBG-DR Action Plan (Action Plan) provides the bulk of funding to housing programs, particularly, the Home Repair, Reconstruction and Relocation Program (R3).

The Action Plan aims to guide Puerto Rico to three Recovery Goals: 1) Stabilize homeowner and renter housing markets; 2) Restore housing infrastructure; and 3) Build local capacity to support housing recovery. The Action Plan also outlines steps for economic and infrastructure recovery alongside multi-sector programs to promote resilience to meet recovery goals. Of the \$3.2 billion allocated for the entire CDBG-DR program, \$27.8 million has been disbursed.

Timeline of Hurricanes Maria and Irma recovery funding:

September 2017 - Major Disaster Declaration. FEMA support to save lives, provide medical assistance, shelter, food, and water.

October 2017 – FEMA begins to repair critical roads and public access infrastructure.

November 2017 - FEMA and other federal agencies start taking applications from residents and agencies; contractors are sent to inspect hurricane damage claims on the island.

July 2018 – HUD grants final approval of Puerto Rico's CDBG-DR (Disaster Recovery) Action Plan.

September 2018 – FEMA has distributed over \$1.3 billion to individuals and another \$3 billion in public assistance and opened 65 recovery centers; Small Business Administration (SBA) has issued over \$1.8 billion in loans. HUD tracked recovery planning efforts in parallel.

January 2020 – HUD posted another notice for the \$8.285 CDBG-MIT (Mitigation fund), with an Action Plan expected to be submitted in one year.

September 2020 – PRDOH publishes CDBG-DR Action Plan Amendment 5 for public comment and is pending HUD approval.

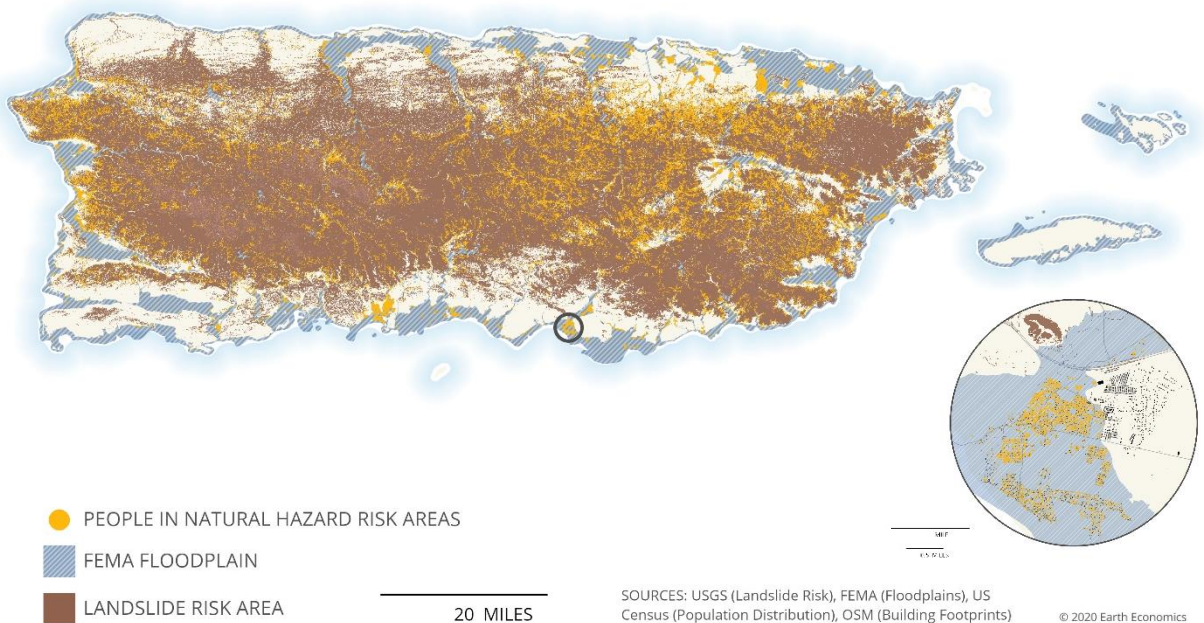
⁵⁸ Bayne. 2019.

⁵⁹ Stephen Hughes and William Schulz, "Map Depicting Susceptibility to Landslides Triggered by Intense Rainfall, Puerto Rico," U.S. Geological Survey Open-File Report 2020–1022, 2020, <https://doi.org/10.3133/ofr20201022>.

b. Households in High Risk Areas

The Action Plan Amendment Five, which guides use of CDBG-DR funds, considers high-risk areas to include landslide risk areas, FEMA designated floodplains, and/or other areas of concentrated damage. The map in Figure 2 depicts both the FEMA Special Flood Hazard Area and the U.S. Geological Survey map of areas with a greater-than-moderate landslide risk (40th to 100th percentile susceptibility).⁶⁰ The Action Plan does not provide a map of households located in designated risk areas.

Figure 2. Map of Flood and Landslide Risk Areas with Population Distribution



One third of the population live in these risk areas, which combines population from 2018 Census Tracts and Open-Street Map Building Footprints. Approximately 638,100 people live in landslide prone areas (40th to 100th percentile susceptibility) and 331,200 people live in FEMA flood hazard areas; 4,200 people live in both flood and landslide hazard areas.

c. Unmet Housing Needs for Disaster Recovery

The Action Plan identifies \$31 billion in unmet housing needs to restore pre-hurricane standards and an additional \$3 billion to account for resilience costs, totaling \$34 billion. Despite the \$1.4 billion designated by FEMA for 463,000 households and the \$1.64 billion in Small Business Administration (SBA) household loans to 49,768 homeowners and renters, the Action Plan identifies large, ongoing unmet needs for housing. Individuals and households that experienced damage to their homes after the disasters had the opportunity to apply for individual recovery assistance for Hurricanes Maria and Irma through November 2019. However, the program rejected around 60 percent of applicants due to the inability to prove property ownership; 81 percent were rejected for housing assistance and 61 percent for SBA loans.

⁶⁰ "Towards Just Recovery: CDBG-DR Funds and Forced Displacements * Ayuda Legal Puerto Rico," *Ayuda Legal Puerto Rico* (blog), March 1, 2019, <https://www.ayudalegalpuertorico.org/2019/03/01/cdbgdgdr-funds-displacement/>. "Towards Just Recovery."

For those who received housing repair grants from FEMA, two-thirds received less than \$3,000; the median assistance grant was \$1,800.⁶¹ Additionally, households reported insufficient funds being allocated from the FEMA-funded Tu Hogar Renace program to repairs other than the basic repair of roofs, windows, and doors that would make homes habitable.⁶² A review of expenditures from FEMA contractors for home repair under the Tu Hogar Renace program found much of the funding going towards overhead, profit, and markups.⁶³

More broadly, logistical and administrative issues have also limited household recovery funding. FEMA contractors lack standard orientation, familiarity with the territory, and language skills, resulting in a smaller volume of claims.⁶⁴ Poor coordination between agencies and individuals is also a major obstacle for efficient and fair funding disbursement.⁶⁵ HUD claims that PRDOH needs to improve grant administration controls and has thus delayed financial aid disbursement to Puerto Rico, despite similar criticism against Texas and Florida's recovery efforts, which share the same flaws, yet nevertheless have been distributed by HUD on-time.⁶⁶ The added time and resources spent on Puerto Rico's recovery from federal, territorial, and municipal governments and agencies only places greater cost and time burdens on households seeking assistance.

5. DISPLACEMENT

a. Displacement Framework

Residents in Puerto Rico face two kinds of displacement risk: either direct displacement from the recovery process, or indirect displacement due to recovery-related pressures.⁶⁷

- Direct displacement occurs when the government prohibits housing reconstruction in a risk area, acquires property as a hazard mitigation measure, or evicts residents through expropriation for development.
- Indirect displacement is the result of pressures that arise from deteriorating access to essential services; for example, when cost-of-living increases price residents out of an area, when services such as water or power are cut off, or when government fails to reinvest in crucial services like clinics and schools, thereby generating systems of neglect.

The CDBG-DR Action Plan attempts to address displacement in three ways.

- 1) **Anti-displacement Statement.** Funded activities will minimize displacement or help those displaced from CDBG-DR-funded projects with 42 months of rental assistance payments or temporary housing until new units are rehabilitated or constructed. However, the statement adds that such activities "will not limit the ability of Puerto Rico to conduct buyouts or acquisitions for destroyed and extensively damaged units or units in a floodplain," which further prioritizes relocation at the risk of providing adequate financial support and compensation.

⁶¹ *Ayuda Legal Puerto Rico*. 2019. "Towards Just Recovery."

⁶² Frances Robles, "\$3,700 Generators and \$666 Sinks: FEMA Contractors Charged Steep Markups on Puerto Rico Repairs," *The New York Times*, November 26, 2018, sec. U.S., <https://www.nytimes.com/2018/11/26/us/fema-puerto-rico-housing-repairs-maria.html>.

⁶³ *Ibid.*

⁶⁴ Wilhelm Colin, "'It's All Stuck': FEMA Struggling to Pay out Disaster Aid in Puerto Rico," *Washington Examiner*, June 29, 2019, sec. Economy, <https://www.washingtonexaminer.com/policy/economy/its-all-stuck-fema-struggling-to-pay-out-disaster-aid-in-puerto-rico>.

⁶⁵ Colin. 2019.

⁶⁶ Nicole Acevedo, "Audit Shows Persistent Disparity in Puerto Rico Post-Hurricane Housing Aid versus Florida, Texas," *NBC News*, March 20, 2020, <https://www.nbcnews.com/news/latino/audit-shows-persistent-disparity-puerto-rico-post-hurricane-housing-aid-n1164416>.

⁶⁷ *Ayuda Legal Puerto Rico*. 2019. "Towards Just Recovery."

- 2) **Voluntary Relocation and Acceptance Deference.** The Action Plan states, “To engage in voluntary acquisition and optional relocation activities to avoid repeated flood damage and improve floodplain management, Puerto Rico accepts the HUD waiver of the Section 104(d) requirements, which assures uniform and equitable treatment by setting the URA and its implementation regulations.⁶⁸” The Action Plan additionally instructs that those awarded relocation may defer acceptance “to allow for the participative development of a housing mitigation program under the CDBG-MIT Program.⁶⁹” Further, this decision still allows the participant to remain in the R3 Program until the Housing Mitigation Program is established under CDBG-MIT.
- 3) **Title Clearance Program.** Prioritizes homeowners who experienced rejection and other challenges with FEMA assistance due to the lack of a clear title.

Despite these amendments and statements in the Action Plan, the R3 program for housing repair or relocation creates pathways for displacement for households in designated risk areas through delays, caps, and criteria. Please see the appendix for a visual outline of these pathways.

Eligibility. The R3 program focuses on three kinds of applicants – **priority applicants** or people with disabilities, the elderly, and low-income households; households with **demonstrable hardships**; and those with **substantially damaged homes**. Following the trend with FEMA applications, not all of those who are eligible know about the program, how to apply, who to talk to, and/or provide documentation, including homeownership. Access to apply and receive funding is a particular issue for people living in more isolated areas or without easy access to transport, phone, or internet services.⁷⁰ Households that do not receive funding in high-risk areas may face eviction from their property and displacement without compensation or process. When a community is seen as at-risk and prioritized for relocation, households face additional risks from displacement due to disinvestment in services and depopulation.

Program caps and delays. The first \$1.5 billion in CDBG-DR funds were assigned in 2019, but households report they have not yet received the promised funding.⁷¹ After the R3 program started receiving applications in spring 2020, it quickly reached its capacity for applicants. Out of the 26,951 applications received, 65 percent came from priority populations: the elderly, people with disabilities, or citizens whose homes sustained severe damage⁷². The current cap leaves out thousands of other eligible households who cannot repair, reconstruct, or relocate without funding and support, leaving large unmet needs. For those who do receive assistance, criteria for repair will leave most with the option for relocation to a safe area. Relocation means that PRDOH acquires or buys out the property and provides a replacement home voucher of \$185,000 maximum or supports the construction of a home on a new lot that costs \$15,000 maximum. This new residence must serve as the applicant’s primary residence for 15 years.

b. Costs of Displacement

Relocation, whether supported by the R3 Program or occurring as a result of displacement, carries additional costs and considerations beyond house or property purchase that influence a household’s economic security, resilience, decision-making, and, ultimately, future displacement risk. Furthermore,

⁶⁸ “Puerto Rico Disaster Recovery Action Plan,” 126.

⁶⁹ “Puerto Rico Disaster Recovery Action Plan,” 131.

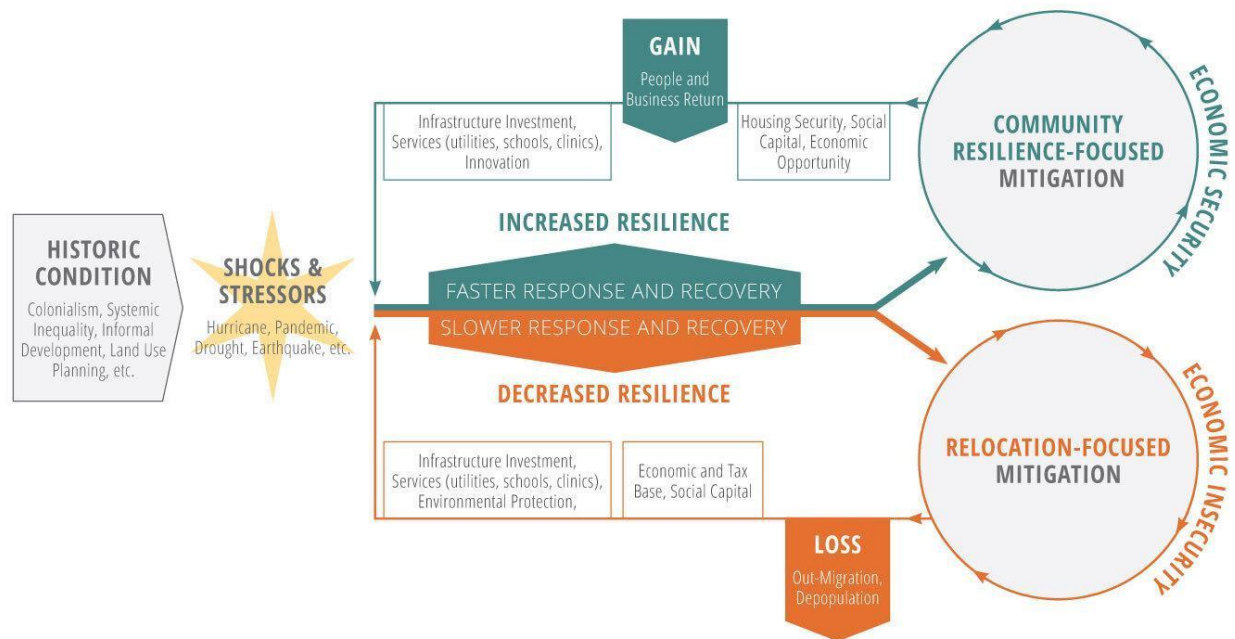
⁷⁰ “Un R3 Para Menos Gente * Ayuda Legal Puerto Rico,” *Ayuda Legal Puerto Rico* (blog), June 15, 2020, <https://www.ayudalegalpuertorico.org/2020/06/15/un-r3-para-menos-gente/>.

⁷¹ *Ayuda Legal Puerto Rico*. 2019. “Towards Just Recovery.”

⁷² “PRDOH Reaches Maximum Capacity for R3 Program Applications,” *CDBG* (blog), May 1, 2020, <https://www.cdbg-dr.pr.gov/en/prdoh-reaches-maximum-capacity-for-r3-program-applications/>.

communities face additional costs and impacts from household-level programs, especially when households include extended family, multiple generations, and strong ties to other neighboring families. With the current government response and leadership, residents and local organizations are taking on the costs of short-term disaster response and longer-term recovery using their own labor, savings, remittances, and/ or other donations. Additionally, the situation is pushing many to leave Puerto Rico for the U.S., particularly areas in the mainland where friends and family have already established themselves. Population loss, particularly of youth, families, and skilled workers, creates additional economic repercussions that harm residents who are not able to move due to political, economic, or physical conditions. Outmigration and the associated depopulation impact local development, employment losses, and Puerto Rico’s tax base.⁷³ As such, the community and household-level impacts of displacement and relocation create additional costs and economic considerations for the territory and Federal government, as outlined in Figure 3.

Figure 3. The Vicious and Virtuous Economic Cycle of Disaster Recovery



Employment Opportunities

Hurricane Maria negatively impacted the employment and income of 42 percent of residents.⁷⁴ Reductions to income and employment can produce serious financial challenges that make it difficult to meet basic needs such as food and shelter. Residents surveyed requested resources for supporting employment, business recovery, and home repair. Inadequate support in these areas has contributed to off-island migration and internal displacement.⁷⁵ Displacement from a neighborhood is also associated with additional non-wage costs tied to loss of employment, increased commute times, and uncertainty

⁷³ Adam P. McGuire et al., “Social Support Moderates Effects of Natural Disaster Exposure on Depression and Posttraumatic Stress Disorder Symptoms: Effects for Displaced and Nondisplaced Residents,” *Journal of Traumatic Stress* 31, no. 2 (April 2018): 223–33, <https://doi.org/10.1002/jts.22270>.

⁷⁴ Mora, Dávila, and Rodríguez, “Migration, Geographic Destinations, and Socioeconomic Outcomes of Puerto Ricans during La Crisis Boricua: Implications for Island and Stateside Communities Post-Maria.”

⁷⁵ Michael Cernea, “Risks, Safeguards and Reconstruction: A Model for Population Displacement and Resettlement,” *Economic and Political Weekly* 35 (January 1, 2000): 3659–78, <https://doi.org/10.2307/4409836>.

finding new employment, all of which have associated social and environmental costs and impacts.⁷⁶ Relocation can be especially damaging to the livelihoods of farmers, fishermen, and business owners who rely on their land or hometown location to make a living. Landlessness caused by relocation could be especially damaging to their employment prospects.⁷⁷

Lost Equity and Affordable Housing

The effects of job loss are acutely felt by low-income residents. These residents face a limited supply of affordable housing choices, thus exposing them to inadequate living conditions and additional cost burdens. Development pressures have led to the demolition and loss of public housing and housing in affordable areas⁷⁸. Furthermore, low-income renters are especially vulnerable to displacement from communities where they live and work. As the Action Plan identifies, many houses and businesses do not have formal documentation. Relocation from homes and businesses without formal documentation places many at risk of further economic loss, because residents who invested in repairing their homes to make them livable will not be able to recover their investment.

Searching for a New Home

At the best of times, moving is an expensive and challenging proposition. Any displaced household will need to spend time and money reviewing eligible properties for permanent relocation from the roster made available by PRDOH's R3 Program. Households may even need to take the additional step of finding temporary housing to transition between the damaged residence and a new one. When households cannot find or purchase a new home, they are likely to become renters and take on the additional costs associated with rent and rent insecurity.

Educational Opportunities

A major displacement factor for communities across Puerto Rico and contributor to outmigration is a lack of educational capacity.⁷⁹ Low education rates are linked to higher unemployment and lower wages, thereby acting as an economic constraint which can further contribute to displacement. Researchers point to the importance of returning to school,⁸⁰ but in reality, many schools have closed due to funding shortfalls, privatization and the subsequent consolidation of schools, all of which exacerbate concerns of additional displacement.⁸¹ Education and housing intersect when students experience homelessness, which is associated with missed classes and chronic absenteeism.⁸² The results of this are twofold, where absenteeism reduces funding for schools, and students miss out on hours of instruction, leading to a tangible economic loss for the individual. Relocating can disrupt education for children and young adults, impacting social-emotional and cognitive skills.⁸³ Long-term absence from school due to school closures,

⁷⁶ Rebecca Page et al., "Potential Environmental and Social Costs of the Magic City Innovation District: Technical Summary" (Tacoma, WA: Earth Economics, 2019), https://static1.squarespace.com/static/561dcdc6e4b039470e9afc00/t/5d0abfe73cbc950001a596a8/1560985585232/CJP-LittleHaiti_EarthEconomics_0612-2.pdf.

⁷⁷ Cernea, "Risks, Safeguards and Reconstruction."

⁷⁸ Erin Sheridan, "Puerto Rico Is Slowly Eliminating Public Housing," *People Live Here*, October 7, 2019, <https://peoplelivehere.press/2019/10/07/las-gladiolas-vive/>.

⁷⁹ Reyes Jové, "Clustering Around the Wage Floor: The Effects of the Federal Minimum Wage on Employment in Puerto Rico."

⁸⁰ Hinojosa, Meléndez, and Pietri, "Population Decline and School Closure in Puerto Rico."

⁸¹ Jennifer Erb-Downward and Payton Watt, "Chronic Absenteeism of Homeless Children in Michigan | Poverty Solutions" (University of Michigan, 2018), <https://poverty.umich.edu/data-tools/chronic-absenteeism-of-homeless-children-in-michigan/>.

⁸² Erb-Downward and Watt.

⁸³ "Children's Social, Academic Functioning Is Impeded When Their Families Move More Often" (Society for Research in Child Development, May 25, 2016), <https://www.sciencedaily.com/releases/2016/05/160525083914.htm.S>

repair, and relocation can hurt educational attainment for individuals, which is one of the strongest predictors of lifelong earnings.⁸⁴

Health Care

By 2018, Puerto Rico had lost about 15 percent of its medical specialists to the mainland US, according to Puerto Rico’s College of Physicians and Surgeons. For those living in rural areas further from San Juan, the shortage in healthcare workers can mean a wait of up to four to six months to see a medical professional.⁸⁵ Healthcare needs also increase post-disaster - depression is one consequence of a disrupted sense of community,⁸⁶ and it is related to housing insecurity.⁸⁷ It can also be costly—among other costs, depression-associated estimated annual losses to work productivity across the U.S. amounted to nearly \$31 billion (USD 2003).

Utility Access

Many people continue to experience prolonged power outages, which are costly to households across the U.S.⁸⁸ For example, a Briggs & Stratton survey across the U.S. found that during just one power outage, 40 percent of respondents faced an average cost of \$160 due to spoiled food. Emergency supplies such as flashlights, candles, and diesel are also costly; 29 percent of those surveyed reported such spending at an average of \$76 per household. A portable generator costs on average \$650. People also report taking time off work to deal with their loss of power, resulting in an average of \$310 in lost wages. The average cost of power outage-related property damage was \$1,916. Residents can experience similar costs and time burdens for poor access to other services, such as water and transportation.

Food Insecurity

Losses in earnings and income from COVID-19 and recent disasters have amplified food insecurity and hunger. Market closures, loss of agricultural productivity, and increasing food prices make access to food another significant cost calculus for Puerto Rican households. On average, healthcare costs for food insecure adults are \$1,834 higher annually than people who are food secure.⁸⁹ Food insecurity in Puerto Rico takes roots in recent import policies and mono-crop agricultural production, which degraded soils, restricted crop diversity, and increased food prices.

Commute Times between Work, School and Home

Mobility in Puerto Rico compared to the United States is lower, with 92 percent of people reporting they lived in the same *municipio* as a year ago. A survey of 150 people after the earthquakes of 2020 highlights a strong preference for staying as close to home as possible. If people are displaced, it is likely that they will choose to relocate to areas as close to their original home as possible. If forced to move outside of their preferred communities, people will incur costs in the form of additional time and resources traveling back and forth to jobs, schools, family, friends, and essential community resources. A failing public

⁸⁴ Christopher R. Tamborini, ChangHwan Kim, and Arthur Sakamoto, “Education and Lifetime Earnings in the United States,” *Demography* 52, no. 4 (August 2015): 1383–1407, <https://doi.org/10.1007/s13524-015-0407-0>.

⁸⁵ Bonilla and Klein, “The Trauma Doctrine: A Conversation Between Yarimar Bonilla and Naomi Klein.”

⁸⁶ Sarah A. Burgard, Kristin S. Seefeldt, and Sarah Zelner, “Housing Instability and Health: Findings from the Michigan Recession and Recovery Study,” *Social Science & Medicine* (1982) 75, no. 12 (December 2012): 2215–24, <https://doi.org/10.1016/j.socscimed.2012.08.020>.

⁸⁷ Burgard, Seefeldt, and Zelner.

⁸⁸ “The Often Overlooked Costs of an Extended Power Outage,” A&A Genpro, Inc., June 13, 2017, <https://www.aagenpro.com/often-overlooked-costs-extended-power-outage/>.

⁸⁹ Seth A. Berkowitz, “State-Level and County-Level Estimates of Health Care Costs Associated with Food Insecurity,” *Preventing Chronic Disease* 16 (2019), <https://doi.org/10.5888/pcd16.180549>.

transportation system – another service impacted by austerity measures – further compounds the cost of commuting for low-income households.

Disruption of Social Infrastructure

Studies of disaster recovery show that a sense of community, social networks, and a feeling of belonging shape household decisions to rebuild or relocate. The community resilience that stems from strong social ties and robust community organizations increases an individual’s capacity to access resources, recover, and rebuild. Research finds that enhancing a community’s adaptive capacity mitigates future disaster risk.⁹⁰ Relocation disconnects families from their neighbors and members of their community. People that are displaced after disasters are subjected to psychological stressors and healthcare disruption. Yet, staying connected with friends, neighbors, and others who can deal with their emotional and physical well-being will increase their crisis support. Studies of Hurricane Katrina survivors found that those people with greater crisis support reported fewer instances of negative mental health outcomes.⁹¹

Tax Base and Debt

As Puerto Rico and *municipios* lose residents to migration, they lose a part of their tax base from outmigration and growing poverty rates. The scale of migration resulting from Hurricane Maria is hard to determine,⁹² but if relocation contributes further to outmigration from the island, *municipios* and Puerto Rico will have to contend with a smaller share of revenue from income, property, and sales taxes. Building resilience to future disasters and climate change in Puerto Rico will require a supply of labor and expertise, resources which outmigration and displacement siphon away.

5. RECOMMENDATIONS

a. Rights-based Recovery

Limiting displacement and enhancing community resilience requires a rights-based approach for recovery.⁹³ A rights-based recovery approach is founded on principles of human rights alongside governmental transparency and participation. In addition to recognizing housing and property rights and equal access to funding, supporting a rights-based recovery includes assessment of mitigation options with communities and the right to remain, return, and resist displacement.⁹⁴ Meaningful community participation and engagement are key factors for the success of recovery efforts, as is equitably investing recovery funds within and between communities.

⁹⁰ López-Marrero and Yarnal, “Putting Adaptive Capacity into the Context of People’s Lives.”

⁹¹ John K. Pierre and Gail S. Stephenson, “After Katrina: A Critical Look at FEMA’s Failure to Provide Housing for Victims of Natural Disasters,” *Louisiana Law Review* 68 (2008 2007): 443, <https://heinonline.org/HOL/Page?handle=hein.journals/louilr68&id=447&div=&collection=>; Elizabeth Fussell and Elizabeth Harris, “Homeownership and Housing Displacement After Hurricane Katrina Among Low-Income African-American Mothers in New Orleans,” *Social Science Quarterly* 95, no. 4 (2014): 1086–1100, <https://doi.org/10.1111/ssqu.12114>.

⁹² Sutter John and Sergio Hernandez, “‘Exodus’ from Puerto Rico: A Visual Guide,” *CNN*, February 21, 2018, <https://www.cnn.com/2018/02/21/us/puerto-rico-migration-data-invs/index.html>; Martin Echenique, “Mapping Puerto Rico’s Hurricane Migration With Mobile Phone Data,” *Bloomberg CityLab*, May 11, 2018, <https://www.bloomberg.com/news/articles/2018-05-11/where-puerto-rico-s-residents-migrated-since-maria>; Monica Alexander, Kivan Polimis, and Emilio Zagheni, “The Impact of Hurricane Maria on Out-Migration from Puerto Rico: Evidence from Facebook Data,” *Population and Development Review* 45, no. 3 (2019): 617–30, <https://doi.org/10.1111/padr.12289>; Jennifer Hinojosa, “Two Sides of the Coin of Puerto Rican Migration: Depopulation in Puerto Rico and the Redefinition of the Diaspora,” *Centro Journal* 30, no. 3 (2018): 230–53; Jack DeWard, Janna E. Johnson, and Stephan D. Whitaker, “Out-Migration from and Return Migration to Puerto Rico after Hurricane Maria: Evidence from the Consumer Credit Panel,” *Population and Environment*, January 20, 2020, <https://doi.org/10.1007/s11111-020-00339-5>.

⁹³ María O’Neill and Omayra Crespo, “The Landscape of Community and Participatory Design in Puerto Rico: A Critical Examination of the Effects of Attempting to Facilitate ‘Listening to Their Voices,’ (‘Escuchando Las Voces’) the Island’s First Exhibition of Community and Participatory Design,” *Dialectic* 2, no. 1 (2018), <https://doi.org/10.3998/dialectic.14932326.0002.107>; “Towards Just Recovery.”

⁹⁴ “Puerto Rico Disaster Recovery Action Plan.”

b. Build Community Resilience

Rather than disinvesting in communities through a relocation-focused recovery plan, the Action Plan and other upcoming funds should provide opportunities to invest in community-led solutions, including mitigation to support redevelopment in place⁹⁵. Rehabilitation and reconstruction in place for both housing and businesses scored highly in public engagement proposals in response to the Action Plan as did mitigation and resilience measures⁹⁶. These responses are indicative of the desire to stay in place and reinvest in existing neighborhoods. Similarly, in a 2020 post-earthquake survey⁹⁷ of 150 households from Guánica (n=77), Peñuelas (n=34); Guayanilla (n=20), Yauco (n=14), Ponce (n=1), Other (n=4), participants overwhelmingly responded that they would like to rebuild in or near where they live and receive government assistance for rebuilding. A major factor motivating these responses is the desire to be near family and stay connected with the community (See Appendix C. for table summaries). To cope with the disaster and the disaster recovery process, people have built strong social networks and communities. For example, the community organization, IDEBAJO, works with a coalition to protect cultural and natural heritage and advocate for marginalized communities. Bolstering these networks supports resilience goals and builds capacity. Holistic disaster recovery and mitigation investments present one clear opportunity to support and build a local workforce towards the Action Plan's stated goals of advancing community-driven and resilient development.

Examples of Local Recovery Efforts

Community-based recovery efforts are responsible for saving lives and rebuilding communities as local groups work to improve the resiliency of their communities, ensuring they will be better prepared for future natural disasters.

Following Hurricane Maria, **Mentes Puertorriqueñas en Acción (MPA)** organized the #EnAccion Initiative, one of the first efforts to mobilize communities after Hurricane Maria. MPA began organizing volunteers within 10 days of the storm. At the community level, this organization and mobilization was able to occur prior to the restoration of phone and electrical services. The initiative grew organically and has evolved to include over 400 volunteers who have invested almost 3,000 hours of work in impacted communities. Given the lack of assistance from various levels of government, *“Todo ha sido a pulmón”* has become a common phrase. In other words, communities around Puerto Rico have had to do everything on their own. The mayor of Villa Calma, one of the impacted communities from Hurricane Maria, said that the government offered little to devastated communities. Instead, organizations like MPA were able to provide communities with the help they desperately needed.⁹⁸

In a similar scenario, the Utuado region went 42 days, or 6 weeks, without any government assistance after Hurricane Maria. **Corporación de Servicios de Salud y Desarrollo Socio-económico del OTOAO (COSSAO)** has helped the region pursue sustainable development after Hurricane Maria. With the help of

⁹⁵ Ivis García, Robert B. Olshansky, and David Carrasquillo, “Puerto Rico Lurches Toward Recovery,” *American Planning Association*, accessed August 20, 2020, <https://www.planning.org/planning/2019/aug/puertoricorecovery/>; Daniel Sledge and Herschel F. Thomas, “From Disaster Response to Community Recovery: Nongovernmental Entities, Government, and Public Health,” *American Journal of Public Health* 109, no. 3 (2019): 437–44, <https://doi.org/10.2105/AJPH.2018.304895>.

⁹⁶ R. Anna Hayward et al., *“‘Todo Ha Sido a Pulmón’: Community Organizing after Disaster in Puerto Rico,”* *Journal of Community Practice* 27, no. 3–4 (2019): 249–59, <https://doi.org/10.1080/10705422.2019.1649776>.

⁹⁷ Dra. Marinilda Rivera Díaz, Dr. Yamil Ortiz Ortiz, Randy R. Tejada Duarte, Natalie Álamo Rodríguez. 2020. “La comunidad dice lo que quiere”: Resultados de encuestapost terremotos en el sur de Puerto Rico sobre el derecho a la vivienda. Centro de Investigaciones Sociales de la Facultad de Ciencias Sociales de la Universidad de Puerto Rico.

⁹⁸ Holladay et al., “Utuado, Puerto Rico and Community Resilience Post-Hurricane Maria: The Case of Tetuan Reborn,” *Recreation, Parks, and Tourism in Public Health* 3, no. 2019 (2019): 5, <https://doi.org/10.2979/rptph.3.1.02>.

COSSAO, communities in Utuado mobilized immediately after the hurricane and worked on a variety of projects, including infrastructure stabilization, construction of a community primary health center, and socio-economic development through coffee farm rehabilitation.⁹⁹ These community-based efforts were vital in both saving lives after Hurricane Maria and bolstering regional community resilience to future natural disasters.

Similarly, leaders of the town of Mariana developed the **Proyecto de Apoyo Mutuo (PAM)** to respond to their neighbors' urgent needs. PAM is one of 14 Mutual Aid Centers located around Puerto Rico. Throughout the recovery process, PAM provided clean water, nutritious food, hygiene kits, and solar lamps, among a host of other things. The organization also worked to bring in mental health professionals, doctors, teachers, and others willing to offer their services to the community. Additionally, PAM mobilized volunteer brigades to clean up and rebuild community spaces. Beyond these more concrete recovery efforts, PAM became a focal point for the community where members could reconnect with their neighbors and begin the healing process together. PAM has also noted the importance of the rebuilding process in ensuring that communities address the factors that make them especially vulnerable, thereby bolstering their resilience to future disasters. Looking to the future, PAM is working on projects to build a community garden, a BoxPower solar panel, and a new park for kids.¹⁰⁰

The informal community of **Caño Martín Peña** outside of San Juan came together to establish a Community Land Trust. In addition to making repairs to homes, they created a collective title for their homes, which allows them to access recovery funding and minimize risks of future displacement¹⁰¹.

These examples highlight the importance of local organizations and community members in saving lives after Hurricane Maria.¹⁰² To ensure resilience down the road, Puerto Rico has an opportunity to invest in local systems built through community organizing that have already invested time, money, resources, and mental and emotional capacity. Furthermore, investing in decentralized systems with community participation provides additional support systems. Providing renewable energy options for households and communities can address issues of energy affordability and provide back-up sources in case of a disaster. Similar investments are available to help address food security and affordability, such as community farms.

c. Mitigation Options

Successful mitigation and resilient development require incorporating the potential impacts of future climate change. Flood losses along tropical Atlantic coastlines are estimated to increase by 80 percent by 2030¹⁰³, and more land area is already flood prone than is currently represented on outdated maps.¹⁰⁴ As climate change forces flood-prone areas to expand and flooding from hurricanes continues to worsen, it becomes increasingly unsustainable and costly to relocate people out of flood zones and make continuous structural updates. On the other hand, natural mitigation measures like agriculture and

⁹⁹ Rachael E. A. Carrell, "Targeting the Roots of Disaster : Community Work Dismantling Vulnerability in Mariana , Puerto Rico after Hurricane Maria Targeting the Roots of Disaster .," 2019.

¹⁰⁰ Naomi Klein, *The Battle For Paradise: Puerto Rico Takes on the Disaster Capitalists* (Chicago, Illinois: Haymarket Books, 2018).

¹⁰¹ Zoe Sullivan, "The Role of Community Land Trusts After Hurricane Maria," June 1, 2018, <https://nextcity.org/daily/entry/the-role-of-community-land-trusts-after-hurricane-maria>.

¹⁰² Klein, *The Battle For Paradise*.

¹⁰³ Beverly A. Cigler, "U.S. Floods: The Necessity of Mitigation," *State and Local Government Review* 49, no. 2 (June 2017): 127–39, <https://doi.org/10.1177/0160323X17731890>.

Lloyd's/RMS, "Coastal Communities and Climate Change: Maintaining Future Insurability," 360 Driving the Debate on Emerging Risk (London, UK: Lloyd's, 2008), <https://www.lloyds.com/news-and-risk-insight/risk-reports/library/natural-environment/coastal-communities-and-climate-change>.

¹⁰⁴ Cigler, "U.S. Floods."

healthy wetlands provide long-term protection without increasing costs. Considering this, mitigation strategies such as ecosystem restoration, green infrastructure, and agroforestry can provide both cost effective and sustainable solutions to natural disasters and their worsening impacts.

Relocating people from hazard areas through the acquisition and subsequent demolition or relocation of structures in a hazard-prone area is a common mitigation measure. Typically, this involves removing buildings and people to another location outside of the floodplain, where flood risk is minimal to nonexistent. However, relocation is not always the most appropriate action for disaster mitigation recovery. Relocation without community participation and safeguards risks placing additional burdens on communities and increasing precarity, thus rendering this mitigation action inappropriate.

Fortunately, structure acquisition is not the only mitigation measure that can reduce a community's flood risk. Other approaches to reducing a community's risk include structure elevation and localized and non-localized flood risk reduction projects. Flood-risk reduction projects can utilize gray or green infrastructure approaches, based on the needs and desires of the community. Federal law, specifically the Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), requires that these alternative mitigation measures be considered, so as to determine whether the proposed action is the best approach to meet the community's needs.¹⁰⁵

Alternative mitigation measures can be cost-effective for flood risk reduction. One study estimates the average benefit-cost ratio (BCR) for flood mitigation projects at 4.6.¹⁰⁶ BCRs are useful indicators that express the benefits of a project relative to its costs. When the broader benefits of flood mitigation are considered, the benefits of flood mitigation projects outweigh the costs by more than 6 to 1, meaning that for every \$1 spent on a project, there is an estimated economic return of over \$6.¹⁰⁷ Thus, flood mitigation projects are not only crucial for increasing disaster resilience within flood-prone communities, but they are also economically beneficial investments.¹⁰⁸ Examples of flood mitigation projects include:

- Elevating houses in flood-prone areas, which has an estimated BCR of 14.5, meaning that the benefits of elevation are 14.5 times greater than the costs.¹⁰⁹
- Distributed electricity generation, which can reduce risks from disruption to a centralized power station.¹¹⁰

Green Infrastructure

Green infrastructure approaches for hazard mitigation—specifically stormwater management—use an ecosystem-based approach to regulate an area's natural hydrologic function. While traditional “gray infrastructure” stormwater management systems move excess water as quickly as possible downstream, green infrastructure seeks to reduce the speed and rate at which water is distributed into a system by

¹⁰⁵CFR, “Emergency Management and Assistance - Federal Disaster Assistance - Hazard Mitigation Grant Program - Eligibility,” Pub. L. No. FR 56534, § 206.434, Title 44 Code of Federal Regulations (2016), https://www.ecfr.gov/cgi-bin/text-idx?SID=aeb0ca5d30cb1bb051191b2a0da7b546&mc=true&node=se44.1.206_1434&rgn=div8.

¹⁰⁶ R. Mechler, “Reviewing Estimates of the Economic Efficiency of Disaster Risk Management: Opportunities and Limitations of Using Risk-Based Cost-Benefit Analysis,” *Natural Hazards* 81, no. 3 (April 1, 2016): 2121–47, <https://doi.org/10.1007/s11069-016-2170-y>.

¹⁰⁷ The Economist Intelligence Unit, “Flood Mitigation Takeaways: Five of the Key Findings from the Flood Economics Research,” *Flood Economics*, 2019, <https://floodeconomics.com/flood-mitigation-takeaways/>.

¹⁰⁸ Cigler, “U.S. Floods,” p. 137.

¹⁰⁹ C. M. Shreve and I. Kelman, “Does Mitigation Save? Reviewing Cost-Benefit Analyses of Disaster Risk Reduction,” *International Journal of Disaster Risk Reduction* 10 (December 1, 2014): 213–35, <https://doi.org/10.1016/j.ijdr.2014.08.004>.

Howard C. Kunreuther, E.O. Michel-Kerjan, and C. Heller, *Policy Options for Reducing Losses from Natural Disasters: Allocating \$75 Billion* (Center for Risk Management and Decision Processes, the Wharton School, University of Pennsylvania, 2012).

¹¹⁰ David R. Godschalk et al., “Estimating the Value of Foresight: Aggregate Analysis of Natural Hazard Mitigation Benefits and Costs,” *Journal of Environmental Planning and Management* 52, no. 6 (September 1, 2009): 739–56, <https://doi.org/10.1080/09640560903083715>.

storing water on site. By holding water on site, it can slowly and naturally be released back into the system.

Green infrastructure is often utilized in a distributed manner; bioswales, wetlands, and other green spaces dispersed throughout an area. Typically, green infrastructure is best at addressing lower impact events (e.g., 10-year and 50-year flood events), the costs of which add up over time due to their repeated nature. Green infrastructure can also be appealing to planners seeking to provide additional ecosystem service benefits such as recreation, air quality, water filtration, slope stability, and aesthetic beauty to meet a multitude of goals with efficient investment. Because of its complementary nature, green infrastructure is often a part of a comprehensive flood-risk reduction strategy.

Green infrastructure is a valuable tool for mitigating flood hazards and improving resilience to future extreme weather events. EPA studies reveal that green infrastructure can reduce stormwater runoff, a significant cause of flooding, by 99 percent.¹¹¹ Furthermore, implementing green infrastructure as a mitigation strategy can save flood-prone communities in the United States approximately \$6.1 million annually in money they would otherwise have to spend addressing flood-related damages.¹¹²

As disasters become costlier, FEMA is seeking innovative approaches to reducing the risk of future disasters. FEMA has begun to recognize the value of investing in green infrastructure approaches, also called nature-based solutions (NBS), for mitigating the impacts of floods, wildfires, and droughts, as reflected by recent environmental benefits policy updates in 2013 and 2016. These changes have made it easier to access FEMA mitigation funding for land conservation and nature-based solutions in flood-prone areas for activities such as floodplain reconnection and restoration, soil stabilization, improved aquifer storage and recovery, and improved conveyance measures (e.g., vegetated filter strips, bioswales, and culverts).

Research continues to show that many green infrastructure solutions are competitive, if not outright more cost-effective than traditional gray infrastructure approaches.¹¹³ Determining the appropriate mixture of green and gray infrastructure can help to address community needs—both in terms of disaster risk reduction and cost-effectiveness, while also preserving environmental and cultural resources.¹¹⁴ For Puerto Rico, deed restrictions preventing future development placed onto titles of lands acquired through relocation from hazard areas present opportunities for implementing additional mitigation measures and increasing resilience for the surrounding communities. The creation of open space through this process can create an opportunity for implementing nature-based solutions, such as stormwater retention, to protect nearby communities or to promote local agriculture and agroforestry for community food security and resilience.

¹¹¹ Cigler, “U.S. Floods.”

¹¹² Jenna Tyler, “Sustainable Hazard Mitigation: Exploring the Importance of Green Infrastructure in Building Disaster Resilient Communities,” *Consilience*, no. 15 (2016): 134–45, <https://www.jstor.org/stable/26188762>; Qizhong Guo and Carlos A. Correa, “The Impacts of Green Infrastructure on Flood Level Reduction for the Raritan River: Modeling Assessment,” in *World Environmental and Water Resources Congress 2013* (World Environmental and Water Resources Congress 2013, Cincinnati, Ohio: American Society of Civil Engineers, 2013), 367–76, <https://doi.org/10.1061/9780784412947.035>.

¹¹³ “Banking on Green: A Look at How Green Infrastructure Can Save Municipalities Money and Provide Economic Benefits Community-Wide” (American Rivers, American Society of Landscape Architects, ECONorthwest, Water Environment Federation., April 2012), <https://www.americanrivers.org/conservation-resource/banking-on-green/>; “Green versus Gray Infrastructure: The Economics of Flood Adaptation in Fiji,” *Yale Environment Review*, April 11, 2017, <https://environment-review.yale.edu/green-versus-gray-infrastructure-economics-flood-adaptation-fiji-0>.

¹¹⁴ OW U.S. EPA, “Benefits of Green Infrastructure,” Overviews and Factsheets, U.S. EPA, September 30, 2015, <https://www.epa.gov/green-infrastructure/benefits-green-infrastructure>.

Green infrastructure projects also improve air quality, reduce urban temperatures, and save on energy costs.¹¹⁵ Given that Puerto Rico already has higher electricity costs than the U.S. mainland, the link between green infrastructure and energy cost savings, through reductions in the costs of stormwater management and the heating/cooling of buildings, could be especially valuable. Furthermore, many families after Hurricane Maria were forced to pay rising fuel costs to power a generator in order to turn on things like fans and air conditioning, which are often necessary in Puerto Rico's heat.¹¹⁶ By lowering urban temperatures and reducing the cost to heat/cool buildings, green infrastructure could save households money on fuel and generator costs post-disaster. Another factor that makes green infrastructure especially attractive as a flood mitigation option is its cost-effectiveness. One study, which compares a variety of both green and traditional gray infrastructure techniques, finds that when accounting for avoided damages and ecosystem service benefits, green infrastructure options are more cost-effective than gray infrastructure.¹¹⁷ In this way, green infrastructure can help build disaster resilient communities in Puerto Rico, while also saving communities money and providing a host of other ecosystem service benefits.

Agroforestry

Agroforestry systems are another valuable tool that can improve Puerto Rico's resilience to future natural disasters. Agroforestry is an intensive land management system that optimizes the benefits from the biological interactions created when trees and shrubs are deliberately combined with crops and/or livestock. Other similar agricultural systems include permaculture, ecological agriculture, and biodynamic agriculture, all of which mimic the patterns and resilient features found in natural ecosystems and add vitality to plants, soil, and/or livestock.

Studies have linked agroforestry and other similar agricultural systems to reduced disaster risk,¹¹⁸ and they are more resilient than the widely used monocultures¹¹⁹ found throughout Puerto Rico. Agroforestry has also been shown to protect crops like coffee, one of the more popular crops in Puerto Rico, from high temperatures and humidity, providing windbreaks, and prevent crops from being damaged.¹²⁰ Compared to sun-grown coffee, which is the main method for production,¹²¹ agroforestry techniques for coffee production mimic the natural process of coffee plants. As a result of the protection agroforestry techniques provide to both crops and the surrounding ecosystem, one study found that farmers who had implemented agroforestry systems suffered, on average, one month less food insecurity during droughts and floods than those farmers who did not have agroforestry systems.¹²² In this way, agroforestry systems

¹¹⁵ Tyler, "Sustainable Hazard Mitigation."

¹¹⁶ Jeremy Deaton, "Puerto Rico Still Needs Help. These People Picked up the Cost.," *Peril & Promise: The Challenge of Climate Change* (blog), May 17, 2019, <https://www.pbs.org/wnet/peril-and-promise/2019/05/puerto-rico-still-needs-help-these-people-picked-up-the-cost/>.

¹¹⁷ A. Daigneault, P. Brown, and D. Gawith, "Dredging versus Hedging: Comparing Hard Infrastructure to Ecosystem-Based Adaptation to Flooding," *Ecological Economics* 122 (February 1, 2016): 25–35, <https://doi.org/10.1016/j.ecolecon.2015.11.023>.

¹¹⁸ Patrick J. Holladay et al., "Utuaado, Puerto Rico and Community Resilience Post-Hurricane Maria: The Case of Tetuan Reborn," *Recreation, Parks, and Tourism in Public Health* 3 (2019): 5–16, <https://doi.org/10.2979/rptph.3.1.02>.

Frederik Noack, Marie-Catherine Riekhof, and Salvatore Di Falco, "Droughts, Biodiversity, and Rural Incomes in the Tropics," *Journal of the Association of Environmental and Resource Economists* 6, no. 4 (March 19, 2019): 823–52, <https://doi.org/10.1086/703487>.

¹¹⁹ Rodel D. Lasco, Rafaela Jane P. Delfino, and Marya Laya O. Espaldon, "Agroforestry Systems: Helping Smallholders Adapt to Climate Risks While Mitigating Climate Change," *WIREs Climate Change* 5, no. 6 (2014): 825–33, <https://doi.org/10.1002/wcc.301>.

P. J. Gregory and J. S. I. Ingram, "Global Change and Food and Forest Production: Future Scientific Challenges," *Agriculture, Ecosystems & Environment* 82, no. 1 (December 1, 2000): 3–14, [https://doi.org/10.1016/S0167-8809\(00\)00212-7](https://doi.org/10.1016/S0167-8809(00)00212-7).

¹²⁰ Lasco, Delfino, and Espaldon, "Agroforestry Systems."

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¹²¹ Abby Chudnovsky, "Sun-Grown vs. Shade-Grown: How It Impacts the Environment and the Farmers," *De la Gente*, accessed August 20, 2020, <https://www.dlgcoffee.org/news/2017/4/6/coffee-cultivation-sun-grown-shade-grown-and-how-it-impacts-the-environment-and-the-farmers>.

¹²² Lasco, Delfino, and Espaldon, "Agroforestry Systems."

can improve Puerto Rico's resilience to the periods of prolonged food insecurity that many faced across the island after Hurricane Maria. Agroforestry is also beneficial in terms of income generation and can help support livelihoods in disaster-prone communities.¹²³ Ultimately, implementing and protecting existing agroforestry systems can help communities establish a more secure food system, improve health outcomes, and increase social and environmental resilience, as well as promote healthier ecosystems.

Coastal Habitat Regeneration

Puerto Rico's poor stormwater infrastructure, channelization and dredging, and destruction of coastal ecosystems ensured that Hurricane Maria was extremely destructive. Restoring these ecosystem structures is necessary to improve Puerto Rico's resilience to future disasters.¹²⁴ Development in Puerto Rico in the mid-1900s led to mangrove removal around the island¹²⁵ and reduced coastal ecosystems' ability to naturally protect the island from storm impacts.

Mangroves protect coastlines by lowering community exposure to flooding and erosion, with studies showing that the first 100 meters of mangrove forest can reduce up to 66 percent of wave energy.¹²⁶ One study, which viewed a wide range of flood risk reduction projects from around the world, found that the projects with the highest BCR, or ratio of project benefits to costs, were mangrove reforestation projects, with the Community-based Mangrove Reforestation and Disaster Preparedness Programme reporting a BCR between 28 and 104 for mangrove reforestation projects when also accounting for ecological benefits.¹²⁷ In other words, for every \$1 spent on mangrove reforestation projects, one can expect to receive between \$28 and \$104 in benefits. Without implementing mangrove reforestation projects, 16 percent more people will experience flooding because of mangrove loss during 100-year storm events.¹²⁸

When compared to structural mitigation measures, mangrove regeneration projects are often more beneficial for multiple reasons. Mangroves provide adaptive defenses as they can, under the right conditions, keep pace with climate change-derived sea level rise through vertical accretion,¹²⁹ whereas built infrastructure requires maintenance and further capital investments to meet changing future conditions. Furthermore, mangroves provide storm surge protection that increases during more intense weather events. In contrast, built infrastructure tends to weaken and potentially fail during increasingly

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¹²⁴ Brenda Torres, "After María, Resilience in Puerto Rico: Why María Had Such a Devastating Impact—and How to Mitigate Future Climate Disaster," *NACLA Report on the Americas* 50, no. 1 (March 2018): 11–14, <https://doi.org/10.1080/10714839.2018.1448583>.

¹²⁵ Tania López-Marrero, "An Integrative Approach to Study and Promote Natural Hazards Adaptive Capacity: A Case Study of Two Flood-Prone Communities in Puerto Rico," *The Geographical Journal* 176, no. 2 (June 1, 2010): 150–63, <https://doi.org/10.1111/j.1475-4959.2010.00353.x>.

¹²⁶ Anna L. McIvor et al., "Reduction of Wind and Swell Waves by Mangroves," Cambridge Coastal Research Unit Working Paper 40, Natural Coastal Protection Series (Cambridge, UK: The Nature Conservancy & Wetlands International, 2012), <http://www.naturalcoastalprotection.org/documents/reduction-of-wind-and-swell-waves-by-mangroves>.

¹²⁷ Shreve and Kelman, "Does Mitigation Save?"

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¹²⁸ M. W. Beck et al., "The Global Value of Mangroves for Risk Reduction Technical Report," Summary Report (Berlin, Germany: The Nature Conservancy, May 2018), <https://www.conservationgateway.org/ConservationPractices/Marine/crr/library/Documents/GlobalMangrovesRiskReductionSummaryReport10.7291/V9930RBC.pdf>.

¹²⁹ Karen L. McKee, "Biophysical Controls on Accretion and Elevation Change in Caribbean Mangrove Ecosystems," *Estuarine, Coastal and Shelf Science* 91, no. 4 (March 1, 2011): 475–83, <https://doi.org/10.1016/j.ecss.2010.05.001>.

stronger storms,¹³⁰ which can exacerbate beach erosion due to displaced wave energy as compared to dissipating these effects through nature-based solutions. Beyond their protective services, mangroves also provide important co-benefits in terms of fisheries habitat and carbon sequestration, ensuring that mangroves enhance disaster resilience by supporting livelihoods and producing multiple social and economic services.¹³¹ These studies highlight the benefits mangrove reforestation and conservation projects can provide in Puerto Rico for cost-effective disaster risk reduction.

Reefs are another critical coastal ecosystem for a resilient future in the face of climate changes for Puerto Rico. Oysters act as ecosystem engineers to form the basis of reefs while providing a number of ecosystem services, but in many cases their abundance within local ecosystems and across ecoregions has decreased in comparison to historical levels.¹³² Coral reefs also act as an important ecosystem structure that provides vital resilience measures, including critical habitat and biodiversity sources, storm surge and wave energy dissipation, beach nourishment, and living structures that can adapt to rising sea levels.¹³³ Investment into reef restoration and conservation is a critical action that can improve the resiliency of coastal ecosystems and provide numerous resilience benefits for the people of Puerto Rico. Restoration of Puerto Rico's natural coastal ecosystems is necessary to cope with future hurricanes in a climate-changed future that requires both adaptation and mitigation efforts. Not only that, but these ecosystems can provide greater funding sources from increased eco-tourism and greater prevalence of local food sources.

Calculating the ecosystem service benefits of Puerto Rico's coastal natural capital highlights the value of protecting these assets for communities. Coastal ecosystems provide a number of services, including: water storage and supply; improved water quality; recreation; soil retention; disaster risk reduction; climate stability and carbon sequestration. Conservatively estimated, Puerto Rico's mangroves, coastal wetlands, reefs, and seagrass areas alone provide an average of \$250 million in benefits each year. Combining these coastal ecosystem services with those from forests, pastures, wetlands, and grasslands provides at least \$2 billion in value each year.

6. CONCLUSION

This report summarizes the ways in which recovery policies may drive displacement and the associated costs to individuals, communities, and the municipal government, as well as illustrate the economic and social benefits that accrue from helping people to rebuild in place. As this report explains, disaster recovery without a holistic view of development and mitigation or meaningful engagement can lead to increased vulnerability and displacement. Supporting systems which reduce vulnerability to disaster risk in the first place, such as investing mitigation options and social services to help people stay in place, can help break the cycle of economic hardship and build resilience for future disasters. A rights-based framework for disaster recovery and development to uphold human rights is crucial, particularly given Puerto Rico's lack of political representation as a commonwealth.

¹³⁰ Pelayo Menéndez et al., "The Global Flood Protection Benefits of Mangroves," *Scientific Reports* 10, no. 1 (March 10, 2020): 4404, <https://doi.org/10.1038/s41598-020-61136-6>.

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¹³² Michael W. Beck et al., "Oyster Reefs at Risk and Recommendations for Conservation, Restoration, and Management," *BioScience* 61, no. 2 (February 1, 2011): 107–16, <https://doi.org/10.1525/bio.2011.61.2.5>.

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8. APPENDIX

a. Puerto Rico Disaster Recovery Funding Status July 2020

Funding Status from COR3

Agency	Allocated	Obligated	Disbursed	% Made Available	% Transferred to Recipient
Total Funds	\$49,775,843,224	\$25,275,050,869	\$16,343,081,264	51%	33%
FEMA Funding	\$20,515,007,016	\$17,615,413,591	\$13,707,487,773	86%	67%
Non-FEMA Funding	\$29,260,836,208	\$7,659,637,278	\$2,635,593,491	26%	9%

FEMA Funding Status from COR3

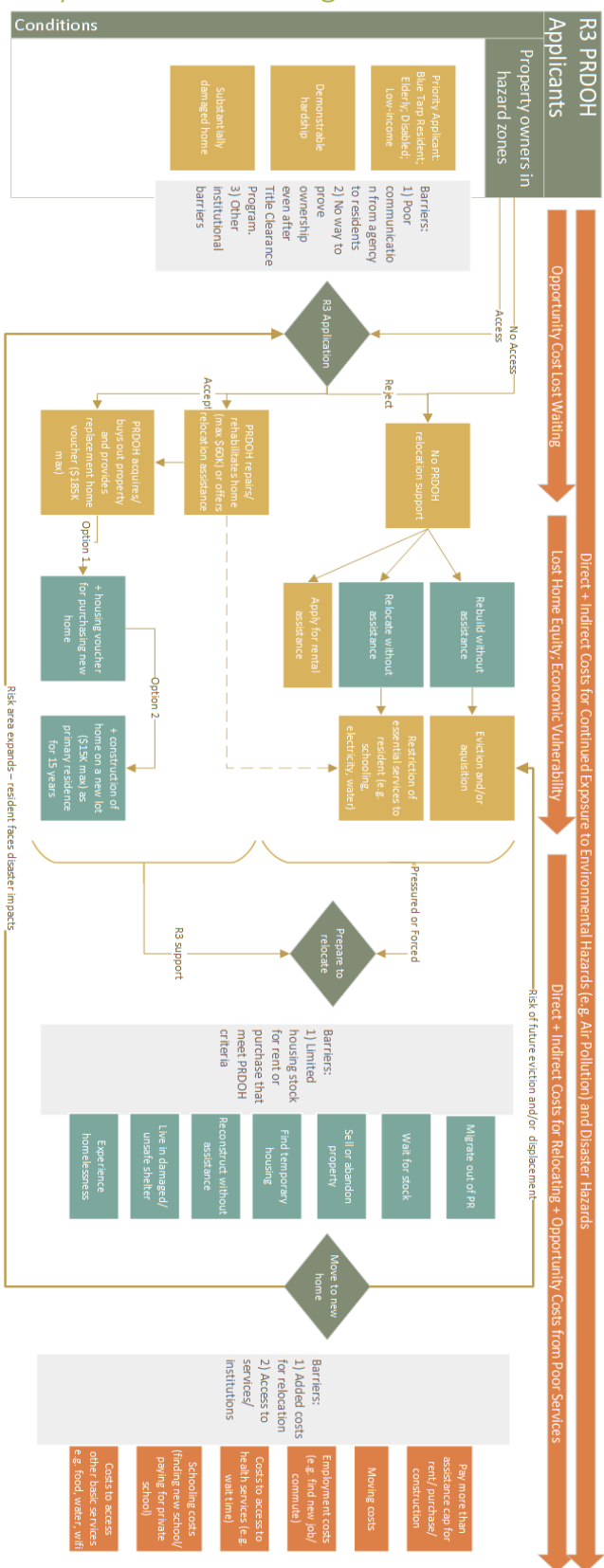
Agency	Allocated	Obligated	Disbursed	% Made Available	% Transferred to Recipient
Public Assistance	\$7,044,417,729	\$7,044,417,729	\$4,192,064,225	100%	60%
Individual Assistance	\$2,654,852,325	\$2,654,852,325	\$2,556,600,148	100%	96%
Administration	\$3,164,591,014	\$3,164,591,014	\$2,777,627,754	100%	88%
Hazard Mitigation Grant Program	\$2,999,975,000	\$100,381,575	\$-	3%	0%
Operations	\$4,308,440,582	\$4,308,440,582	\$3,936,290,173	100%	91%
Community Disaster Loan	\$306,389,192	\$306,389,192	\$244,905,473	100%	80%
Mitigation	\$36,341,174	\$36,341,174	\$-	100%	0%

Funding Status from Other Agencies from COR3

Agency	Allocated	Obligated	Disbursed	% Made Available	% Transferred to Recipient
Environmental Protection Agency	\$48,613,368	\$13,745,719	\$2,886,663	28%	6%
Federal Communications Commission	\$51,200,000	\$-	\$-	0%	0%
General Service Administration	\$41,757,029	\$41,757,029	\$13,829,232	100%	33%
National Science Foundation	\$1,999,746	\$-	\$-	0%	0%
Small Business Administration	\$1,987,622,300	\$1,987,622,300	\$1,275,845,779	100%	64%
Army Corps of Engineers	\$2,539,206,390	\$93,303,982	\$43,376,816	4%	2%
Department of Agriculture	\$2,149,264,252	\$846,165,038	\$681,178,216	39%	32%
Department of Commerce	\$83,972,144	\$67,891,932	\$4,835,955	81%	6%

Department of Education	\$780,605,402	\$736,139,099	\$247,779,900	94%	32%
Department of Energy	\$12,337,000	\$12,337,000	\$10,124,560	100%	82%
Department of Health and Human Services	\$202,978,550	\$202,978,550	\$69,637,676	100%	34%
Department of Homeland Security	\$507,045,307	\$154,823,986	\$114,230,653	31%	23%
Department of Housing and Urban Development	\$19,945,593,000	\$3,207,179,000	\$28,745,508	16%	0%
Department of Justice	\$6,579,465	\$5,814,091	\$3,695,561	88%	56%
Department of The Interior	\$50,466,864	\$41,459,436	\$17,464,024	82%	35%
Department of Transportation	\$738,126,311	\$217,091,805	\$103,470,193	29%	14%
Department of Veterans Affairs	\$71,569,080	\$15,214,410	\$10,721,435	21%	15%
Department of Labor	\$41,900,000	\$16,113,901	\$7,771,320	38%	19%

b. Displacement Pathways from the R3 Program



c. Survey Responses on Earthquake Housing Recovery

From Dra. Marinilda Rivera Díaz, Dr. Yamil Ortíz Ortíz, Randy R. Tejada Duarte, Natalie Álamo Rodríguez. 2020. “La comunidad dice lo que quiere”: Resultados de encuesta post terremotos en el sur de Puerto Rico sobre el derecho a la vivienda. Centro de Investigaciones Sociales de la Facultad de Ciencias Sociales de la Universidad de Puerto Rico.

Earthquake Housing Recovery Statements

	Yes	No	N/A or Did Not Answer
<i>Vacant homes owned by the banks should be given to people who lost their houses</i>	64 (42.7%)	2 (1.3%)	84 (54%)
<i>A structural engineer should determine whether my house is safe to return to</i>	56 (37.3%)	7 (4.7%)	87 (58%)
<i>The government should provide me with the materials and technical assistance so that I can rebuild my house to be resistant to earthquakes and hurricanes</i>	53 (35.3%)	9 (6%)	88 (58.7%)
<i>The government should help me rebuild my house</i>	51 (34%)	6 (4%)	93 (62%)
<i>The government should help me restore my house so that it is safe</i>	44 (29.33%)	14 (9.3%)	91 (60.7%)

Appealing Permanent Housing Alternatives

	Yes	No	Maybe	N/A or Did Not Answer
<i>A house in the same place where I was living before</i>	35 (23.3%)	24 (16%)	4 (2.7%)	87 (58%)
<i>A house in another place but in the same municipality</i>	31 (20.7%)	22 (14.7%)	5 (3.3%)	93 (62%)
<i>A house in another place but in the same neighborhood</i>	30 (20%)	22 (14.7%)	7 (4.7%)	91 (60.7%)
<i>A house in another municipality close by</i>	26 (17.3%)	22 (14.7%)	10 (6.7%)	92 (61.3%)
<i>A house somewhere else in Puerto Rico</i>	17 (11.3%)	34 (22.7%)	7 (4.7%)	92 (61.5%)
<i>Outside of Puerto Rico</i>	14 (9.3%)	33 (22%)	8 (5.3%)	95 (63.3%)