Community Planning and Capacity Building in Puerto Rico After Hurricane Maria

Predisaster Condition, Hurricane Damage, and Courses of Action

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Preface

On August 8, 2018, the government of Puerto Rico submitted to Congress its economic and disaster recovery plan, as required by the Bipartisan Budget Act of 2018. Under contract with the Federal Emergency Management Agency (FEMA), the Homeland Security Operational Analysis Center (HSOAC) provided substantial support in developing the plan by soliciting and integrating inputs from a wide variety of stakeholders, contributing analysis where needed, and assisting with drafting the plan. The plan included an overview of damage and needs, courses of action (COAs) to meet those needs, costs of the COAs, and potential funding mechanisms for those costs.

This detailed volume, released by HSOAC, is intended to support federal agencies evaluating and funding recovery actions for the Community Planning and Capacity Building (CPCB) sector. The purpose of this document is to provide decisionmakers greater detail on the conditions in Puerto Rico prior to the 2017 hurricane season, impact from Hurricanes Irma and Maria, COAs that were identified to help the sector (and, more broadly, Puerto Rico) recover in a resilient manner, potential funding mechanisms, and considerations for implementers as they move forward. HSOAC plans to release similar detailed volumes for other sectors engaged as part of recovery planning.

This document will likely also be of interest to other stakeholders funding or implementing recovery activities in Puerto Rico, including commonwealth and local agencies, nongovernmental organizations, and the private sector. Furthermore, this body of material contributes to the larger literature about disaster recovery and resilience and may be of interest to other communities planning for or recovering from similar disasters.

This research was sponsored by FEMA and conducted within the Strategy, Policy, and Operations Program of the Homeland Security Operational Analysis Center, a federally funded research and development center (FFRDC). More information about HSOAC’s contribution to planning for recovery in Puerto Rico, along with links to other reports being published as part of this series, can be found at www.rand.org/hsoac/puerto-rico-recovery.

About the Homeland Security Operational Analysis Center

The Homeland Security Act of 2002 (Section 305 of Public Law 107-296, as codified at 6 U.S.C. § 185), authorizes the Secretary of Homeland Security, acting through the Under Secretary for Science and Technology, to establish one or more FFRDCs to provide independent analysis of homeland security issues. RAND Corporation operates HSOAC as an FFRDC for the U.S. Department of Homeland Security (DHS) under contract HSHQDC-16-D-00007.
The HSOAC FFRDC provides the government with independent and objective analyses and advice in core areas important to the department in support of policy development, decisionmaking, alternative approaches, and new ideas on issues of importance. The HSOAC FFRDC also works with and supports other federal, state, local, tribal, and public- and private-sector organizations that make up the homeland security enterprise. The HSOAC FFRDC’s research is undertaken by mutual consent with DHS and is organized as a set of discrete tasks. This report presents the results of research and analysis conducted under Task Order 70FBR218F00000032, “Puerto Rico Economic and Disaster Recovery Plan: Integration and Analytic Support.”

The results presented in this report do not necessarily reflect official DHS opinion or policy.

For more information on HSOAC, see www.rand.org/hsoac. For more information on this publication, visit www.rand.org/t/RR2598.
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Summary

In September 2017, two major hurricanes made landfall in Puerto Rico within two weeks of each other: the category 5 storm Irma passed over the northern part of the main island followed by the category 4 storm Maria, which traveled east to west across Puerto Rico, resulting in severe destruction of land, systems, and infrastructure. Among the devastating effects were a near universal lack of access to power, cellular phone communication, and drinking water, as well as widespread damage or blockage to roads. Officially, about 3,000 deaths in the six months after the storm have been attributed to the impact of the disaster.

The Bipartisan Budget Act of 2018 (Public Law 115-123), which included funds for hurricane relief, required the governor of Puerto Rico to submit to Congress an economic and disaster recovery plan that would define the priorities, goals, and outcomes of the recovery effort. The Homeland Security Operational Analysis Center (HSOAC), a federally funded research and development center operated by RAND Corporation under contract with the U.S. Department of Homeland Security, supported the U.S. Federal Emergency Management Agency (FEMA) in assisting the Puerto Rico government in the development of that congressionally required report, which in this document we refer to as the “Recovery Plan.”

This document describes work that HSOAC conducted in supporting one of the FEMA recovery support functions (RSFs), Community Planning and Capacity Building (CPCB), in the Recovery Plan development process. The mission of the CPCB RSF is to support and build the recovery capabilities and community planning resources of local, state, and tribal governments. CPCB RSF supports partner agencies and organizations, develops resources in support of preparedness efforts, and offers tools and resources for planning, managing, and implementing postdisaster recovery.

4 More information about HSOAC’s contribution to planning for recovery in Puerto Rico, along with links to other reports being published as part of this series, can be found at www.rand.org/hsoac/puerto-rico-recovery.
5 FEMA, “Community Planning and Capacity Building,” undated.
Research Questions

Development of the Recovery Plan consisted of three overlapping tasks: identifying damage, needs, and priorities for recovery; identifying potential courses of action (COAs) along with estimated costs; and aligning the plan objectives and COAs and identifying potential funding sources. To support the development of the plan, HSOAC carried out several analyses, qualitative and quantitative, including conducting fieldwork to collect new data. Broadly speaking, the analyses sought to answer these three questions:

1. What were the conditions of Puerto Rico’s communities before the hurricanes?
2. How are communities across different levels of social vulnerability affected differently by the hurricanes?
3. What would help improve Puerto Rico’s capacity to engage in community-based planning for emergency preparedness and for recovery?

To address the first question, on prestorm conditions, HSOAC examined demographics, population trends, and vulnerable populations in Puerto Rico. We also explored governance structures and economic pressures that affected prestorm conditions and the road to recovery for Puerto Ricans. This work helped identify populations that are disproportionately affected by disasters (e.g., older adults, children, and residents of informal housing) and described how municipalities govern and deliver services to constituents.

On the second question, HSOAC explored how the hurricanes affected communities in terms of damage, community stress, and migration away from Puerto Rico. We conducted surveys, interviews, and focus groups with municipalities, government leaders, subject-matter experts (with expertise in law enforcement, emergency management, community planning, etc.), nonprofits, and community residents, among others. These diverse stakeholders have a vital role to play in disaster recovery efforts. As such, their strengths, weaknesses, priority concerns, and specialized knowledge or experience must be factored into decisions about building resilience to ensure that policies and programs appropriately leverage local capacities and reflect community needs. In addition, HSOAC conducted analysis to estimate the increase in outmigration from Puerto Rico. The information we collected provided critical context that enables this report to more comprehensively describe the status of Puerto Rican communities.

The work done to address these questions constitutes an assessment of the damage, needs, and priorities for recovery. This provided necessary insight for answering the third question regarding what could be done to improve Puerto Rico’s capacity, through developing COAs, which are activities, policies, and other actions that would contribute to Puerto Rico’s recovery.
Findings

Preexisting Conditions

Disasters have a tendency to exacerbate challenging situations that already exist in communities prior to their arrival, whether economic, social, or structural challenges. The resources that are available to a community, such as funds, information, or staffing, affect how prepared communities are to face disasters. Therefore, it is critical to understand such conditions, as they provide context for the extent of damage incurred by disasters.

We found several preexisting social and economic issues that subsequently affected timely recovery and response in Puerto Rico and created conditions where residents were especially vulnerable to the hurricane’s impact. Regarding preparedness, Puerto Rico’s residents described a varied level of preparedness among themselves and other community members as Hurricane Maria approached. Many described themselves and their neighbors as not preparing at all, often due to a disbelief that a highly destructive hurricane would actually hit. Community members expressed the most concerns about the level of preparedness among the elderly, those with medical conditions, and the poor, who lacked funds or social support for preparation. These perceptions are important to highlight as they suggest that community mindset concerning hurricane risk may be a barrier to improving their preparedness. Furthermore, in the absence of quantitative assessments of risk, eyes and ears in the community may be the best source of information about vulnerable populations.

There were mixed reports on the adequacy of plans, preparation, and disaster staffing at the municipal level. Based on International City/County Management Association data, while a majority (93 percent; 71 of 76) of municipalities that responded to the survey reported having a disaster preparedness plan in place prior to Hurricane Maria, less than half (39 percent; 28 of 71) indicated that their plans were adequate for the 2017 hurricane season. Respondents had mixed thoughts about disaster management and damage mitigation, with seven municipalities reporting inadequacy.

Current and former residents told us that many preexisting community-level stressors affected Puerto Rico’s response and recovery efforts, including five sources we identified as foundational issues and four we identified as sources of chronic stress. Foundational issues are those that arise from the community context and build up over generations. In contrast, chronic stressors stem from those foundational issues, and while they are not intergenerational, they do also build up over time. Together, foundational issues and chronic stressors build up stress within a community. The community-level stress in turn could affect the community’s ability to respond to and recover from natural disasters. Among the foundational issues, we

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noted (1) poor infrastructure, (2) a fragile economy, (3) poor governance/government corruption, (4) inequality, and (5) lacking a sense of community—all had been affecting Puerto Rico prior to the landfall of Hurricane Maria. Chronic stressors—including (1) the lack of an adequate emergency preparedness/response system, (2) misinformation, and (3) outmigration to the continental United States—were related to the aforementioned foundational issues and likely to have also affected preparedness at the individual level.

Academic disaster literature emphasizes the importance of “place” in accounting for differences in people’s vulnerability to disasters and resilience in the face of disasters, and place-based vulnerability assessments have become a common tool for reducing disaster risk and loss, as well as creating the conditions for more resilient communities. Researchers have increasingly examined the social dimension of these concepts, including social inequalities, to explain community differences in disaster impact, response, and recovery. Accordingly, we decided to assess the level of social vulnerability of Puerto Rico’s municipalities, using a number of observable preexisting social and economic conditions, and applied a latent measurement method to measure the overall construct. We found that municipalities categorized as having a low level of social vulnerability (those that are affluent and densely populated) are clustered around the San Juan metropolitan area while municipalities categorized as having a high level of social vulnerability (those that are socioeconomically disadvantaged and least densely populated) are primarily clustered in the west-central region of the island, the southwestern coast, and the southeastern coast. Municipalities with a medium level of social vulnerability have a moderate socioeconomic disadvantage and intermediate population density and are located in the northeast corner of Puerto Rico, as well as along the coasts, in the islands of Culebra and Vieques, and in the central region of the main island proximal to the San Juan metropolitan area.

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Hurricane Impact on Communities

Having assessed preexisting social vulnerability by municipality, we then examined the geographic distribution of damage levels and evaluated whether there is evidence that more-vulnerable municipalities were differentially damaged by Hurricane Maria. What we found is that the pattern of damage (using housing damage as a proxy for total damage) substantially overlaps the distribution of social vulnerability, as opposed to the path of the hurricane. **The most socioeconomically disadvantaged municipalities sustained the most damage, while the municipalities with the most socioeconomic advantage experienced the least damage.** This finding corresponds with other disaster studies that demonstrate the disparity between socioeconomically advantaged and disadvantaged communities. In particular, building structures in less advantaged communities tend to be less able to withstand the physical impact of natural disasters. These studies have shown that because of their lower quality construction, lower cost housing exposes residents to greater risks from disasters such as earthquakes, fires, and tornados. Thus it is not surprising that housing in more advantaged communities in Puerto Rico located relatively close to the path of Hurricane Maria fared somewhat better than housing in less advantaged communities outside the storm’s main corridor.\(^{11}\)

Throughout, we use “displacement” in reference to Puerto Ricans departing the island in the wake of the hurricane for reasons related to the hurricane (although displaced individuals may return at some point, for the purposes of our analyses, they had not returned by February 2018 or thereabouts). **We estimate that 45,476 households were displaced, and those households are estimated to contain 96,563 individuals, indicating that 2.89 percent of the population of Puerto Rico was displaced in the wake of Hurricane Maria.** Prior to Hurricane Maria, rates of outmigration were highest in and around San Juan (4.0 percent) and on the southeast coast, whereas the rates were generally lowest toward the center of the island. Hurricane-related displacement rates in San Juan were lower (2.5 percent) than the prehurricane outmigration rates, but posthurricane displacement exceeded prehurricane outmigration in most other municipalities, such as Humacao (8.6 percent post- vs. 2.5 percent prestorm outmigration) and Arroyo (6.4 percent post- vs. 3.0 percent prestorm outmigration), as well as in the northwest, such as Isabela (5.7 percent post- vs. 1.8 percent prestorm outmigration) and Aguada (4.8 percent post- vs. 0.7 percent prestorm outmigration). We also see evidence that displacement rates are higher in more damaged areas—2.53 percent in the least damaged municipalities, compared to 3.29 percent in the most vulnerable municipalities.

**Six months after Hurricane Maria’s landfall, most residents interviewed in Puerto Rico were still focused on near-term survival.** Similar to communities hit hard during previous major storms, disaster survivors needed a considerable amount of time to deal with the

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devastating impact of a natural disaster of this magnitude and were less interested in talking about recovery when immediate needs remained unfilled. Residents in more rural and poorer areas in particular discussed issues related to near-term survival—i.e., the provision of food, water, fuel, and sheltering materials—more than they did issues related to longer-term recovery, such as the return of the economy and business to a healthy state and the development of new businesses and employment opportunities.

**Puerto Rico residents saw government as most important in response and recovery efforts.** In the focus groups and interviews we analyzed, government agencies were mentioned about twice as often as other initiators of response and recovery activities, such as nongovernmental organizations (NGOs), local communities, families, and individuals. However, their comments were more favorably disposed toward NGO and local community-based activities. While a clear majority of focus group and interview participants voiced negative views of the government response and recovery effort, perceptions of NGOs, communities, families, and individuals were largely positive. Compared to residents in more socially vulnerable areas, people in less socially vulnerable areas commented on a wider range of response and recovery activities, were more apt to mention the government as the primary purveyor of assistance, and were more critical of governmental disaster agencies. The interests and perceptions of those living in areas that were more heavily damaged by the hurricanes mostly aligned with those residing in disadvantaged areas, which indicates a high degree of correlation between prehurricane socioeconomic/demographic conditions and hurricane impact.

**Most Puerto Ricans relied on faith-based organizations, NGOs, community, family, and individuals (including community leaders) for information on posthurricane news.** Residents across municipalities cited pastors and/or priests as being essential spokespeople throughout the crisis life cycle. NGOs closely followed as an important source of information as they distributed services and resources. Finally, community, family, and individuals were noted as important sources of information. With mass media sources unavailable, residents relied on personal networks to spread messages and seek and deliver news. Following the storm, the only channels available to coordinate recovery included the radio, emergency responders and/or community leaders with walkie-talkies, satellite phones, vehicles equipped with an external speaker, bulletin boards in public areas, or word-of-mouth networks. Some of the highest endorsed channels and sources were (1) CNN en Español, (2) WKAQ 580 AM, (3) Wapa Radio 680 AM, (4) Catolica Radio FM, (5) Facebook, and (6) El Nuevo Día (newspaper). Workshop participants in San Juan shared that the recommended sources “put the necessary information and do not alarm” and that they were “accessible” at various points during and after the disaster.

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Residents shared an overwhelming amount of distrust for local and federal government agencies. Frustration with slow-moving recovery and a lack of transparency in government decisions were two commonly cited reasons. Participants emphasized the necessity of working with the community to establish trust and gain a better understanding of conditions on the ground. For example, respondents shared that many other types of organizations (e.g., faith-based organizations) were much more visible in the aftermath of the hurricanes, while some municipality leaders seemed to be missing entirely during the initial response. Municipal governments seem to be aware of this need, where almost 80 percent of local government officials included increasing community involvement and improving communication as top priorities for improving community engagement. While trusted messengers like faith-based organizations, NGOs, community groups, family members, and personal networks can help amplify communication across preparedness, response, and recovery disaster phases, they cannot replace the role of government in disaster response. Moving forward, additional strategies are needed to utilize existing preferred information sources, improving resident engagement with local and federal government agencies, coordinating between organizations to improve message convergence, and documenting future plans. Convergence occurs when several distinct messages, shared by separate sources, “lead to a single conclusion.” In a noisy media environment, this becomes important as individuals wait for confirmation from multiple credible sources prior to taking action during a crisis. Finally, creating a crisis communication plan will assist with future response efforts. During an imminent threat, there is often little time to make interorganizational contacts, establish communication coordination procedures, and create more sophisticated strategies for amplifying crisis communication messages.

Development of Courses of Action

The analyses that were conducted, coupled with discussions with community members, subject-matter experts, and FEMA personnel, led to the development of 15 total COAs that can be grouped into the following categories:

- emergency preparedness
- communication
- recovery planning
- research and training
- engagement with NGOs.

The CPCB COAs listed here are a subset of the entire set of COAs that appeared in the Recovery Plan. HSOAC developed these based on our interactions with community members and subject-matter experts and in close consultation with the CPCB RSF. The COAs themselves are detailed in Appendix A.

Emergency Preparedness

- CPCB 1 Disaster Preparedness Data Analysis and Decision Support Capability
- CPCB 2 Capacity Building for Community-Level Preparedness and Response
- CPCB 4 Resilience Building in Collaboration with High-Risk Communities
- CPCB 7 Capacity Building for Emergency Shelter Planning
- CPCB 8 Strengthening Emergency Management Capacity at Municipalities

Communication

- CPCB 6 Public Information and Communication Capability for Coordinated Recovery

Recovery Planning

- CPCB 3 Capacity Building to Incorporate Hazard Risk Reduction into Planning and Design
- CPCB 9 Coordinated Local Recovery Planning Process
- CPCB 10 Incentivize the Design of Creative Solutions to Addressing Disaster Hazards
- CPCB 11 Cross-Sector Coordination in Infrastructure and Implementation
- CPCB 12 Capacity Building for Financial Management
- CPCB 13 Training Workshop on Best Practices in Postdisaster Procurement
- CPCB 14 Building Grant-Writing Capacity

Research and Training

- CPCB 5 Establishing a University-Based Center of Excellence for Disaster Preparedness and Recovery

Engagement with Nongovernmental Organizations

- CPCB 15 Strengthen Local Nonprofit and NGO Involvement in Disaster Recovery

The government of Puerto Rico has selected these COAs as what they will do to improve preparedness and address recovery. They cross a range of critical domains focused on building capacity to prepare for future disasters, identifying hazards requiring mitigation, and communicating and planning with communities to improve their resilience. In addition, they provide for the staffing and training necessary to build the capacity of Puerto Rico to plan for and manage the current recovery.

Acknowledgments

We acknowledge the steadfast support and encouragement of our project sponsor Michael Byrne, the FEMA’s acting Caribbean Area Division director and the federal coordinating officer and federal disaster-recovery coordinator for Hurricane Irma and Maria response and recovery in Puerto Rico. We also appreciate the contributions of other key FEMA partners, including Gerilee Bennett, Kevin Snyder, Patrick Tuohy, Hope Thompson, and Jose Gil Montanez. From Puerto Rico, we are particularly grateful for the inputs of Omar Marrero Diaz and Laura Femenias Jove, the director and associate director of the Central Office for Recovery, Reconstruction and Resilience.

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This work also was strengthened by the Puerto Rico Central Office of Recovery, Reconstruction and Resilience, the Governor’s Planning Board, the Puerto Rico National Guard, and the Puerto Rico Planning Board. We also thank the Office of Socioeconomic Development, who provided data that improved our understanding of the local context, helped us access data that made the damage and needs assessments as complete as possible, and helped us identify appropriate recovery actions.

We also thank other organizations who participated through discussions and providing data, including the Puerto Rico Institute of Statistics, for their assistance in accessing data on population demographics; the Pennsylvania State University, for assistance with accessing data on population demographics; Boston University, for their assistance with outreach to outmigrants, data collection, and analysis; Edelman Miami Latin America Corporation, for assistance with data collection and intellectual contributions related to communication planning and strategy; University of Miami, for their assistance with outreach to outmigrants, data collection, and analysis. We thank Peter Gudaitis, Meryl Hulse, and Peter Cavadini from New York Disaster Interfaith Services for their assistance with accessing data on residential information. We also thank the University of Puerto Rico for their contributions surrounding the community workshops. We are grateful to the faculty, staff, and students who assisted with planning, recruitment, facilitation, and translation of data collected from the workshops. We
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<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>ACS</td>
<td>American Community Survey</td>
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<tr>
<td>CERT</td>
<td>Community Emergency Response Teams</td>
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<td>COA</td>
<td>course of action</td>
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<td>COE</td>
<td>Center of Excellence</td>
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<td>CPCB</td>
<td>Community Planning and Capacity Building</td>
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<tr>
<td>DHS</td>
<td>U.S. Department of Homeland Security</td>
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<tr>
<td>FTE</td>
<td>full-time employee</td>
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<tr>
<td>HSOAC</td>
<td>Homeland Security Operational Analysis Center</td>
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<td>IA</td>
<td>Individual Assistance</td>
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<td>ICMA</td>
<td>International City/County Management Association</td>
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<td>NCR</td>
<td>Natural and Cultural Resources</td>
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<td>NGO</td>
<td>nongovernmental organization</td>
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<td>NYDIS</td>
<td>New York Disaster Interfaith Services</td>
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<tr>
<td>ODSEC</td>
<td>Office for the Socioeconomic and Community Development (Oficina para el Desarrollo Socioeconómico y Comunitario)</td>
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<td>PREMA</td>
<td>Puerto Rico Emergency Management Agency</td>
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<td>Puerto Rico Planning Board</td>
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<td>RSF</td>
<td>Recovery Support Function</td>
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<td>SME</td>
<td>subject-matter expert</td>
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<td>UPR</td>
<td>University of Puerto Rico</td>
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1. Introduction

In September 2017, two major hurricanes made landfall in Puerto Rico within two weeks of each other: the category 5 storm Irma passed over the northern part of the island followed by the category 4 storm Maria, which traveled east to west across the entire island, resulting in severe destruction of land, systems, and infrastructure.\(^1\) Among the devastating effects were a near universal lack of access to drinking water, widespread damaged or blocked roads, and highly diminished air travel for over a week after the event. Furthermore, 95 percent of cellular sites went offline, and 100 percent of residents were without power. Over half of homeowners who registered with the U.S. Federal Emergency Management Agency (FEMA) said their property had been damaged, and Puerto Rico’s economy declined by approximately 12 percent in the three months following the hurricane. Officially, about 3,000 deaths in the six months after the storm have been attributed to the disaster.\(^2\)

The Bipartisan Budget Act of 2018 (Public Law 115-123), which included funds for hurricane relief, required the governor of Puerto Rico to submit to Congress an economic and disaster recovery plan that would define the priorities, goals, and outcomes of the recovery effort. The Homeland Security Operational Analysis Center (HSOAC), a federally funded research and development center operated by RAND Corporation under contract with the U.S. Department of Homeland Security (DHS), supported FEMA in assisting the Puerto Rico government in the development of that congressionally required report, which in this document we will refer to as the “Recovery Plan.”\(^3\)

FEMA established response and recovery efforts in Puerto Rico using the National Disaster Recovery Framework’s Recovery Support Function (RSF) structure. The RSFs comprise the coordinating structure for key functional areas of assistance in the National Disaster Recovery Framework, consisting of

- Community Planning and Capacity Building (CPCB)
- Economics
- Health and Social Services
- Housing
- Infrastructure Systems
- Natural and Cultural Resources (NCR).

\(^1\) Government of Puerto Rico, August 8, 2018.
\(^2\) Hernandez, Schmidt, and Achenbach, 2018.
\(^3\) More information about HSOAC’s contribution to planning for recovery in Puerto Rico, along with links to other reports being published as part of this series, can be found at www.rand.org/hsoac/puerto-rico-recovery.
Because of the scale and scope of recovery needs in Puerto Rico, the Health and Social Services RSF was broken up into two, with the second sector being Education. Similarly, Infrastructure Systems was divided into five sectors—Energy, Public Buildings, Telecommunications/Information Technology, Transportation, and Water.

This document describes work that HSOAC conducted in supporting the CPCB RSF in the Recovery Plan development process. The aims of the CPCB RSF include strengthening governments to effectively carry out community-based recovery planning and building capacity for local plan implementation and recovery management. The mission of the CPCB RSF is to support and build the recovery capabilities and community planning resources of local, state, and tribal governments. CPCB RSF supports partner agencies and organizations, develops resources in support of preparedness efforts, and offers tools and resources for planning, managing, and implementing recovery postdisaster.4

**Research Questions**

Development of the Recovery Plan included identifying damage, needs, and priorities for recovery and identifying potential courses of action (COAs), along with estimated costs. To support the development of the plan, HSOAC carried out several analyses for CPCB, both qualitative and quantitative, including conducting fieldwork to collect new data. Broadly speaking, the analyses sought to answer these three research questions:

1. What were the conditions of Puerto Rico’s communities before the hurricanes?
2. How are different communities affected differently by the hurricanes?
3. What would help improve Puerto Rico’s capacity to engage in community-based planning for emergency preparedness and for recovery?

To address the first question, on prestorm conditions, HSOAC examined demographics, population trends, and vulnerable populations in Puerto Rico. We also explored governance structures and economic pressures that affect prestorm conditions and the road to recovery for Puerto Ricans. This work helped identify populations that are disproportionately affected by disasters (e.g., older adults, children, and residents of informal housing) and described how municipalities govern and deliver services to constituents.

On the second question, HSOAC sought to explore how the hurricanes affected communities in terms of damage, community stress, and migration away from the island. We conducted surveys, interviews, and focus groups with municipalities, government leaders, subject-matter experts (SMEs, with expertise in law enforcement, emergency management community planning, etc.), nonprofits, and community residents, among others. These diverse stakeholders

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have a vital role to play in disaster recovery efforts. As such, their strengths, weaknesses, and priority concerns must be factored into decisions about building resiliency to ensure that policies and programs appropriately leverage local capacities and reflect community needs. In addition, HSOAC conducted analysis to estimate the increase in outmigration from Puerto Rico. The information we collected provided critical context that enable this report to describe the status of Puerto Rican communities.

The work done to address the first two questions constitutes an assessment of the damage, needs, and priorities for recovery. This provided necessary insight for answering the third question, what could be done to improve Puerto Rico’s capacity. Building on our interactions with community members and SMEs, and in close consultation with the CPCB RSF, HSOAC developed COAs, which are potential activities, policies, and other actions that would contribute to Puerto Rico’s recovery. The COAs described in this document are a subset of the COAs, relevant to CPCB, that appeared in the Recovery Plan (Government of Puerto Rico, 2018). This report includes 15 total COAs that can be grouped into the following categories:

- emergency preparedness
- communication
- recovery planning
- research and training
- engagement with NGOs.

HSOAC developed these based on our interactions with community members and SMEs and in close consultation with the CPCB RSF. The COAs themselves are detailed in Appendix A.

Organization of This Report

The rest of this report is organized as follows. Chapter Two discusses the data collection and analysis completed to answer the research questions described above and ultimately assist in developing the Recovery Plan.

Chapter Three describes our findings on the first two research questions. We discuss the preexisting conditions on Puerto Rico prior to the hurricane, including background on the population, residential, and municipal-level preparedness, cumulative community stress, and social vulnerability. Following, we discuss how the hurricane affected various communities, looking at damage, outmigration, and trust, among other issues.

Chapter Four discusses how these findings influenced the development of proposed CPCB COAs, which are the actions that can help improve Puerto Rico’s capacity for preparedness and response. The individual COAs are detailed in Appendix A.
2. Data and Methods

In an effort to gain a more thorough understanding of the hurricane’s impact on communities, we engaged in discussions with residents and communities in Puerto Rico, gathering qualitative data on pre- and postdisaster issues through workshops, focus groups, interviews, and media analysis. In the aftermath of a disaster, it is critical to collect information directly from the community, as there are typically no other detailed sources of information available on community experience. The eyes and ears of residents in communities provide a unique perspective on areas of improvement for preparedness, effects on vulnerable populations, and observations of response activities and their effectiveness. Given the context, obtaining much of this information often proved challenging, and the nature and quality of feedback varied depending on the type of engagement approach we employed. In addition to collecting qualitative data, we also analyzed statistically rich quantitative data sources, including information derived from FEMA and the U.S. census. Our goal was to gain a more intimate perspective of residents through a variety of methods. In this chapter, we describe the data approaches we used in our work.

Qualitative Data Collection

Our qualitative data collection helped us to assess conditions of Puerto Rico’s communities and populations in the periods before, during, and after the 2017 hurricanes. Through discussions with residents, we were able to get a better sense of community perspectives and more thoroughly understand challenges the community encountered before and after the hurricanes. Furthermore, these conversations advanced our awareness of ways in which response and recovery communication, and preparedness efforts, might be improved in the future. We spoke with residents, SMEs, and former residents who had migrated from Puerto Rico to Florida. To assist us with recruiting and conducting focus groups and interviews, we partnered with a Miami-based communications firm, NGOs in Puerto Rico, Boston University, and the University of Miami. These partner organizations were critical in facilitating this work, as they provided contacts and specialized knowledge with respect to Puerto Rico’s communities located on the island and in the continental United States.

The blue stars in Figure 2.1 show the 35 of 78 Puerto Rico municipalities in which HSOAC and its partner organizations conducted resident focus groups and SME interviews during April and May 2018. Municipality selection criteria included (1) level of social vulnerability, (2) extent of damage inflicted by the hurricanes, (3) geographic variation (e.g., coastal and interior), and (4) the local connections of the data collectors. The resulting set of municipalities
was not entirely representative of Puerto Rico as a whole, as it included a bias toward municipalities that were socially vulnerable, heavily affected by the hurricanes, and rural. We attempted to compensate for this bias by including data from seven focus groups in six largely urban, somewhat less vulnerable, and less affected municipalities conducted by the Resilient Puerto Rico Advisory Commission. These focus groups were part of ReImagina Puerto Rico an initiative funded by the Rockefeller, Ford, and Open Society Foundations.¹

Instruments

We developed a master protocol for all focus groups, community member interviews, and SME interviews to provide an overarching framework for gathering data in a consistent manner and to facilitate comparison. We tailored this protocol to each discussion to account for the background, knowledgeability, and circumstances of those being interviewed. The protocol included guiding questions in four key topic areas: (1) risk assessment, which focused on prehurricane hazards, vulnerabilities, and capacities; (2) hurricane impact and risk assessment; (3) hurricane recovery planning; and (4) future preparedness. Specific questions were added to the master protocol to address the needs and concerns of participants.

Qualitative Data Sources

Puerto Rico Resident Focus Group and Individual Interview Participants

Working closely with two local NGOs and the communications firm Edelman Miami Latin America Corporation, we recruited residents from 20 municipalities. The municipalities were selected using community characteristics and input from recovery stakeholders. We also considered the outreach capabilities of the NGOs and communications firm conducting the focus group and informal discussions with community residents. All participants were at least 18 years old and had to have resided in one of the selected municipalities at the time Hurricane Maria made landfall on Puerto Rico. From April to June 2018, we conducted a total of 20 focus groups covering 20 municipalities (see Figure 2.1). The size of focus groups ranged from 8 to 12 participants. Approximately 200 individuals participated in the focus groups. In addition, we conducted 31 individual interviews with residents representing 18 of the 20 municipalities. Focus groups and interviews were conducted in Spanish by local NGO and Edelman Miami staff and observed by HSOAC staff. Topics in this report that used this data source include community cumulative stress, residential and municipal preparedness, perceptions of response and recovery, preferred sources of information, and trust and communication during recovery and response.

Media Content Analysis

Edelman conducted a media analysis based on coverage from top-tier English- and Spanish-language outlets in the United States and Puerto Rico, published between February 1, 2018, and April 24, 2018. A total of 275 articles were captured across 40 outlets through a news search software program, which is programmed for language, geography, and taxonomy. The outlets included Yahoo!, the Orlando Sentinel, Los Angeles Times, Washington Post, Miami Herald, Politico, Economist, Telemundo, Univision, El Nuevo Día, El Vocero, and Primera Hora, among others, representing outlets with nationwide reach in both Puerto Rico and the United States. The search terms used included “Puerto Rico” and one of “hurricane” or “maria” or “irma” or “recovery” or “rebuilding” or “FEMA” or “government.” The time frame for this research was carefully chosen to focus on articles reflecting Puerto Rico’s recovery process as opposed to the emergency response phase. Comprehensive data classification was carried out to define the tone, key topics, target audiences, and influencers mentioned in each article.

SME Interviews

Fifteen interviews were conducted with SMEs who provide, assess, or receive disaster management and planning/preparedness services, including government, academic, nonprofit, and private-sector stakeholders. All interviews were conducted by HSOAC staff in either Spanish or English, depending on the interviewee’s preference. Topics in this report that used this data source include preferred sources of information and trust and communication during recovery and response.
Outmigrant Focus Groups

Researchers from our university partners (Boston University and the University of Miami) partnered with community organizations in Orlando and Miami, Florida, to recruit participants for the outmigrant focus groups. A total of four focus groups took place during April 2018. Each group consisted of nine participants. Over half (67 percent) of participants were female. All participants were at least 18 years old and had migrated to Florida after Hurricane Maria. The focus groups were all conducted in Spanish. Topics in this report that used this data source include community cumulative stress and perceptions of response and recovery.

Resilient Community Focus Groups

HSOAC analyzed data from Spanish-language focus group transcripts made available by the Resilient Puerto Rico Advisory Commission as part of its ReImagina Puerto Rico initiative funded by the Rockefeller, Ford, and Open Society Foundations.\(^2\) Seven focus groups were held in six Puerto Rican municipalities. These transcripts cover discussions with a range of community leaders and focus on activity before, during, and after Hurricane Maria, as well as opportunities for future community development. Topics in this report that used this data source include community cumulative stress, preferred sources of information, and trust and communication during recovery and response.

Community Workshops

In collaboration with the University of Puerto Rico (UPR), HSOAC organized two half-day community workshops in San Juan and Ponce in June 2018. San Juan and Ponce were selected to capture perspectives from both the north and south sides of the island. The workshops provided an opportunity to meet with residents in an engaging and interactive way (i.e., not a focus group or interview) and obtain community assessments of the challenges facing residents after Hurricane Maria. Participants were split into smaller groups led by a facilitator and assisted by a note taker. Facilitators led conversation around each activity and answered questions or clarified concepts if they were unclear. Five activities were completed in this small group setting, and all interactions were conducted in Spanish. Table 2.1 contains a brief description of each activity.

Faculty and students at UPR assisted with the recruitment of workshop participants through Spanish-language flyers and emails. Participants were recruited via word of mouth and campus-based outreach, and through community-based organizations. No incentive was provided for workshop participation; however, food was offered during the discussion. All participants were 19 years or older, a resident of Puerto Rico, and on the island when Hurricanes Irma and Maria made landfall. Topics in this report that used this data source include preferred sources of information and trust and communication during recovery and response.

### Table 2.1. Description of Community Workshop Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Week in Your Life</td>
<td>Participants completed sample weekly calendars depicting life before and after the hurricane.</td>
<td>Johnson, 1991</td>
</tr>
<tr>
<td>Community Mapping</td>
<td>Each individual used maps of Puerto Rico and the continental United States to mark where important social and emotional connections are located.</td>
<td>Erwin, 2014</td>
</tr>
<tr>
<td>Information Channels</td>
<td>Participants noted which local, statewide, and international news sources they trust.</td>
<td>Basso, 1996</td>
</tr>
<tr>
<td>In Other Words</td>
<td>One of three news articles related to hurricane information was given to participants. Next, they shared how they interpreted and judged the news reports.</td>
<td>Erwin, 2014</td>
</tr>
<tr>
<td>And . . . We're Back</td>
<td>The final exercise elicited mental models of what makes a place feel like home.</td>
<td>Erwin, 2014</td>
</tr>
</tbody>
</table>


### Community Walks

Members of the study team accompanied a local NGO community leader on informal community walks through four municipalities: Comerío, Barranquitas, Arecibo, and Toa Baja. In this approach, the community leader (and study team members) encountered individuals in the streets, on their porches, at local watering holes, or other community gathering places. The goal was to reach individuals in a casual setting and those who might otherwise be inhibited from engaging in a formal discussion due to lack of transportation, physical impairments, family obligations, intimidation in large groups, and so forth. Individuals were asked to provide thoughts on disaster preparedness, impact, and recovery from Hurricane Maria. These informal conversations took place during morning and afternoon hours and were held in Spanish. Conversations typically lasted an hour. Approximately 25 people participated in these engagements, including single mothers, senior citizens, shopkeepers, unemployed men, and disabled residents, among others. The topic in this report that used this data source was perceptions of response and recovery.

### Qualitative Data Analysis

All focus groups and interviews were audio recorded and transcribed verbatim. Spanish transcripts were translated into English by professional translators. A detailed codebook was developed prior to analyzing the data from Puerto Rico resident focus groups and interviews, SME interviews, and outmigrant focus groups. The codebook was organized both temporally and thematically. This allowed the team to extract data across multiple periods, facilitating greater
understanding of actions that occurred before, during, and after the hurricane. Therein, primary codes referred to the following time periods and themes:

- before the hurricane (code: 01 Prehurricane Period)
- during and immediately following the hurricane (code: 02 Hurricane Impact and Response)
- further after the hurricane (code: 03 Recovery and Preparedness for Future Disasters)
- issues related to outmigration (code: 04 Outmigration)
- an “other” theme (code: Other) for such topics as messaging, racism and classism, community resilience, and others.

Under each primary code were 6 to 18 subcodes relating to more specific, or nuanced, units of information (e.g., preparation by organizations, psychological and physical trauma, issues related to economy).

A thematic text analysis was applied to identify patterns within the data. During the initial coding phase, a team of two coders first coded 10 percent of the transcripts line by line according to the initial codebook. After the initial round of coding, the two coders met, discussed, and reconciled any discrepancies. Additional codes and/or changes to existing codes were added to the initial codebook during coding, and no codes were discarded until the coding process was complete. After the coding process, codes were then categorized into themes and subthemes.

Qualitative Data Limitations

The qualitative data is limited by several factors. Like most qualitative research, findings from the focus groups, interviews, community workshops, and community walks may not produce generalizable data. For example, accounts of the experiences of outmigrant focus group participants who left Puerto Rico after the hurricanes reflect their unique perspectives and do not reflect the views of all outmigrants. Additionally, we collected most of the data six to nine months after Hurricanes Irma and Maria. Considering the amount of time that had passed, there is the possibility that some participants experienced recall issues. An expedited project time line and the conduct of this work in a Spanish-only or Spanish-preferred setting led us to make certain choices for qualitative data best practices. We trained the interviewers on basic best practices but had less time to train everyone on the range of potential probes and to do that in Spanish. Demographic information of focus group participants was not collected because we lacked time to get a questionnaire written, translated, and approved by RAND’s institutional review board prior to the focus groups. In addition, there was variation in the rigor of how these conversations were recorded (e.g., shorthand notes vs. recorded and transcribed). Nonetheless, obtaining qualitative data is necessary for building out robust, descriptive overviews of the social

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world. Without the additional perspective these data provide, statistical (e.g., quantitative) approaches may lack depth and necessary explanation needed to be meaningful.

**Quantitative Data Collection**

In addition to the qualitative data collected above, we also performed quantitative analysis using existing data sources to help provide a more comprehensive view of the factors contributing to recovery, preparedness, and response issues in Puerto Rico. These analyses helped to support many of the issues raised by residents in focus groups and interviews. With the quantitative data, we sought to gain insight into the preparedness and response of municipal governments that may have affected initial response efforts. To more clearly illustrate displacement issues residents faced before and after the hurricane’s impact, we also analyzed outmigration patterns, with the use of residential and housing damage data.\(^4\) Collection and analysis of these data helped to elucidate discussion in the focus groups we conducted with Puerto Rico outmigrants in Florida, mentioned above. Analysis of the quantitative data also contributed to illustrating social and demographic issues often touched on in our conversations with residents. Below, we outline the data and methods used by our team in our quantitative assessment.

**Quantitative Data Sources**

*Assessment of Municipalities in Puerto Rico*

A standardized data collection instrument was developed by the International City/County Management Association (ICMA) Assessment of Municipalities in Puerto Rico in consultation with HSOAC, FEMA, and UPR. The survey included questions about the municipality’s capacity to provide services, how they are structured and operate, and the damage they incurred during the hurricanes. An interdisciplinary team led by professional city and county management staff identified by ICMA or by a UPR professor conducted site visits at Puerto Rico’s 78 municipalities in April 2018 through June 2018 to administer the assessment via in-person interviews.

The survey respondents consisted of Puerto Rico government officials and staff from 73 of the 78 municipalities. The survey consisted of multiple choice and free response items. For open-ended questions, responses were assessed for themes, which were tallied to produce figures. The objective of the surveys was to develop baseline data at the individual municipality level on

\(^4\) U.S. Postal Service data on a potential indicator of population displacement (i.e., change in active residences) was examined at the outset of the project. However, these data were not included in the final estimates because, unlike the data that was employed, it was impossible to distinguish between moves from Puerto Rico to the continental United States and moves within Puerto Rico.
municipal finances, capacity (including human capital), and service delivery, as well as hurricane impacts and outstanding needs.

We collected data from ICMA to gain an understanding of the level of preparedness and response of the municipal governments. The data from the surveys allowed us to examine the recovery issues municipalities were facing and identify ways to better address needs and improve their ability to provide desired services. Topics in this report that used this data source include residential and municipal preparedness, preferred sources of information, and trust and communication during recovery and response.

**FEMA Individual Assistance Data**

FEMA Individual Assistance (IA) data includes information on individuals applying for assistance from FEMA due to personal property damage (i.e., primarily housing but also vehicles and personal property). These are compiled in the IA database regardless of whether the individual completes the full application for assistance or is approved for assistance.

We obtained from FEMA an extraction of individual records for applications respective to Hurricane Maria. These records included a subset of all variables collected by FEMA through phone interviews—that is, address of current residence (state, county, city, and zip code), address of damaged property (municipality, city, and zip code), and the number of individuals in the applicant’s household.

These data, in combination with the data source described immediately below, were used to estimate the outmigration of Puerto Rican communities following the hurricanes (which we refer to as “hurricane-related displacement”). These data comprised one of the two sources of data on migration that we were able to obtain that allowed us to estimate where within Puerto Rico outmigration was highest. The topic in this report that used this data source was hurricane-related displacement.

**New York Disaster Interfaith Services Data**

New York Disaster Interfaith Services (NYDIS) Data is a 501(c)(3) faith-based federation of service providers and charitable organizations who work in partnership to provide disaster readiness, response, and recovery services to New York City. We used administrative records from the NYDIS on 1,580 households that sought services from February 2018 through May 2018. Individual records obtained from the agency included the address of current residence and the predisaster address (state, city, and zip code), the number of individuals in the applicant’s predisaster household, and whether the respondent had applied for assistance from FEMA. The data collected from NYDIS provided the second source for outmigration data that distinguished where within Puerto Rico a given migrant had resided. The topic in this report that used this data source was hurricane-related displacement.
American Community Survey Data

The American Community Survey (ACS), also known as the Puerto Rico Community Survey when collected within Puerto Rico, is administered annually by the U.S. Census Bureau. The 2017 ACS provides valuable information regarding prehurricane social, demographic, and economic conditions in Puerto Rico. We used five-year summaries (i.e., the 2012–2016 ACS) to estimate characteristics that can be more difficult to assess in the short term, such as prehurricane patterns of outmigration from the island. Topics in this report that used this data source include community demographics and social vulnerability.

Quantitative Data Analysis

Based on the academic literature on “place-based” assessments of disaster-prone regions, we employed data on a number of observable conditions from administrative data collection systems and quantitative measurement techniques to help explain differences in disaster impact, response, and recovery in Puerto Rico’s 78 municipalities. In particular, our goal was to explore the extent to which different levels of social vulnerability were associated with different levels of hurricane impact and, by combining the results of our quantitative analysis with data from our focus groups and interviews, explore how social vulnerability and hurricane impact were associated with different perceptions of response and recovery activities conducted by governmental and nongovernmental entities in a subset of Puerto Rico municipalities.

Creation of a Measure of Social Vulnerability by Municipality

We used statistical analysis to divide municipalities into three categories of social vulnerability (high, medium, low). The general statistical approach of statistically modeling what constitutes vulnerability using observed data on a range of different observed characteristics for a given location (e.g., latent variable modeling) that we employ is considered the benchmark approach in social science research on contextual indicators, including on social vulnerability and resilience. The specific latent measurement method of latent class analysis offers advantages of producing archetypes of communities. (For example, it captures archetypes by

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identifying what can be thought of as the most predominant interactions between indicator variables in the analysis.\(^8\)

Although analysts have already developed and make publicly available social vulnerability indexes for the continental United States, such as the Social Vulnerability Index,\(^9\) these measures are not available for Puerto Rico.\(^10\) Rather than simply replicate the Social Vulnerability Index but using data from Puerto Rico, we employed an alternative statistical methodology that is specifically designed to measure different types (e.g., archetypes) of communities. Although this measurement approach has similarities to those that have predominantly been employed, it offers the advantage of identifying different combinations of characteristics rather than a continuous range along the combination of the characteristics.\(^11\)

The variables in this analysis were seven social, economic, and demographic characteristics of municipalities commonly employed in vulnerability and resilience indexes: population density, percent poverty, percent elderly (age 65 and older), percent low education (less than ninth grade), unemployment rate, and median home value. With the exception of the unemployment rate, which comes from the Bureau of Labor Statistics,\(^12\) all data are from the ACS 2011–2016.\(^13\)

Creation of a Measure of Hurricane Damage by Municipality

We used data from an assessment of Puerto Rico’s posthurricane community conditions conducted by FEMA to develop a measure of hurricane-related damage by municipality. The damage score used for our impact analysis is a combination of three equally weighted variables: the portion of housing units in the municipality with a FEMA-verified loss between $5,000 and $25,000; the portion of housing units with a FEMA-verified loss greater than $25,000; and the


\(^{9}\) Cutter, Boruff, and Shirley, 2003.

\(^{10}\) Puerto Rico has a prior history of designating communities as *cummunidades especiales*, or “special communities”; however, they are not determined using a statistical measurement methodology such as we employ here.


percent of IA applications that are denied due to insufficient damage. Based on these scores, municipalities were divided into low, medium, and high levels of housing damage.\textsuperscript{14}

Estimating Hurricane-Related Displacement of Puerto Rican Communities: Capture/Recapture Approach

We used a capture/recapture approach to combine a pair of unique data sources on outmigrants to estimate outmigration rates in the wake of Hurricane Maria with a degree of geographic and sociodemographic specificity. Following any disaster, it is common for a portion of the affected population to be displaced. The magnitude of the displacement can have lasting impacts on the disaster region and can affect the region’s ability to recover.

Data limitations are a well-established impediment to studying disaster-related population displacement. For Puerto Rico, the issue of hurricane-related displacement is additionally complex because it has been experiencing a population decline for many years leading up to Hurricane Maria.\textsuperscript{15} We addressed this issue by using administrative records from two agencies serving individuals displaced by the disaster, FEMA IA data and administrative data from NYDIS. Both data sources contain individuals who were displaced by the hurricanes (including geographic information regarding the address of their residence prior to displacement), and we were able to quantify the number of individuals who were contained in both data sets using a capture/recapture approach.

The capture/recapture approach exploits the fact that the overlap between the two data sources can be quantified. That is, the total number of individuals who left the island is estimated by taking the product of the number of individuals that appear in the NYDIS data set with the number of individuals that appear in the IA data set and dividing by the number that appeared in both data sets.\textsuperscript{16} Similar calculations can be applied across specific municipalities to estimate displacement from the population of the corresponding municipality.

Quantitative Data Limitations

Our quantitative data are limited by the amount of data that can be measured, the population samples over which data can be collected, the granularity of the data, and our ability to validate the data used. Specifically, ACS data, though robust in the scope of characteristics measured, are collected over small samples, which makes estimation of characteristics at geographic levels

\textsuperscript{14} FEMA assessments of housing damage are employed as a proxy for overall built infrastructure damage caused by the hurricane. These data are derived from the FEMA property inspections (FEMA Individual Data Team, May 11, 2018), which consist of de-identified records on approximately 600,000 on-site home inspections that were performed poststorms and used to calculate FEMA verified loss (FVL).

\textsuperscript{15} In this report, we do not address internal displacement, which often occurs following a disaster.

below municipality infeasible. This hinders the utility of indexes of social vulnerability, as much of the variability in social vulnerability occurs below the municipality level. However, measurements of housing damage (which are based on insurance claims) are collected over a broader sample (all individuals reporting housing damage) but are much more limited in the range of information collected.

As such, it is difficult to establish the validity of the social vulnerability and housing damage indexes considered here, although the former has been used extensively in prior literature. Similarly, the NYDIS data were not collected over a large enough sample of outmigrants to facilitate estimation at the municipal level. In addition, those data are collected only for outmigrants to New York City, which may not necessarily be representative of all outmigrants to the continental United States. As with most quantitative data, measurement error, missing data, and other quality issues are of concern; however, sensitivity assessments of the measurement model and indicators suggest that those do not appear to be a substantial issue here.

As mentioned previously, the issue of hurricane-related displacement in Puerto Rico was additionally challenging because the population had been in decline for many years prior. As such, it is difficult to fully disentangle displacement caused by the hurricane from preexisting outmigration patterns, and there are limitations to our estimates of population displacement.

A key limitation to the capture/recapture approach that we use is that it assumes independence between the mechanisms that generate the two samples. This assumption cannot be fully validated in practice.

**Overcoming Challenges to Data Collection**

The study team recognizes the number of limitations in the qualitative and quantitative data collected; these limitations were often the result of multiple challenges faced during data collection. We attempted to anticipate potential challenges and worked to overcome them. For example, studies have shown that cultural, language, or perceived power differentials between outside researchers and historically oppressed populations can limit trust building and become barriers to effective community engagement.\(^\text{17}\) While the study team did not know whether the Puerto Rico context might present such challenges, we collaborated with local NGOs for the qualitative work to avoid this potential problem. Although these efforts were generally

successful, we were limited by the reach of the NGOs and the populations they serve, which were mainly residents of rural municipalities. However, we were able to connect with residents living in urban municipalities by working with a communications firm (Edelman Miami) that had more ties to urban areas in Puerto Rico.

Another data collection challenge we faced is that the particular type of community engagement activities conducted can unduly influence the type of information participants share. For example, when asked their perspectives on how they would overcome the impact of the hurricanes, we observed (post hoc) that participants in focus group settings frequently mentioned themes centered on community resiliency. By designing a format that gathered people together to think collectively about recovery solutions, views may have veered more toward community-minded needs and actions. To this point, one-on-one interviews also mentioned community resilience, but views tended to be more individualistic in nature and often emphasized the importance of identifying local leaders to guide communities out of despair. Employing a range of engagement strategies mitigated this challenge to some degree by providing various opportunities for people to highlight different perspectives. We also relied on quantitative information sources (described below) to supplement our findings. The mixed-methods approach allowed us to identify and compare a wider range of perspectives not easily attained through a single analytical approach.

Across all data collection tasks, timing presented a substantial challenge. As with any type of disaster research, posttest-only designs can limit the research’s ability to determine the degree to which the disaster affected individuals and communities.\(^\text{18}\) Although the Puerto Rico resident focus groups were conducted nearly nine months after Hurricane Maria made landfall, most participants were still concerned with immediate needs. As a result, the qualitative data provided relatively little information about residents’ thoughts about future preparedness. Conducting focus groups at a later date may have allowed more time for participants to recover from the immediate impact of the hurricane and to think about future needs, although our time frame for collecting data about future preparedness and long-term recovery is considered reasonable (i.e., six months postdisaster). In addition, the study team was under a deadline to provide inputs to the Recovery Plan, which was due to Congress on August 8, 2018. We do note that FEMA’s CPCB RSF remains heavily engaged in Puerto Rico and continues to identify recovery-centric data-collection opportunities.

Last, as with any disaster research project, we collected these data in an unpredictable and quickly evolving setting. At times, we needed to demonstrate agility to meet with participants when available and recognize that our requests for information at times corresponded with other time-sensitive requests. For example, the professionals and participants included in our data

expectedly endured many demands on their time, which affected their availability to provide input and/or decreased their ability to engage in research activities. When possible, the research team met participants where they were to adjust to busy schedules, often traveling across municipalities to conduct interviews in person (i.e., interviews, focus groups, community workshops, assessment of municipalities survey), scheduling phone sessions when possible, and rescheduling data-collection activities as needed.

Data and Methods Summary

The study team used a mixed methods approach to improve HSOAC’s understanding of and recovery and response issues in Puerto Rico before and after the disaster. The workshops, focus groups, interviews, and media analysis conducted to gather resident and SME perspectives enabled our team to gain a better understanding of underlying issues residents faced prior to and following the disaster. In addition, the information captured through outmigrant focus groups correlated well with the results of quantitative analyses we performed of resident displacement and outmigration. Using this combined approach allowed us to paint a more thorough picture of response and recovery challenges.

Additionally, as mentioned earlier, the focus groups and interviews were conducted in selected municipalities, most of which were highly vulnerable and seriously affected. Our quantitative results provided additional insight into the social vulnerability and additional displacement challenges faced by many of these communities. Through the use of mixed methods, we were able to better explore how this may have resulted in varied perceptions of response and recovery activities and better assess how communication might be improved during response and recovery.
In the previous chapter, we outlined the methods used in collecting and analyzing the qualitative and quantitative data utilized for the development of the Recovery Plan and specify the kinds of data used for each of the topics discussed. The following research questions are addressed in this chapter: What were the conditions of Puerto Rico’s communities before the hurricanes? How are different communities affected differently by the hurricanes?

This chapter describes our research findings in three sections: preexisting conditions (including the level of disaster preparedness, stresses that Puerto Rican communities faced, and social vulnerability among municipalities), hurricane impact (quantitatively assessing levels of damage and outmigration), and community perceptions and communication during response and recovery (qualitatively seeking outmigration perspectives, outlook on recovery, and the sources of information and level of trust among Puerto Rican communities).

Preexisting Conditions

Background on the Population of Puerto Rico

Overview of Community Demographics

The intersection of poverty, unaffordable housing (i.e., high housing costs relative to income), and high unemployment was the context for Puerto Rico’s communities as the hurricanes made landfall. These are among the social and demographic characteristics that have been used to define social vulnerability to disaster events.\(^1\) According to the ACS, prior to 2017, about 3.3 million people were living in Puerto Rico. About 75 percent of the population identifies as white, followed by those who identify as black (15 percent).\(^2\) Nearly all people living in Puerto Rico identify as Hispanic/Latino (99 percent). Among people aged 25 years and older, just under 75 percent have graduated from high school in Puerto Rico compared to 87 percent of the continental United States.\(^3\) Puerto Rico is multilingual—close to 95 percent of the population speaks Spanish, but 82 percent report speaking English at least moderately.\(^4\)

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\(^1\) Cutter, Boruff, and Shirley, 2003.
In terms of housing, about 70 percent of residents own their homes, and 35 percent of home owners with a mortgage have housing costs that are greater than 35 percent of their monthly household income. Among renters, the ACS indicates that 47 percent of residents have rental costs that are greater than 35 percent of their monthly household income. The rate of vacant housing units across Puerto Rico is high at 22 percent. In 2016, about 94 percent of residents were living in an urban area.

In 2017, among Puerto Rico residents 16 and older, 56 percent were not in the labor force, and 8 percent of those in the labor force were unemployed, which is approximately double the unemployment rate of the continental United States as of 2019. Nearly 40 percent of Puerto Rico’s households received Supplemental Nutrition Assistance Program benefits (food stamps) in 2017. Forty-five percent of Puerto Rico residents and 57 percent of children under 18 were living below the poverty level in 2017.

Puerto Rico’s Aging Population, Outmigration, and Economy

Over the past three decades, Puerto Rico’s population has transformed—from a primarily young, rapidly growing, and urbanizing population to an older population in which deaths outnumber births. These demographic changes have been driven by ongoing population losses that reflect a long-standing relationship between deteriorating labor market opportunities, declining childbearing, and outmigration for economic opportunity in the continental United States that shape current and future human capital for economic recovery (Dietz, 1986; Ayala and Bernabe, 2007).

In the span of approximately one generation, the age distribution of men and women has shifted from the pyramid shape of a relatively young and growing population (Figure 3.1, left side) to the rectangular shape of a rapidly aging population (Figure 3.1, right side). Two factors are responsible: a nearly twofold increase in outmigration to states in the United States (from a net migration of –1.5 percent of the total population in 1981 to –2.8 percent in 2012) and a halving of childbearing from 2.6 births per woman in 1980 to 1.3 in 2016 (compared with 1.8 in both years in the United States in total). Puerto Rico has one of the lowest fertility rates when compared to both the estimates for the United States in total and to other countries and territories worldwide, with only four countries reporting lower fertility than the island.

Migration out of Puerto Rico has outpaced migration into Puerto Rico from the continental United States since the onset of the Great Recession in about 2008, and the net loss of people has been accelerating.\textsuperscript{12} Even before Hurricane Maria hit, the postrecession migration wave had already become larger than the last great wave of migration (i.e., the Great Exodus of 1945–1960). Beyond the magnitude of the losses, the young age and relatively better socioeconomic composition of migrants leaving Puerto Rico have made this migration particularly costly.

Although much of the research on the consequences of Puerto Rico’s migration patterns argue that the territory has not experienced a “brain drain,” with more educated individuals leaving the island for better employment opportunities,\textsuperscript{13} these studies all employ data from 2010 and earlier. Unfortunately, more recent data from the U.S. Census Bureau demonstrate that the average education of migrants leaving Puerto Rico has exceeded that of the resident Puerto Rican population and (the relatively small number) of migrants coming to Puerto Rico.\textsuperscript{14} The continuing loss of people from Puerto Rico, particularly school-aged children and working


adults, has added further strain on its economy and created a shortage of professional workers in many sectors.

**Cumulative Community Stress**

The preexisting conditions that we discuss above contributed to stress on individuals in Puerto Rico, and the hurricane’s impact added an additional stress on residents already strained. Community cumulative stress can have a negative impact on community health and well-being, which, in turn, can influence individual health and well-being. There are three factors that are thought to build up stress within a community: (1) foundational issues, (2) chronic stress, and (3) acute shocks. Foundational issues are those that arise from the community context and can build up over generations. Foundational issues include structural stressors, such as inequality, residential segregation, and low trust in institutions. In contrast, chronic stressors stem from those foundational issues, and while they are not intergenerational, they do also build up over time. Chronic stress includes such stressors as community violence, isolation, and population loss. Finally, acute shocks include substantial environmental, economic, and political crises. When a community is experiencing an acute shock, such as a hurricane, foundational issues and chronic stress influence the community’s ability to respond to and recover from that shock.

Community stress can be measured by direct elicitation of information from populations of interest and/or gathering data from relevant sources about standard topics, such as income equality or infrastructure decline. For this effort, we fortunately were able to take advantage of direct elicitation on community members’ experiences, as described in the previous chapter. Current and former residents from Puerto Rican resident and outmigrant focus groups told us that a number of preexisting community-level stressors affected Puerto Rico’s response and recovery efforts, including five sources we identified as foundational issues and four we identified as sources of chronic stress.

Focus group participants identified five key foundational issues: (1) poor infrastructure, (2) a fragile economy, (3) poor governance/government corruption, (4) inequality, and (5) a lacking sense of community. Furthermore, they indicated that these were long-standing issues, and from their perspective, all had been affecting Puerto Rico prior to the landfall of Hurricane Maria. For example, residents shared that the power, water, transportation, health care, and communication systems were already in disrepair and falling apart prior to the landfall of Hurricane Maria. In addition, many participants discussed the challenging economic conditions as particularly stressful to them and to their communities. Some participants reported poor governance as another major community-level stressor. They complained about the lack of or inadequate public

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services. For example, roads were not fixed, and power lines were not serviced properly. These issues did not affect residents equally. Participants thought that rural and poor residents suffered disproportionately from community-level stressors. Finally, many participants expressed a sense of disengagement from their community. Many shared that community members did not work together to take care of their community.

Chronic stressors—including (1) the lack of an emergency preparedness/response system, (2) misinformation, and (3) outmigration to the continental United States—were related to the aforementioned foundational issues. Participants discussed a chaotic and insufficient emergency preparedness and response system that did not prepare community members adequately prior to Hurricane Maria. In addition, many participants reported that government officials have provided inconsistent information about when and how to prepare for hurricanes over the years. One focus group participant said, “[A] hurricane warning became a political circus that the leaders of the island used to make personal expression without considering the impact it could have on the island. Likewise, I have to say people minimized the effects of the hurricane because of all the misinformation that, for years, they’ve been given.” As a result, residents did not know whom to trust and what to do to prepare for emergencies. The combination of various foundational issues has resulted in an increase in outmigration to the continental United States, and this was described as a chronic stressor that disrupted families and larger societal structures. We discuss these issues in more detail in our analyses that follow.

These foundational issues and chronic stressors are, in many cases, interconnected. For example, Puerto Rico’s poor economic conditions and limited resources for infrastructure maintenance and improvement decreased the government’s ability to develop an effective emergency response system. The challenging preexisting conditions limited the island’s capacity to respond to and recover from Hurricane Maria effectively and efficiently and further exacerbated preexisting community stressors.

It is important to note that the generalizability of the information we gathered from the focus group participants is limited by the fact that participants were not representative of the island population. Our goal in this effort was to collect the perspectives from populations that were more vulnerable and less likely to be captured elsewhere; hence the island resident sample consisted of mostly Puerto Ricans living in more rural and poorer municipalities. However, we were not able to interview the most vulnerable segments of the population: children, older individuals, and individuals with disabling conditions (e.g., chronic illnesses). Information gathered from the focus group participants suggested that these individuals were disproportionately affected by community-level stressors and suffered the highest amount of trauma after the hurricane. To fully understand the influence of community-level stress on disaster response and recovery, the voices of the most vulnerable must be heard.
Residential and Municipal-Level Disaster Preparedness

As discussed in the section above, many communities and individuals were already dealing with multiple stressors when the hurricane made landfall. This may have also affected the overall level of preparation of individuals and municipalities. The Puerto Rico residents in our sample described a varied level of preparedness among themselves and other community members as Hurricane Maria approached. Most described stockpiling enough supplies and necessities for three to four days, while some described collecting water and food to last for weeks or even to share with neighbors. Still, others described themselves and neighbors as not preparing at all. This was often due to a disbelief that a highly destructive hurricane would actually hit. This misperception of risk is consistent with prior studies that demonstrate that residents often underestimate the threat of hurricanes and have biased beliefs that it would cause them any harm.¹⁶ A focus group participant describes why residents of Puerto Rico may have been underprepared:

We prepared like previous years. Like she said, we lived through George. The difference with George is that it didn’t hit the entire island. Everything happened so fast and we had forgotten. Every year it was the same thing. People would wait, and wait, and wait, and it would never hit us. Even though we tried to prepare, or not, we would have never been prepared for a hurricane of this magnitude because we’ve never lived through something like this.

Hurricane Maria illustrated just how much emergency responders must be prepared to assist the unprepared. Community members identified the elderly, those with medical conditions, and the poor, who lacked funds or social support for preparation, as groups with the lowest levels of preparedness coming into the hurricanes. Posthurricane, residents indicated that in the absence of a timely government emergency response, they took it upon themselves to help these members of the community.

Community responses about variations in levels of preparedness described above were additionally supported by mixed reports on the adequacy of plans, preparation, and disaster staffing at the municipal level. Based on the ICMA municipal assessment, nearly 93 percent of municipalities (71 of 76 municipalities that responded) reported having a disaster preparedness plan in place for the municipality prior to Hurricane Maria, but only 39 percent (28 of 71 municipalities) indicated that their plans were adequate for the 2017 hurricane season. Municipalities were also asked about the adequacy of specific disaster preparedness plan components in an open-ended format. Figure 3.2 presents the components mentioned by the municipalities that responded, and whether these components were adequately or inadequately implemented. Communications was the component most commonly cited as being inadequately

implemented \((n = 15)\). Respondents added that communications failures, including inadequate emergency backup systems and Internet service outages, affected other disaster preparedness plan operations and that preparations made did not adequately meet the scale of the hurricane’s destruction. Respondents also cited the inadequate availability and distribution of food and supplies \((n = 8)\), saying distribution had to be improvised since the originally planned buildings for food storage were damaged and that the quantity of supplies were insufficient. Respondents had mixed thoughts about disaster management and damage mitigation, with seven municipalities reporting inadequacy. They reported roads were not cleared in a timely manner and that shelters had sustained damage.

**Figure 3.2. Number of Municipalities Reporting Adequacy of the Implementation of Disaster Preparedness Plan Components**

![Figure 3.2](image_url)

**NOTE:** Source of data are municipal responses to open-ended questions in ICMA survey for which the themes were tallied; not all municipalities responded to open-ended questions.

**Social Vulnerability**

As the previous discussions of preparedness and community stress in Puerto Rico indicate, hazards often trigger underlying social, economic, and political conditions that create disaster risk. Socially vulnerable groups have fewer resources to prepare for, respond to, and recover from disaster and are more likely to live in areas exposed to high hazard. Thus, when a hazard strikes them, they are hit particularly hard.\(^{17}\) This led us to attempt to characterize Puerto Rican

\(^{17}\) Wisner et al., 2004.
municipalities by their level of social vulnerability using the quantitative, latent measurement methods described in Chapter Two and then assess the relationship of municipality social vulnerability prior to the recent hurricanes. As noted in Chapter Two, we used a range of characteristics—the key factors being percentage living in poverty and population density—to divide Puerto Rico’s 78 municipalities into three levels of social vulnerability.

Figure 3.3 shows the distribution of Puerto Rico municipalities by their predicted social vulnerability from Hurricanes Irma and Maria. Recall that a latent class analysis segmented municipalities into three classes on the basis of social vulnerability. The figure reveals that municipalities categorized as having a low level of social vulnerability (class 1)—that is, those that are affluent and densely populated—are clustered around the San Juan metropolitan area. By contrast, municipalities categorized as having a high level of social vulnerability (class 3)—those that are socioeconomically disadvantaged and least densely populated—are primarily clustered in the west-central region of the main island and also include two additional groups

![Figure 3.3. Puerto Rican Municipalities by Social Vulnerability Level](image)

**NOTE:** The map uses cross-hatching to indicate which of the municipalities were selected for focus groups and interviews.
of municipalities on the southwestern coast and southeastern coast. Municipalities with a medium level of social vulnerability (class 2) have a moderate socioeconomic disadvantage and intermediate population density. They are found in a cluster of municipalities in the northeast corner of Puerto Rico as well as along the coasts, in the islands of Culebra and Vieques, and in the central region of the main island proximal to the San Juan metropolitan area.

Cross-hatching is used to indicate the municipalities that were selected for our focus groups and interviews. We deliberately included focus group participants and interviewees from municipalities that were representative of all three classes of social vulnerability to assess differences with respect to perceptions of response and recovery efforts depending on the level of vulnerability associated with a municipality class.

Hurricane Impact on Communities

Hurricane Damage by Municipality

Having assessed preexisting social vulnerability by municipality, we then examined the geographic distribution of housing damage levels and evaluated whether there is evidence that more-vulnerable municipalities were differentially damaged by Hurricane Maria. For the analyses here, the damage index, which was described previously and is calculated on a per-house basis, was segmented into three groups (low, medium, and high) based on (approximate) terciles of the index.

Maria first made landfall in Puerto Rico in Yabucoa, and consistent with the hurricane’s path (Figure 3.4), the cluster of municipalities on the southeastern coast sustained the most damage of all municipalities. The subsequent path of the hurricane continued northwesterly across the island; however, the spatial pattern of damage across municipalities does not match this path. Instead, the pattern of damage substantially overlaps the distribution of social vulnerability. In addition to the group of municipalities on the southeastern coast (which are the most socioeconomically disadvantaged), the municipalities that sustained the most housing damage are located in the middle of the island and are also some of the most socioeconomically disadvantaged areas. This is illustrated in Figure 3.4, where higher levels of damage (levels 2 and 3) are apparent in more vulnerable areas located in the center of the island. It should be noted, however, that since these areas were initially more susceptible to damage, it is difficult to completely disentangle social vulnerability from storm exposure.

In contrast, the municipalities with the lowest damage included municipalities along the southwestern coast, which were furthest removed from the hurricane path. These municipalities also tended to be municipalities with more socioeconomic advantage.
**Outmigration and Population Displacement**

Outmigration

As we outlined in Chapter Two, we used the capture/recapture approach to estimate population displacement. Using our data sources, we estimated that 45,476 households were displaced, and those households were estimated to contain 96,563 individuals, indicating that 2.89 percent of the population of Puerto Rico was displaced in the wake of Hurricane Maria.

It is interesting to contrast our estimate with the one-year ACS estimate of outmigration for 2017, which was 97,488 persons. The main difference between the estimates is time frame. Our estimate captured moves observed over seven months (i.e., October–December 2017 and January–May 2018) and only included individuals whose departure from Puerto Rico were directly influenced by Hurricane Maria. By contrast, the ACS estimate captured moves over 12 months and included individuals displaced by the hurricane during October–December 2017, individuals who left Puerto Rico for other reasons during those months, and Puerto Rico residents...
who moved to U.S. states in the nine months prior to the hurricane. While our estimates for the number of displaced individuals by the hurricane and the rate of hurricane-related displacement were higher than all previous one-year ACS estimates of outmigration from Puerto Rico to U.S. states, we note that these figures were within the trajectory of increasing outmigration from Puerto Rico since the first one-year ACS estimation in 2005.

Outmigration Trends by Municipality

Figure 3.5 contains maps that illustrate prehurricane outmigration rates as well as hurricane-related displacement rates for each municipality. We used 2012–2016 ACS data to determine prehurricane outmigration rates. Prior to Hurricane Maria, rates of outmigration were highest in and around San Juan (4.0 percent) and on the southeast coast, whereas the rates were generally lowest toward the center of the island. A handful of other municipalities had higher outmigration rates than San Juan; however, due to the smaller population size of these municipalities, we could not distinguish with statistical certainty that the estimates were higher than that for San Juan.

**Figure 3.5. Maps by Municipality of Annual Rates of Outmigration During 2012–2016 (Top Panel) and Estimated Rates of Displacement Due to Hurricane Maria (Bottom Panel)**

![Maps showing outmigration rates and displacement due to Hurricane Maria](image)

NOTE: ACS Rate: American Community Survey Rate 2012–2016 Rate.

Hurricane-related displacement rates in San Juan were lower (2.5 percent) than the prehurricane outmigration rates. However, hurricane-related displacement exceeded prehurricane outmigration in most other municipalities, most distinctly in the southeast, such as Humacao (8.6 percent displacement vs. 2.5 percent prehurricane outmigration) and Arroyo (6.4 percent...
displacement vs. 3.0 percent prehurricane outmigration), as well as in the northwest, such as Isabel (5.7 percent displacement vs. 1.8 percent prehurricane outmigration) and Aguada (4.8 percent displacement vs. 0.7 percent prehurricane outmigration). Note that the path of Hurricane Maria’s eye was from the southeast to northwest of the island (see Figure 3.4), which to some degree parallels the areas where we see increased hurricane-related displacement.

Outmigration Trends by Social Vulnerability

To supplement our findings regarding displacement and outmigration rates within each municipality, we examined rates of prehurricane outmigration and hurricane-related displacement across the three municipality-based categories of social vulnerability. (Social vulnerability is the level of resilience a community has when confronted by an adverse event.) Results are shown in Table 3.1. We see a minimal effect of social vulnerability on the rates of displacement related to Hurricane Maria. Specifically, the rate of hurricane-related displacement was 2.65 percent in the least vulnerable municipalities compared to 2.88 percent in the most vulnerable municipalities (a difference that is not statistically significant). However, prehurricane outmigration rates were higher in the less vulnerable municipalities. For example, the prehurricane outmigration rate was 2.80 percent in the most vulnerable areas and 2.11 percent in the middle category of vulnerability (a difference that is statistically significant). As such, we see evidence that the preexisting trends in outmigration across levels of social vulnerability were not similarly observed in Hurricane Maria–related displacement patterns.

Table 3.1. Displacement and Prehurricane Outmigration Rates by Social Vulnerability and Damage Levels

<table>
<thead>
<tr>
<th>Social vulnerability</th>
<th>Population (2017 ACS)</th>
<th>Displaced (Number)</th>
<th>Rate of Displacement Due to Hurricane Maria (Percent)</th>
<th>Prehurricane Outmigration Rates (2012–2016 ACS, Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3,337,177</td>
<td>96,563</td>
<td>2.89</td>
<td>2.24</td>
</tr>
<tr>
<td>Low</td>
<td>1,214,767</td>
<td>32,156</td>
<td>2.65</td>
<td>2.80</td>
</tr>
<tr>
<td>Medium</td>
<td>1,527,950</td>
<td>45,531</td>
<td>2.98</td>
<td>1.83</td>
</tr>
<tr>
<td>High</td>
<td>594,460</td>
<td>17,124</td>
<td>2.88</td>
<td>2.11</td>
</tr>
<tr>
<td>Damage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>1,955,880</td>
<td>49,459</td>
<td>2.53</td>
<td>2.38</td>
</tr>
<tr>
<td>Medium</td>
<td>629,940</td>
<td>20,879</td>
<td>3.31</td>
<td>2.19</td>
</tr>
<tr>
<td>High</td>
<td>751,357</td>
<td>24,741</td>
<td>3.29</td>
<td>1.88</td>
</tr>
</tbody>
</table>

Outmigration Trends by Damage

We next considered rates of hurricane-related displacement and prehurricane outmigration across the three municipality-based levels of housing damage as outlined in Chapter Two; the results are also shown in Table 3.1. We found evidence that hurricane-related displacement rates were higher in areas with more housing damage. In particular, the rate of displacement was
2.53 percent in the least damaged municipalities, compared to 3.29 percent in the most damaged municipalities (a statistically significant difference). Moreover, we observed that this trend in higher migration reversed differences in outmigration between these municipalities that existed before the hurricane—that is, outmigration rates for 2012–2016 were 1.88 percent annually in the municipalities that subsequently became the least damaged and 2.38 percent in those that subsequently became the most damaged municipalities. Therefore, we can conclude with added rigor what had been indicated by the analyses of displacement by municipality: damage levels were a driver of displacement in the wake of Hurricane Maria.

Community Perceptions and Communication During Response and Recovery

Community Perceptions of Response and Recovery

Our quantitative analysis of outmigration data was intended to provide decisionmakers, emergency managers, and recovery planners with a deeper understanding of trends in Puerto Rico’s population flows. This information can then support efforts to design recovery processes, programs, and resource allocation plans to most effectively meet the future needs of the island’s residents. To gain a better understanding about the decisionmaking behind whether to leave Puerto Rico following the hurricane, we sought the direct input of residents and outmigrants themselves, through focus groups and interviews.

Why Outmigrants Have Not Returned to Puerto Rico

Focus groups with outmigrants in Florida suggest Puerto Rico residents left the island motivated by the promise of better jobs, health care, and education, which they hoped would be found outside of Puerto Rico. Answers by three different focus group participants to the question “Do you plan on staying here in Florida?” exemplify broader results.

A. Yes, I have nothing else to look for over there, whatever was left there is gone. Professionally, in our profession it doesn’t compare, we make three times the amount we made there. Also, our son is getting some health tests done here; he came out positive in one and just came out positive in another. So, they are running some tests, and here the treatment is covered completely, over there it’s $5K a month and it was an odyssey to have to ask for referrals, fighting with the doctors so they will give me referrals. One time we had to collect donations at my job to get his medications.

A. We want to be well, live well because it’s possible here. Here there is a future for children and for us. It is clear we need help from the government, but we don’t want to depend on it.
A. But I said mami, I am leaving, bought a ticket to Orlando. A few days later I find out that a university here is offering help. They offered me acceptance at St. Thomas University [in Miami], they offered me 2,500 dollars, room and board and all included to the university, I am studying here, I love it they include us in everything.

While we did not specifically ask participants whether they had planned to leave Puerto Rico prior to the storm, many of the motives cited above are often drivers for population mobility and likely correspond to reasons previous residents may have left the island. Future data-collection efforts may benefit from exploring whether the conditions left by the hurricanes hastened the already existing outmigration patterns or whether the storm displaced people who would not have left otherwise.

Recovery Outlook Among Puerto Rico Communities

Outmigrants we engaged with were ready to think about their hopes for the future and a better life in the continental United States. However, our data collection efforts in Puerto Rico suggest that, similar to circumstances following major natural disasters like Hurricane Katrina, many residents who remained were not yet prepared to think beyond immediate needs, even six to nine months after Hurricane Maria. We organized and tallied the number of immediate-response and long-term recovery themes discussed during focus groups and interviews conducted in Puerto Rico and found that the majority of themes centered on immediate needs and concerns regarding such issues as critical infrastructure damage, physical and psychological harm, how the hurricane affected Puerto Rico’s most vulnerable, the lack of preparation, and the lack of government capacity to adequately address residents’ needs. Participant comments mentioned issues associated with long-term impact, such as optimism or pessimism about the future, less frequently. Appendix B provides a table with the list of key themes and definitions from participant responses to illustrate what we determine to be the distinction between immediate and long-term recovery themes. Figure 3.6 displays the proportion of themes mentioned by participants during focus groups, interviews, and community walk-throughs in descending order. Red bars highlight immediate response-related themes. Recovery-centric themes are expressed in blue.

These findings suggest that disaster survivors need considerable time to deal with the impact of a natural disaster and tend to be less focused on talking about longer-term recovery when immediate response needs remain unfilled. This point is reinforced by the results of our analysis of focus group and interview responses (see Table 3.2). Community members discussed the provision of emergency relief supplies by government, NGO, local community, family,

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individual, and unnamed external providers more than any other response and recovery activity (51 percent). Emergency relief supplies were defined as the basic necessities of life (e.g., food, water, sheltering materials, fuel) provided to people in hurricane-affected areas who lack adequate supplies of these items or ready access to them and are in danger of physical harm if they do not obtain them in the near term. The definitions for the other activity categories were taken from FEMA’s listing of response and recovery core capabilities. Of these activities, enabling infrastructure systems and providing warning and information to the public came a distant second and third in terms of discussion topics, receiving 14 percent and 9 percent of total mentions, respectively. Activities associated with longer-term economic recovery comprised only 2 percent of mentions.

As part of our analysis, we sought to understand whether Puerto Rican perceptions of the response and recovery effort differed by location, type of response and recovery activity, and/or governmental and nongovernmental assistance provider and, if they did, what contextual factors might be associated with these differences. Although anecdotal evidence suggested that certain communities on the island were more heavily affected than others, in particular people living in

## Table 3.2. Number of Response and Recovery Activity Mentions by Activity Provider

<table>
<thead>
<tr>
<th>Response and Recovery Activity</th>
<th>Government</th>
<th>NGO</th>
<th>Community Family Individual</th>
<th>Unknown</th>
<th>External Agency</th>
<th>No. of Activity Mentions Across Provider Types</th>
<th>Percent of Activity Mentions Across Provider Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning and providing information to public</td>
<td>24</td>
<td>2</td>
<td>12</td>
<td>11</td>
<td>8</td>
<td>57</td>
<td>9</td>
</tr>
<tr>
<td>Providing critical transportation</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>Enabling infrastructure systems</td>
<td>42</td>
<td>4</td>
<td>3</td>
<td>29</td>
<td>9</td>
<td>87</td>
<td>14</td>
</tr>
<tr>
<td>Conducting search and rescue</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Provision of security, protection, and law enforcement</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Provision of emergency medical services</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>15</td>
<td>31</td>
<td>5</td>
</tr>
<tr>
<td>Provision of emergency relief supplies</td>
<td>103</td>
<td>63</td>
<td>67</td>
<td>22</td>
<td>74</td>
<td>329</td>
<td>51</td>
</tr>
<tr>
<td>Economic recovery****</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Provision of health and social services</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Providing/helping with housing</td>
<td>30</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>41</td>
<td>6</td>
</tr>
<tr>
<td>Other type of R/R activity</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>18</td>
<td>3</td>
<td>47</td>
<td>7</td>
</tr>
<tr>
<td><strong>No. of activity mentions by provider type</strong></td>
<td><strong>241</strong></td>
<td><strong>92</strong></td>
<td><strong>99</strong></td>
<td><strong>96</strong></td>
<td><strong>114</strong></td>
<td><strong>642</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Percent of activity mentions by provider type</strong></td>
<td><strong>38</strong></td>
<td><strong>14</strong></td>
<td><strong>15</strong></td>
<td><strong>15</strong></td>
<td><strong>18</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES: * Response or recovery activity was either primarily conducted by members of the respondent's local community (e.g., rural village or urban neighborhood), family, or by him- or herself with minimal or no assistance from government agencies or NGOs.

** This category includes activity mentions where the respondent was unclear about the type of organization, group, or individual that conducted the response or recovery activity or, if not conducted, whose responsibility they believed it was to carry out the activity.

*** Response or recovery activity conducted by organizations or entities from outside the community where it is unclear whether the organizations referred to are governmental agencies, NGOs, or both.

**** Response or recovery activity focused on the return of economy and business (including food and agriculture) to a healthy state and the development of new business and employment opportunities that result in an economically viable community.
areas in the mountainous interior of the island where economic disadvantage was predominant, there was limited research that looked at whether perceptions differed depending on geography and socioeconomic status. We found that they did. Using quantitative data and techniques to assess municipal-level social conditions and qualitative means to understand community perceptions of disaster response and recovery activities, we discovered that residents in more rural and poorer areas discussed issues related to near-term survival more than they did issues related to longer-term recovery. For example, provision of emergency relief supplies was discussed the most frequently in municipalities with the highest level of social vulnerability (see Table 3.3).

### Table 3.3. Mentions of Provision of Emergency Relief Supplies and Other Response and Recovery Activities by Level of Social Vulnerability

<table>
<thead>
<tr>
<th>Social Vulnerability</th>
<th>Mentions of Provision of Emergency Relief Supplies</th>
<th>Overall Response and Recovery Activity Mentions</th>
<th>Percent of Total Mentions Represented by Provision of Emergency Relief Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>11</td>
<td>47</td>
<td>23</td>
</tr>
<tr>
<td>Medium</td>
<td>173</td>
<td>382</td>
<td>45</td>
</tr>
<tr>
<td>High</td>
<td>145</td>
<td>213</td>
<td>68</td>
</tr>
</tbody>
</table>

As a focus group member from one of these municipalities, Lajas, remarked:

> The lack of communication channels is what elevated the levels of desperation. Not knowing what to do, and being told no to the things we needed, and the possibility of things running out. There were people without gas. I even witnessed two people in their cars and they were about to attack each other if the police hadn’t arrived to stop them.

Community walks through an isolated mountain region revealed that the rural hurricane survivors often relied on self-initiated activities to meet their needs. Local residents identified some creative (though not always optimal) ideas to overcome adversity:

> The electric company eventually came but they only dropped off the poles and didn’t come back for months. The community grew so frustrated that they all pooled their resources and hired a private electric company to install the poles in the ground.

> The community should identify needs and plan. For example, a volunteer to read to illiterate people how to cook MREs . . . and a mechanism for the community to take photos and provide “pins” to downed poles or other issues needed to be reported.

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In terms of response and recovery providers, respondents in all geographic locations and socioeconomic statuses mentioned government agencies about twice as often as other initiators of these activities. Overall, perceptions were somewhat more positive than negative. Although they saw government as the most important player in response and recovery efforts, *Puerto Rico* residents who participated in the focus groups and interviews we analyzed were more favorably disposed toward NGO and local community-based activities, as well as unidentified external agencies (see Table 3.4).

**Table 3.4. Overall Perceptions of Response and Recovery Activities by Activity Provider**

<table>
<thead>
<tr>
<th>Activity Provider</th>
<th>Positive</th>
<th>Negative</th>
<th>Mixed</th>
<th>None</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>57 (24%)</td>
<td>151 (63%)</td>
<td>21 (9%)</td>
<td>12 (5%)</td>
<td>241 (38%)</td>
</tr>
<tr>
<td>NGO</td>
<td>64 (70%)</td>
<td>16 (17%)</td>
<td>6 (7%)</td>
<td>6 (7%)</td>
<td>92 (14%)</td>
</tr>
<tr>
<td>Community/family/individual</td>
<td>85 (86%)</td>
<td>8 (8%)</td>
<td>5 (5%)</td>
<td>1 (1%)</td>
<td>99 (15%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>16 (17%)</td>
<td>63 (66%)</td>
<td>13 (14%)</td>
<td>4 (4%)</td>
<td>96 (15%)</td>
</tr>
<tr>
<td>External agency</td>
<td>79 (69%)</td>
<td>21 (18%)</td>
<td>11 (10%)</td>
<td>3 (3%)</td>
<td>114 (18%)</td>
</tr>
<tr>
<td>All activity providers</td>
<td>301 (47%)</td>
<td>259 (40%)</td>
<td>56 (9%)</td>
<td>26 (4%)</td>
<td>642 (100%)</td>
</tr>
</tbody>
</table>

In a breakdown analysis of our focus group and interview data by the level of social vulnerability, Table 3.5 shows that NGO-initiated response and recovery activities were viewed more positively in municipalities with the highest level of social vulnerability. For example, a focus group participant from the municipality of Utuado credited international and community-based NGOs for providing and distributing relief supplies to the Puerto Rican countryside, which had been “totally cut off” by the hurricanes. An interviewee from Yabucoa stated that Save the Children, the Red Cross, and an unnamed NGO had helped community members to replace the roofs of their houses.

**Table 3.5. Perceptions of Nongovernmental Organization Response and Recovery Activities by Level of Social Vulnerability**

<table>
<thead>
<tr>
<th>Social Vulnerability</th>
<th>Positive</th>
<th>Negative</th>
<th>Mixed</th>
<th>None</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2 (20%)</td>
<td>6 (60%)</td>
<td>1 (10%)</td>
<td>1 (10%)</td>
<td>10 (11%)</td>
</tr>
<tr>
<td>Medium</td>
<td>38 (75%)</td>
<td>6 (12%)</td>
<td>4 (8%)</td>
<td>3 (6%)</td>
<td>51 (55%)</td>
</tr>
<tr>
<td>High</td>
<td>24 (77%)</td>
<td>4 (13%)</td>
<td>1 (3%)</td>
<td>2 (6%)</td>
<td>31 (34%)</td>
</tr>
<tr>
<td>All respondents</td>
<td>64 (70%)</td>
<td>16 (17%)</td>
<td>6 (7%)</td>
<td>6 (7%)</td>
<td>92 (100%)</td>
</tr>
</tbody>
</table>
Compared to residents in more socially vulnerable areas, **people in less socially vulnerable areas commented on a wider range of response and recovery activities, were more apt to mention the government as the primary purveyor of assistance, and were more critical of governmental disaster agencies.** In Caguas, for example, a focus group participant lamented the “lack of leadership and collapse of the government” in the aftermath of Hurricane Maria. A San Juan resident who was interviewed faulted the government for “allowing development in bad areas . . . around shores and flood zones.”

The interests and perceptions of those living in areas that were more heavily damaged by the 2017 hurricanes mostly aligned with those residing in disadvantaged areas—as did the interests and perceptions of people in more prosperous and less affected areas. For example, the provision of emergency relief supplies was discussed more frequently in more socially vulnerable municipalities than in less vulnerable municipalities at all levels of damage (see Table 3.6). This adds further support to the notion that more-vulnerable communities were disproportionately affected and that such communities require relatively more assistance in preparing for and recovering from disasters.

**Table 3.6. Emergency Relief Supply Mentions by Social Vulnerability and Damage Level**

<table>
<thead>
<tr>
<th>Social Vulnerability</th>
<th>Provision of Emergency Relief Supplies: Percentage of Activity Mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Damage</td>
</tr>
<tr>
<td>Low</td>
<td>11 of 47 (23%)</td>
</tr>
<tr>
<td>Medium</td>
<td>66 of 127 (52%)</td>
</tr>
<tr>
<td>High</td>
<td>31 of 42 (74%)</td>
</tr>
</tbody>
</table>

The perceptions of those in socially vulnerable municipalities were also largely more positive about response and recovery activities at higher levels of hurricane damage (see Table 3.7). For example, a focus group participant from a high-vulnerability, high-damage municipality opined:

Patillas is one of the towns that, maybe amongst all towns, has been one of the most organized and the one whose community leaders have given all their time. They’ve worked through floods, rain . . . I think we have to thank God for that.

**Preferred Information Sources, Trust, and Communication During Recovery and Response**

Information Sources and Trust Among Puerto Rican Communities

In addition to analyzing perceptions surrounding the response and recovery process, we explored residents’ preferences for certain information sources, media channels, topics in the media, and emerging narratives in resident focus groups, individual interviews, media analysis, and in community workshops. We also examined the issue of trust with respect to receiving information. Effective communication remains essential in the recovery phase posthurricanes,
for both short-term recovery and long-term resilience building. Fran H. Norris et al. (2008) first conceptualized the core components of community resilience in their framework consisting of (1) community competence, (2) economic development, (3) information and communication, and (4) social capital. They recognize the importance of communication in community resilience, and subsequent frameworks also adopted this approach. Information and communication capacity are constituted by responsible media, narratives, skills and infrastructure, and trusted sources of information. During data analysis, challenges and opportunities emerged surrounding information and communication capacity. This component of resiliency remains important for moving into the long-term recovery phase for individuals and municipalities.

Preferences for Sources of information

As mentioned, government agencies are viewed as initiators of response and recovery activities, but residents did not report viewing the government as a preferred source for information throughout the hurricanes. Understanding how residents choose to gather

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Table 3.7. Perceptions of Response and Recovery Activities by Social Vulnerability and Damage Level

<table>
<thead>
<tr>
<th>Social Vulnerability</th>
<th>Total</th>
<th>Positive</th>
<th>Negative</th>
<th>Mixed</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Damage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>47</td>
<td>6 (13%)</td>
<td>36 (77%)</td>
<td>2 (4%)</td>
<td>3 (6%)</td>
</tr>
<tr>
<td>Medium</td>
<td>127</td>
<td>52 (41%)</td>
<td>50 (39%)</td>
<td>20 (16%)</td>
<td>5 (4%)</td>
</tr>
<tr>
<td>High</td>
<td>42</td>
<td>26 (62%)</td>
<td>11 (26%)</td>
<td>3 (7%)</td>
<td>2 (5%)</td>
</tr>
</tbody>
</table>

Medium Damage

<table>
<thead>
<tr>
<th>Social Vulnerability</th>
<th>Total</th>
<th>Positive</th>
<th>Negative</th>
<th>Mixed</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>68</td>
<td>29 (43%)</td>
<td>31 (46%)</td>
<td>5 (7%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>High</td>
<td>11</td>
<td>2 (18%)</td>
<td>9 (82%)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

High Damage

<table>
<thead>
<tr>
<th>Social Vulnerability</th>
<th>Total</th>
<th>Positive</th>
<th>Negative</th>
<th>Mixed</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>185</td>
<td>96 (52%)</td>
<td>66 (36%)</td>
<td>18 (10%)</td>
<td>5 (3%)</td>
</tr>
<tr>
<td>High</td>
<td>160</td>
<td>90 (56%)</td>
<td>56 (35%)</td>
<td>8 (5%)</td>
<td>6 (4%)</td>
</tr>
</tbody>
</table>
information can be helpful for developing best practices for distributing information throughout the crisis life cycle (i.e., before, during, and after the hurricanes). As residents discussed sources of information after the hurricanes, most relied on faith-based organizations, NGOs, community, family, and individuals (including community leaders) as being the primary conduits for updates. Residents expressed their dissatisfaction with various levels of government. For example, residents shared the following:

Look, I’m going to use the most cliché phrase that’s been used throughout the event: we knew it as coming but we didn’t know it was going to be that big. The problem was the information that the government provided and has been providing during this time. A hurricane warning became a political circus that the leaders of the island used to make personal expression without considering the impact it would have on the island. Likewise, I have to say that I was working directly in the event and people minimized the effects of the hurricane because of all the misinformation that, for years, they’ve been given. (Guayama)

I think we need to prepare the leaders to announce the news, and not take the government for granted like our colleague says. We sit and wait for the government to give us everything, which isn’t the way it should be. I’m the government. He’s the government. We’re all the government. So I have to govern well in my house, my community and after that in my job, because the thing with this is that they give you so many documents, but they don’t follow up on anything here. (Lares)

Maybe one thing if you’re going to prepare some kind of report, the worst kind of message is the one a liar tells you, because you don’t believe it. Even if it’s true, you don’t believe it. Don’t take it the wrong way, because all of the parties are the same, but for weather events, whatever kind, the least suitable person to send out the message is the government, because no one believes them anymore. (Orocovis)

What happens is everything’s collecting dust and it never arrives to the organizations or nonprofits or churches. I think the government has failed on many things in terms of information—communicating the information. (Patillas)

Another resident from Guayanilla believed NGOs were critical in the immediate recovery, as “those are the ones who have really worked. Based on my experience, they were the first ones who went out in the streets.” Named NGOs included the Red Cross, Acción Social, Washington and AmeriCorps agencies, Samaritan’s Purse, and Esperanza Center, among others. However, many residents discussed NGOs and nonprofits in the context of being “volunteer groups” and in some cases did not provide more details about organizational affiliations. Overall, residents across municipalities cited pastors and/or priests as being essential spokespeople throughout the crisis life cycle. NGOs closely followed as an important source of information as they distributed services and resources. Finally, community, family, and individuals were noted as important sources of information. With mass media sources unavailable, residents relied on personal networks to spread messages and seek and deliver news.
Media Channels

Most means of communication were unusable immediately after the hurricanes due to severely damaged infrastructure and a lack of electricity. Expectedly, as residents discussed access to communication following the hurricanes, discussion highlighted the inadequate infrastructure that impeded their ability to get in touch with others in Puerto Rico and beyond. After the hurricanes, residents lost access to all mass communication channels except for the handful of radio stations that managed to keep broadcasting.

Following the storm, the only channels available to coordinate recovery included the radio, emergency responders and/or community leaders with walkie-talkies, satellite phones, vehicles equipped with an external speaker, bulletin boards in public areas, or word-of-mouth networks. Community members did discuss some infrastructure that functioned during the response and recovery phases. WAPA 680 AM radio was mentioned by name frequently during the focus groups and during community workshops and served as an essential connection following Hurricane Maria. The radio station is an affiliate of the CNN en Español radio news network. A Patillas resident reported that WAPA stayed on the air after the hurricanes and became Puerto Rico’s lifeline. Broadcasters would even read notes from those that could call in if they were looking for someone. Residents heard WAPA throughout the island after the hurricanes, but we did not confirm that the station was accessible in each municipality individually.

Community workshop participants provided greater details on “recommended” media sources, with some of the highest endorsed channels and sources including (1) CNN en Español, (2) WKAQ 580 AM, (3) WAPA Radio 680 AM, (4) Catolica Radio FM, (5) Facebook, and (6) El Nuevo Día (newspaper). Workshop participants in San Juan shared that the recommended sources “put the necessary information and do not alarm” and that they were “accessible” at various points during and after the disaster. Summary notes from the Ponce workshop also listed WAPA and WKAQ as top choices for their relevance and trustworthiness. Deborah Martorell, a journalist and meteorologist, was also recommended by community workshop participants as a trusted source of information. Community workshop participants provided fewer details to media sources they “do not recommend,” with some of the results including (1) Mega 106.9 FM, (2) Instagram, (3) Snapchat, and (4) El Nuevo Día. In some cases, workshop participants did not have enough time to discuss reasons behind their reticence for media sources because this was one of the later questions in the exercise. However, even without this qualitative information, participants successfully completed detailed rankings of media sources by indicating which sources they knew, would recommend, and would not recommend.

Information Topics

The media analysis of top-tier English- and Spanish-language outlets published between February 1, 2018, and April 24, 2018, in the United States and Puerto Rico provided a snapshot of the types of most important recovery topics to several audience groups. For example, outlining the most frequently covered topics and issues can point to potential opportunities for addressing
information needs. This brief snapshot of the media landscape suggests avenues for types of recovery topics most important for the general public (including the general population throughout Puerto Rico and its municipalities), vulnerable populations, and outmigrants.

Core issues of relevance for the general public included (1) inadequate preparation efforts at the community level, (2) inadequate recovery coordination or strategy, (3) prolonged lack of electricity, and (4) declining physical and mental health. The perceived lack of preparation efforts at the community level was often discussed in conjunction with stories about individual families that prepared their own stockpiles and home security measures. Relatedly, reviewed media suggested a theme related to inadequate recovery coordination or strategy. Decisionmakers are described as not having a clear vision for deciding priorities for recovery. Next, the prolonged lack of electricity was described as taking tolls on economic and social aspects of life in Puerto Rico. This was discussed frequently as thousands of residents remained without electricity for months after the hurricane. Finally, as the hurricane destabilized day-to-day routines and disrupted the lives of residents, many experienced physical and mental health challenges. A key theme highlighted in the media was the increased death tolls of those with health conditions that were left unmet, in addition to the rising suicide rate.

Vulnerable populations face additional challenges to those mentioned above, and media analysis suggests that other topics of interest include (1) access to critical medical care, (2) access to central distribution centers, and (3) directions for caretakers. Residents in need of medical care (such as dialysis) or medication could not access essential services resulting in poorer health outcomes. Leveraging a centralized resource center for information about where those in need can access health care (i.e., a website or flier that describes any health pop-ups available) would be essential to help connect vulnerable groups to care. Further, barriers to accessing central distribution centers could make receiving care even more challenging for residents of rural or isolated municipalities. Finally, caretakers and their families were affected both economically and mentally due to their inability to access patients. Patients also were separated from caretakers they rely on for essential care.

Media related to outmigrants focus on (1) the strain on Puerto Rico’s economy, (2) lack of local health care, and (3) a general negative outlook and lack of information about recovery. The strain on the economy led to young families and working professionals to seek better job opportunities in the continental United States. Some Puerto Ricans may have left to acquire health care or disability services. Last, the news surrounding outmigrants highlighted negative aspects of the recovery efforts and urged outmigrants to remain in the continental United States.

While this media analysis is not exhaustive, reviewing a subset of articles provides context for the tone and topics of interest across groups. Understanding the topical needs of various audiences can help communicators to achieve their desired impact on them. Media analysis is iterative and needs to be updated in real time, but collecting snapshots from points throughout the recovery process can document shifting information needs and help chart a path for strategic communication efforts.
Narrative Landscape

Aside from examining recovery topics discussed in English- and Spanish-language outlets, we analyzed interview and focus group content for the presence of prospective or retrospective narratives. Narratives include stories shared by participants that collectively depict the worldview of residents. For example, prospective narratives could touch on residents framing themselves or affiliated communities as survivors, triumphant, and/or rising to the challenge of recovery. Retrospective narratives might frame residents as defeated, downtrodden, or fearful. Capturing the narrative landscape can point to the shared experience of residents and provide perspective for how a disaster is perceived and interpreted.

Residents shared examples of communities working together after the hurricanes to repair damage, feelings of unity, and a desire to contribute to Puerto Rico’s recovery. We found prospective narratives most frequently in stories shared by Puerto Rican residents, when compared to those on the continental United States (e.g., SMEs and outmigrants) and concentrated in transcripts of rural (93.1 percent of total code applications) and interior participants (63.7 percent of total code applications). For example, residents shared the following:

The best agent of change is all of us. When all the sectors in a community unify, they change the history of the community. That has always been my message and that’s where we collaborate. We have created a directory of resources because within the community we have carpenters, builders, plumbers, etc. We have people with equipment who can help clear the roads. There’s a bank of resources and that’s the most valuable currency we can have, the people. Really, we’re the ones who will see Puerto Rico through. Whatever comes from the outside is just mere aid, but we’re the ones who will make Puerto Rico rise above. It’s our attitude and actions. (Naranjito)

Well, apart from all of the negatives that it might have brought, this hurricane has brought lots of positives. We’ve learned to give a helping hand, to show solidarity to one another. We’ve learned not to see others as enemies, as strangers, rather as brothers, my neighbor, and, “Let’s work together. Let’s go and clear the roads. Let’s go and clear the rubble. Let’s go and help.” I saw a lot of solidarity. I saw a lot of togetherness. I saw a lot of acceptance. I’m talking about here in Loiza. Maybe one sector that doesn’t go to another sector due to whatever differences there may be, well I saw families from one sector going to take refuge in the home of another family who lived in the other sector. And that had an impact on me, because often there aren’t good relations between one sector and another. And even though they’re relatives; but I’ve seen it too, I’ve experienced it with neighbors too. That’s the way it is, and seeing the moment where people have come together, they’ve put their differences aside, well that means a lot to me. And nationally, not just in Loiza, but nationally as well, I’ve seen that, the solidarity, the support and values that maybe we’d lost, and that we managed to recover, and that’s all thanks to Maria. (Loiza)

Well, I can say that I believe there is something called unity, and if the government is not accessible, then the people have to come together, and we can then begin to contribute with whatever we can do. I can’t depend on the mayor or
the governor to help me in my home. I have to act, even with the limitations that I have. I think that unity is strength. Especially when a community comes together. You contribute this, you contribute that, a little bit here, a little bit there. Between everyone, help can be provided until the governmental aid from the US or anywhere else arrives. We can’t be sitting down, crying, and hoping that government will resolve this for us. We will come together. We will understand that we are a country and I think that in that sense I can help my neighbor and not be selfish. I have to say, “I can help you,” or that neighbor tell me in what way I can help someone else. I believe that when we come together, we can begin to see the light at the end of the tunnel. (Rio Grande)

Alternatively, residents also discussed retrospective narratives about defeat, a chaotic response and recovery, and skepticism about disaster preparedness. With such profound and devastating impacts to individuals, families, and communities on the island, an equal number of retrospective stories (when compared to the number of prospective stories) suggest a duality of worldviews. Overall, residents expressed pervasive uncertainty surrounding what will happen in the future and how the island will improve. Retrospective narratives were most common in stories shared by Puerto Rican residents when compared to stories share by those on the continental United States (e.g., SMEs and outmigrants). Retrospective stories were also more concentrated in the narratives of participants residing in rural areas (92.3 percent of total code applications). On the other hand, interior and coastal municipalities more equally shared instances of retrospective stories (42.3 percent and 57.7 percent, respectively). Examples of retrospective narratives include the following:

People, me, the majority, I don’t know how I managed. We were really beaten, really down. You think it and you don’t want say it—thank God the priest isn’t here—you say, “Why is God doing this to me? What happened? What have we done?” because as everyone knows, this was all across the island. (Maricao)

And the biggest effect of the hurricane I think is the desperation you feel because you think nothing will get better. You see all these millions of dollars come and they disappear just like that and everything’s the same, people are still left to fend for themselves, and we see that they keep sending more millions and more money, and where are those claims? And yeah, more federal funds for this and with the power, after so long, if you look at how much money they’ve spent on the recovery and reconnecting the power, people are saying that with what they’ve spent we could have built a new power grid. And I think that’s one of the problems we’re going to continue seeing if they don’t start taking the communities and the people into consideration, because the budgets, lots of organizations, NGOs, non-profits that receive so much money, well that money disappears, on the supervisors, on this guy, but it never gets where it needs to go. It never gets to the people, to the farmers who are suffering, who are struggling every day, building as best they can. (Orocovis)

Right now, all there is a collective frustration, except for sport once in a while. There was no way for us to prepare and the only thing the State gives you is a list of telephone numbers, and we don’t realize they don’t work when the communications are knocked out. I don’t need 911 or 123 if I don’t have a
phone. The Federal Emergency Management Agency already told me 80 times, “We weren’t prepared for this.” So, any plan we might have had before, I didn’t think this could have been this bad. I thought it would be an inconvenience. But now I think that we have to deal with our response processes ourselves, adapt to the specific situation, because I don’t . . . It’s the irony of going out now. It didn’t bother me before. Now I go out and I see the Tsunami Route signs and they say, “Go this way in the event of an earthquake,” but I get to thinking, “Well, I prepared for a hurricane, escape route, meeting point.” That doesn’t work because all of the posts are on the ground, there wasn’t a route and there was no meeting point. It doesn’t exist. That doesn’t work. (Loiza)

Ideally, strategic communication initiatives should be tailored to the worldviews of their audiences. While some residents are ready to rebuild Puerto Rico, others are still focused on what went wrong. Most residents desire an acknowledgment of what happened and the current reality on the ground. Further, residents seek validation that they have suffered in the aftermath of the hurricanes and, in some cases, are still suffering. While it could be expected that some municipalities (e.g., rural or interior communities) might have more retrospective narratives suggesting greater trauma, we did not find noticeable differences across the municipalities related to narrative types.

Trust

Residents shared an overwhelming amount of distrust for local and federal government agencies. Frustration with slow-moving recovery and a lack of transparency in government decisions were two commonly cited reasons. Yet another reason cited was the lack of sincere government efforts to reach out to communities in need. In Barranquitas, a resident recounts meeting with the mayor and “never had any results, we only had to wait.” Another resident in Cayey found that municipality officials “forgot about [them],” and an individual from Guayama suggests that mayors “forgot to attend to the emergency” following Hurricane Irma. A resident of Loiza stated that politicians did not volunteer after the disaster to help their communities, but rather local officials went to municipalities “because of politics” (e.g., to be seen during the response). In other words, “the least suitable person to send out the message is the government, because no one believes them anymore.” An interview with one SME supported these views:

The key is engagement, that’s a very long and slow process. There is mistrust between some groups of residents and governmental response organizations like FEMA. FEMA says disaster response uses whole community approach—but in marginalized communities many feel saying “whole community” excludes them. Need engagement with marginalized communities in planning process.

An additional challenge included the perception that for-profit contractors had been hired “from outside the island” by the federal government to support response and recovery. One resident said that contractors would hire subcontractors, sometimes with million-dollar or more contracts, and it was very hard to follow spending and formal responsibilities. A community member in Orocovis supported this perception, noting that there were “so many really strange
organizations, where you don’t really know what’s behind each of them, and they came to tell you, because they were here to help, but we really didn’t know.” Another participant from Guayanilla shared the following:

I can tell you that the ones who have supported the community the most, have been the non-profit organizations. . . . Based on my experience, they were the first ones who went out in the streets. The non-profit organizations and people who don’t belong to any organization or government agency. Individuals, they got motivated. They got organized and have wanted to help and make a difference. The agencies have been a bit lazy. When it’s time to respond to emergencies, they have even been insensitive.

Outside of the data collected in resident focus groups, individual interviews, and in community workshops, we learned via the ICMA assessment of municipalities that respondents emphasized the value of reaching into the community to establish trust and gain a better understanding of conditions on the ground. For example, almost 40 percent of local government officials listed improving communication and 32 percent listed encouraging community participation as a priority for improving community engagement (see Figure 3.7). A particular point of emphasis during the recovery process is planning when and how to engage with residents affected by disasters and ensuring that vulnerable populations are included in risk and crisis communication plans.

![Figure 3.7. Municipal Staff Community Engagement Priorities](image)

**Figure 3.7. Municipal Staff Community Engagement Priorities**

<table>
<thead>
<tr>
<th>Priority</th>
<th>Percent of Municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve communication</td>
<td>38.5%</td>
</tr>
<tr>
<td>Encourage community participation</td>
<td>32.1%</td>
</tr>
<tr>
<td>Increase services, improve infrastructure</td>
<td>25.6%</td>
</tr>
<tr>
<td>Offer education/training/resources</td>
<td>19.2%</td>
</tr>
<tr>
<td>Community development</td>
<td>14.3%</td>
</tr>
<tr>
<td>Empower local/community leaders</td>
<td>11.5%</td>
</tr>
<tr>
<td>No change/no plan</td>
<td>11.3%</td>
</tr>
</tbody>
</table>

SOURCE: Municipal responses to open-ended questions in ICMA survey for which the themes were tallied; respondents could provide answers that span up to three categories.

In the following section, we consolidate our findings into conclusions and discuss how this work tied into our proposed COAs.
Conclusions

Based on the findings above, we offer several conclusions that have implications for disaster response and recovery in Puerto Rico and that influenced the development of the COAs described in Chapter Four, particularly those having to do with community-focused emergency preparedness, improved public communications, coordinated recovery planning, and engagement with NGOs.

Disaster recovery efforts are likely to be more effective if they are attuned to the needs and perspectives of particular communities.

Governmental and nongovernmental disaster response and recovery organizations need to keep in mind that populations most in need after a catastrophic event tend to be relatively poor, less educated, (possibly) less fluent in English, and often reside in areas outside of major urban centers, making them harder to reach and engage. Thus, a concerted effort must be made to ensure that socially vulnerable communities get a share of pre- and postdisaster assistance that reflects their relatively greater requirements. That said, poor people living in rural areas are used to privation and fending for themselves, and they take pride in community efforts to take care of one another. Thus, grassroots efforts to help disadvantaged communities prepare for future disasters could be quite effective, given sufficient resources and understanding of local needs.

Although those affected by natural disasters tend to look to the government for response and recovery assistance, NGOs may have better ability to connect with people at the local level and satisfy their requirements. Thus, besides taking extra steps to strengthen their contributions, government agencies should coordinate more effectively with NGOs with local knowledge and connections and bolster the latter’s capabilities to sponsor disaster activities that directly affect people. Such an effort would prove beneficial—from a humanitarian and public relations standpoint.

Finally, although Puerto Rico may be an extreme example, people who face devastating losses as the result of a disaster are understandably preoccupied with their near-term survival, especially when response efforts are perceived as being too slow or otherwise inadequate. However, if community recovery and disaster preparedness are to be achieved in a publicly acceptable and sustainable way, agencies will need to employ various participatory mechanisms to get people thinking realistically about their future and ensure they play a major role in fulfilling that vision. This will require additional outreach efforts and planning for socially vulnerable areas that are shown to be especially prone to the impact of disasters. It will also require strengthening agencies’ ability to communicate the importance of long-term planning by framing present-day survival challenges as circumstances that could be avoided, at least in part, by better planning for recovery and resilience. For this message to resonate, however, government agencies will need to convince affected communities that steps are being taken to address near-term survival needs. If communication by these agencies remains absent, residents
may resist consideration of long-term revitalization projects without needed reassurance and trust that these agencies are taking their interests to heart.

**It is critical to have a multifaceted strategy for improving community engagement and communication for disaster preparedness and recovery.**

Engaging communities in meaningful conversations about local risks and the personal actions that can help mitigate those risks is an essential part of disaster preparedness and recovery. Launching a multifaceted engagement strategy can expose alternative narratives regarding the disaster experience, while encouraging communities to actively participate in the decisions that most affect their lives. Narratives capture the shared experience of individuals and communities, which can ultimately shape how a disaster is framed and interpreted. Striking the right tone is important for achieving intended communication outcomes, such as awareness of recovery activities, fostering trust and support between audiences, and achieving support for ongoing and future recovery activities. However, after gathering qualitative and quantitative data from affected residents, outmigrants, and other types of professionals, we found that no single approach will independently capture all perspectives. Rather, the evidence shows that different community engagement formats shed light on distinct aspects of recovery concerns, needs, hopes, and aspirations.

Focus groups can foster lively discussions that produce a substantial number of useful insights in a relatively short period of time. The group dynamic might also fortify community bonds and encourage civic-minded solutions to address future disasters. Community walkthroughs offer opportunities to elevate the voices of the most vulnerable populations to ensure that future response and recovery efforts take into account their unique needs. Interviews with SMEs often corroborated what we found in the field. Incorporating survey data from government officials can further round out the results by providing an added layer of leadership perspectives. In our case, local governments seem to largely support community views. This suggests local officials positioned on the front lines of the disaster were relatively in tune with their communities’ strengths and weaknesses. In other cases, comparing community feedback with government perspectives might illuminate critical disconnects that need to be addressed to establish a unified front against a looming disaster. Comments pertaining to a lack of trust in government suggest that emergency managers operating in Puerto Rico should improve their efforts to interact with the communities they serve.

**There are other issues to consider when thinking about optimizing community engagement, particularly regarding communication before and after disasters.**

In the aftermath of Hurricane Maria’s devastating impact on Puerto Rico, community members reported that the central Puerto Rico government faced sweeping distrust among the

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22 Norris et al., 2008.
general public and was not seen as a reliable source for disseminating information. Fueled by perceived government corruption and what is said to be an inadequate preparation for and response to Maria, participants’ skepticism and lack of confidence toward current and future recovery efforts surfaced as central themes.

Notwithstanding the challenges related to distrust, participants did note their preference for local, municipality-based information sources. Some leaders emerged organically in the community when residents noticed individuals stepping up in the midst of the storm to go door to door to help families get to safety. Others relied on churches, business owners, and in some cases mayors. Many community members said they trust local channels, including WAPA 680 AM, printed newspapers like El Nuevo Día (and its associated website), and social networks (particularly Facebook and YouTube).
4. A Strategy for Recovery in Community Planning and Capacity Building

The previous chapters highlight the analyses HSOAC conducted to gain a better understanding of the response and recovery issues communities faced following the disaster. In addition to this work, we also consulted with FEMA’s CPCB RSF to obtain insight into capacity-building needs due to the RSF’s extensive engagement with various stakeholders in Puerto Rico and the federal government. Their knowledge and experience from the field—as well as our findings from substantial community engagement with current and former residents, nonprofits, SMEs, and federal agencies—helped to guide us in the development of the recovery activities associated with the COAs.

Rebuilding Puerto Rico to ensure its resilience to future disasters and economic growth will rely on a wide range of activities. As we conclude in the previous chapter, it will require robust community engagement along with a strong capacity at the local and commonwealth levels to guarantee success. Our discussions with the RSF and conversations with residents, representatives from nonprofit organizations, and other SMEs during our research led to the development of 15 COAs that can be grouped into the following categories:

- emergency preparedness
- communication
- recovery planning
- research and training
- engagement with NGOs.

Below, we highlight the critical needs HSOAC identified in each of these categories based on our research, drawing attention to the specific COAs that respond to those needs. (Note: the COAs are numbered according to how they appear in the recovery plan.) We briefly describe the expected benefits of these COAs and identify the stakeholders who would likely be involved in their respective implementation. More detailed descriptions of each COA are available in the appendixes.

Emergency Preparedness

*Emergency Preparedness: General*

We note that this section may be of particular interest to the Puerto Rico Emergency Management Agency (PREMA), the Puerto Rico Planning Board (PRPB), municipality-level planning boards, the Puerto Rico Department of Housing, FEMA, FEMA Public Buildings Sector/RSF, and municipal-level emergency management offices.
This section describes the development of the following COAs:

- CPCB 1 (Disaster Preparedness Data Analysis and Decision Support Capability)
- CPCB 7 (Capacity Building for Emergency Shelter Planning)
- CPCB 8 (Strengthening Emergency Management Capacity at Municipalities)

During focus groups with residents, many complained of insufficiencies in initial emergency response and expressed concern regarding aid and assistance particularly for elderly, sick, and low-income residents. We found that the populations most in need were not those that appealed most for assistance. High-need populations often resided outside major urban areas and thus were harder to reach and engage. Given the logistical complexity of recovery coupled with limited resources and wide variation in need across populations, governmental and nongovernmental disaster and recovery organizations must be able to identify areas and people of highest vulnerability and implement a more prioritized approach to recovery and relief operations. Our findings support the development of CPCB 1, which builds a disaster-related data analysis and decision support capability. The collection and analysis of the data will help make informed choices about priority preparedness activities and improve decisionmaking using systematically collected data.

Residents also reported that emergency shelters and sites designated for essential resource distribution became damaged from the disaster. The need for reliable shelters that can withstand large-scale disasters is addressed in CPCB 7, which seeks to hire planners within each municipality and at the commonwealth level to support building a more robust emergency shelter system. This COA aims to improve access to safe and adequately resourced shelters that are accessible and able to accommodate community needs, including those with disabilities and medical conditions.

Although 93 percent of municipalities reported having a disaster preparedness plan in place prior to the hurricane, fewer than half of municipalities (39 percent, 28 of 71 municipalities) indicated having an adequate disaster preparedness plan. In order to bolster emergency management capacity at the municipality level, CPCB 8 ensures that an Emergency Management Office is established within each municipality where one does not already exist. This COA develops a multipronged strategy to improve emergency response, which includes addressing capability gaps, training disaster managers, ensuring stakeholders understand their roles and responsibilities, and improving data collection on residents who require special aid.

**Emergency Preparedness: Focus on Community**

This section may be of particular interest to FEMA, PREMA, the Puerto Rico Office for Socioeconomic and Community Development (Oficina para el Desarrollo Socioeconómico y Comunitario, or ODSEC), community-level emergency response teams, municipal governments, the government of Puerto Rico, and local NGOs.
This section describes the development of the following COAs:

- CPCB 2 (Capacity Building for Community-Level Preparedness and Response)
- CPCB 4 (Resilience Building in Collaboration with High-Risk Communities)

In our analysis of cumulative community stress from focus group discussions, we identified several issues (poor infrastructure, fragile economy, poor governance/corruption, inequality, lack of community) that affected Puerto Rican communities prior to the hurricane. These foundational issues exacerbated many chronic stressors (lack of emergency preparedness/response system, misinformation, outmigration to the continental United States). Puerto Rico’s poor economy, for example, could not sustain infrastructure maintenance or improvement, which hindered the development of a robust emergency system. Residents expressed that rural and poor residents were affected disproportionately by these stressors and that elected officials and emergency management authorities did not engage with community members in the wake of the hurricane. The accumulation of chronic stressors and the lack of sufficient response left residents feeling they had no one to trust or turn to, leading to an increase in outmigration, yet another stressor that disrupted families and larger societal structures.

In our analysis of social vulnerability, we found that the more socially vulnerable groups (those with fewer resources to cope with, resist, and recover from disasters) tended to be in the west-central region, southwestern coast, and southeastern coast, areas that saw higher levels of damage from the hurricane. These groups were more focused on near-term survival than on issues pertaining to longer-term recovery, as evident in our focus groups.

Populations with increased stressors and social vulnerabilities need special attention in the context of a disaster. These findings informed the development of CPCB 2, which develops and implements preparedness activities for 50–100 priority communities at levels smaller than the municipality level, enabling communities to have more specific disaster plans and training tailored to their needs. The findings also informed CPCB 4, which builds resilience within high-risk communities by employing planners to develop and implement disaster resilience plans for 50–100 select communities. This COA includes investments in programs that address and promote capacity to cope with acute and long-term stressors, such as workforce development, microfinance loans, education, and improvement in access to essential services.

Communication

This section may be of particular interest to the government of Puerto Rico and media companies (newspapers, radio, Internet).

This section describes the development of the following COA:

- CPCB 6 (Public Information and Communication Capability for Coordinated Recovery)
The damage to Puerto Rico’s communications grid adversely affected disaster plan operations and hindered residents’ ability to communicate with others on the island and beyond. The few channels available to coordinate recovery included radio, walkie-talkies, satellite phones, vehicles with external speakers, public bulletin boards, and word-of-mouth networks.

Residents indicated that they felt distrust for local and federal government agencies because of the stagnant progress in recovery, lack of transparency, and lack of government efforts to engage with the community. One resident living in a socially vulnerable area of Puerto Rico noted that as resources ran low, the inability to convey their circumstances to others and contact those who might be able to help them increased anxiety, and residents were left worried about not knowing what to do. Increasing community involvement and improving communication were among the highest priorities reported by municipality officials.

Additionally, our analyses of the media indicated that much of the information generated following the disaster was negative in content and tone and offered limited information on the progress of recovery. These messages often suggested outmigrants remain in the continental United States and possibly further fueled distrust in local and federal agencies. The results also highlighted key points of interests for residents, such as information on access to medical care and directions on where and how to receive care. This may be important information for vulnerable populations who may face additional barriers to receiving assistance.

CPCB 6 aims to address reports by residents of the failure of the government of Puerto Rico’s agencies to communicate consistently with the public. This issue is addressed through improving engagement of Puerto Rico’s communities in the recovery process, which may improve the public’s trust and allow rural residents a channel to receive needed information. The COA advocates for two-way communication methods, such as community meetings and listening sessions, as well as interpersonal and mediated channels (e.g., radio, print, online). Implementing communication strategies that make use of information sources trusted by communities would help the government of Puerto Rico communicate more clearly with the public, increase transparency, and improve public trust.

Recovery Planning

Recovery Planning: Coordination

This section may be of particular interest to the government of Puerto Rico, PRPB, municipal-level governments, and local NGOs.

This section describes the development of the following COAs:

- CPCB 9 (Coordinated Local Recovery Planning Process)
- CPCB 11 (Cross-Sector Coordination in Infrastructure and Implementation)
Respondents of the municipal assessment cited the timeliness and coordination of governmental leadership as an inadequate component of municipal disaster preparedness plans. In addition, frustration with the slow-moving recovery process was a common theme expressed across focus groups. Collapsed infrastructure, shortages in personnel and resources, and insufficient emergency plans resulted in residents being without aid for prolonged periods. To mobilize federal and commonwealth resources and deliver them to residents in a timely and efficient manner, government agencies must be coordinated in recovery efforts. CPCB 9 is intended to address the fragmented delivery of federal resources by developing recovery and reconstruction plans in a common, coordinated way. Efforts would be led by PRPB with dedicated disaster recovery managers at the local level. A structured planning process and early investments in planning will maximize opportunities, reduce future losses, and incite transformational change. CPCB 10 also promotes coordination but in the development of infrastructure systems and across sectors. Many residents discussed critical damage in the communications, power, road, and housing infrastructures, and a majority of municipal officials surveyed reported “no change or worsening conditions” with respect to infrastructure damage even six months after the hurricane. CPCB 10 aims to build government capacity for coordination and development across sectors to ensure infrastructure projects are planned and implemented in a thoughtful manner and result in robust systems that can withstand future disasters.

Recovery Planning: Hazard Mitigation

This section may be of particular interest to the government of Puerto Rico, PRPB, infrastructure stakeholders, FEMA, PREMA, and residents of Puerto Rico.

This section describes the development of the following COAs:

- CPCB 3 (Capacity Building to Incorporate Hazard Risk Reduction into Planning and Design)
- CPCB 10 (Incentivize the Design of Creative Solutions to Addressing Disaster Hazards)

The fragile state of Puerto Rico’s infrastructure systems magnified the impact of the hurricanes on the entire island, with some of the most socioeconomically disadvantaged municipalities sustaining the most damage. An important aspect of rebuilding Puerto Rico is to incorporate risk reduction in planning and design decisions to mitigate hazards in the event of future disasters. The goal of CPCB 3 is to enhance the current Puerto Rico hazard-mitigation assessment, for which PRPB is responsible.¹ This COA equips PRPB and municipalities with the capacity to conduct multihazard risk assessments, update and revise codes, incorporate risk

¹ PRPB oversees the planning and permitting for 60 municipalities, while the 18 autonomous municipalities are responsible for their own.
reduction considerations in all building decisions, and use geographic information system–
generated hazard maps to inform zoning decisions.

As Puerto Rico invests in numerous disaster preparedness projects, returns could be
maximized if the end products can serve the residents in manifold ways. While projects are
aimed at mitigating hazards (such as hurricanes and flooding), they can also be designed to have
social, economic, and environmental cobenefits. Flood protection structures, for example, can
simultaneously provide irrigation for agricultural crops or surrounding landscape. CPCB 10
allocates funds for a design competition for creative design solutions that reduce risks while
providing cobenefits. The design competition could elicit original ideas that benefit communities
in more ways than conventional risk-mitigation projects.

**Recovery Planning: Building Management Capacity**

This section may be of particular interest to the government of Puerto Rico, municipal
governments, and the Puerto Rico Funds Management Office, particularly those with past
experience with disasters response and recovery, chief acquisition officers, contract officers, and
procurement experts.

This section describes the development of the following COAs:

- CPCB 12 (Capacity Building for Financial Management)
- CPCB 13 (Training Workshop on Best Practices in Postdisaster Procurement)
- CPCB 14 (Building Grant-Writing Capacity)

When Hurricane Maria made landfall, Puerto Rico was already facing economic hardship;
the economy was in the midst of a 13-year economic depression and Puerto Rico over $72 billion
in debt.² As many residents described during focus group discussions and interviews, these
economic issues directly affected them. Many complained of inadequacies in public services and
attributed this to poor financial management of government funds, which further exacerbated the
impact of the disaster. As Puerto Rico faces a substantial influx of grant funding to assist with
rebuilding efforts, CPCB 12 attempts to ensure better financial management of this funding
through assessing current grant management processes and hiring additional financial
management personnel. These personnel would assist with added workload and improve
financial oversight.

As Puerto Rico receives postdisaster recovery funds much larger than funding received for
prior disasters, ensuring the effective use of funds is an important part of the rebuilding process.

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² J. Caraballo-Cueto and J. Lara, “Deindustrialization and Unsustainable Debt in Middle-Income Countries: The
CPCB 13 acknowledges this challenge and convenes a conference with procurement experts and acquisition officers who recently assisted with rebuilding following Hurricanes Sandy, Katrina, and Harvey. The conference is expected to provide an opportunity to discuss best practices and train procurement officers in Puerto Rico. At the end of the conference, both a postdisaster procurement guide and a record of conference proceedings would be disseminated to establish a working tool for best practices.

Finally, in the immediate aftermath of Hurricane Maria, residents relied heavily on local NGOs who were often the ones initiating response and recovery activities. In focus groups and interviews conducted in municipalities of high social vulnerability, residents often mentioned the role of NGOs in a positive light and discussed their aid as critical during this postdisaster period. In addition, many residents living in rural areas who were cut off from communication systems relied mostly on NGOs as their trusted source of information and stated their assistance was crucial to recovery, providing leadership, and distributing services and much needed resources.

CPCB 14 seeks to establish better funding and improved training and development for local NGOs to improve their capabilities and provide them with long-term skills that include a management role in recovery. The training would aid them in acquiring grant funding and supporting NGOs to better plan the sustainability of their activities. The COA seeks to empower these organizations, include them in recovery management, and ensure they are able to be competitive for funding while championing awareness of community-based issues.

Research and Training

This section may be of particular interest to universities and the DHS Science and Technology Directorate.

This section describes the development of the following COA:

- CPCB 5 (Establishing a University-Based Center of Excellence for Disaster Preparedness and Recovery)

Since the Great Recession in 2008, Puerto Rico has had an accelerating net loss of its population, particularly residents who are young and educated. Many of them are leaving for better opportunities in the continental United States. Students who had migrated from Puerto Rico to Florida following Hurricane Maria discussed improved educational opportunities and a better professional outlook in Florida compared to the opportunities available back home. With more recent data demonstrating that more educated individuals are leaving Puerto Rico, improving professional and academic opportunities locally is critical to ensuring residents stay in Puerto Rico and encouraging others with skills to come to Puerto Rico. CPCB 5 establishes a Center of Excellence (COE) for Disaster Preparedness and Recovery based at UPR. COE would nurture local research in the area of disaster preparedness, response, and recovery; help develop
innovative solutions in these areas; and improve Puerto Rico’s capacity to respond to natural disasters. Establishing a COE would also attract talent and resources, helping to ensure the retention of students and faculty in Puerto Rico.

**Engagement with Nongovernmental Organizations**

This section may be of particular interest to ODSEC and local NGOs.

This section describes the development of the following COA:

- CPCB 15 (Strengthen Local Nonprofit and NGO Involvement in Disaster Recovery)

Many residents relied on NGOs and the nonprofit sector when federal and state emergency responders were unable to reach them. Although the government of Puerto Rico was regarded as the primary and key player in response and recovery efforts, residents spoke much more favorably of recovery and activities by NGO and local community groups than of government activities. Municipalities with the highest level of social vulnerability particularly perceived NGO-initiated response and recovery activities positively. The rural poor were more likely to rely on NGOs and community-based activities to meet their needs, such as relief-supply distribution in areas that were hard to access following the hurricanes. Residents also turned to faith-based organizations, NGOs, and community groups and leaders for trusted sources of information and relied on local sources when mass media sources became no longer available.

Given the important role local nonprofits, faith-based organizations, and NGOs played in responding for Puerto Ricans, CPCB 15 aims to engage them in delivering recovery programs and resources. This would be done by establishing a unit within ODSEC to strengthen the relationship of government agencies with local nonprofits and NGOs and maximize those organizations’ contributions as partners in the recovery process while helping to build their capacity. The goals of this COA include more clearly defining the roles and responsibilities of NGOs during disaster response and recovery and improving cooperation and coordination to strengthen partnerships and drive more successful cross-sector collaboration.

**Closing**

In support of the development of the Recovery Plan, HSOAC conducted research that examined the conditions of Puerto Rico communities before the hurricanes and how the hurricanes affected those communities in different ways. Economic conditions had left much of the population unemployed, in poverty, and living with high housing costs. This had contributed to an outmigration away from Puerto Rico, particularly among those who were younger, more educated, and better off socioeconomically. The resulting population is older, more vulnerable, less able to take care of themselves, and thus highly reliant on assistance from the government. The damage caused by the hurricanes added to the communities’ difficulties and stresses and
exacerbated outmigration, which makes recovery from these storms and preparing for future disasters even more challenging.

The government of Puerto Rico identified these COAs as what they will implement to improve preparedness and address recovery. These COAs were selected because they cross a range of critical domains but share a common goal of building capacity. Additionally, they focus on improving capacity building of the government of Puerto Rico and its municipalities to advance emergency preparedness planning, identify hazards requiring mitigation, and communicate and plan with communities to improve resilience. This further promotes capacity for communities to do their own planning regarding preparedness. These COAs also encourage staffing and training necessary to build the capacity of government, NGOs, and others, to work with each other to plan for and manage the current recovery. Together they serve to rebuild Puerto Rico and prepare for challenges in the future.
Appendix A: Community Planning and Capacity Building Courses of Action

The COAs that HSOAC developed are discussed in Chapter Four. These COAs are documented in the pages that follow, using the same numbering scheme as the summary versions that appeared in the Recovery Plan.
CPCB 1
Disaster Preparedness Data Analysis and Decision Support Capability

Sectors Impacted

Community Planning and Capacity Building, Municipalities, Natural and Cultural Resources, Housing, Health and Social Services, Water

Issue/Problem Being Solved

In focus group discussions, many residents indicated that the initial emergency response was insufficient and expressed concern regarding aid and assistance, particularly for vulnerable populations. These populations were noted as living in harder-to-reach areas and were thus more difficult to engage. Responders need better information to improve disaster planning and decisionmaking and to more efficiently and effectively spend disaster preparedness resources, which are typically limited. Puerto Rico would benefit from an improved ability to make informed choices about priority preparedness activities.

Puerto Rico has communities living in many different types of environments (e.g., coastal, mountainous, urban, etc.) that face different disaster risks. In addition, some residents when faced with few alternatives, live in areas not considered safe for habitation. Without more detailed and specific data for communities within municipalities, it will be challenging to prioritize preparedness and hazard-mitigation activities.

Description

This COA will build a disaster-related data analysis and decision support capability at PREMA and in partnership with PRPB that will support both disaster preparedness and hazard-mitigation activities. It will establish a commonwealth-level team of ten people who will oversee the continued collection and analysis of data on hazards, environmental risks, housing, infrastructure, economic barriers, preparedness, and so forth, by geography (municipality or smaller). This information will then be disseminated to planners in PREMA, other commonwealth-level agencies, and municipalities. In addition, this COA will establish outreach teams within each of Puerto Rico’s 78 municipalities to work directly with communities to collect data on hazard vulnerabilities and preparedness capabilities. These types of high-quality data will support the development of decision support tools, such as geographic information system tools, to help prioritize areas for improving disaster preparedness or hazard-mitigation activities.

1 This information was shared with us through subject-matter expert interviews with commonwealth and municipal government representatives.
Potential Benefits

Given limited resources for dealing with disasters and the regularity of disaster threats (e.g., hurricane season, landslides), systematically collecting better data to help support decisionmaking for improving preparedness can help Puerto Rico efficiently and effectively spend the funds they have.

There is insufficient data that can be geographically mapped to help community planners, emergency managers, or hazard-mitigation teams make decisions about how to improve and prioritize their key capacity-building activities, high-risk communities, and hazardous geographic areas. Analysts have already developed a Social Vulnerability Index (SOVI) to identify the most socially vulnerable census tracts within each FEMA IA-designated municipality (Cutter, Boruff, & Shirley, 2003). Measures of social vulnerability such the SOVI can help planners think about where they need to focus but does not necessary help them understand local barriers (e.g., road conditions, access, environmental barriers) and make decisions on key activities.

Potential Spillover Impacts to Other Sectors

Many decisions for improving disaster preparedness happen at the municipal level, but the ability of municipalities to collect data varies. This COA creates a robust data-gathering and analysis capability at PREMA that can support the work of municipalities, as well as other commonwealth agencies. The key sectors where disaster preparedness analysis could have an impact are Natural and Cultural Resources (because of mitigation activities related to the environment), Housing (because of activities related to residents of informal housing and activities to make homes safer and more resilient to hurricanes), and Health and Social Services (because medical facilities, social service providers, and community-based organizations are likely to be key players in disaster response).

In terms of environmental and other hazards, issues like the release of contaminants into flood waters and the water supply, residence in flood plain areas, and coastal hazards (sedimentation, shoreline erosion, etc.) could be considerations in disaster preparedness. Collaboration with Natural and Cultural Resources, Water, and related sectors is critical.

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2 The data that would be most helpful here are up-to-date data on neighborhoods within municipalities. A review of available data sources with government partners suggested some existing municipal data are not up to date, although data collected by the census are available. However, data at smaller administrative levels would be more useful for decisionmaking.


4 FEMA, 2006.

Potential Costs

Potential up-front costs: —
Potential recurring costs: $21 million in estimated recurring costs (11 years)
Potential total costs: $21 million in total estimated costs

Recurring costs are estimated based on personnel cost. The basis of the cost assumes a 10-full-time employee (FTE) analytic team at the commonwealth level and an average 0.25 FTE outreach per municipality (total ~20). The estimate assumes 30 FTEs annually, at a cost of $1.9 million.

Potential Funding Mechanisms

Hazard Mitigation Grant Program, Community Development Block Grant—Disaster Recovery, Puerto Rico Emergency Management Agency

Implementation

Government of Puerto Rico, municipal governments, Puerto Rico Planning Board

Potential Pitfalls

Spending money on disaster preparedness is a challenge for a cash-strapped government that may need to divert resources to other priorities. Furthermore, the collection of quality data at the level of communities is hard to establish and maintain. Coordination between the commonwealth and municipalities is critical. The sustainability of this effort will be challenging, especially if this is funded through a grant that ends; Puerto Rico would have to find funds to continue these efforts.

Likely Precursors

A thorough review of available data at the commonwealth and municipal levels to identify gaps is necessary. In addition to coordination across governmental levels, it will be critical to review the data available from other key sectors mentioned previously. The sustainability of this effort will be challenging, especially if this is funded through a grant that ends; Puerto Rico would have to find funds to continue these efforts.

References


FEMA, “FEMA 549: Chapter 8: Overview of Hurricane Katrina in the New Orleans Area,” 2006. As of February 18, 2019:


CPCB 2
Capacity Building for Community-Level Preparedness and Response

Sectors Impacted

Community Planning and Capacity Building, Health and Social Services

Issue/Problem Being Solved

Lack of disaster preparation: Puerto Rico was not adequately prepared during the last hurricane season. In addition to a financial crisis and aging infrastructure, essential preparation and disaster response and recovery capabilities were not in place, especially for the most isolated and vulnerable communities.

Specific issues include a lack of updated disaster preparedness plans at the commonwealth and municipal levels. Other essential gaps include the capability to activate trained community volunteers during the response phase.

Description

This COA will focus on capacity building for preparedness and response. Efforts are currently underway to update preparedness and response plans for the commonwealth, 30 commonwealth-level agencies, and all 78 municipalities. However, community-level response and recovery preparedness activities should be developed and implemented for 50–100 priority communities (i.e., at levels smaller than the municipality level) that are particularly vulnerable to disaster impacts. The communities will be identified by PREMA, in consultation with ODSEC and municipality governments. The number of communities needing more specific disaster preparedness plans and training will be updated as needed. The commonwealth will also actively recruit, train, and equip Community Emergency Response Teams (CERT) in these vulnerable communities. Communities will work with community leaders and community-based organizations who are most knowledgeable about the special needs of local communities and will establish with them an approach for checking on people with access and functional needs. This will allow communities to better sustain themselves during response periods, when the availability of emergency responders and access to communities is often limited. Finally, the poor road conditions and hard-to-reach locations of some communities warrant building caches of emergency supplies, such as water filters and generators.

Potential Benefits

This COA will put into place fundamental preparedness and response capabilities at the commonwealth and municipal levels.
Updated preparedness plans are fundamental requirements for states, counties/cities, and agencies. Based on Puerto Rico’s unique regional terrains and accessibility issues, it is preferable to also have plans for specific communities that experience higher risk, given that they are most likely to be cut off from first responders immediately after a disaster. Some consistent themes that emerged from primary data collection from focus groups with affected communities and subject-matter expert interviews included that few or no community residents knew about preparedness plans, residents did not feel that the communities were adequately prepared, and there was low interest in trainings to join CERT. The benefits of this COA would be overall improvements to local levels of preparedness through the development of CERT teams (who will know and can communicate about plans), availability of basic emergency supplies, and capability to implement updated plans.

**Potential Spillover Impacts to Other Sectors**

This COA is not likely to have spillover to many other sectors, but there may be some collaboration with Health and Social Services, based on the training of CERT teams and their potential interaction with Health and Social Services entities (e.g., hospitals, NGOs) during and after a disaster.

**Potential Costs**

- Potential up-front costs: $3 million in estimated up-front costs
- Potential recurring costs: $34 million in estimated recurring costs
- Potential total costs: $37 million in total estimated costs

The up-front costs are estimated as material consisting of $30,000 per community cache times 100 communities. The recurring costs are estimated based on a 10-FTE planning team at the commonwealth level and 0.5 FTE (on average) CERT coordinator per municipality (total ~40), for a total of 50 FTEs annually.

**Potential Funding Mechanisms**

- Community Development Block Grant—Disaster Recovery, Puerto Rico Emergency Management Agency

**Implementation**

- FEMA, Puerto Rico Emergency Management Agency, municipal governments

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Potential Pitfalls

This COA could be affected by challenges in funding and coordination between the commonwealth and municipalities. PREMA would be responsible for identifying the communities but would have to do so in consultation with ODSEC and the municipalities. Development of plans and placement of supply caches would also need to be done in cooperation with each of the municipalities, which would necessitate establishing accountability mechanisms between the commonwealth and municipalities.

Given that the Fiscal Oversight and Management Board of Puerto Rico proposes to cut nearly one-third of the government budget in six years, including substantial reductions in subsidies to municipal governments, it may be difficult to obtain sustainable funding for these activities. Furthermore, the financial crisis strains relationships between municipalities and the commonwealth.

Likely Precursors

In order to select the 50–100 high-risk communities for focused development of preparedness plans and other related activities, it will be necessary to complete CPCB 1 (Disaster Preparedness Data Analysis and Decision Support Capability), which focuses on collecting better data for preparedness decision support.

References


CPCB 3
Capacity Building to Incorporate Hazard Risk Reduction into Planning and Design

Sectors Impacted

Community Planning and Capacity Building, Natural and Cultural Resources, Water, Energy, Public Buildings

Issue/Problem Being Solved

As Puerto Rico rebuilds, all planning and design decisions should incorporate risk reduction as a principle. To enable this, a sustained, systematic, and standardized approach to identifying risks across the commonwealth is required.

Puerto Rico has a FEMA-approved commonwealth hazard mitigation plan; responsibility for that plan resides with PRPB. In addition, local jurisdictions have hazard mitigation plans as well. PRPB has responsibility for planning and permitting for 60 of the municipalities, while the 18 autonomous municipalities are responsible themselves. Regardless of jurisdiction, adequate capacity is needed to conduct multihazard risk assessments, to update and revise codes and standards, and to communicate this to agencies at all levels in order that they incorporate risk reduction considerations into building decisions. What may additionally be helpful is to link or coordinate data-driven decisions made about hazard-mitigation plans by PRPB to preparedness decisionmaking by PREMA (referred to in CPCB 1).

Description

This COA will enhance the commonwealthwide hazard-mitigation assessment, monitoring, and evaluation enterprise within PRPB so that the board can better inform and promote the incorporation of risk reduction as a principle in all planning and design decisions. For this COA, analysts capable of using geographic information systems will generate hazard maps for each municipality for the purpose of informing zoning decisions and improving municipal hazard-mitigation planning capacity. Additionally, hiring a risk officer for each of the 27 commonwealth-level agencies will infuse risk reduction into decisions across those agencies.

Potential Benefits

This COA brings needed analytic capability to enable a standardized and systematic approach to hazard mitigation by specifying the need to routinely assess, monitor, and evaluate hazards. This COA would also encourage a more data-driven implementation of Puerto Rico’s hazard-mitigation plan.
**Potential Spillover Impacts to Other Sectors**

Although many key activities are categorized as response/preparedness actions, hazard mitigation can also include regulation revision, infrastructure projects, natural systems protection, and education programs for the public. A monitoring and evaluation system may need to coordinate with sectors leading these activities (e.g., Water, Energy, Buildings, and Natural and Cultural Resources) to ensure that goals are being met.

Examples of regulation revision include land use ordinances, building codes and enforcement, and capital improvement programs. Infrastructure projects include acquisitions and elevations of structures in flood-prone area, floodwalls and retaining walls, and utility undergrounding. Natural systems protection could be sediment and erosion control, wetland restoration and preservation, and forest management. These examples provide more context for how hazard-mitigation monitoring and evaluation would affect a range of sectors.¹

**Potential Costs**

Potential up-front costs: —

Potential recurring costs: $84 in estimated recurring costs (11 years)

Potential total costs: $84 million in total estimated costs

The recurring costs are based on the annual staffing cost of personnel, include 20 FTE analysts at PRPB ($124,600 per analyst annually) and one risk officer in each of the 27 commonwealth-level agencies ($187,000 per risk officer annually). The total annual cost for personnel is estimated as $7.6 million.

Analysis personnel would be assumed to have a higher level of specialized skills than average; therefore, a cost per FTE that is twice that of the average government employee ($62,300) is assumed, thus $124,600. The risk officer at each of the commonwealth-level agencies would need to be a senior official in order to have influence over decisions; therefore, a cost per FTE that is three times that of the average government employee is assumed, thus $187,000.

**Potential Funding Mechanisms**

Hazard Mitigation Grant Program, Community Development Block Grant—Disaster Recovery

**Potential Implementer(s)**

Puerto Rico Planning Board, infrastructure sectors

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Potential Pitfalls

The successful incorporation of risk reduction principles in building decisions depends on many other sectors, such as Public Buildings, Water, Energy, Natural and Cultural Resources, and so on. While PRPB may have some influence over decisions by other sectors, its formal power may have limitations. Consequently, these other sectors would have to agree to having their activities monitored at the commonwealth level by PRPB.

Likely Precursors

A comprehensive review and alignment of hazard-mitigation plans at the commonwealth and municipal levels.

References

Beyond the Basics, “Beyond the Basics: Best Practices in Local Mitigation Planning,” undated. As of February 18, 2019:
http://mitigationguide.org/task-6/mitigation-actions/#natural
Sectors Impacted

Community Planning and Capacity Building, Health and Social Services

Issue/Problem Being Solved

Communities that could not be reached quickly in the aftermath of Hurricanes Maria and Irma had to find ways to survive without outside help. The challenge of withstanding and recovering from the ensuing adversity was compounded by the lack of disaster preparedness and response systems to reduce negative impacts. Given the continued fragility of infrastructure systems—and the arrival of a new hurricane season—the possibility of communities facing long periods without essential services in the aftermath of a disaster remains a potential future scenario.

The guidance for household preparation usually recommends three days of supplies. However, in a context where new guidance for households is to be self-reliant for ten days after a storm, it is critical to resilience for the community as a whole. According to the Rockefeller Foundation’s City Resilience Framework, a resilient community consists of the health and well-being of those in the community, functional social and financial systems, strong and protective man-made and natural infrastructure, and effective leadership and integrated planning.

Description

This COA will hire planners, on average 1.5 FTEs per municipality, to develop and implement disaster resilience plans in collaboration with 50–100 selected communities. These plans will include investments into programs that address long-term stressors, such as workforce development, microfinance loans, and education, as well as the improvement of essential services. Such plans promote the capacity to cope and acclimate to chronic and acute stressors. This COA will also conduct a gap analysis to understand which essential services are missing in communities that nonprofits could then be incentivized to provide. In partnership with local nongovernmental organizations, the commonwealth will set up resilience-building events, including making connections among governmental agencies, community groups, and NGOs, and will provide settings and resources to enable selected communities to take charge of becoming more resilient to future disasters. The resilience of a community depends on the diversity of economic opportunities, robust public services, a tight-knit social support network, effective emergency management, and cross-sector collaborations.

Potential Benefits

Building community and individual resilience is critical for both response and long-term recovery. Puerto Rico has already experienced inadequate response and suboptimal recovery phases, so it makes sense to focus on building resilience for the future.

Resilience building is also an activity that more directly engages communities and encourages more community volunteers. Furthermore, it emphasizes the assets that communities bring to response and recovery, regardless of income and background. However, there still needs to be some effort to address underlying socioeconomic challenges over the long term to better prepare them to withstand future disasters.

Potential Spillover Impacts to Other Sectors

One critical aspect of community resilience planning is improving critical community resources and assets over the long term, such as health care facilities, schools, social services, and urban design. Therefore, Health and Social Services could experience spillover impacts.

Community resilience also represents an intersection of preparedness and traditional public health, with an emphasis on preventive care, health promotion, and health security to minimize negative consequences of disaster.

Potential Costs

Potential up-front costs: —
Potential recurring costs: $83 million in estimated recurring costs (11 years)
Potential total costs: $83 million in total estimated costs

The recurring cost is based on the personnel for an average of 1.5 FTEs per municipality (~120 FTEs in total). The annual recurring cost is estimated to be $7.5 million.

Potential Funding Mechanisms

Community Development Block Grant—Disaster Recovery, Hazard Mitigation Grant Program, U.S. Department of Commerce Economic Development Administration


Potential Implementer(s)

Government of Puerto Rico, municipal governments, local nongovernmental organizations

Potential Pitfalls

The most difficult aspect of resilience building is the need to improve critical community resources and assets, such as hospitals, education, mental health services, and so on. Having to depend on other sectors being able to improve their own capacities may affect a community’s ability to build resilience. The second most difficult part of resilience building is getting those community assets—governmental and nongovernmental—to work with each other.

Building resilience also depends on strong community organizations. The poor presence of such organizations may compromise a community’s ability to build resilience.

Likely Precursors

It is necessary to identify key local partners: community-based organizations, hospitals, schools, and so forth.

References


Establishing a University-Based Center of Excellence for Disaster Preparedness and Recovery

Sectors Impacted

All

Issue/Problem Being Solved

Build capacity among colleges and universities to maximize recovery and disaster preparedness through research and curriculum development.

Description

This COA will establish a COE for Disaster Preparedness and Recovery at a university in Puerto Rico. The mission of the COE will be threefold: First, it will foster local, multidisciplinary research on disaster preparedness, response, and recovery. Second, it will develop innovative solutions to preparedness, resilience, hazard mitigation, and recovery problems, with a focus on environments particularly vulnerable to climate change, such as Puerto Rico. Third, it will build preparedness, response, and recovery capacity in Puerto Rico through curriculum development and training that will be provided to government agencies, nonprofit organizations, and individuals.

Potential Benefits

As a research entity, the COE would contribute to the body of knowledge. As a design center, the COE would translate that knowledge to innovative and usable solutions. As a training center, the COE would increase the preparedness of agencies, entities, and residents of Puerto Rico and beyond. The COE would provide benefits to the university through increased resources for research and teaching and the fostering of multidisciplinary and multiagency collaboration. This would contribute to the attraction and retention of students and faculty.

The Department of Homeland Security’s development of COEs throughout the United States is an example of a successful way to use academic centers to improve security challenges and develop solutions to serious issues through the establishment of COEs. Examples of COEs include those focused on the Arctic, coastal resilience, maritime security, and critical infrastructure resilience, to name a few.¹

Potential Spillover Impacts to Other Sectors

The knowledge and solutions created by the COE would have an impact on all sectors involved in the building of resilient infrastructure and the mitigation of hazards. Improving preparedness and response would have an impact on government and nongovernment entities involved in the well-being of people. Strengthening the university would have an impact on education and economics by providing an attractor of students and faculty.

Potential Costs

Potential up-front costs: —
Potential recurring costs: $22 million–$55 million in estimated recurring costs (11 years)
Potential total costs: $22 million–$55 million in total estimated costs

The recurring costs are based on the funding levels of other U.S. Department of Homeland Security COEs. The cost of establishing a COE in Puerto Rico could be as high as $5 million. However, even a lower funding level would be useful. Consequently, the estimated costs for a COE for disaster preparedness and recovery range from $2 million to $5 million annually. This funding would be used to fund research projects and design projects, develop curriculum, disseminate training, and administer the new center.

The Department of Homeland Security Science and Technology Directorate established COEs at several academic centers, appropriating similar funding through their Office of University Programs. In 2015, DHS awarded the University of North Carolina at Chapel Hill with a $20 million five-year grant to launch their Coastal Resilience Center of Excellence focused on researching coastal hazard issues that affect communities across the United States (University of North Carolina at Chapel Hill, 2015). In addition, the University of Alaska Anchorage received a $17.5 million grant through the Department of Homeland Security over five years for the development of the Artic Domain Awareness COE focused on improving crisis response to artic environmental challenges (McCoy, 2015). Based on this information, we conclude existing COEs are funded at about $5 million annually. However, a COE in Puerto Rico could start smaller.

Potential Funding Mechanisms

Community Development Block Grant—Disaster Recovery, U.S. Department of Homeland Security Science and Technology Directorate, private sector, nongovernment sources

Potential Implementer(s)

Universities, U.S. Department of Homeland Security Science and Technology Directorate

Potential Pitfalls

Initial establishment of the COE would require some development of university infrastructure to sustain a center of this magnitude. Initial hiring and curriculum and infrastructure planning
would be needed. A longer-term funding source beyond Community Development Block Grant—Disaster Recovery would have to be identified to sustain the COE; this would require a decision by U.S. Department of Homeland Security Science and Technology Directorate and a request to Congress or a commitment by other sources of funding.

**Likely Precursors**

It will be necessary to identify an appropriate university with the infrastructure needed and willingness to maintain and develop a COE at the university.

**References**


University of North Carolina at Chapel Hill, “UNC Launches Coastal Resilience Center of Excellence,” 2015. As of June 20, 2018:
https://college.unc.edu/2015/06/coastalcenter/

https://www.dhs.gov/science-and-technology/centers-excellence
Sectors Impacted

Community Planning and Capacity Building and any sector communicating with the public about recovery

Issue/Problem Being Solved

It is challenging for government agencies in both Puerto Rico and the United States to communicate consistently with the public about their respective recovery efforts.

Residents of Puerto Rico must be kept well informed on recovery progress and may get information on recovery from a number of different sources that they trust. However, their trusted sources, which include media, influential public voices, and leaders at municipal or local levels, do not always provide correct or the most updated information. This can lead to confusion for Puerto Rico residents about the recovery process. Furthermore, outmigrants are another important audience. The recovery may influence their decisions to return to the commonwealth, but also, they themselves may serve as an important and trusted source of information for family members (in particular, seniors) on the commonwealth about the recovery.¹

Description

This COA will build a Public Information and Communication capability that will facilitate the continued engagement of Puerto Rican communities in the recovery process. This COA will not only support one-way informational dissemination from the government to residents—in the form of press releases, policy briefs, newsletters, and websites—but it will also establish and maintain methods of two-way communication focused on listening to, responding to, and involving residents during the entire life cycle of the recovery process. The commonwealth government Public Information and Communication capability will support the community engagement component of local recovery planning processes. Specific communication activities include community meetings, listening sessions, and sharing information relevant to communities broadly via interpersonal and mediated channels (e.g., radio, print, online). Effective communication can have a substantial impact on residents’ participation in community development; this participation, in turn, can improve the likelihood that residents will support and believe in the changes in their communities. Including communities of Puerto Ricans who have moved to the continental United States is also important because it will help the government of

¹ This was a theme identified broadly through focus groups with outmigrants who left Puerto Rico following Hurricanes Irma and Maria, as well as communities in Puerto Rico affected by the hurricanes.
Puerto Rico understand—and plan accordingly for—both the informational needs of these communities and also how and/or when residents might decide to return to Puerto Rico.

**Potential Benefits**

Developing and implementing a communication strategy, particularly one that is supported by such well-established approaches as message testing, would help the government of Puerto Rico communicate more clearly with the public, increase transparency, and improve public trust. These positive effects may also help stakeholders involved in the recovery process work together to accomplish their mutual goals.

Across the phases of disaster, including recovery, it is important for the government to communicate with their constituents about what is happening in the short and long term.¹

 Particularly in the area of disaster preparedness and recovery, research has shown the importance of government using communication strategies and message testing to both encourage understanding of the situation and motivate audiences to adopt desired behaviors.³ There are a number of research efforts specifically describing postdisaster recovery communication that use messaging as a way to inform audiences and positively influence their opinions, such as on tourism and reconstruction.⁴ Given the stress experienced by Puerto Rico residents caused by the ongoing economic crisis and recent hurricanes, it is critical for the government of Puerto Rico to meaningfully engage in clear two-way communication with their constituents.

**Potential Spillover Impacts to Other Sectors**

Implementation of the Public Information and Communication capability could be beneficial to all sectors involved in recovery. For example, there is a great deal of public interest in the progress of efforts to fix the power grid at the commonwealth and local levels. Engaging in two-way communication channels would help infrastructure sectors not only deliver information but also receive information to inform their work.

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The National Disaster Recovery Framework discusses the importance of needing to provide “ongoing clear, consistent, effective, accessible, and culturally appropriate communication and information sharing throughout recovery” and that it is “vital for ensuring that all voices are heard from all parties involved in recovery and that all available resources are brought to the table.”

One example of two-way communication from government to citizens include the Italian government opening data portals to provide citizens with relevant information about reconstruction after an earthquake, which also provided citizens with tools to participate in the reconstruction, through donations for specific projects. Social media was also a critical communication tool in the Joplin, Mississippi, tornado disaster of 2011, and their best practices have been shared.

### Potential Costs

- Potential up-front costs: —
- Potential recurring costs: $8.8 million in estimated recurring costs (11 years)
- Potential total costs: $8.8 million in total estimated costs

Estimates range $250,000–$500,000 annually for engaging a communications firm. Recurring costs include $320,000 annually, for an estimated 5 FTEs, to ensure feedback from the community is disseminated back to planners. Total recurring costs are estimated as $800,000 per year.

### Potential Funding Mechanisms

- Community Development Block Grant—Disaster Recovery, Puerto Rico Emergency Management Agency

### Potential Implementer(s)

- Government of Puerto Rico

### Potential Pitfalls

This COA depends on a strong coordinating mechanism across the government of Puerto Rico, other sectors, and many stakeholders. Additionally, a communication strategy cannot control the flow of information from other potentially conflicting data sources outside of its scope.

### Likely Precursors

Conduct outreach to other government or partner entities who are working in communications on recovery.

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6 Tagliacozzo and Magni, 2018.

References

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doi:10.1080/10548408.2012.638565


doi:10.1111/1468-5973.12119
Sectors Impacted

Community Planning and Capacity Building, Health and Social Services, Municipalities, Public Buildings

Issue/Problem Being Solved

Many of the shelters in which residents sought refuge after Hurricanes Maria and Irma lacked basic accommodations, such as kitchens or showers for use by residents in the longer term, or an appropriate level of supplies. A comprehensive assessment of the capacity and capability of shelter facilities is required.

Prior to the landfall of Hurricane Irma, Puerto Rico had designated 456 emergency shelters (schools and other government buildings) that were prepared to house up to 62,100 people (The Weather Channel, 2017). People who went to shelters during and shortly after the hurricanes numbered in the thousands in shelters, with many more coming in and out of the shelters for several months poststorms (Government of Puerto Rico, May 10, 2018). Reports from community focus groups described shelters as being inadequately resourced and staffed, having insufficient living facilities, and lacking enough or any equipment or supplies to appropriately support people with disabilities, medical conditions, or injuries.

Description

This COA will conduct an assessment and develop a shelter plan that includes a comprehensive and strategic approach to sheltering across Puerto Rico. Actions include hiring planners in each municipality and at the commonwealth level to support the development of a more robust emergency shelter system and borrowing from best practices in sheltering, including involvement of the community and tying sheltering considerations to long-term housing-development and survivor services. Planners will develop parameters, standards, and general design guidelines for shelters that will better support residents in the longer term. The planners at the commonwealth level will provide appropriate support to planners in municipalities so that they can develop and implement their own emergency shelter plans. This will include the selection of appropriate facilities; ensuring optimal numbers and locations of shelters; and developing and implementing shelter maintenance, power, water, and security plans. Planners will also establish a protocol with the National Guard for effective management of response commodities for shelters and with Departamento de la Vivienda for the staffing and management of the shelters themselves.
Potential Benefits

This COA will improve access to safe and appropriately resourced shelters, within a reasonable distance, that can accommodate community needs, such as disabilities and medical conditions.

The commonwealth government did begin preparations about seven days prior to Maria’s landfall, including the designation of 456 emergency shelters. However, given the recommended FEMA criteria for facility selection; consideration of life-sustaining services; recommended staffing, equipment, and material resources; average space calculations per shelter resident; and so forth, standing up a robust emergency shelter system will require more advance preparation.1

Potential Spillover Impacts to Other Sectors

Intensive collaboration on the development and implementation of emergency shelter plans could empower municipalities—who already have local knowledge of facilities and a faster ability to respond during a disaster—to make key emergency shelter plan decisions. Furthermore, collaboration with Health and Social Services to improve medical care for the ill or injured at emergency shelters could mean less stress on hospitals during a disaster. Public Buildings may be asked to work closely with emergency planners around the repair and upgrade of existing facilities, which could result in safer buildings outside of disasters.

Ideally, emergency shelters should be able to provide food, water, a place to sleep, sanitation facilities, and access to basic health and mental health services. While some emergency shelters are intended to be temporary based on the assumption that people will return to their homes when the emergency has subsided,2 Puerto Rico, given its current state of infrastructure, may need their emergency shelters to operate over a longer period and therefore need more planning and collaboration with other sectors to optimize.

Potential Costs

Potential up-front costs: —
Potential recurring costs: $57 million in estimated recurring costs (11 years)
Potential total costs: $57 million in total estimated costs

The recurring costs are personnel costs, including three FTE planning staff at the commonwealth level and about one FTE on average planning staff in each municipality (~80 in

total). The recurring costs are estimated as $5.2 million per year. The cost estimate in this COA
does not include the cost of operating the shelter or of feeding the clients.

Potential Funding Mechanisms

Community Development Block Grant—Disaster Recovery, government of Puerto Rico,
municipal governments

Potential Implementer(s)

FEMA, Puerto Rico Emergency Management Agency, Public Buildings

Potential Pitfalls

Because the establishment of a robust emergency shelter system depends very heavily on
collaboration with other sectors, it is critical to bring many stakeholders to the table from Health
and Social Services, Public Buildings, Municipalities, and potentially others during the planning
stages.

Likely Precursors

A review of current guidelines for selecting and establishing emergency shelters will be
needed. Commonwealth partnerships with municipalities to designate roles in emergency shelter
planning and implementation.

References

DW, “Hurricane Irma Heads for Caribbean, Florida, Puerto Rico Trigger States of Emergency,”
June 9, 2017. As of February 18, 2019:
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FEMA, “Resource Typing Definition for Mass Care Services,” March 2017. As of February 18,
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https://www.fema.gov/media-library-data/1494265054957-eee79ef7f4f39b422dac884dee65fd11/NIMS_508_Shelter_Facility_Selection_Team_MAR202017.pdf

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Operating Shelters After Hurricane Katrina,” International Journal of Emergency
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CPCB 8
Strengthening Emergency Management Capacity at Municipalities

Sectors Impacted

Community Planning and Capacity Building, Municipalities

Issue/Problem Being Solved

Many municipal governments lack sufficient trained personnel for emergency management and response. Since municipal governments are more likely to be the first to respond to their local needs than the commonwealth government, it is critical to ensure that municipalities have enough adequately trained staff to plan for emergencies and coordinate the response of various agencies.

Description

This COA will establish a Municipal Emergency Management Office in municipalities where one does not already exist. FEMA will work with PREMA zone managers and local emergency managers to identify gaps in emergency management capability, including personnel needs, training gaps, equipment, and so on. This COA will develop a strategy for addressing capability gaps; develop a training curriculum that more directly establishes a clear understanding of the diverse roles of different entities during a disaster and how they connect; provide training that involves all the entities with a role in disaster management (emergency managers, public works officials, finance officers, mayors and vice mayors, local city planners, health officials, community leaders, etc.); ensure that state and local stakeholders each understand their roles and responsibilities and have access to checklists, protocols, and staff rosters/communications plans that enable them to perform their duties; train emergency managers to collect better information about people requiring evacuation (e.g., disabled, elderly) and to prepare to be able to serve people with access and functional needs during a disaster; and develop forms, templates, and relationships (mutual aid compacts, procurement guidelines, permitting reserve capability, etc.) that will enable municipalities to meet response and recovery needs effectively after a disaster.

Most of the municipalities have a Municipal Emergency Management Office, where emergency response and management staff are positioned. In an emergency event, the municipal staff become part of the emergency staff. Municipal Emergency Management Offices should refer to the Emergency Management Accreditation Program, which describes the Emergency Management Standard, which establishes the baseline performance criteria for an Emergency Management Program (FEMA, 2016).
**Potential Benefits**

Given that municipalities are fundamentally responsible for responding first to their residents during a disaster, it is critical that municipalities have appropriate emergency management and response capacity. To this end, this COA will benefit Puerto Rico residents by providing them better emergency response and addressing severe disaster impacts with more efficiency.

The commonwealth should have an overarching role in coordination across municipalities and commonwealth agencies. Furthermore, using procedures specified in the commonwealth’s plan, the commonwealth’s emergency management organization should provide additional support by coordinating deployment of commonwealth personnel and resources to the affected areas in specific municipalities.¹

**Potential Spillover Impacts to Other Sectors**

Improved emergency planning and response could lead to economic benefits from perceived reductions in risk.

**Potential Costs**

Potential up-front costs: —

Potential recurring costs: $165 million in estimated recurring costs (11 years)

Potential total costs: $165 million in total estimated costs

Recurring costs are estimated based on personnel costs, including 3 FTEs, on average, for each Municipal Emergency Management Office, or about 240 FTEs total. At a cost of $62,300 per FTE, the total recurring cost is estimated as $15 million per year.

**Potential Funding Mechanisms**

FEMA Emergency Management Performance Grant, Hazard Mitigation Grant Program, Community Development Block Grant—Disaster Recovery, Puerto Rico Emergency Management Agency

**Potential Implementer(s)**


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**Potential Pitfalls**

Emergency management responsibilities of PREMA could overlap with those of the Municipal Emergency Management Offices. A clear division of responsibilities would be required to avoid conflict or unnecessary duplication. Strengthened Municipal Emergency Management Offices, who take on more responsibility, could also mean that municipalities would have to coordinate with each other.

**Likely Precursors**

Identify which municipalities *do or do not* have a Municipal Emergency Management Office. Begin connecting municipalities lacking such offices with key agencies (e.g., PREMA, FEMA) to establish an office.

In addition, many of the other proposed Community Planning and Capacity Building COAs involve adding staff to work at the local level on specific tasks. Those COAs did not specify whether their field staff would be employed by PREMA or the Municipal Emergency Management Offices. That staff would be in addition to the staff counted in this COA. If Municipal Emergency Management Offices were strengthened, as called for in this COA, it is possible that the staff in the other COA could be employed by the Municipal Emergency Management Offices rather than by PREMA.

**References**


As of February 18, 2019:

https://training.fema.gov/emiweb/downloads/is7unit_2.pdf
Sectors Impacted

All

Issue/Problem Being Solved

A fundamental challenge to maximizing the opportunities present in recovery is the fragmented delivery of federal resources, both over time and among numerous programs. Absent a coordinated recovery planning process, this leads to ad hoc decisionmaking and a piecemeal recovery.

For many communities, the impacts from Hurricanes Irma and Maria were significant and across multiple sectors. With financial resources potentially dedicated to addressing these impacts, there is a unique opportunity for comprehensive transformation that could place communities in a position to thrive. Coordinated planning is able to address multijurisdictional or systems interdependencies and examine approaches to risk reduction that extend beyond the facility itself. In essence, it is highly unlikely that recovery will result in increased community resilience if it is not planned for. With much effort dedicated to the development of a commonwealthwide economic and disaster Recovery Plan, its effectiveness is likely to be substantially reduced without a coordinated framework for translating the larger strategic objectives and COAs into recovery projects and programs on the ground at the local level.

Description

This COA will establish a process by which all the municipalities who were severely affected by the hurricanes develop their respective recovery and reconstruction plans in a common, coordinated way. An additional component of this COA will be to provide support to municipal governments needing to coordinate the implementation of many recovery projects in the form of a dedicated local disaster recovery manager.

FEMA’s National Disaster Recovery Framework recommends that local governments with large-scale multisector recovery create local disaster recovery manager positions to manage the implementation of recovery plans and projects.

Implementation of the planning process would be done by conducting a detailed commonwealthwide analysis of disaster impacts, unmet needs, and future multihazard risk. The analysis would identify which municipalities received a scale and breadth of impacts that present a transformational opportunity and thus the need for a dedicated planning process to guide the investment of substantial anticipated funding. PRPB could procure the planning consultants and provide the technical assistance to the municipalities, or funds could be provided directly to municipalities to procure planning assistance. However, in either case, a common baseline
planning process and plan structure should be established to ensure that the resulting plans/products coordinate with one another at various scales. It is also necessary to establish common standards for how hazard risk should be identified and analyzed. Since resilience spans across disciplines, PRPB should ensure that planning assistance teams (whether procured directly or by municipalities) should be multidisciplinary.

Previous local recovery planning programs have used the commitment of future Community Development Block Grant—Disaster Recovery funding to help implement the resulting plans as an incentive for the process to be taken seriously and drive participation. It is also imperative that the process be inclusive, transparent, and participatory—engaging residents and stakeholders in ways and to a degree that exceeds previous planning efforts in the commonwealth. Traditional public hearings alone will be inadequate in securing the necessary buy-in of the community and ensuring that plans truly reflect the community’s vision and priorities. Particular efforts need to be made to engage residents who have been displaced and are currently residing on the continental United States. It is estimated that program design, procurement, and launch would take approximately three to four months with a six- to nine-month planning process to follow. Plans should be complete within one year. The location could be in as few as approximately 25 municipalities or as many as 78. Planning efforts could also be done at a multijurisdictional or metropolitan scale. It is estimated that approximately half of municipalities (40) will have a scale and breadth of recovery projects sufficient to require establishing a dedicated local disaster recovery manager.

Potential Benefits

The substantial investment in disaster recovery and reconstruction following Hurricanes Irma and Maria provides an opportunity to address long-standing problems. The benefit of investing the potential tens of billions of dollars in a planned and coordinated way is that capitalizing on these opportunities will be maximized, resulting in transformational change. Coordinated planning of recovery investments also enables hazard risk to be examined and addressed at a neighborhood, municipal, and/or multijurisdictional scale, increasing return on investment and reducing future losses. Through a structured planning process, innovative solutions can be developed to produce cobenefits across sectors, from jobs to housing to social services to infrastructure.

The expected outcome is for community recovery plans to be established and adopted, which guide local program- and project-level investments and have resident and stakeholder support. Local stewardship of the plans manages expectations and provides a vehicle to track progress and ensure accountability in implementation. The resulting plans effectively serve as capital

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improvement plans for the implementation of local recovery projects, including project prioritization, funding, and sequencing.

The value of planning can often be considered in the opportunity cost of not doing it. Assuming that a minimum of $1 billion will be invested in recovery projects through municipalities, not planning for these investments may reduce the opportunities that can be realized by a minimum of 10 percent. If $1 billion in investment is expected to produce $1 billion in value or benefit with coordinated planning, the absence of a planning process would have a cost of approximately $100 million. Planning will also help ensure that recovery solutions are holistic in their approach to providing social, economic, environmental, and physical benefits. Additional tens of billions of dollars are anticipated to be spent by commonwealth agencies across all infrastructure sectors throughout the island.

**Potential Spillover Impacts to Other Sectors**

A coordinated local recovery planning process would have a method of integrating sector-level recovery planning activities and initiatives (such as for FEMA Section 428 Public Assistance and Hazard Mitigation Grant Program funds) with the development of local recovery plans to coordinate commonwealth-level projects with local projects.

This course of action is inherently multisectoral. Numerous federal departments and agencies require some type of plan to guide individual nondisaster program investments, including Department of Housing and Urban Development, Environmental Protection Agency, Economic Development Administration, and Department of Transportation. However, there is no federal requirement for a plan that coordinates all federally funded projects at the local level. The recovery plans produced by this course of action will be focused on guiding local federal investments from across numerous departments and agencies for which disaster-specific funding was provided through supplemental appropriations P.L. 115-56 and P.L. 115-123.

**Potential Costs**

- Potential up-front costs: $51 million in estimated up-front costs (3 years)
- Potential recurring costs: —
- Potential total costs: $51 million in total estimated costs

The up-front cost is estimated as $35 million–$40 million for the planning process, plus approximately $11.2 million for local disaster recovery managers (on average 0.5 FTE per municipality) for about 40 FTEs. The local disaster recovery managers are estimated to cost $93,500 per FTE.

Approximately $37.5 million was the amount used to implement the local recovery planning process in New York following Hurricane Sandy (New York Rising Community Reconstruction Program). Costs in Puerto Rico could be greater due to a one-time surge in demand for experienced recovery planning consultants from the continental United States and elsewhere.
This COA could be tied to future anticipated allocations of Community Development Block Grant—Disaster Recovery to municipalities for “community recovery,” which would assist in implementing recovery plans. Previous examples in Louisiana and New York have dedicated between $500 million to $1 billion.\(^2\)

Cost per FTE for local disaster recovery managers was estimated as 50 percent higher than the average government employee, to account for the experience level required.

**Potential Funding Mechanisms**

Hazard Mitigation Grant Program, Community Development Block Grant—Disaster Recovery, U.S. Department of Commerce Economic Development Administration, nongovernment sources

**Potential Implementer(s)**

Puerto Rico Planning Board, municipal governments

**Potential Pitfalls**

Coordinating any planning efforts occurring at a sectorwide scale with local planning efforts is inherently challenging. To be effective, it will be imperative that senior leadership at FEMA and at the commonwealth level make this a priority and communicate to program and field staff accordingly.

Each local recovery planning process should be guided by a community recovery committee consisting of a cross-section of key local stakeholders. While the mayor is ultimately responsible for the implementation of each plan, broad community participation and support are needed to help drive successful implementation and ensure accountability.

Consultant resources in Puerto Rico may be limited both in number and experience. As a result, increased costs necessary for importing specialized labor should be considered.

**Likely Precursors**

Inclusion of the activity in the Community Development Block Grant—Disaster Recovery Action Plan if Community Development Block Grant—Disaster Recovery funds are to be used. Submission of a Hazard Mitigation Grant Program project application if Hazard Mitigation Grant Program funds are to be used. Collaboration, not just coordination, between PRPB PR Department of Housing and Central Office of Recovery, Reconstruction and Resiliency regarding Section 428 Public Assistance projects and other federally funded projects is required.

\(^2\) Based on internal FEMA estimates.
References


Incentivize Resilient, Creative Design Solutions for Addressing Hazards

Sectors Impacted

Community Planning and Capacity Building, Natural and Cultural Resources

Issue/Problem Being Solved

Disaster preparedness projects are often narrow in scope and targeted to address a specific risk. However, they have the potential for a greater return on investment. It would be more efficient to spend funds to develop solutions that not only reduce risk but also have added social, economic, or environmental benefits.

Certain hazard-mitigation projects are merely intended to address the risks that the hazard poses. For example, a floodwall generally serves little purpose but to provide barrier against inundation. If a more holistic approach is taken in which hazard-mitigation projects are integrated into the planning of an urban area that people reside in or with consideration of what else the geographic landscape offers, communities can enjoy cobenefits even in the absence of a disaster, and investing in such projects would be much more attractive. Examples of such resilience projects include flood protection structures that provide irrigation for agricultural crops or surrounding landscape, shelters that double as clinics or schools in nondisaster periods, and the installment of more resilient wireless communications, which simultaneously improve access to telephone and data services. Following Hurricane Sandy, a competition, Rebuild by Design, was conducted, resulting in the creation of the East Side Coastal Resiliency Project, a 2.4-mile integrated coastal protection system in New York City being built to protect against coastal flooding while also serving as public space.

Description

This COA will fund a design competition that fosters innovative solutions for risk reduction. The design will be required to be aimed at mitigating hazards, including, but not limited to, hurricanes and flooding, while having added social, ecological, or economic benefits to the community. The design determined to be the most beneficial and favorable to the respective community could then be commissioned using hurricane recovery funds.

Potential Benefits

The design competition will elicit original ideas to mitigate disaster risks. Because the ideas are crowdsourced from the broad public, expertise and deliberation unconventional to traditional risk-mitigation strategies may yield out-of-the-box solutions and transdisciplinary approaches. Implementing such projects may be an efficient use of funds as they could potentially concurrently address multiple issues. Also, people will base ideas on what they perceive to be problems or areas of improvement in their own communities, providing a valuable perspective from the ground level. If the funds are unavailable to realize the entirety of the project, a substantial funding of the project and publicity of its positive impact could prompt more funds from other investors.

The Rebuild by Design Hurricane Sandy Design Competition, which bred multidisciplinary collaboration and cross-sector ideas, has become the model many regions have adopted to prepare communities for future uncertainties. For example, the National Disaster Resilience Competition was launched in 2014 and awarded $1 billion to 13 cities across the United States to fund resilience-building projects.3

Potential Spillover Impacts to Other Sectors

The designs may target a variety of issues, in turn affecting other sectors.

Potential Costs

Potential up-front costs: $6 million in estimated up-front costs
Potential recurring costs: —
Potential total costs: $6 million in total estimated costs

The up-front cost is estimated as $6 million for the design competition (not including the cost of building the winning design). According to an article by Nate Berg in The Guardian, the Rebuild by Design competition in San Francisco was estimated to cost $5.8 million, not including building costs.4,5 For this COA, the cost to build the winning design would be covered under the relevant infrastructure project budget and is not included in this estimate, which covers only the cost of the competition itself.

Potential Funding Mechanisms

Hazard Mitigation Grant Program, Community Development Block Grant—Disaster Recovery, Puerto Rico Emergency Management Agency

Potential Implementer(s)

Potential Pitfalls
Design submitters may have concerns over sharing ideas due to rights over intellectual property if all participants focus on a single site. Navigating the procurement process to implement creative and innovative concepts for the first time may also be challenging.

Likely Precursors
This COA includes the cost of operating a design competition to solicit creative ideas, but it does not include the cost of building the selected project. Building costs are assumed to be included in the various sector COAs calling for respective rebuilding efforts. This COA is therefore dependent on rebuilding efforts being funded.

References
Berg, Nate, “How a Design Competition Changed the US Approach to Disaster Response,” The Guardian, January 18, 2017. As of February 18, 2019:

https://www1.nyc.gov/site/escr/vision/vision.page

Rebuild by Design, “Hurricane Sandy Design Competition: Origin and Impact,” undated. As of February 18, 2019:
http://www.rebuildbydesign.org/our-work/sandy-projects

Resilient by Design, “Resilient by Design: Bay Area Challenge,” 2016. As of July 5, 2019:
http://www.resilientbayarea.org/

Tanner, Thomas, Swenja Surminski, Emily Wilkinson, Robert Reid, Jun Rentschler, and Sumati Rajput, The Triple Dividend of Resilience, London: Overseas Development Institute, 2015. As of February 18, 2019:
Sectors Impacted

All

Issue/Problem Being Solved

Build government capacity to develop coordinated sector-based plans for infrastructure systems and ensure that capital improvement projects are implemented in a coordinated manner.

Description

This COA will ensure coordination and development across sectors and will work to ensure that major infrastructure projects are implemented in a thoughtful manner, while taking into account participation from other sectors during development and implementation phases. Five experienced planners—or cross-sector infrastructure and implementation leaders—can be hired into dedicated positions within the Central Office of Recovery, Reconstruction, and Resiliency. Cross-sector infrastructure and implementation leaders would be devoted to ensuring collaboration and coordination between sectors when major infrastructure projects are proposed or are in the process of being developed. Cross-sector infrastructure and implementation leaders’ activities include coordinating cross-sector meetings with relevant sector members and stakeholders, reviewing infrastructure plans, coordinating participation in cross-sector meetings during infrastructure planning and development, and ensuring thoughtful development and coordination during the infrastructure planning process.

One of the key tasks of the Central Office of Recovery, Reconstruction, and Resiliency is to coordinate and channel the recovery and reconstruction efforts and infrastructure projects related to recovery; thus, this task is best suited to exist within the Central Office of Recovery, Reconstruction, and Resiliency. Executive Order 2017-065, which created the office, gave it the power to “receive and manage all funds and resources made available to the Government of Puerto Rico to deal with the Recovery,” which helps ensure that all parties will participate in these cross-sector meetings.

Potential Benefits

This COA would help to increase transparency of infrastructure planning and integrate sector needs during development and implementation. In addition, due to the interdependency of

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systems, especially evident postdisaster, it is critical that there is integration of planning from the start to ensure systems are built stronger and smarter. Cross-sector infrastructure and implementation leaders will work to ensure there is investment in collaboration and will coordinate input from all sectors to achieve infrastructure system development goals.

**Potential Spillover Impacts to Other Sectors**

Cross-sector infrastructure and implementation leaders would help all sectors involved with any aspect of infrastructure system planning.

**Potential Costs**

Potential up-front costs: —

Potential recurring costs: $6.8 million in estimated recurring costs (11 years)

Potential total costs: $6.8 million in total estimated costs

The recurring costs are estimated as personnel cost, including five FTEs dedicated cross-sector infrastructure and implementation leaders at the Central Office of Recovery, Reconstruction, and Resiliency costing $124,600 per FTE. The recurring cost is estimated as $623,000 annually.

Because conducting this coordination requires planners with experience, the FTE costs are estimated as being twice that of the average government employee.

The cost estimated for this COA does not include the cost of time for cross-sector meetings needed among government officials, sector employees, and leaders who may need to attend these collaborative engagements. Those costs are assumed to be part of their respective normal duties.

**Potential Funding Mechanisms**

Hazard Mitigation Grant Program, Community Development Block Grant—Disaster Recovery, government of Puerto Rico

**Potential Implementer(s)**

Government of Puerto Rico

**Potential Pitfalls**

Because successful implementation and planning of infrastructure systems relies on cross-sector collaboration, it is critical to ensure transparency within the development of these systems. However, this relies on the willingness of sectors to invest time and energy into collaborative engagements to ensure that the collaboration is a success.
Likely Precursors

The cross-sector infrastructure and implementation leaders’ roles and responsibilities will need to be developed within Central Office of Recovery, Reconstruction, and Resiliency. The role and its responsibilities will also need to be introduced to all sectors, who will need to have a clear understanding of its purpose.

References


Sectors Impacted

Community Planning and Capacity Building, Municipalities

Issue/Problem Being Solved

The number and size of grants that will be received by Puerto Rico as part of rebuilding efforts is likely to be much higher than the historical levels the commonwealth has been used to receiving. Effectively and efficiently managing those funds will be vital to ensuring they are spent in accordance with regulations and accounting practices.

According to the Puerto Rico Office of Management and Budget’s Federal Funds Management Office, Puerto Rico in Fiscal Year (FY) 2013 had twice the number of audit findings as the average state and was the sixth highest among states in the ratio of number of audit findings relative to dollars expended in federal funds.

Description

This COA will conduct a study to reevaluate the current state of the commonwealth’s grant management processes and workforce in light of the increased volume and pace of work that will follow from hurricane rebuilding efforts. In anticipation that the study will call for the hiring of additional financial management personnel, this course of action includes hiring ten additional FTEs.

Potential Benefits

According to the U.S. Census Bureau’s Consolidated Federal Funds for Fiscal Year 2010, the last year for which the report is available, Puerto Rico received $6.3 billion in federal grants. Grants to assist with the rebuilding of Puerto Rico following Hurricanes Irma and Maria may be many times larger than this. An evaluation of, and likely an increase in, the financial management workforce will help address this additional workload and prevent the poor management of funds.

According to an undated briefing from the Puerto Rico Federal Funds Management Office from around FY 2015, a number of national and local consultants have been engaged to evaluate various areas related to the application for and management of federal grants. One such study was to “document the current state of the Commonwealth’s grant management workforce and prepare a plan for the development of a grant management workforce within the public sector.” An update of this study to reflect posthurricane rebuilding needs may be required.

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Potential Spillover Impacts to Other Sectors

Improving the financial management of recovery funds would have a positive impact across all sectors engaged in rebuilding and recovery.

Potential Costs

Potential up-front costs: $1 million in estimated up-front costs
Potential recurring costs: $14 million in estimated recurring costs
Potential total costs: $15 million in total estimated costs

The up-front costs are estimated as $1 million for contracting an outside firm to assist with a study. The recurring costs are estimated from ten FTEs annually, at a rate of $124,600 per year (representing double the cost of an average government employee), for a total cost of $1.25 million annually. The cost of hiring an appropriate firm to conduct an update of the previous study may vary from the estimate depending on bids received. The number of additional financial management personnel recommended by such a study may also vary from the number called for in this COA.

Potential Funding Mechanisms

Hazard Mitigation Grant Program, Community Development Block Grant—Disaster Recovery

Potential Implementer(s)

Puerto Rico Federal Funds Management Office

Potential Pitfalls

Qualified financial management personnel would have to be identified and hired. If there are not sufficient trained personnel in Puerto Rico, incentives may be needed to draw individuals willing to relocate. Additional personnel may have to be hired beyond those budgeted in this COA.

Likely Precursors

Sizing the workforce required will depend on an estimate of the likely amount of funds to be managed, but that total amount is not yet known.

References

Commonwealth of Puerto Rico, “Federal Funds Management Office Initiative,” briefing by Merrill Oliver, undated. As of June 8, 2018:
http://www.agencias.pr.gov/agencias/federalfunds/Pages/default.aspx

U.S. Census Bureau, *Consolidated Federal Funds Report for Fiscal Year 2010*, undated. As of June 8, 2018:
CPCB 13
Training Workshop on Best Practices in Post-Disaster Procurement

Sectors Impacted

Community Planning and Capacity Building, Municipalities, Housing, Health and Social Services, Water

Issue/Problem Being Solved

With Puerto Rico receiving three times the postdisaster recovery funds given to states affected by Hurricane Sandy, it is imperative for local governments to possess the capacity to use these funds to procure resources and aid in an effective and efficient way. Governments must be able to process the quantity of procurement contracts and amendments in a timely and compliant manner in the face of a disaster. Because inadequacies in procurement can cause bottlenecks and challenges for postdisaster rebuilding, there is a need to identify areas of improvement and to streamline processes. Puerto Rico has much to learn from past recovery experiences in the continental United States (e.g., Hurricane Katrina, Hurricane Sandy), where similar problems in procurement have arisen.

In the aftermath of a major disaster, a key part of recovery is procuring external support. Planning and establishing procurement processes and capacity are essential for securing contractors that deliver cost-efficient and high-quality recovery programs. This may include establishing a skilled team experienced in complex and quick-turnaround procurement activities or a contracting team to draft agreements or ensure accountability in program execution.¹ Other planning for streamlining procurement in the event of a disaster includes maintaining a centralized listing of vendor contacts and availabilities to respond to specific emergencies or facilitating a network of resources and agencies to locate materials, supplies, and deployable workers (National Association of State Procurement Officials, 2013). There is much to gain from past experiences, including lessons learned, best practices, and tried solutions to procurement deficiencies, which Puerto Rico can apply toward quickly streamlining and optimizing procurement processes. For example, in the aftermath of Hurricane Katrina, the inefficient use of funds and contract mismanagement have resulted in high taxpayer cost to make amends for the wasteful response (U.S. House of Representatives Committee on Government Reform—Minority Staff, 2006). Puerto Rico can learn from procurement officers and contractors about their experiences in Louisiana and apply them to address similar challenges. Past solutions may include improved planning, fostering competition for low costs and high quality, increased accountability to ensure

responsible expenditures and execution, and added transparency to preserve trust in the management of taxpayer funds.²

Description

This COA will organize a three-day conference in Puerto Rico that convenes chief acquisition officers, contract officers, and other procurement experts from the continental United States (particularly Louisiana, New Jersey, and New York) involved in rebuilding after Hurricanes Katrina, Harvey, and Sandy, along with officers and experts in Puerto Rico. Workshops on various topics in recovery would be offered. Two deliverables would be produced after the event: a document on conference proceedings and a guide to postdisaster procurement for innovation and resilience.

Potential Benefits

The conference would provide a forum for individuals with postdisaster experience to train procurement officers in Puerto Rico, share best practices, give advice on possible shortcomings, and provide recommendations. Current officials can build on past knowledge and avoid oversight that has occurred in the past. The conference would also provide a networking opportunity among professionals in disaster management for continued guidance and advising. The conference proceedings will memorialize conversations held and document best practices. The guide to postdisaster procurement for innovation and resilience would act as a working tool that could be disseminated to procurement officers across Puerto Rico, with useful applications from the best practices and lessons learned.

Potential Spillover Impacts to Other Sectors

This COA could have a positive impact across almost all sectors since procurement contracts affect all aspects of recovery.

Potential Costs

Potential up-front costs: $400,000 in estimated up-front costs
Potential recurring costs: —
Potential total costs: $400,000 in total estimated costs

The up-front costs are estimated as a combination of personnel costs, travel, and venue costs. The personnel cost is estimated as five FTEs for a six-month period, at $124,600 per year per FTE, for a total of $312,000. Travel expenses are estimated as $57,500 for 25 people from the continental United States and an additional $32,500 to house 25 participants from Puerto Rico.

The venue cost is estimated to be $30,000. The total up-front costs are estimated as $432,000, represented as $400,000 in the Recovery Plan.

The conference would bring together an estimated 25 chief acquisition officers, contract officers, and other procurement experts from locations recently affected by hurricanes (New York, New Jersey, Louisiana, Puerto Rico). Travel expenses for 25 people for a three-day conference: $1,000 airfare, four nights of hotel at $200/day/person, five days of meals and incidentals at $100/day/person, for a total of $2,300 per person, or $57,500 total. Some Puerto Rico participants may require lodging as well. Funding for 25 participants using the same logic as above (excluding airfare) results in a cost of $32,500.

Because the FTEs hired to prepare the conference and write the documents will be temporary hires requiring some expertise, the cost is estimated at twice the average for a government employee (doubling $62,000/year to $124,600/year).

**Potential Funding Mechanisms**

Community Development Block Grant—Disaster Recovery, FEMA

**Potential Implementer(s)**

Puerto Rico Federal Funds Management Office, chief acquisition officers, contract officers, procurement experts

**Potential Pitfalls**

Not all ideas and practices shared will necessarily be effective or relatable solutions. Puerto Rico faces unique challenges because it is an island, has a different baseline infrastructure being dealt with, has a different set of resources available, and numerous other factors. Therefore, lessons learned from the conference should be taken with caution and consideration.

**Likely Precursors**

Identify individuals in acquisition, procurement, and disaster management positions in Louisiana, New Jersey, and New York who were involved in rebuilding after hurricane destruction. Identify logistical and administrative processes to organize a well-run conference.

**References**

Amey, S. H., *Federal Contracting: Lessons Learned from Hurricane Katrina*, 2006. As of June 7, 2019:

Cheatham, Ben, Anne Healy, and Becca O’Brien Kuusinen, *Improving Disaster Recovery: Lessons Learned in the United States*, 2015. As of February 18, 2019:
https://www.mckinsey.com/~/media/mckinsey/business%20functions/risk/our%20insights/improving%20disaster%20recovery/improving_disaster_recovery_280615_final.ashx


U.S. House of Representatives Committee on Government Reform, Minority Staff, *Waste, Fraud, and Abuse in Hurricane Katrina Contracts*, 2006. As of June 7, 2019:
Sectors Impacted

Community Planning and Capacity Building, Municipalities

Issue/Problem Being Solved

Many municipalities do not have the capacity to apply for grants or the expertise to write quality proposals. This gap leads to a lack of federal grant participation and potential unused funds that could benefit Puerto Rico.

According to the Puerto Rico Federal Funds Management Office, in FY 2012 Puerto Rico participated in 214 federal grant programs but identified another 222 programs in which it was eligible to participate but had not participated in.\(^1\) It ranks behind every state in the number of programs it participates in, as well as the grant dollars per capita. Furthermore, about 23 percent of Puerto Rico’s annual budget relies on federal grant funding.\(^2\) Grant management capacity is essential for the effectual utilization of federal funds, and an important first step of acquiring funds is writing an effective proposal. Increasing the capacity to write proposals would enable Puerto Rico to increase the amount of money available, whether for disaster recovery or nondisaster purposes.

Description

This COA will establish a set of 100 scholarships each year, for five years, for municipal government office workers and local NGO staff to receive ongoing training over a one-year period in grant writing from university-based certification programs (many of which are established in the continental United States, as well as one located at the University of Puerto Rico). This builds upon existing policy set by the governor’s executive order that every agency from the executive branch must contract with the University of Puerto Rico for capacity building. These programs prepare participants to research funding prospects, write effective proposals, and budget and implement grants. In addition to spending time on-site at academic institutions in the continental United States, awarded scholars will have continuing remote support as they write grants. The scholarship will provide funds for tuition, travel, and room and board for the duration of the one-year program. To manage the scholarship, a three-person committee will be needed to organize the program and coordinate with grant sources and training programs. Because

\(^1\) Merril Oliver, *Federal Funds Management Office Initiative*, undated.

municipalities may lack personnel to write grants, this COA also includes funding to hire an average of 0.25 FTE per municipality to seek grants and ultimately run projects.

**Potential Benefits**

This COA further encourages municipal government office workers to prepare competitive and compelling grant proposals to acquire funds for state-financed projects, including those in disaster recovery. This COA also provides professional development for the governmental workforce and empowers members of the municipalities to seek solutions for their own community. In contrast, outsourcing grant-writing skills would cost more in the long term and might entail conflicts of interest. Also, there is general increased capacity for raising awareness of issues, proposing COAs, and costing activities.

**Potential Spillover Impacts to Other Sectors**

Writing effective grant proposals will increase the likelihood of municipalities successfully acquiring funds and other necessary resources to address their most pressing issues. Grants can also provide funding for projects that would improve issues spanning various sectors (e.g., increasing access to water, making transportation more efficient, identifying renewable sources of energy).

**Potential Costs**

Potential up-front costs: $3.2 million in estimated up-front costs (5 years)
Potential recurring costs: $14 million in estimated recurring costs (11 years)
Potential total costs: $17 million in total estimated costs

The up-front costs are based on the costs of the students and personnel to manage the program. The student costs include $1,500 for certification program tuition; $1,000 for airfare, $1,500 for one week’s lodging, $500 for one week’s meals and incidentals, per student for a total of $4,500. For 100 students per year over a five-year period, the total cost is $2.25 million total up-front cost. The personnel to manage the program are estimated as three FTEs, at a cost of $62,300 per FTE per year, for a total of $187,000 annually, or an estimated $900,000 over five years.

The recurring costs are estimated based on 0.25 FTE per municipality on average, or ~20 FTEs, at a cost of $62,300 per staff, totaling $1.25 million annually.

**Potential Funding Mechanisms**

Community Development Block Grant—Disaster Recovery, nongovernment sources

**Potential Implementer(s)**

Government of Puerto Rico, municipal governments
**Potential Pitfalls**

Grants have different application requirements because agencies providing grants have different priorities and cover different subject matters. The grant-writing curricula in the programs will provide general skills, but the participants will still need to hone their writing skills for specific subject matters and agencies.

**Likely Precursors**

Identify the most suitable grant-writing programs.

**References**


Oliver, Merril, *Federal Funds Management Office Initiative*, undated. As of June 8, 2018:
http://www.agencias.pr.gov/agencias/FederalFunds/Documents/Fondos%20Federales%20vFINAL.pdf
CPCB 15

Strengthen Local Nonprofit and NGO Involvement in Disaster Recovery

Sectors Impacted

All

Issue/Problem Being Solved

Increase the engagement of local nonprofits and NGOs with governmental agencies to maximize coordination and contribution as partners in delivering recovery programs and resources, while also building capacity to develop community resilience.

Local nonprofits and NGOs are important in building community resilience in all phases of disaster. Disasters such as Hurricanes Sandy and Katrina have demonstrated that they are an important link to communities in disaster recovery, providing services and much needed information to community members.1 Engaging NGOs, recognizing their capabilities, building their capacity, and collaborating with them can help the commonwealth more effectively respond to future disasters while aiding the process of long-term recovery.

Description

This COA will strengthen local nonprofit and NGO involvement in disaster recovery. It will establish a unit within ODSEC that will work to strengthen the engagement of local nonprofits and NGOs with government agencies to maximize their contributions as partners in the recovery process, while also helping to build their capacity. This COA will also develop symposiums, involving both new and long-term nonprofits from places that have experienced large-scale disasters, to network and share experiences working in the postdisaster time frame.

The office would oversee five tasks:

1. Engage with the local nonprofit community and organize a working group to create a municipalwide plan of roles and responsibilities for NGOs and nonprofits. The plan would offer guidance to NGOs and nonprofits during all phases of disaster.
2. Create a task force that oversees the implementation of new roles and responsibilities for NGOs and nonprofits to foster coordination and collaboration of these organizations

during disaster phases. The task force could manage a small amount of funds to help facilitate NGO partnerships.

3. Oversee the formation of a commonwealthwide database to help track NGO services and evaluate and assess their capabilities. The database would also provide a centralized way to improve information exchange between government agencies and NGOs. Engagement with NGOs (task 1) may assist them in helping to populate this database.

4. Create a certification process to qualify NGOs to serve a specific capacity during the recovery process and incentivize this certification by offering an opportunity for federal match funding to NGOs who go through the certification process.

5. Provide technical assistance and training to NGOs and nonprofits. Technical assistance may include but will not be limited to fund-raising planning, applying for grants, strategies in communication, and financial management courses.

This COA was developed based on prior research following Hurricane Katrina. Recommendations were developed by leaders’ perspectives with the intent to provide an agenda of actionable response recommendations from the NGO community. Recommendations included the need to create a database of organizations, make clear roles and responsibilities of NGOs, identify ways to leverage NGO capabilities, and improve information exchange among NGOs and governmental agencies. The tasks listed above were created to reflect these recommendations.

A database that tracks NGO services would provide a centralized way to communicate with NGOs while properly assessing their capabilities. Creating a certification process would also help government agencies to better leverage their resources and allocate funding. The certification would be an additional credential for NGOs to demonstrate their ability to respond and provide needed services. These certified NGOs would help government agencies identify organizations who are able to fulfill needs during disaster recovery and could be tracked within the database. They would also be allowed to apply for match funding.

To incentivize NGOs and nonprofits to obtain certification, matching federal grants could be offered to those who obtain certification. The match program would require that the grantee match a portion of the funds provided by the federal grant. Awardees would need to obtain certification before applying for funding and outline how the funding would be used in order to receive match funds. Program outcomes would also need to be reported to the managing entity to ensure accountability.

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3 Acosta, Chandra, and Ringel, 2013.

4 Acosta, Chandra, and Ringel, 2013.

5 Acosta, Chandra, and Ringel, 2013.
Capacity building is both a responsibility to improving and strengthening abilities to achieve goals and also supporting programs and improve their sustainability. This COA would provide an opportunity to strengthen the capacity of nonprofits through providing technical assistance and advancing their ability to respond and rebuild in the face of disaster. Supporting these NGOs and improving coordination with government agencies through the creation of the commonwealthwide plan for NGOs ensures they understand their roles and responsibilities and are able to respond effectively. Additional certification and grant funding through the match program would ensure that assistance would be provided and help to empower these organizations.

**Potential Benefits**

A clear plan is needed to delineate the roles and responsibilities of NGOs during disaster response and recovery. Working together alongside NGOs to create a plan is a necessary step to outline these responsibilities should another similar disaster occur. Improving cooperation and coordination would strengthen partnerships and drive more successful cross-sector collaboration. Creating a centralized system to track NGOs and their capabilities would improve coordination and communication among government agencies and NGOs and would enhance resource allocation. Strengthening local NGO and nonprofit support is critical to building community resilience. Improving credentialing for these organizations and offering opportunities for additional funding would improve their capacity while helping them to begin developing more long-term sustainable funding.

Developing NGO and nonprofit capacity can improve community resilience during and after a disaster and strengthen the services they are able to provide to the most affected individuals. Previous research has demonstrated that the ability of nonprofits to provide services often falls short due to lack of coordination and collaboration among government agencies and other NGOs leading to inefficiencies, overlap of services, and underutilization of their capabilities. This COA was created to ensure a more integrated response and more coordinated planning of roles and responsibilities.

**Potential Spillover Impacts to Other Sectors**

Improving local capacity support enables communities to rebuild and strengthens community resilience in the face of disaster. This COA has the potential to spillover to all other sectors, and specifically to Housing, Municipalities, Water, Health and Social Services, Transportation, and Communications and Information Technology.

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7 UNC Center for Law, Environment, Adaptation, and Resources, *CLEAR Report Recognizes the Importance of Non-Profits in Disaster Relief and Calls for Improved Coordination in Disaster Response and Recovery*, 2011.
**Potential Costs**

Potential up-front costs: —

Potential recurring costs: $9 million in estimated recurring costs (11 years)

Potential total costs: $9 million in total estimated costs

The recurring costs are estimated as personnel costs. The personnel costs include two FTEs to manage outreach, coordinate the working group, and supervise development of a commonwealthwide plan; one FTE to assist with maintenance and creation of the database; and three FTEs to help coordinate technical assistance programs, oversee certification, and manage grant match funding. These six FTEs, at $124,600 per year, are estimated to cost $747,600 annually. Because technical skills will be required, the cost per FTE is estimated at twice the cost of the average government employee.

**Potential Funding Mechanisms**

Community Development Block Grant—Disaster Recovery, nongovernment sources

**Potential Implementer(s)**

Office for Socioeconomic and Community Development, nongovernmental organizations, local nonprofits

**Potential Pitfalls**

It could be challenging to engage already overburdened local nonprofits and NGOs in additional disaster recovery initiatives.

**Likely Precursors**

Identify local nonprofits and NGOs who were involved in disaster recovery after the hurricanes. Include any newly formed (e.g., after the hurricanes) local nonprofits and NGOs that could be effective partners in future disaster recovery efforts.

**References**


Acosta, Joie D., Anita Chandra, Sally Sleeper, and Benjamin Springgate, *The Nongovernmental Sector in Disaster Resilience*, Conference Recommendations for a Policy Agenda, 2011. As of February 18, 2019:


Table B.1. Recovery Themes and Definitions

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<tr>
<td>Infrastructure and Services</td>
<td>Information related to local infrastructure (e.g., buildings, roads, bridges, power supplies, and transportation challenges related to roads) and services (e.g., schools, libraries, universities, fire departments, police, hospitals, and utilities such as gas, cable, and Internet)</td>
</tr>
<tr>
<td>Vulnerable Populations</td>
<td>Information about challenges faced by the poor, elderly, children, disabled, or similarly disadvantaged persons in addition to individuals, organizations, and entities entrusted with caring for them</td>
</tr>
<tr>
<td>Psychological/Physical Trauma</td>
<td>Psychological and physical challenges endured</td>
</tr>
<tr>
<td>Preparations by Organizations</td>
<td>Actions, efforts, and resources expended by governments, NGOs, faith-based organizations, and public-sector entities that provided emergency assistance</td>
</tr>
<tr>
<td>Capacity Deficit</td>
<td>Information on factors that had a negative effect on the community’s capacity to prepare for hurricanes and disasters (i.e., lack of enough people, resources, and relevant policies to adequately prepare for a natural disaster)</td>
</tr>
<tr>
<td>Preparations by Individuals</td>
<td>How individuals prepared for the hurricanes</td>
</tr>
<tr>
<td>Resignation</td>
<td>Refers to situations where individuals indicate that they are not empowered to improve, prepare, or make changes or situations where they indicate giving up</td>
</tr>
<tr>
<td>Distrust</td>
<td>Refers to distrust of government due to corruption, ineptness, or lack of capability</td>
</tr>
<tr>
<td>Personal Housing and Property</td>
<td>Information related to people’s homes, apartments, and so forth, in addition to their personal property</td>
</tr>
<tr>
<td>Community Resilience</td>
<td>Refers to situations where individuals indicate that they feel empowered to improve, prepare, or make changes that can improve their ability to respond to adverse events</td>
</tr>
<tr>
<td>Pessimism</td>
<td>Negative outlook on the future of an individual or community</td>
</tr>
<tr>
<td>Optimism</td>
<td>Positive outlook on the future of an individual or community</td>
</tr>
<tr>
<td>Issues Related to the Economy</td>
<td>Information related to the overall health of the economy (i.e., public debt, economic turmoil, or economic revitalization)</td>
</tr>
<tr>
<td>Isolated Communities</td>
<td>Communities in remote or otherwise difficult-to-reach locations</td>
</tr>
<tr>
<td>Employment and Jobs</td>
<td>Information on employment and jobs—to include statistics about the unemployment rate, labor shortages, and migrant labor</td>
</tr>
<tr>
<td>Outmigration</td>
<td>Information about citizens leaving the island</td>
</tr>
<tr>
<td>Adequate Capacity</td>
<td>Having enough people, resources, and relevant policies to adequately prepare for a natural disaster</td>
</tr>
<tr>
<td>Trust</td>
<td>Refers to trust of government based on government response, reliability, and capability</td>
</tr>
<tr>
<td>Informal Housing</td>
<td>Information about people living in housing units constructed on land to which the occupants have no legal claim</td>
</tr>
<tr>
<td>Community Engagement</td>
<td>Refers to any information about how often engagements (town halls, visits from FEMA, focus groups) with communities occur</td>
</tr>
</tbody>
</table>
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The government of Puerto Rico developed a plan to recover from the destruction caused by Hurricanes Irma and Maria, build resilience to withstand future disasters, and restore the struggling economy. The Homeland Security Operational Analysis Center (HSOAC), operated by RAND Corporation under contract with the U.S. Department of Homeland Security, worked with the Federal Emergency Management Agency (FEMA) to assist with the development of the plan.

Acting in support of FEMA’s Community Planning and Capacity Building (CPCB) sector, HSOAC conducted surveys, interviews, and focus groups with municipalities, government leaders, subject-matter experts (with expertise in law enforcement, emergency management, community planning, etc.), nonprofits, and community residents, among others, to provide critical community context for CPCB efforts. HSOAC also used multiple data sources to estimate the outmigration of residents who in the wake of the hurricane moved out of their communities to the continental United States.

The authors describe the status of Puerto Rico’s communities in terms of population characteristics and dynamics, community and individual preparedness, and economic pressures leading up to the landfalls of the hurricanes. They also report on the impact that the hurricanes had on Puerto Rico’s communities in terms of damage, community stress, and migration away from the island. These analyses and discussions informed the development of 15 courses of action (COAs) aimed at improving Puerto Rico’s capacity for emergency preparedness, coordination, communication, recovery planning, and research and training, to meet the needs of Puerto Rico and its vulnerable communities during a disaster.