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A Content Analysis on the Phases of Emergency Management for Hurricane Maria in Puerto Rico

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ABSTRACT: The destruction caused by Hurricane Maria challenged the emergency management agencies in Puerto Rico. More than a month after the storm, most of the island remained without electricity, and full recovery has taken several months, if not years. This study explores the four phases of emergency management (mitigation, preparedness, response, and recovery) for Hurricane Maria in Puerto Rico from the perspective of FEMA and AEMEAD. Data comes from a content analysis of official communications, news reports, and social media postings from FEMA, AEMEAD, and other agencies responsible for emergency management in Puerto Rico. Results suggest that the magnitude of the storm, previous financial struggles, and a lack of preparedness were the main factors that influenced the emergency management process for AEMEAD. Also, results indicate that ongoing disasters, lack of priority, and geographic challenges were the main factors that influenced the emergency management process for FEMA. The findings of this study provide a comprehensive review of the emergency management procedures taken by FEMA and AEMEAD before, during, and after Hurricane Maria. This review can inform those involved in emergency management and can be utilized as a policy tool to learn and prepare for future catastrophic events.

KEYWORDS: Hurricane Maria, Puerto Rico, emergency management, natural disaster

..... *Republication not permitted without written consent of the author.*

INTRODUCTION

On September 20, 2017, Puerto Rico was hit by a category 4 hurricane named Maria.¹ It was the worst natural disaster in the island's modern history, and the third most destructive hurricane in the United States.² Hurricane Maria's devastation was estimated to cost about \$90 billion. This hurricane was the second largest and the deadliest of the season, causing about 2,975 deaths in Puerto Rico.³ Hurricane Maria destroyed the entire northeastern part of the Caribbean, especially those areas previously affected by Hurricane Irma.

Puerto Rico was completely devastated by the impact of Hurricane Maria. The socio-economic challenges of the island made the situation more complicated. Puerto Rico's severe government insolvency complicated the emergency management process. Federal and Puerto Rican authorities worked together to address the catastrophe in the island: The Federal Emergency Management Agency (FEMA) and the Puerto Rico Emergency Management Administration (AEMEAD, for its Spanish acronym).

The 2017 hurricane season was particularly alarming since there were several hurricanes affecting the United States at the same time. First, the unexpected devastating impact of Hurricane Harvey in Houston, Texas. Then, the impact of Hurricane Irma in Florida and the Southeast of the U.S. Both of these emergencies deviated resources and the attention of federal agencies from the later impact of Hurricane Maria in Puerto Rico. Funding and emergency response resources were already allocated to these affected states, leaving the devastated territory of Puerto Rico in a precarious situation.

Before Hurricane Maria, Puerto Rico had been affected by Hurricane Irma. Although Irma did not cross through Puerto Rico as expected, she made the island more vulnerable. The island's crumbling infrastructure was damaged, especially the Puerto Rico Electric and Power Authority (PREPA). Many households were left without water or electricity during the impact of Hurricane Irma. Approximately 60,000–80,000 of PREPA customers were without power. Most of these customers did not have power restored before the impact of Hurricane Maria.

This study explores the four phases of emergency management, which include mitigation, preparedness, response, and recovery for Hurricane Maria in

Puerto Rico. The evaluation of these four phases provides a comprehensive review of the different emergency management procedures taken by FEMA and AEMEAD. Conflicting perspectives about the emergency management. In particular, this study aspires to reach confident conclusions that clarify the role and actions taken by participating emergency management agencies throughout the catastrophe.

METHODOLOGY

Data utilized in this study comes from a content analysis of official communications, news reports, and social media postings related to FEMA, AEMEAD, and Hurricane Maria. Sources include the following: FEMA and AEMEAD's website, El Nuevo Dia newspaper reports, as well as scholarly publications from CUNY and GWU, among others. This assessment evaluates the four phases of emergency management: mitigation, preparedness, response, and recovery for both agencies.

- Mitigation—The capabilities necessary to reduce the loss of life and property by lessening the impact of disasters.⁵
- Preparedness—The capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk.⁶
- Response—The capabilities necessary to save lives, protect property and the environment, and meet basic human needs after an incident has occurred.⁷
- Recovery—The core capabilities necessary to assist communities affected by an incident to recover effectively.⁸

An overview of AEMEAD's role in the catastrophe was completed using its website as the main source. A holistic evaluation was done of AEMEAD's website and its content to understand how much information about Hurricane Maria was provided. Then, official communications, Puerto Rican news reports, and executive statements were utilized as sources to analyze the phases of emergency management for AEMEAD. First, key themes that relate AEMEAD and Hurricane Maria were identified, such as AEMEAD's Catastrophic Plan, island wide power outages, communication loss, etc. Then, these key themes were further researched.

As for FEMA, I performed a comprehensive comparison of the funding distribution across hurricanes Harvey in Texas, Irma in Puerto Rico, Irma in Florida, and Maria

in Puerto Rico. This evaluation was done using the disaster declaration reports available in FEMA's website. The factors addressed in the comparison were Individual Assistance applications approved, total Individual & Households Program dollars approved, and total Public Assistance Grants dollars allocated to all four disaster declarations. Also, an evaluation of the phases of emergency management for FEMA was completed using the *2017 Hurricane Season FEMA After-Action Report* as a primary source.

OBSERVATIONS

Puerto Rico Emergency Management Administration (AEMEAD)

The Puerto Rican (P.R.) government did not properly follow its Catastrophic Hurricane Plan with Hurricane Maria.⁹ This plan is made up of other sub-plans that address the emergency protocols to follow before, during, and after a hurricane. These sub-plans are as follows: The Operational Emergency Management Plan, Continuity of Operations Plan, Family Reunification Plan, Distribution Plan, and Mitigation Plan. All these plans are based upon a set of uniform procedures for emergency management established by the National Incident Management System (NIMS), which is authorized by presidential orders. The most recent Operational Emergency Plan of the AEMEAD was approved on September 26, 2016 and the Mitigation Plan on August 3, 2016.¹⁰ Before Maria's impact, approval of the Distribution Plan was still pending along with the evaluation of facilities that would be used as distribution centers.

There had been limited simulations to test the effectiveness of the emergency plans with responders or the coordination of agencies with municipalities and the federal government before the catastrophe.¹¹ Even though AEMEAD is responsible for requiring agencies and municipalities to have updated emergency plans, it did not fully comply with its own protocol. According to the 2016 Transition Report of the past administration of AEMEAD, only 24 of the 78 municipalities had an Operational Emergency Plan approved. Before Hurricane Maria, the only meeting between the interagency coordinators who were assigned to work in the Emergency Operations Center (COE, in Spanish) during the emergency occurred in March of 2017. According to Carlos Muñoz, an emergency responder with 45 years of experience working for AEMEAD,

the agency as of June 2017 had only shared with the 78 municipalities information about the company hired to develop the operational emergency plans for all municipalities.¹² The agency was not prepared to respond to an emergency management situation.

Phases of Emergency Management

Mitigation

The P.R. government was not able to successfully follow its Mitigation Plan. This plan is federally required for every state and territory by the Stafford Act, which provides the guidelines for states and territories to develop their mitigation plans.¹³ AEMEAD, which is responsible for implementing the Mitigation Plan in the island, took limited mitigation measures. This agency does not publicly share its emergency plans as other states do, such as Florida.^{14,15} Nevertheless, given the devastation of the hurricane, it is fair to conclude that mitigation procedures were not properly followed to prevent such a catastrophe.

The collapse of the infrastructure in Puerto Rico demonstrates the lack of implemented mitigation measures. The infrastructure was already in a very vulnerable condition before Hurricane Maria hit the island. Partially due to its financial struggles, Puerto Rico had not invested in renovating its infrastructure. Although maintaining a stable infrastructure is an essential component in the mitigation process, it was not given priority. All major power plants in Puerto Rico, which failed during and after the hurricane, date back to the 50's and 70's.¹⁶ Since then these major power plants, owned by PREPA, have not been heavily renovated. Infrastructure maintenance is a key element of the mitigation process, so the lack of priority from the P.R. government in ensuring a stable power grid demonstrates its ineffectiveness in following its mitigation plan.

Preparedness

The P.R. government did not prepare to face Hurricane Maria adequately. It had a sense of comfort and lack of urgency given that Hurricane Irma did not affect the island as expected. Originally, when Puerto Rico was given a hurricane advisory for Hurricane Irma, the expectations were that it was going to strike the island straight through the middle as a major hurricane. The P.R. government took needed actions to properly prepare for Hurricane Irma. By contrast, the general expectations

of the P.R. government when preparing for Hurricane Maria underestimated the severity of the hurricane. The sense of urgency for Hurricane Maria was much less than for Irma since people on the island felt greater confidence on their level of preparedness and security. Island residents and the P.R. government had already prepared and mobilized to face Hurricane Irma, so people thought they were prepared to face Hurricane Maria.

The P.R. government did not prepare to face a hurricane with the magnitude of Hurricane Maria. The fast development of Hurricane Maria into a major category 4 hurricane was overlooked in the preparation process. People in the island could not imagine that a hurricane like Maria could cause the amount of damage it did. The hurricane advisories given to Puerto Rico predicted that Hurricane Maria was going to impact the island as a major hurricane and that it was going to affect some areas severely, but many individuals were indifferent about these predictions. The P.R. government did not fully follow its Catastrophic Plan, including its communication methods.¹⁷ In particular, they relied on AEMEAD's satellite communications system that broke down during the hurricane, leaving no alternate communication method.

Response

AEMEAD was incapable of effectively responding to the catastrophe since it did not fully follow its Emergency Operational Plan and Catastrophic Plan.¹⁸ Both of these Plans are designed to ensure that AEMEAD, on behalf of the P.R. government, effectively responds to disaster. During the first few days of the catastrophe the island was in chaos. The ex-director of AEMEAD under Gov. Fortuño, Epifanio Jimenez, claimed that the chaos was due to lack of familiarity of AEMEAD's leadership and other agencies with the emergency plans. According to him, not even the Crisis Management Plan or the Distribution Plan were followed to properly distribute and handle food and donations. Also, he claimed that most of AEMEAD's response to the catastrophe was improvised.¹⁹

As AEMEAD failed to respond to the catastrophe, FEMA had to take the primary role in the emergency management process during Hurricane Maria. Simply put, the P.R. government was not prepared and did not follow its emergency plan. In a statement, Brock Long, FEMA administrator, expressed to Congress that the

P.R. government "trusted [FEMA] to be not only the primary response, but basically the only answer for many weeks."²⁰ He continued by adding that "FEMA has never been designed to be the first response and should not be." The P.R. government's emergency protocol, however, was unable to comply with its primary responsibilities during an emergency situation, proving itself unresponsive.

Recovery

The recovery period for Hurricane Maria in Puerto Rico was uncertain. On October 14, 2017 (24 days after landfall), Gov. Rosselló announced that the P.R. government would ensure a 95% power restoration by December 15, 2017.²¹ Due to the magnitude of the devastation, the P.R. government was not able to fulfill its promise of achieving a 95% power restoration, only achieving a 63% by December 14, 2017.²² P.R. officials blamed their unsuccessful attempt on the lack of materials and the severity of the destruction. By March 16, 2017, Justo Gonzalez, acting director of PREPA, announced that PREPA had achieved 93% of power restoration.²¹ The recovery process led by the P.R. government resulted in an even longer recovery period than originally expected.

The severity of the financial situation on the island represented an even greater challenge for the recovery process. After the devastation, the need to rebuild the power grid of the island became the main financial burden for the P.R. government. Based on estimates given by Gov. Rosselló, the first 2 months of work for restoring power in Puerto Rico would cost an approximate of \$1,680 million.²⁴ The P.R. government relied on the federal government's financial support for these expenses, but much of the delay in the recovery of the island and the restoration of power was due to the inability of the P.R. government to disburse funding for these efforts. The P.R. government was forced to rely on the financial support of the federal government to continue recovery operations in the island.

Federal Emergency Management Agency (FEMA)

FEMA	Texas Hurricane Harvey ²⁵ (DR-4332)	Puerto Rico Hurricane Irma ²⁶ (DR-4336)	Florida Hurricane Irma ²⁷ (DR-4337)	Puerto Rico Hurricane Maria ²⁸ (DR-4339)
Incident Period:	Aug. 23, 2017– Sept. 15, 2017 (23 days)	Sept. 05, 2017– Sept. 07, 2017 (3 days)	Sept. 04, 2017– Oct. 18, 2017 (44 days)	Sept. 17, 2017– Nov. 15, 2017 (59 days)
Designated Counties (Individual Assistance):	41	10	59	78
Individual Assistance Applications Approved:	370,454	1,329	771,436	438,220
Total Individual & Households Program (IHP) Dollars Approved:	\$1,555 million	\$3 million	\$987 million	\$1,023 million
Total Public Assistance (PA) Grants Dollars Obligated:	\$625 million	\$4 million	\$17 million	\$555 million
Total Dollars:	\$2,180 million	\$7 million	\$1,004 million	\$1,578 million

*As of February 16, 2018 (website keeps being updated with new approved applications)

Table 1. Summary of Findings

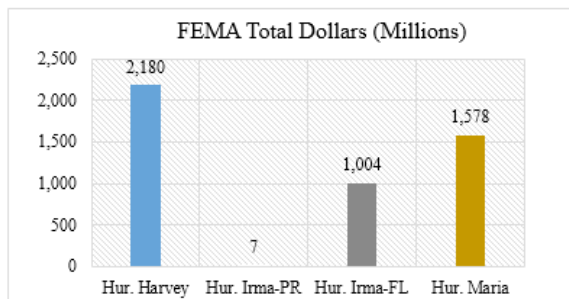


Figure 1. FEMA Total Dollars

Figure 1 illustrates that as of February 16, 2018 FEMA had approved a total of \$4,769 million in funding for hurricanes Harvey, Irma in Puerto Rico, Irma in Florida, and Maria. This total amount includes funding approved through the Individual & Households Program (IHP) and Public Assistance (PA) Grants. Hurricane Harvey had the highest funding allocation of \$2,180 million, followed by Hurricane Maria which had an allocation of \$1,578 million.

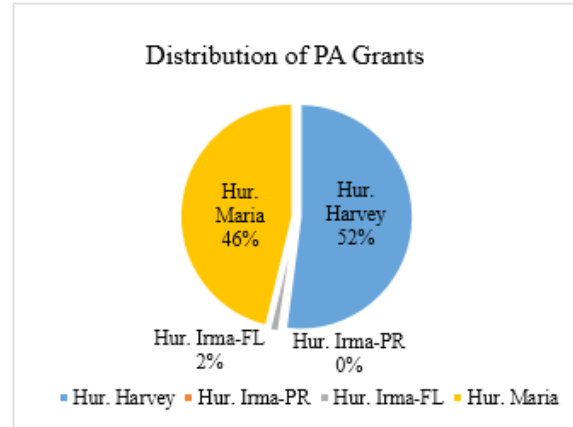


Figure 2. Distribution of PA Grants

Figure 2 illustrates the distribution of the total amount of Public Assistance (PA) Grants allocated as of February 16, 2018 by hurricane. The distribution is represented in percentages (%). The total amount allocated in PA Grants was \$1,201 million. Hurricane Harvey received the highest allocation of PA Grants accounting for 52% (or \$625 million) of the total amount, followed by Hurricane Maria which received 46% (or \$555 million).

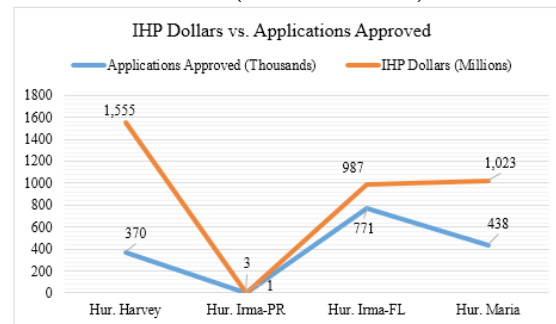


Figure 3. IHP Dollars vs. Applications Approved

Figure 3 illustrates the distribution between total Individual & Households Program (IHP) dollars assigned and the total number of applications approved as of February 16, 2018. A total of \$3,568 million was approved in IHP dollars. Hurricane Harvey received the highest allocation \$1,555 million of IHP dollars, followed by Hurricane Maria with an allocation of \$1,023 million, and a total of about 1.6 million applications were approved. Hurricane Irma in

Florida had the highest application approval of 71,000, followed by Hurricane Maria with a total of 438,000.

Phases of Emergency Management

Mitigation

The federal government did not enforce sections of the Stafford Act requiring states, territories, and tribal government who receive federal funding for mitigation measures to invest it accordingly.²⁹ Sec. 203(g)(2) of the Stafford Act states that the President shall consider, when awarding financial assistance for mitigation, "the degree of commitment by the State or local government to reduce damages from future natural disasters." In the *2017 Hurricane Season FEMA After-Action Report* (AAR), FEMA "encourage[s] critical infrastructure owners and operators, and state and local governments, to invest in more resilient infrastructure."³⁰ There had been limited federal oversight on how funds were being allocated and how effective the investments of past mitigation efforts in Puerto Rico were.

The territorial status of Puerto Rico made FEMA more lenient in its planning strategies to address a disaster on the island. In the AAR, FEMA recognized that "the planning assumptions for a hurricane, earthquake, or tsunami striking Puerto Rico and the U.S. Virgin Islands under-estimated the actual requirements in 2017." The report shows that FEMA's earliest emergency plan for Puerto Rico was drafted in 2012, while those for the states of Florida and Texas was drafted in 2016 and 2013 respectively. Perhaps the distance of Puerto Rico from the mainland U.S. gave FEMA a lesser sense of priority with the island territory.

Preparedness

FEMA was not fully prepared to address a catastrophe in Puerto Rico for the 2017 hurricane season. In the AAR, FEMA recognized that their "planners increasingly employ the practice of pre-disaster resource phasing planning," but Puerto Rico "did not [have] an existing Resource Phasing Plan (RPP) during the response" of Hurricane Maria. Their planners had to improvise using lessons learned from past RPP efforts to ensure the flow of resources to the island. The impact of Hurricane Harvey and Irma did affect the ability of FEMA to be properly prepared for Hurricane Maria. FEMA faced staffing challenges, forcing the agency to "implement innovative methods to augment the disaster workforce."

FEMA had to divide its support efforts between Texas, Florida, the U.S. Virgin Islands, and Puerto Rico, given the record demand for FEMA assistance.

FEMA had a lesser sense of priority addressing the resource short-fall on the island after Hurricane Irma. Puerto Rico almost depleted the resources FEMA had available on the island. The island territory had to face Hurricane Maria with a shortage of resources. The AAR states that the "distribution activities following Hurricane Irma created an immediate deficit of commodities" at the Caribbean Distribution Center warehouse in Puerto Rico, "requiring additional items to be transported in the days immediately prior to and following Hurricane Maria's landfall." FEMA was faced with historically unprecedented preparedness needs and therefore did not have all resources available to effectively respond the disasters.

Response

As AEMEAD failed to respond to the catastrophe, FEMA had to step in and take the leading role in the emergency management process. The P.R. government collapsed due to a lack of communications and power, forcing the federal government to take the leading role in the emergency response. In the AAR's key findings, "FEMA provided logistical coordination to move and distribute commodities from staging areas to survivors in Puerto Rico, supplementing a role that should largely be managed and coordinated at the state or territory level." FEMA had to overcome its preparedness challenges while dealing with very limited emergency response support from the P.R. government.

Geographic challenges and lack of preparedness of the P.R. government represented a struggle for FEMA to respond effectively. FEMA had to take a more active role in the emergency response situation during Hurricane Maria than historically expected. FEMA had to assume "a more active role in coordinating whole community logistics operations for Puerto Rico and the U.S. Virgin Islands due to these territories' preparedness challenges, geographic distance, and pre-existing, on-the-ground conditions." The severity of the impact of Hurricane Maria in Puerto Rico forced FEMA to scale its emergency operations to one of the biggest in its history.

Recovery

Previous disasters in other states and territories diverted

FEMA's limited resources from Puerto Rico's disaster relief. Due to Hurricanes Harvey, Irma, Maria, and the California wildfires, FEMA had to deal with "unprecedented resource needs of consecutive response operations."³² According to the AAR, the problem was that "FEMA not only exhausted commodities on hand but also exhausted pre-negotiated contracts to provide meals, tarps, water, and other resources during the responses to hurricanes Harvey and Irma." When FEMA had to deal with the emergency in Puerto Rico after Hurricane Maria, it had already depleted most of its resources.

Worse yet, the allocation of federal funding for disaster relief was unequally distributed among affected states and territories. Hurricanes Harvey, Irma, and Maria caused a combined \$265 billion in damage and resulted in widespread displacement of survivors. Yet Congress and other federal agencies have been dubious about the island's requests of relief funding "due to poor pre-disaster infrastructure conditions."³³ In the AAR, FEMA claims it has been challenging to "determine whether some or all of post-hurricane recorded damages were attributable to the disasters." Because of PREPA's already weak power grid, "FEMA could not make necessary repairs to damaged system components that remained connected or serviced by undamaged, outdated elements." The main struggle of Puerto Rico's recovery is finding the appropriate funding to overcome the \$90 billion in damage caused by Hurricane Maria.

CONCLUSION

Hurricane Maria was the worst natural disaster to impact Puerto Rico in its modern history. It caused an approximate of \$90 billion in damages and an estimated of 2,975 deaths during the following six months after its impact.³⁴ Participating agencies did not take necessary procedures to effectively deal with the phases of emergency management before, during, and after the catastrophe. The evidence suggests that AEMEAD and FEMA fell short on their preparedness and response to Hurricane Maria in Puerto Rico. The magnitude of the storm, previous financial struggles, and lack of preparedness were the main factors that influenced the emergency management process for AEMEAD. Also, ongoing disasters, lack of priority, and geographic challenges were the main factors that adversely affected FEMA's emergency management process. The collapse of the entire commutation system and power grid in the island were the main elements that significantly

complicated local and federal emergency management scenario.

FEMA utilized outdated emergency planning procedures for Puerto Rico that dated to 2012. There is a need for FEMA to take responsibility and update its emergency plans to respond to a hurricane crisis for the island. Also, there is a need for FEMA to have an appropriate system for data collection and trained staff in the island. FEMA should recognize that Puerto Rico and the U.S. Virgin Islands are extremely vulnerable. Therefore, it must have supplemental commodities and resources available in its Caribbean Distribution Center. Additionally, it should properly train local officials in Puerto Rico about FEMA resources, such as grant opportunities available and how to solicit them. The gap between AEMEAD and FEMA should be bridged through greater and more constant interaction between the two agencies.

AEMEAD's lack of response to the catastrophe adversely affected the lives and wellbeing of its citizens. After the hurricane's landfall, AEMEAD was unable to assess the catastrophe or communicate with help outside of the island. Also, it did not have enough resources as to mitigate the hurricane's impact. The island descended into chaos while AEMEAD failed to reach most municipalities and was incapable of transporting commodities. AEMEAD must adopt an implementable emergency plan that accounts and corrects for its failures during Hurricane Maria. It should routinely simulate and test the effectiveness and employability of its plan. The island's emergency management officials should also be properly trained to understand the emergency plan and what to do in case of an emergency.

Puerto Rico is facing the biggest social and economic crisis in its modern history. Because of the crisis caused by Maria, an estimated amount of 136,000 Puerto Ricans left the island and moved to the mainland U.S.³⁵ This exodus raises serious concerns, especially for the P.R. government, since its population continues shrinking, further complicating the fiscal and economic conditions of the island. Puerto Rico is suffering a catastrophic combination of "a vicious cycle of austerity, recession and a shrinking population, now compounded by a natural disaster, creating even greater challenges for its recovery."³⁶

It is essential that FEMA and AEMEAD make themselves accountable for the emergency management process in Puerto Rico. Also, it is important for them

to accept responsibility for their short comings. Corrective actions are necessary to address these issues. Proper actions such as effective planning, routine training, and responsible mitigation measures should be implemented to responsibly correct for previous emergency management failures. These three elements—*accountability*, *responsibility*, and *corrective actions*—are essential for each agency to recognize what needs to be addressed to avoid any similar catastrophes in the future. The environmental threats are real and they keep getting worse. Therefore, it is necessary to be prepared as a nation and become more resilient to mitigate future natural disasters and avoid further tragedies.

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