



**DSMG28001 Foundations of Emergency and
Disaster Management**

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Academic Year:

Topic: Hurricane Maria, Puerto Rico, 2017

Table of Contents

Introduction	3
Background of Hurricane Maria and its impact on people	4
Hazards and risks	5
Factors affecting vulnerability	6
Potential advancement of the PPRR framework for Hurricane Maria	6
References	8

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Introduction

Being a powerful category 4 hurricane, Maria made landfall on the southeast coast of Puerto Rico on 22 September 2017. The infrastructure of Puerto Rico Island was massively damaged due to this devastating tropical storm Hurricane Maria. As per the official report, the storm caused 2,975 deaths. However, as per the survey report by Harvard University, the number of deaths was much higher estimated at around 4,645 on the Puerto Rico Island. Communication over cell phones was disrupted as 95% of cell towers became damaged due to Hurricane Maria (Velazquez, 2022). Eight months after this incident in May 2020, many vital services, health care systems, utility services and telecommunication had not been recovered yet. The tropical storm destroyed the power grid, road signs, and all traffic lights in Puerto Rico. More than thousands of residents left Puerto Rico Island to find shelter in the US within the months after the storm passed (Blunden and Hartfield, 2018).



Figure 1: Hurricane Maria

(Source: Blunden and Hartfield, 2018)

Background of Hurricane Maria and its impact on people

On 12 September 2017, on the west coast of Africa, a tropical atmospheric wave originated and moved westward over the tropics. On 16 September 2017, the atmospheric disturbance had been more organised and strengthened into a tropical storm within several hours. According to the Saffir-Simpson scale, the intensity of Hurricane Maria was a category 5 hurricane when it was moving towards Dominica. However, the storm's intensity later fluctuated after its collision with the Dominica Mountain. However, the storm maintained its category 4 intensity while landing in Puerto Rico. During landfall in the islands, the maximum speed of winds was 155 mph and rainfall was 18 inches.

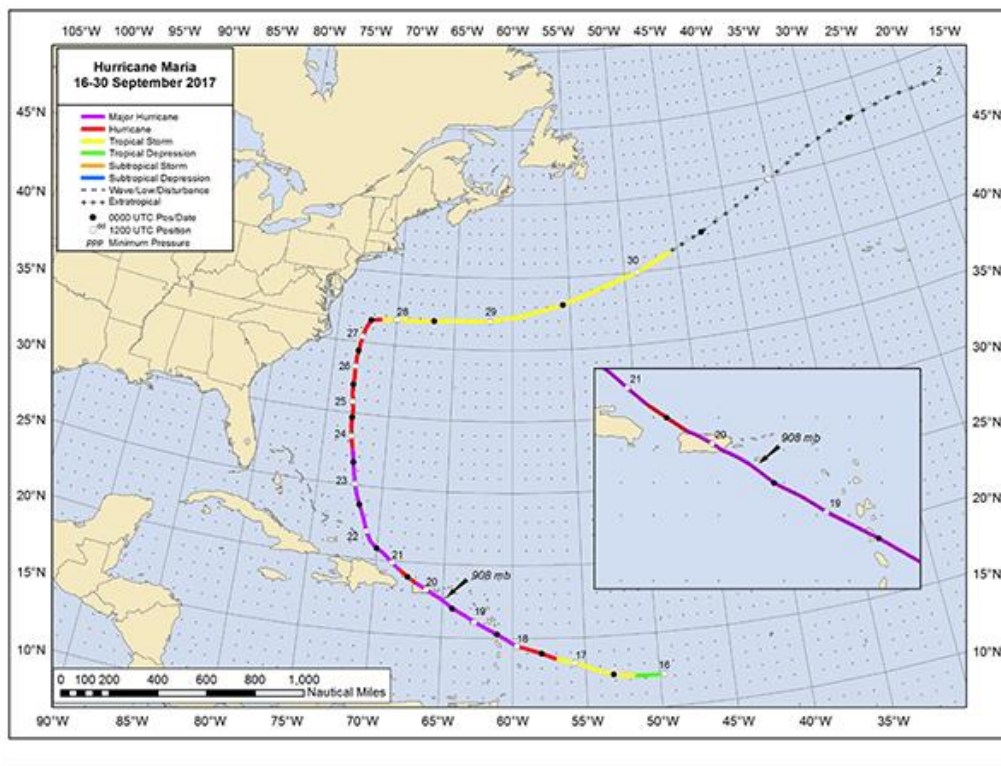


Figure 2: Routes of Hurricane Maria

(Source: Hurricane Science, 2017)

According to Mercy Corps (2018), Hurricane Maria was the worst storm to strike Puerto Rico in over 80 years which resulted in a \$94.4 billion loss in infrastructure. Around 80% of the crop value of the island was destroyed by Hurricane Maria, resulting in a loss of \$780 million

in agricultural outputs. Approximately, 130,000 people of Puerto Rico left their homeland between July 2017 to July 2018. The powerful storm left 3.4 million residents of Puerto Rico in a desperate humanitarian crisis (Mercy Corps, 2018).

Hazards and risks

According to Mercy Corps (2018), after three years of Hurricane Maria, the residents of Puerto Rico are still suffering from the aftermath effects. The rural areas of Puerto Rico have still faced day-long power outages from time to time due to collapsing of utility poles. West *et al.* (2023), more than 70,000 landslides happened across local communities after Hurricane Maria in 2017. According to a survey report, it has been found that 33% of the population of Puerto Rico, equivalent to 1 million people, have been living in extreme landslide susceptibility. March (2022) reported that over 1,00,000 people left Puerto Rico seeking economic opportunities and safety to rebuild their lives in places like Florida.

According to a survey report by Alto *et al.* (2023), 96,000 youth in Puerto Rico reported widespread exposure to mental health risks like trauma. The residents of the islands significantly reported daily stressors even after 6 months of Hurricane Maria. This storm exposes a higher risk for a wide range of mental health issues such as depression, post-traumatic stress disorder (PTSD), anxiety disorders, traumatic grief and externalising issues. On the east coast of Puerto Rico, 67% of respondents reported having major depression, PTSD, and generalised anxiety 6 months after the storm. According to Michaud and Kates (2017), there was an increased risk of infectious diseases due to inadequate hygiene, a lack of safe water and poor sanitation. Additionally, the storm caused a growing burden of chronic diseases like diabetes and cancer (Michaud and Kates, 2017).

Factors affecting vulnerability

Several factors like limited port capacity, isolation, over dependence on imports, and alternative facilities increase the vulnerability of the communities of Puerto Rico. According to Kim and Bui (2019), transportation planning in Puerto Rico was crucial to disaster management, response and recovery. Chronic longer-term factors such as global warming, climate change, sea-level rise, and inadequate infrastructure are also responsible for vulnerability.

Besides this socio-economic status, the overall accessibility of local communities of Puerto Rico and household composition are responsible for higher vulnerability to risk. According to Nolan (2023), Puerto Rico's policymakers identified two system upgrade options including switching to regional mini-grids from centralised power generation. Another option would provide uninterrupted services to improve service delivery for a higher portion of vulnerable populations of Puerto Rico.

Potential advancement of the PPRR framework for Hurricane Maria

According to the International Recovery Platform (2023), the government of Puerto Rico developed the Central Office of COR3 - recovery, reconstruction and resiliency which played a pivotal role in the recovery from the devastating hurricane. FEMA was involved in assisting the government in recovery efforts by recommending all residents to ensure their emergency medical kit read and tested their family communication plan. According to de Arzola (2018), hospitals in Puerto Rico followed an emergency preparedness protocol to reduce the number of patients, formulate contingency plans and ensure adequate supply. Rescue teams organised teams of faculty members and residents to provide food as well as sleeping spaces to victims. According to Noboa-Ramos *et al.* (2023), within the first 24 hours and 72 hours of Hurricane Maria's landfall, 55.8% of firms responded to emergency supplies, water and food to their

target people. SDOs and GAs delivered disaster response services including 70.4% of medical support as well as 57.1% of pharmacy services. Federal and local GAs were involved in the transportation or evacuation of communities as well as patients. They were also involved in evaluating the health and well-being status of communities for quick recovery. The recovery plan involved repairing critical infrastructure, restoring waterways, providing temporary shelters, restoring electricity services and removing debris. The World Bank provided a \$40 million Housing Reconstruction Emergency Recovery Loan, a \$25 million Emergency Agriculture Programme and a \$31 million Disaster Vulnerability Reduction Project. The government recovery plan included 270 courses of recovery action with estimated expenses of \$139 billion over 11 years (International Recovery Platform, 2023).

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