

PLANES DE MITIGACIÓN CONTRA PELIGROS NATURALES

Resiliencia Planificada



JUNTA DE PLANIFICACIÓN

2020

Municipality of Arroyo

Natural Hazard Mitigation Plan

Executive Summary

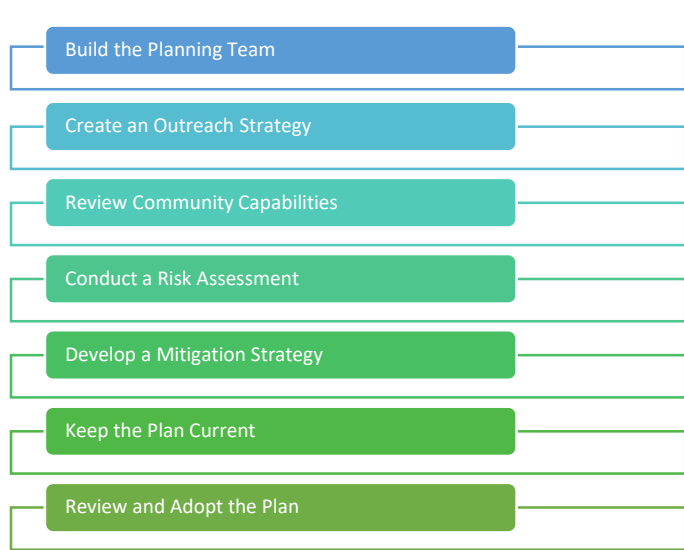


1 Introduction

The municipality of Arroyo has revised its Local Hazard Mitigation Plan (LHMP).¹ This complies with the federal Disaster Mitigation Act of 2000 (DMA2K), which was signed into law to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988. One of the requirements that this legislation establishes is that in order for the municipality to receive federal mitigation funds, it must elaborate and adopt a Federal Emergency Management Administration (FEMA) approved LHMP.² Also, the DMA2K promotes that the local government, together with the State, work on pre disaster planning and encourages the development of sustainable hazard mitigation activities.

These LHMPs must be revised and updated every five (5) years to remain in compliance with regulations and Federal Mitigation Grant conditions. Updating requirement offer the municipality an opportunity to reevaluate recommendations, monitor the implementation of mitigation strategies included in the previous Plan, monitor the impact of mitigation actions that have been implemented, and determine if any changes to the plan need to be incorporated. This plan complies with said regulations.

Figure 1 Hazard Mitigation Planning Process



Hazard Mitigation Planning Process

The strategies and projects enumerated in the LHMP have the goal of reducing the loss of life and property that can result from a natural disaster. Hence, the mitigation strategies included in the LHMP, involve planning efforts, capital projects, and other activities that reduce the impacts of the natural hazards included in Arroyo’s LHMP of 2020.

The municipality has also revised the LHMP under the authority of Act 81-1991³, known as the Autonomous Municipalities Act of 1991, as amended. As stated in Section 2.004 of said Act 81-1991, the municipality can carry out

any activity that establishes programs or adopt convenient and useful measures to prevent and fight fires, offer assistance to the community in cases of emergency or natural disasters, catastrophic fire accidents

¹ Please note that the 2020 Revised HMP was written in Spanish as per agreement between the Municipality of Arroyo, the Planning Board, the Governor’s Authorized Representative (GAR) and FEMA.

² 42 U.S.C 5165; 44 C.F.R. § 201.6.

³ The 2020 Revised HMP was submitted to FEMA for revision on March 2020. Thus, Act 107-2020, the Municipal Code of Puerto Rico was approved on August 14, 2020, derogating Act 81-1991, Autonomous Municipalities Act of 1991. Section 1.010 of said Act, *supra* (former section 2.004 of Act 81-1991) maintains the same presumption as stated above.

and for civil protection in general, pursuant to Act No. 211-1999, as amended, known as the Commonwealth of Puerto Rico Emergency Management and Disaster Administration Agency Act.⁴

This Executive Summary will provide an overview on:

- Arroyo' population characteristics;
- The public participation and outreach effort with the community during the LHMP planning process;
- Arroyo' risk assessment;
- A review of the mitigation strategies, goals and LHMPs action plan; and
- Plan maintenance, and how to keep the Plan current.

2 Arroyo' Profile: Main Population Characteristics

The Municipality of Arroyo is located at the South of Puerto Rico. To the North and East, it is bordered by Patillas, by the Mar Caribe to the South, and Guayama to the West. The municipality has six (6) *barrios* or wards. These are: Barrio Pueblo, Palmas, Ancones, Yaurel, pitahaya and Guasimas. Arroyo has a territorial area of 35.61 square miles.



It corresponds to the subregion Llanura Aluvial Ponce-Patillas which is located in the region known as Llano Costero del Sur. It is a very dry area; although its alluvial plains are productive thanks to an artificial irrigation system. The topography is highly varied, its elevations fluctuate from one meter on the coast to 750 meters in the northern part in the vicinity with the Municipality of Guayama. Approximately 50 percent of the territory has elevations of less than 70 meters. These elevations can be found contiguously from the southern part of the Pitahaya neighborhood, the Ancones neighborhood excluding the adjoining with Patillas and including the Guásimas, Palmas and Pueblo neighborhoods. In a northerly direction the elevations continue to increase until they reach their maximum heights in the northwest-north-northeast adjoining of the municipality.

The Nigua River of Arroyo or Yaurel River, crosses the municipality from north to south, is born in the Yaurel neighborhood at an altitude of 500 meters above sea level. Through its 13.1-kilometer route, from its birth to the coast it is joined by several raves. Its catchment area is 8.26 square miles. Its hydrographic system is completed by the heartlines Heart, Antigua, Jácana, Yaurel known as Zanjón and others of minor importance. In the former Colonia Virella, there is a spring of mineral water. In this municipality there is an outbreak of hot springs that have not been exploited.

⁴ 21 L.P.R.A § 4054

Table 1: Population by age group: 2010 and 2017

Population	2010 Census	2017 ACS estimate	% Rate of Change
Younger than 5 years age	1,369	960	-29.88%
5 to 19 years of age	4,494	3,866	-13.97%
20 to 64 years of age	11,068	10,499	-5.14%
65 years of age and older	2,644	3,179	20.23%
Total	19,575	18,504	-5.47%

Source: US Census Bureau, Census 2010; American Community Survey 2013-2017 Estimates

Arroyo's recorded population for the 2010 Census was of 19,575. According to the American Community Survey 2010-2017 the population of Arroyo diminished to 18,504 which represents a reduction of 5.47%.

According to the 2010 Census, the wards with the largest population were Ancones with 5,719 inhabitants, followed by Guásimas with 4,030 inhabitants. On the other hand, the wards with the least population were Yaurel with 1,589 inhabitants, and Barrio Pueblo with 1,206 inhabitants.

This profile highlights the population that could be potentially vulnerable to natural hazards in the municipality, particularly elders of 65 years of age and older, which had an increase of 20.23% in the municipality during this seven-year period (2010 to 2017). Hazard mitigation strategies and actions consider these population characteristics and their vulnerability toward natural hazards analyzed in this update. Further details, regarding the profile of the municipality, can be found in Chapter 3 of the updated 2020 LHMP.

3 Outreach and Public Participation

In order to guide the development of this Plan, Hon. Eric Bachier Román, Mayor of Arroyo, appointed the following officials to constitute the Mitigation Planning Committee (henceforth, the Planning Committee). The Planning Committee is comprised by representatives from several departments and citizen involvement with key roles and experience in community planning, public works, and emergency management to serve as key components in the planning process. Please refer to Section 2.5 on the LHMP.

Name	Position	Agency	email
Héctor Santiago	Director	Municipal Office for Emergency Management	ommearroyo@yahoo.com 787-839-3500 ext. 361
José A. Alicea Soto	Administrative Assistant	Municipal Office for Emergency Management	ommearroyo@yahoo.com 787-839-3500 ext. 360
Nydia Cruz	Administrative Assistant	Mayor's Office	ommearroyo@yahoo.com 787-839-3500 ext. 360
Iris Torres Villegas	Director	Federal Funds Program	programafederalarroyo@yahoo.com 787-839-3500 ext. 379
Eugenia Desvaríe	Director	Finance Department	arroyooficinafinanzas@yahoo.com 787-839-3500 ext. 324
Víctor R. Rivera	Director	Public Works Office	opm.arroyo@gmail.com 787-839-3500 ext. 358
Carlos Suárez	Private Citizen	Community Representative	csuare1@gmail.com 787-839-3500 ext. 360

The Planning Committee activities included: (1) updating the list of the municipality assets and local critical facilities; (2) updating the status of the previous LHMP mitigation strategies; (3) determine possible new mitigation strategies for the 2020 LHMP; (4) development and implementation of public participation and outreach activities and stakeholders at large such as neighboring municipalities, governmental agencies;

(5) announce the municipality’s LHMP efforts to agencies, stakeholders and public feedback for Arroyo LHMP 2020 draft version and incorporate such comments on the Plan.

On November 19, 2019, a notice was published on a local newspaper (Metro and Primera Hora). Said notice informed the public about the first Public Participation meeting to be held in Arroyo on December 16, 2019. On February 14, a second notice was published regarding the publication of the 2020 LHMP draft version for review providing 20 days period for review, submit comments, and the opportunity to participate in a second community meeting. A draft version of the 2020 LHMP was made available on the Puerto Rico Planning Board (PRPB) website. Also, a hard copy of Arroyo’s 2020 LHMP was placed in the Centro Gubernamental Roberto Sánchez Vilella for public review. The hard copy was available for public review from 8:00 am to 4:00 pm on weekdays.

4 Arroyo’ Risk Assessment

After reviewing the natural hazards identified as priorities on the previous Arroyo’s 2014 LHMP, the Municipal Emergency Response Plan, the Arroyo Land Use Plan of 2016 on the Draft Version, the municipality’s disaster history, and other literature related to potential future hazards, the Planning Committee identified the following hazards in the 2020 LHMP; (1) Sea Level Rise, (2) Drought, (3) Earthquakes, (4) Flooding, (5) Landslides, (6) Strong Winds (Tropical Cyclones), (7) Tsunami, (8) Storm Surge, (9) Coastal Erosion and (10) Wild Fire. Discussion of these natural hazards are included in the 2020 LHMP’s Chapter 4. In addition, the 2020 LHMP includes a quantitative vulnerability analysis based on the best available data for Arroyo and Puerto Rico accounting for future development to assess mitigation strategies to prevent repetitive and severe property loss.

This assessment served as a key tool for the Planning Committee and the public to identify and prioritize potential mitigation strategies by focusing attention on areas that present the greatest risk of damages to people, critical facilities, and normal municipality operations. The analysis for earthquake, flood, landslides, and high winds was performed by assessing the potential impacts from each hazard using geographic information system data (GIS).

By ranking each section, the municipality was in position to determine an overall risk classification. It is important to mention that this classification exercise resulted from the municipality’s 2020 LHMP technical risk assessment along with a capability gap analysis and the local community input, which is based on previous natural events experienced by the Planning Committee and the residents and business owners of Arroyo.

The following table provides a summary of the risk classification for each identified hazard. Part of the process of completing the next appraisal required input from the community as well as from the Committee. Beyond the risk analysis, this table presents the municipality’s prioritization analysis.

Table 2 Natural Hazard Ranking

Natural Hazard	Risk to people	Risk to facilities	Risk to Operations	Classification
Sea Level Rise	2	1	2	Moderate

Natural Hazard	Risk to people	Risk to facilities	Risk to Operations	Classification
Drought	3	2	2	Moderate
Earthquake/Liquefaction	3	2	3	High
Flooding	3	3	3	High
Landslide	2	1	2	Moderate
Strong Winds/Tropical Cyclones	3	3	3	High
Tsunami	3	2	3	High
Storm Surge	3	2	2	High
Coastal Erosion	3	2	2	High
Wildfire	2	2	2	Moderate

Source: *Planning Committee 2019-2020*

High=3, Moderate=2, Low=1

Based on the Natural Hazard Ranking table, the following hazards are considered as significant at Arroyo: (1) flooding, (2) earthquake/liquefaction, (3), strong winds, (4) tsunami, (5) storm surge and (6) coastal erosion.

A ranking methodology was adopted to develop the mitigation strategies based on these risks as discussed on Chapter 6 and are divided into the following categories: (1) Prevention, (2) Property Protection, (3) Natural Resources Protection, (4) Structural Projects, (5) Emergency Services, and (6) Education and Public Awareness. The strategy categories with most mitigation actions are “Prevention” and “Structural Projects”, each with a total of 12 mitigation projects. Flooding is the natural hazard that is most addressed within the mitigation projects.

5 Mitigation Strategies, Goals, and Action Plan

The municipal capabilities, along with the risk assessment, serve as a foundation for the design, development and implementation of mitigation strategies. Mitigation strategies, found in Chapter 6, consist of a broad amount of local goals and strategies. The local mitigation actions were gathered from the 2014 LHMP and were incorporated into the current LHMP. This chapter provides information about the assigned implementation mechanisms and target completion dates. The sections in this chapter are designed to make the Plan strategic by identifying long-term goals, and functional, by identifying short term and immediate actions that will guide the daily local decision-making process and project implementation.

Mitigation goals consist of general guidelines that explain what the Municipality of Arroyo wants to achieve in terms of hazards and mitigation. Thus, the goals included in the 2020 LHMP, offer the Planning Committee and the communities a framework for identifying, prioritizing and implementing actions to reduce the risks associated to natural hazards at Arroyo.

Mitigation strategies are activities, projects, measures, or processes that Arroyo will adopt in order to reduce or eliminate risk to people and property from hazards. Consequently, Arroyo reviewed and revised the criteria adopted in the 2014 LHMP to analyze and prioritize potential mitigation strategies for the municipality. In order to develop the actions, the Planning Committee used the following criteria: (1) the potential of the strategy to reduce expected future damages and/or losses; (2) the capacity of the municipality to implement the action within the 5-year cycle of the Plan; (3) support from the public, agencies, municipal departments, amongst others; and (4) the potential of the action to increase resiliency of Arroyo and its residents. Accordingly, the Planning Committee adopted these criteria, the results from the risk assessment, and the feedback from local and neighboring communities to prioritize each mitigation strategy that was contained in this LHMP.

Most of the strategies and projects in the action plan target the continuity of municipality services after a hazard event. The following summarizes some of the strategies intended to mitigate these hazards:

- Promote mitigation policies by the planning land use.
- Inventory of critical facilities to prepare for strong winds events.
- Debris removal.
- Flood prevention & Coastal protection.
- Tsunami Ready (Tsunami Alert System), including the update on the evacuation program.
- Community training for emergency response and natural hazard awareness.

6 Maintenance to Keep the Plan Current

Chapter 7 details the revision and monitoring process in great extent. The formal maintenance process, identified by the Planning Committee, aims to keep the document viable and current, as it is a living document that shall reflect the hazards and realities affecting its community, and how to plan and prepare ahead in the event of a natural disaster. The plan maintenance process provides the procedures for evaluation and review every year during its 5-year life cycle. Evaluation will include a review of the mitigation action plan implementation, continued public involvement through the Plan's life cycle, as required by federal legislation. As part of the review process, the members of the Planning Committee. In the event of a major natural disaster affecting the island and/or municipality, an emergency meeting must be scheduled, and the Plan should be updated or amended, as necessary, bypassing the 5-year term. The Director of the Municipal Office for Emergency Management will coordinate with other municipal dependencies, as needed, to achieve the goals and objectives stated in this LHMP.

Community Representatives will work with the Committee identifying and organizing, if necessary, coordination with residents, federal and state agencies (Refer to Section 7.3 of the LHMP):

- Participate in the formulation of actions/projects.
- Provide important context information to the Risk Mitigation Monitoring and Assessment Committee, and specifically to action leaders on Project Requirements.
- Facilitate implementation in their respective communities.
- Establish the program-specific Work Plan, based on the schedule and goals set out in the Plan.

7 Plan Approval and Adoption

The Federal Emergency Management Agency (FEMA) completed review of the Municipality of Arroyo Hazard Mitigation Plan, based on the standards pursuant to title 44 C.F.R. Section 201 as authorized by the Disaster Mitigation Act of 2000 (DMA2k). The Plan received a satisfactory rating for all required criteria

and was approved as approvable pending adoption (APA) on September 3, 2020. Accordingly, the Municipality of Arroyo, adopted said Plan on September 29, 2020 via Executive Order No. 07, Serie 2020-2021.

Upon receiving the record of adoption from the municipality, FEMA approved Plan by October 6, 2020 and issued an official approval letter to municipality stating the jurisdiction has adopted said Plan thus approved and eligible for FEMA Hazard Mitigation Assistance programs. The approval letter establishes the expiration date 5 years from the date of approval, or until October 5, 2025.