



## Piñones Preparation, Response, Recovery



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PPRR Program  
Technical Manual.pdf

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## ABSTRACT

The goal of this project was to create an emergency awareness and preparedness program in collaboration with the organization COPI. The Program, Piñones Preparación Respuesta Recuperación, was built to bring the Piñones community together and strengthen preparedness in times of emergencies. In the past, government aid has been unreliable in times of need, leaving the community to rebuild itself time and time again. The emergency program is designed to mitigate response and recovery time by using a community-based network, with COPI being at the forefront of the organization. This program highlights the community's self-resiliency and desire for community change as well as serves to provide the necessary structure for community advancement initiatives in the future.

## ACKNOWLEDGMENTS

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## EXECUTIVE SUMMARY

Sponsoring Organization: La Corporación Piñones Se Integra

**Mission: To raise awareness and preparedness for times of emergency.**

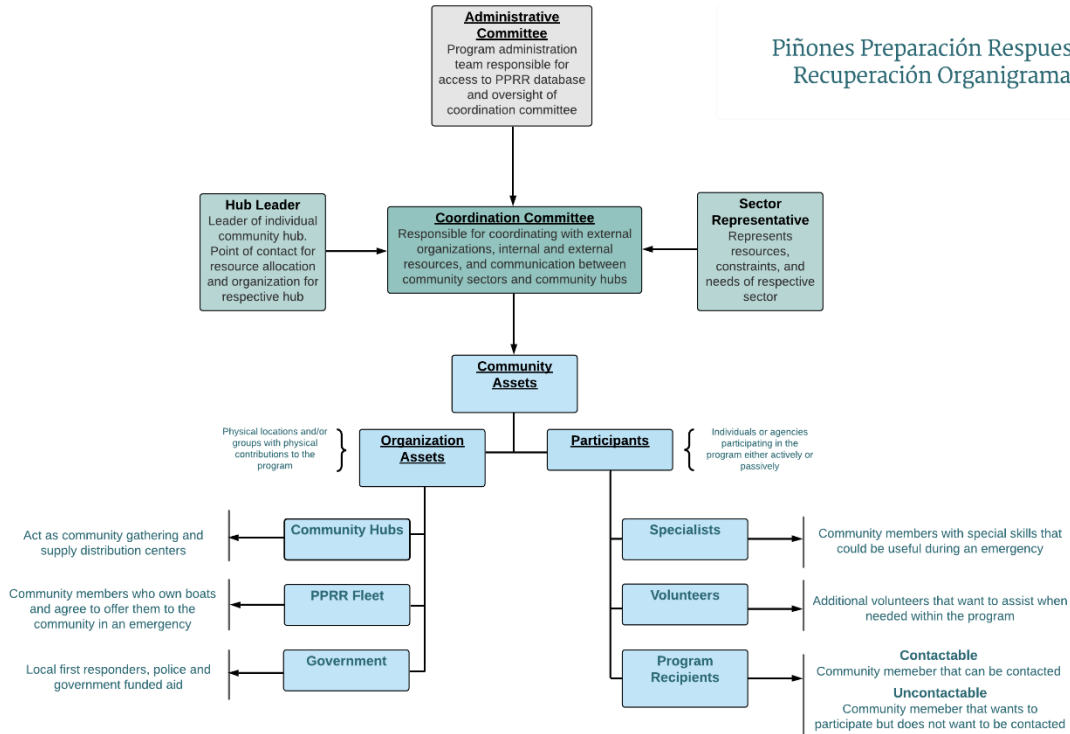
Puerto Rico is an island full of fabulous foods, cultures, and experiences which has made it a tourist destination for many. Unfortunately, Puerto Rico also faces various economic crises that have led to population declines, healthcare disparities, and the decline of education amongst young citizens (Borgen Project).

One community that feels neglected and isolated is Piñones, Loíza, PR. This feeling stems from the two-lane road that serves as the only way in and out of the community and is practically and symbolically what connects and divides Piñones from the rest of the island. Furthering this sense of isolation and neglect is the lack of attention the Piñones community receives after and during natural disasters. In the past, the community has been left to rebuild and support itself time and time again. These issues stem from systematic and institutional racism due to the fact that Piñones has a significantly higher African population than the rest of Puerto Rico (Colón, García, González...). Thus, the government falls short during emergencies and provides an insufficient number of resources to the community, making any distribution of these resources extremely difficult.

In order to combat these everyday challenges, for the first time, students from WPI worked collaboratively in Piñones with Maricruz Clemente Rivera who founded the organization, La Corporación Piñones Se Integra; COPI. COPI is a non-profit organization whose mission is to “find alternatives to the existing social problems that deteriorate Piñones in order to improve the quality of life of residents, families, and visitors” (COPI). In past natural disasters, COPI has been a central resource for the residents of Piñones, where they have collected and distributed supplies and necessities for the community. However, in the past COPI has not had the capacity to distribute supplies to every household due to an absence of knowledge of who needs what, and a preparedness to manage distribution in a crisis. Thus, even when some relief resources were available, they had no efficient way to allocate these resources.

The main outcome of this project was creating the program Piñones Preparación Respuesta Recuperación (PPRR). The team collaborated with sponsors, co-researchers, and the community to create the foundation of an emergency preparedness program for the community of Piñones. The PPRR program focuses on community preparedness for natural disasters using networking and community collaboration. As seen in the figure below, the network of individuals participating in the program is explained.





The program is set up to discover community assets and resources for use in times of need. Through individuals' community efforts, information collection, and community togetherness, the community response time in emergencies will be lessened. This response time relates to resource distribution, checking in on members of the community, and recovery efforts. The relationship between the different aspects of the program is depicted in the diagram below.

## PPRR Overview:



## Findings and Methods:

### **Create Emergency Response Program Foundation:**

The PPRR program is designed to create a network throughout Piñones that will work to engage the community to emphasize emergency awareness. Refer to the attached manual for a more in-depth explanation of each branch of the program. After establishing an administrative body of the network, information will be uploaded to a database based on individuals' status within the program. This database offers a way for the administrative body of the program to access and organize data to best serve the community. Information on how data was collected and reported into Google Sheets can be found in the attached manual and report. In order for this program foundation to be left behind and easily modified for future use, the team decided to use Google Environment based platforms.

### **Discover Ways for Future Data Collection Within the Community:**

Alongside creating the working PPRR program, the team set out to collect example data that can be implemented into the programs database. While in Piñones, the team discovered the advantages and disadvantages of collecting data within the community. The team found that the most beneficial way of individual information collection is going door to door with an electronic and paper version of a form.

### **Work With Sponsors and Co-Researchers on Using System Technology:**

To leave the program's foundation behind, sponsors and co-researchers needed to be able to understand how to work each system. Several days were set aside to sit down with the sponsors and co-researchers and show them how to work the program. The team went through the system step by step and left behind a working manual that explains each part of the program's software.

### **Design System User Manual for Sponsors and Future WPI Initiatives:**

With the program functional, the team worked to complete a handbook that will guide others to complete their own mapping initiatives. This type of handbook is beneficial to others who are looking to complete similar projects for community networks. It included a technical aspect that shows a step-by-step process of how to use every part of the system and how to modify it for the project's sponsors.

## Conclusions:

Based on the community findings, the team concluded that people within the community feel that an emergency plan and overall emergency awareness is needed. A crucial part of the community that was key to creating a working program was the churches, who hold a large influence on the Piñones community. These churches should be the first organizations future project's reach out to. It is also important to note that information gathered for such an important use of emergency preparedness can be extremely sensitive and the security of this information must be taken seriously.

Based on the technological system findings, the team concluded that finding a balance between functionality and ease of use is important. Overall, when considering ease of use, the Google

Environment was the easiest environment to leave behind (Google Sheets, Docs and My Maps). When needing to leave behind a system of different technological pieces, such as databases and maps, it was also found that a user's manual is extremely helpful for explaining how the system works.

When creating the PPRR program sponsors and co-researchers helped the team become fully immersed within the community. This brought new and exciting aspects toward the project when working on the program. The program is expected to continue and be built upon in future projects by anyone who wants to contribute toward preparing the community of Piñones for times of emergency.

### Recommendations:

#### **Recommendations for Collecting Data in the Community**

1. Use Google Forms when collecting data that needs to be uploaded into a system: The use of google forms is quick and easily accessible through a smartphone or computer. The data is easily stored and displayed, based on users' preferences.
2. Either go door to door, have a community event, or interact among known locals to gather data. When walking around neighborhoods it is very unlikely that people will be outside on the streets, which can cause delays in data collection.

#### **Recommendations for Developing Mapping Capabilities**

1. Use "blocks" or areas to map individuals, not exact addresses, or locations: Since many houses and buildings in Piñones do not have exact addresses, the actual mapping of an area would be better done in "blocks" or outlines.

#### **Recommendations for User Manual**

1. Have step by step process for how to use Google Sheets and Google Forms: Having a step-by-step explanation in the manual for google sheets and forms will close any gaps or questions that the project leads have with the google database.
2. Make sure to cite appropriate references: It is important to cite any sources or references used during the development of the manual to give proper credit and allow users to find further information.

#### **Recommendations Regarding Creating a Database**

1. Link Google Forms to a Google Sheets: This helps with organization and automatic updates from google forms to an organized database.
2. Manually enter coordinates or addresses into map: Google My Maps can only automatically input exact addresses from google forms. In areas without exact addresses, individuals will need to manually enter coordinates to pinpoint specific places on a map.

#### **Recommendations for WPI**

1. Research possibility of other IQP groups continuing the data collection side of the project: The database is ready for data entry so another WPI project could potentially be adding data to the system and covering more ground in the actual resource side of the database.

## CHAPTER 1: INTRODUCTION

Puerto Rico is home to rich cultures, fascinating people, and delicious foods. From beautiful beaches to exciting nightlife, Puerto Rico has become a tourist destination for many. The island is home to 3.3 million people living across 78 different municipalities. Although a major tourist destination, the country has suffered through many crises leaving its citizens to deal with hardships and poverty every day.

According to The Borgen Project, 43.5 percent of Puerto Ricans are currently living under the poverty line with the unemployment rate consistently growing. Puerto Rico's economic crisis has led to population declines, healthcare disparities, and the decline of education amongst young citizens. Aside from the rest of the island, a community that suffers the most from government neglect and geographic isolation is Piñones, Loíza, PR. Due to its geographical location with only one road in and one road out, Piñones has been left with a sense of isolation from the rest of Puerto Rico. This sense of isolation also becomes emphasized by the lack of federal aid and attention that it receives in times of need. The small community made up of 2,000 members and divided into three different neighborhoods, historically has needed to rebuild its community on its own.

While in Puerto Rico, the team worked with the community of Piñones to establish a community-based emergency response program that will help prepare the community for emergencies. The team worked to create an adjustable mapping system that displays community resources and occupational skills that will be accessible by community and program leaders. Along with this type of mapping, the team created a database where, in case of an emergency the community will be able to quickly address and analyze who they should help and where they can go for help.

The team worked collaboratively with COPI, a non-profit organization, in their mission to strengthen and preserve the self-sufficiency of Piñones. Programs for collecting community data and giving aid have been attempted before but have failed when it came to providing aid to the community (Nuria Escalara, Online Interview, September 17, 2021). This is where community involvement and resilience came to fruition in the project. Within each sector a sense of community pride is present when it comes to protecting their community and with the new initiative the project hoped to inspire emergency awareness and preparedness throughout Piñones. The team wanted to leave behind the start of a program that can get people engaged and excited to help one another in times of need.

## CHAPTER 2: DISCOVERING AN OVERLOOKED COMMUNITY

The goal of the project was to create an emergency preparedness program for the Piñones community, that can in the future be added to and improved. The following background section describes the information used in forming the method for completing the project. This includes information about the project sponsors and the organizations they work with as well as the Piñones community. Following the background of the Piñones community later in this report, is a description of the developmental strategy the team took when creating the community program. Once the strategies for development are laid out, the background chapter then moves into the technology the team used for the project, such as the Google Environment and Geographical Information Systems, with information including how they work as well as how the team used these systems in the project.

### 2.0 SPONSOR RESEARCH

Social worker and sociologist Maricruz Rivera Clemente founded and has been working with the organization COPI since 1999. COPI stands for La Corporación Piñones Se Integra, which directly translates to The Corporation for the Integration of Piñones. COPI was the team's main sponsor and source of information during their time in Piñones. COPI is a non-profit organization that is committed to strengthening the community of Piñones as a whole. The organization supports the community of Piñones in many ways such as holding educational events, environmental awareness events and overall promoting community involvement. With the goal of strengthening Piñones to become more self-sufficient, Clemente shared in an interview that her goal was to fight against expropriation, which has been a problem within the community in the past. As it will be mentioned later in this chapter, living in Piñones and Puerto Rico comes with struggles that people are met with every day. COPI's mission is to find alternatives to these daily struggles to give people a better quality of life. Right now, COPI has a website where you can view different events or activities offered in Piñones. Some that are partnered with COPI are the Natural Resources Department and Estuario de La Bahia de San Juan.

### 2.1 HISTORY OF PUERTO RICO

The formation of Puerto Rico's economic structure can be traced back to the end of the 1920's following the Great Depression. Like most of the world, the island of Puerto Rico felt every aspect of the fallen economy during this period. While under American law, and not receiving any aid, questions and anger from a wide global audience began to synthesize. Once Puerto Rico's nationalist party started to become a threat to America's plans for the island, the U.S. finally started paying attention to the voices of the people in Puerto Rico. The western world had such an impact that it would set the foundation for this evolving island (Dietz, 1986).

At the time Puerto Rico was transforming from a rural, agriculturally based society to a functioning urban, capitalistic society. This was not an easy adjustment for many people on the island. As time went on, the standard of living had a sharp decline as unemployment continued to increase as wages and incomes decreased. During this economic reset, the government's involvement had become central to the dynamic of the island's economy. Also, during this time the government sector nearly doubled their income, yet agricultural shares of the national income

continued to fall rapidly. This was concerning to many Puerto Ricans, especially considering the people’s reliance on the domestic agricultural industry for their own provisions. Although the quality of life was continuing to decline in Puerto Rico, the government sector continued to consume resources, resulting in little to no productivity in any other industries across the island (Dietz, 1986).

Although suffering from their own economic depression, not every aspect of the island suffered. Sugar cane companies continued to flourish. This export industry continued to grow throughout the years relying heavily on intense agricultural slave labor. As the slave trade in Africa continued to grow from the 17<sup>th</sup> to 20<sup>th</sup> century, Puerto Rico became heavily Afro-Puerto Rican (Dietz, 1986). Although revenues for these companies were growing, wages for these workers were as low as they had been at the turn of the previous century. The GDP per capita for Puerto Ricans have still been historically low even in the 21st century, as shown in Figure 1. Throughout time, Puerto Ricans have adapted by becoming increasingly self-sufficient; relying on themselves and their community to overcome obstacles. People on the island often refer to their daily struggles as “La Brega”. As mentioned in a Podcast by many Puerto Ricans themselves, la brega is a way to describe challenges that cannot be resolved, but problems that people must learn to live with or solve every day (Casanova-Burgess, 2021). This history of struggle has brought a resilient reputation to Puerto Rico’s citizens due to their ability to deal with whatever problems come their way.

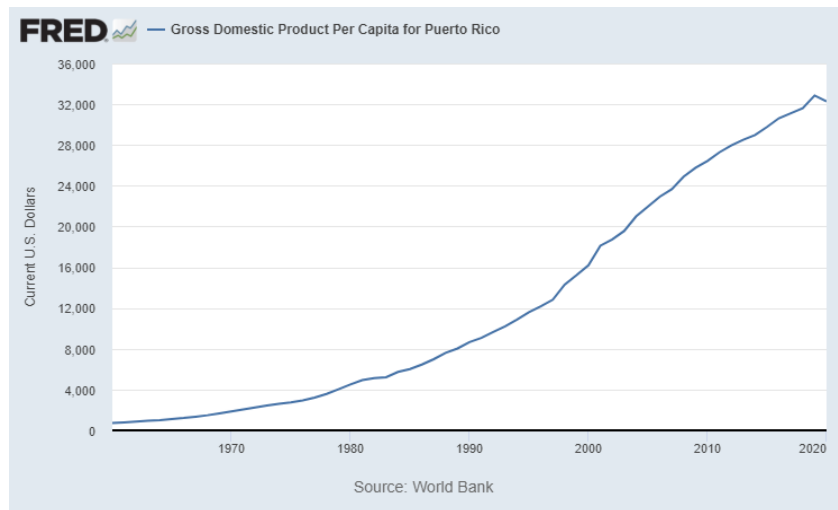


Figure 1 GDP Per Capita for Puerto Rico (World Bank)

## 2.2 HISTORY OF PIÑONES

Piñones is a small community of about 2000 residents, spread across nine different sectors located in the municipality of Loíza, Puerto Rico. The three well-known sectors or neighborhoods, La Torre, Terraplen, and Piñones, are shown in Figure 2. It is important to note that the area as a whole is known as Piñones, but the third known neighborhood is also named Piñones. When referring to Piñones in this paper, we will be referring to the entire area.

Loíza is rich with tradition and has become a popular tourist attraction within Puerto Rico, however many of Loíza’s residents are impoverished. “According to 2019 Census figures, an estimated 48 percent of the municipality’s estimated 24,553 residents live in poverty...about 40 percent of Loíza residents are Afro-Puerto Rican, the highest concentration on the island” (Fajardo, 2021). Within Loíza, a sizable portion of Piñones’ residents are descendants of Africans that were displaced through the transatlantic slave trade, making it the blackest community in Puerto Rico (Asiegbu, 2020). Due to its origins, Piñones is rich with African culture and traditions, including traditional Bomba and Plena music and dance. Traditional Puerto Rican street-food, including bacalitos and empanadillas, are also a big part of Piñones economy and cuisine (Hiraldo, 2006). The streets of Piñones are full of different food kiosks and markets. These traditions create a powerful sense of community and connection. Despite how connected the community is with each other, there are still disparities when compared with the remainder of Puerto Rico. The rest of the island has a much smaller black population, resulting in structural and institutional racism, especially since many Puerto Ricans deny their black and African heritage. Concentrated black populations in Puerto Rico “disproportionately live-in areas with fewer resources that are especially vulnerable to gentrification and the impacts of climate change, like Loíza” (Asiegbu, 2020). Not only does Piñones have fewer resources, but it is also the poorest neighborhood in Puerto Rico. The neighborhood has a stigma of criminal and violent activity along with open discrimination (Suarez, 2021). All these factors contribute to the residents of Piñones being at higher risk for chronic diseases due to limited access to health care.

Piñones is separated from the rest of the municipality of Loíza and the island by the Rio Grande de Loíza River and Puerto Rico’s largest mangrove forest. Due to its isolation, Piñones only has one two-lane road with extremely limited

transportation. The lack of adequate travel through the neighborhood causes routine traffic and congestion, in part due to tourists’ use of the road. The nearest health center is only about nine miles from the community yet is not readily accessible due to the major congestion that is regularly experienced

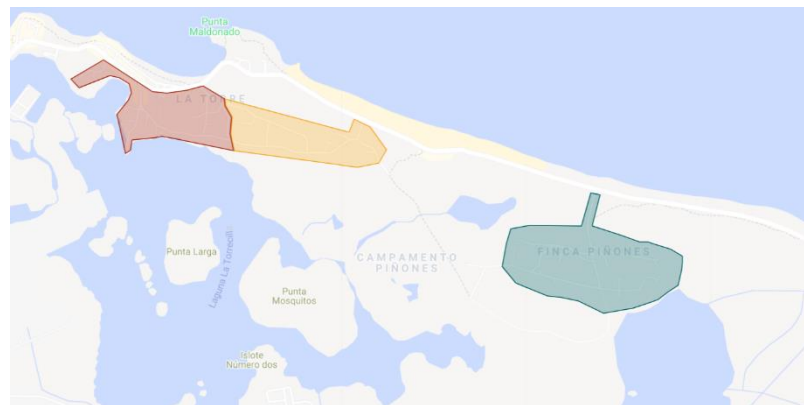


Figure 2 Map of La Torre, Terraplen, and Piñones

(Suarez, 2021). Therefore, many of the residents do not get the health care they desperately need when they need it. This has sparked a discussion on how tourism and increased foot traffic affect the community and on what can be done to make Piñones more accessible.



### 2.2.1 Racism and Living Conditions

As discussed previously, Piñones has had to deal with a sense of isolation and neglect from the rest of Puerto Rico. This sense of neglect has come from multiple organizations such as FEMA, the Federal Emergency Management Agency, the organization Programa Redes, and the local government of Loíza. The project sponsors have described the living and health conditions in Piñones as poor and desolate. Maricruz, head of COPI, describes it as a racial disadvantage, considering that the community of Piñones has a high percentage of African Americans (Colón, García, González...). US census data provided by Us National Library of Medicine National Institutions of Health, shows that less than 45% of residents 25 years and older have a high school diploma, 69% of residents are living below the poverty line, and the community has an unemployment rate of 30%. Described by author Enid J. García-Rivera on the security and well-being of Piñones, “the criminal activity in the area has severe consequences for the population including the stigma, discrimination, and segregation associated with violent neighborhoods”. The geographical makeup of Piñones also serves as a disadvantage to the community considering that the closest health care center is nine miles away. Regarding emergencies and moving throughout the community there are no structured sidewalks or street names within Piñones. These characteristics of Piñones have put the community at a disadvantage for years.

### 2.2.2 Tourism/Congestion Challenges

The two-lane road, route 187, that runs through Piñones is infamous for traffic jams and long waits, especially on the weekends. Due to its size and isolation, the neighborhood only has this one road. The constant backups make it extremely difficult to get first responders or any emergency personnel into and out of the neighborhood. Not only is the nearest health center nine miles from the community but it is also frequently quite difficult to reach. This has caused a large health disparity between Piñones and the rest of Loíza and Puerto Rico. This congestion is cause for concern, especially for any natural disasters that would cause massive amounts of residents to need to leave the area. The large quantity of tourists that travel to Piñones only adds to the congestion problems.

The influx of tourism that Piñones has experienced in recent years has majorly contributed to the traffic and congestion of the area. Piñones is one of the last neighborhoods with a beach area not taken over by developers, making it a popular tourist attraction. People from all over Puerto Rico wander through the community to experience the traditional street food and the culture. This increased foot traffic of nonresidents has become a cause for tension. Although tourism is an economic benefit to Piñones, it also has its downsides. For example, much of the waste management issues within the community are due to tourists being careless with their surroundings. Tourism has also caused a clash between residents and tourism representatives wanting to develop the land around the neighborhood.

## 2.3 BUSINESSES AND ASSETS OF PIÑONES

Piñones is a neighborhood full of culture and tradition. Different food stands, kiosks, and markets line the street that winds through the community, along with many restaurants. These kiosks span back hundreds of years, and they serve everything from Pinchos to Chicharron to



Alcapurrias. The authentic food draws tourists in from all over the island with people lining up and hanging out around these kiosks each day. Most of the businesses in Piñones are small business kiosks or kioskos owned by locals, but there are also a surprising number of businesses not owned by residents. A lot of these restaurants and kiosks are known only by locals because they are not on Google Maps and do not have an online presence, resulting in less business.

Along with the many small businesses, Piñones is also full of vibrant community members including artists, musicians, and activists. These people are exclusively known only by other community members or locals from the other neighborhoods unless their work spreads by word of mouth. Since there is not a lot of communication between families or 'pods' within Piñones, many community members are unaware of the skills of their fellow residents including some of their assets like generators.

These businesses and residents are extremely important assets of the Piñones community. Alongside these assets, this project sought to gain an understanding of who lives within the community.

#### 2.4 EMERGENCY PREPAREDNESS PROGRAM RESEARCH

Before creating an emergency preparedness program with the community of Piñones, the team researched ways of integrating programs, specifically emergency preparedness related, within communities. Research suggests that “social networks, social cohesion, and social interaction” can minimize damage and harm in cases of natural disasters (Mathbor). Mathbor describes that by connecting community members and establishing effective ways of communication, substantial progress of emergency preparedness can be made. When deciding what should be included, articles advise that a multitude of considerations need to be made. These are things such as, infrastructure, the type of people within the community, spatial awareness, and available access to necessities. It is near impossible to account for each aspect of any community and prepare for every natural disaster but starting to prepare for these emergencies at a local level is imperative (Fleeger, Waltzman).

#### 2.5 GOOGLE ENVIRONMENT

The Google Environment is a user friendly and free software platform with multiple different programs such as My Maps, Sheets, and Forms that can be accessed with a Gmail account. Using Google platforms allows for users to easily update new information while also being able to automatically sync information between platforms. Along with being user friendly, Google also offers the option of easy collaboration between individuals with included sharing tools.

#### 2.6 GIS MAPPING OF PIÑONES

Geographical Information Systems (GIS) is the main framework behind all modern mapping technologies. GIS is designed to capture, store, and analyze data to display patterns and pinpoint locations of all things on earth, varying based on the platform used and the specific use case. The data used within GIS systems is called geospatial data which can be defined as the information that describes objects and events with a location anywhere on or near the earth's surface (IBM) The use of GIS mapping has been found to be helpful across different aspects of geographic and

community data. Due to the software's diversity and user-friendly capabilities, Google My Maps software was chosen for displaying community assets within Piñones. An example of this type of map is shown in Figure 3. In this section we will lay out the background and processes that go into using GIS systems. We also go into depth about past WPI projects using GIS systems that we will discuss throughout the paper.



Figure 33 Example Map of Google My Maps

#### 2.6.1 Implementation of GIS Maps in Piñones

The implementation of GIS maps and systems in Piñones will help in a few ways such as applying for grants and creating maps of resources within the community. By using demographic data collected by organizations like the Census Bureau and combining it with GIS software, we will be able to analyze demographic trends within the communities. Information about trends such as these are very useful when applying for financial assistance programs including grants from the government and other organizations. If we can show the trends of the community's demographics in one easy to read map or database this will make it much easier to apply for assistance.

A second way GIS systems will help the community is by providing maps of the assets and resources the members of Piñones have within their own community. Once we discover the assets the community has then it will allow us to help identify and solve other problems that trouble the community. The goal is to be able to either modify an existing platform so that when we are finished with the project, the community leaders will have the ability to understand the program and organizations will be able to view and contribute to the maps as they see fit.

### 2.6.2 Problems and Solutions

A challenge the project plans to encounter when trying to implement a GIS platform is making sure the program that was decided on is accessible for as many people as possible, as well as being user friendly. To accomplish this, the team looked at past mapping projects performed by WPI as well as other organizations to see if any of these past projects used similar GIS programs. Once the team identified which GIS platforms they used, the selections were narrowed down to the platforms that are best suited for the needs and intended outcomes.

## 2.7 COMMUNITY PROFILING

Community profiles are used to assist individuals as well as groups of people in active community development. Often, they are used to help target efforts and understand applicable resources to assist in remedying issues within the community, sometimes even being used to identify problems themselves. Community profiles are a very powerful tool on their own but pairing them with statistical analysis as well as mapping adds to their usefulness, as is the case of this project. These tactics serve as powerful tools for understanding a community, their needs, and possible solutions to local issues.

Community profiles tend to fixate on a few different aspects of communities including:

- Race/ethnicity
- National origin
- Income levels
- Health disparities
- Population size
- Age range
- Gender

Another large focus of a community profile includes the existing resources and adversely the needs present within the community. This aspect of the community profile focuses on what the community needs and what the community already has. Often, this requires an in-depth assessment and understanding of the community to determine. It is also important to remember that one does not develop a community profile without the community. The community is at the center of the process and without interfacing with the community, whatever information is procured is inevitably arbitrary and not indicative of the community's true needs and resources. Almost all information about the community will come from the community, not the researcher creating the profile.

### 2.7.1 Profiling of Community Members

Community assets are not necessarily tangible things or physical property owned or managed by those in the community, they could also be sources of strength or skills held by the community's residents as well as other non-tangible entities. Members of a community may possess skills that are not widely known to other community members, resulting in a lack of knowledge. Having

publicly accessible profiles of these members allows for a flow of information and resources within a community.

A profile is a “written portrait of a person” (MasterClass, 2021). It is a combination of stories and information about a person. The bulk of a profile is written based on interviews with the subjects, but it is also important to observe the person being profiled in their environment. A profile piece should “capture them in their environment and allow readers to see their world” (MasterClass, 2021). A profile should also include photographs, voice memos, or videos to create an interactive story.

Having these types of profiles showcases a community’s skills and talents. This allows for community awareness and a sense of connection, as well as easier communication between someone who provides a service and someone who wants that service.

## CHAPTER 3: METHODOLOGY

The goal of the project was to collaborate with the sponsors and co-researchers to create an emergency preparedness program for the community of Piñones. Along with collecting foundational and example data through multiple different facets, the team has created a user-friendly digital system for collecting and displaying emergency preparedness data of the community. To achieve the goals of the project the team worked collaboratively with the community to gain both a qualitative and quantitative understanding of the Piñones community. With the information and database the team was able to leave behind a working system that will allow community members to network with one another and prepare for times of emergency. Throughout this chapter the several different aspects of the project will be laid out and organized by objectives. These objectives display the steps the group took once arriving in Piñones and conducting field work. Not only was this a time to collaborate, learn from, and assist the community, but also set forth a plan and method for future WPI initiatives.

### Central Objectives:

- Create Emergency Response Program Foundation
  - Develop Program Identity and Plan
  - Build Community Map and Mapping Capability
- Discover Ways to Collect Data Within the Community
- Teach Sponsors and Co-Researchers How to Use Mapping Technology
- Design System User Manual for Sponsors and Future WPI Initiatives

To accomplish the goal of the project the team needed to brainstorm solutions to key obstacles. The first element was to begin understanding the community and the concerns the community carries. This was accomplished through working closely with co-researchers. They were able to provide their perspectives from growing up in the community, as well as interview community members when the group was unable to go into the community. The next step to building the program was deciding on a way to store the data that was collected and how to make it as accessible as possible. The solution was using the Google Environment for all technical aspects of the program. The forms for collecting community information are generated through Google Forms, then that information is automatically stored in Google Sheets, which can be used to generate maps using Google My Maps. Lastly, to make sure the program can be easily modified in the future, the team created a program outline and manual that breaks down the general design of the program as well as provides a step-by-step guide to using the technical side, forms, spreadsheets, and maps.

## CHAPTER 4: FINDINGS

After analyzing the information gathered from interviews, data collection, and field research, the team developed the following findings regarding creating an emergency response program and mapping capability for the Piñones community:

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### FINDINGS REGARDING COMMUNITY INVOLVMENT

1. The team saw that COPI and others in the community feel that an emergency plan and overall emergency awareness is urgently needed: A crucial part of the community that was key to creating a working program was the churches, who hold a large influence on the Piñones community. These churches should be the first organizations future project's reach out to.

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### FINDINGS REGARDING COLLECTING DATA IN THE COMMUNITY

1. Although the Piñones community is very open to program participation, data collection can be difficult due to the scarcity of community members out during the day: We discovered that finding people to talk to or distribute the questionnaires to was much harder than expected. People were almost never out of their houses while we walked through the community. This was largely due to people being at work during the times we were available to travel to Piñones, therefore people were more willing to interact in the evenings.
2. COPI organizers reports indicate the community does not respond to outreach unless it directly influences an active or ongoing issue (ex. Mosquito season presentation situation): We found that it was slightly difficult to gain community participation for a problem that is not directly affecting them at that current moment. For example, when the sponsors needed feedback about how mosquitos were affecting them, community members were more than willing to give responses because the mosquitoes had been impacting everyone daily.
3. Not everyone in the community has access to electronic devices so we would have to have community members interact with the databases through entering responses digitally and on paper. This means some data entry will have to be done manually: One of the last findings was that there is a disconnect between paper and online responses due to lack of accessibility for digital responses. Not everyone in the community has access to the internet so there is bound to be a gap between who can fill out the questionnaires if they are only digital.

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### FINDINGS REGARDING DEVELOPING GROUNDWORK FOR MAPPING CAPABILITY

1. The mapping platform that is chosen all depends on what is desired to be mapped due to different levels of functionality between mapping platforms: Creating a mapping capability is largely dependent on the type of data you want to map and how specific the maps need to be.
2. Google My Maps is simple and easy to use Google My Maps serves this purpose as it can be easily updated and added to. It can also be easily shared.
3. QGIS has census data already integrated: We discovered that QGIS is an excellent platform, as well. QGIS can be used for mapping demographic data to show trends and help with grants.

4. It is best to decide which mapping platform is the most user friendly and then show/teach the co-researchers how to use it: We found that having a mapping capability that is very user friendly and easy to teach would be most useful for the community and COPI

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#### FINDINGS REGARDING WORKING WITH CO-RESEARCHERS

1. Co-researchers were fundamental to the project's success and plans for future development: Working with three young co-researchers from the community of Piñones has helped us discover more than we ever thought about regarding the community. They are actively collaborating and contributing many different ideas that have helped shape the project as a whole. Since first arriving in Piñones, the project has shifted dramatically and having two co-researchers that are fluent in both Spanish and English has brought so much to the new scope of the project.

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#### FINDINGS REGARDING DEVELOPING USER-FRIENDLY DATABASE

1. Most classical databases are too complex to leave behind to individuals with no prior experience or training (server hosted or locally hosted databases using SQL or no SQL relational interfacing): While creating an emergency preparedness system, we had to keep in mind that this will be a working system that will need to be left behind for COPI's use. In order to create a functioning system that will be able to be updated and worked on frequently, we chose to use google databases. We chose google forms, which have already been shared and used by the project's sponsors, google My Maps, and Google Sheets. These databases can be easily connected with one another and have set help buttons for times we are not near.
2. Linking My Maps to the Google Sheet is difficult without actual addresses: Regarding setting the foundation for these systems, we have found that addresses aren't always specific in the community of Piñones. This has been a challenge for the team regarding the actual mapping of specific "hubs" within the community. We found that using coordinates may potentially be easier for a mapping system since many buildings don't have full addresses.



## CHAPTER 5: PIÑONES PREPARACIÓN RESPUESTA RECUPERACIÓN PROGRAM OVERVIEW

This chapter provides an overview of the main components of the creation of the PPRR program. This program is a first effort that reflects the ideas of the team, COPI, and co-researchers, but has not had wide vetting and in any event is just a start on what is expected to be a long-term effort. Co-researchers and WPI will continue building and advancing the program in the future. A working manual contains the fullest explanation and rationale of the program, but below is an overview.

Key deliverables developed from this program include:

- User Manual: Explains the outline of the program and the technical aspect of the system
- Program Brochures: Introduces the program for leaders and participants
- Map of Sectors and Community Hubs: Identifies the three known sectors and known community hubs

### 5.1 CREATE EMERGENCY RESPONSE PROGRAM FOUNDATION

While the project took different shapes throughout the project period, through collaboration, COPI and the team concluded that an emergency awareness and response program would be most beneficial to the community. This program will serve as a system that benefits community members in times of need, including assisting with distributing supplies and resources. It includes a network of information that can be utilized by COPI and other community leaders to organize resources during emergencies. COPI will be able to add to and change many different parts of the program for future use regarding their community.

#### 5.1.1 Develop an Identity for the Program: Piñones Preparación Respuesta Recuperación

When developing an emergency program, COPI's founder Maricruz Clemente Rivera shared what was most important to her about the community; the willingness to help one another and the strong sense of community pride. The program name Piñones Preparación Respuesta Recuperación was decided upon, which translates directly in English to Piñones Preparation Response and Recovery. This name was agreed upon because it explains the reality that natural disasters will strike the community of Piñones, but also shares how the community will be well prepared and ready to help one another to recover.

Along with creating the name Piñones Preparación Respuesta Recuperación, the team and sponsors created a logo to give the program an identity. Shown in Figure 4, the logo displays a sense of community, shown by the hands being in the air together in the center of the logo. COPI's colors are used throughout the logo on the words as well as on the pieces of jewelry on the arms shown. To tie the words together, the team chose to enclose the circle with a heart including a heartbeat that represents medical response and health care. To finish off the logo, a transparent background of COPI's original logo, a mangrove, was added.



Figure 4 PPRR Logo



The next step in the process of developing the identity of the program was to brainstorm the flow of management and display it in an easily digestible way. This was accomplished by first identifying the main components of the program described in the Establish Community Network section below. Then putting them together in a diagram that conveys how all the aspects work together.

Once the main components were established, two brochures were created describing the program. Both brochures described different parts of the program since they were geared towards different groups of people. Each brochure can be found in Appendix A.

#### 5.1.2 Develop Program Requirements

Through brainstorming with sponsors and co-researchers, the team created a set of requirements that applied to the program. Within the Piñones Preparación Respuesta Recuperación (PPRR) program there are questionnaires with information that will help COPI best serve the community. The questionnaire data is stored in a database that organizes the information. Along with a database of information there is a series of maps displaying and sharing the collected information.

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#### DEVELOP STRONG RELATIONSHIP WITH COPI AND CO-RESEARCHERS

The team along with three other teams were the first group of WPI students to work collaboratively within the community of Piñones. The projects aimed to create and strengthen community programs. Since the Piñones project was brand new to WPI and the community, it was important to establish a relationship with the community members, sponsors, and co-researchers. It was especially important for the co-researchers and sponsors to become part of the team and feel that the project is their own.

Working collaboratively with COPI and co-researchers, Paola Rolom, Shawn Halliburton, and Angel Bermudez, allowed a strong working relationship to develop. They were the team's gateway to the community and brought valuable skills and connections to the project. A strong partnership was established with COPI and WPI due to the healthy cooperation and idea flow between each party.

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#### ESTABLISH COMMUNITY NETWORK

As mentioned above in section 3.1.1, when establishing an identity for PPRR, it was agreed on that there should be a clear network put in place between all branches of the program. The program network starts with the administrative committee whose primary job is to organize and further the programs foundation. From here admins will pick individuals from the community who they believe are a good fit to be on the coordinating committee, although community members can also volunteer to be a part of this committee. Those who are on the coordinating committee will also be the hub leaders and sector representatives. The sector representatives will account for community members and be the voice of concern for their sector while the hub leaders have the responsibility of accommodating community members, emergency resources, and necessities in times of need. There will be much overlap between the two positions such as

holding the responsibilities of keeping emergency plans up to date and reporting information back to coordinating committee and admins. These individuals hold more of an authoritative role within the program. After the Coordinating committee comes the community assets which are split into organization assets and participants. The assets part of the program can best be described as what can be contributed to the community, such as community hubs and occupational skills. The overall structure of the program’s network can be seen below in Figure 5.

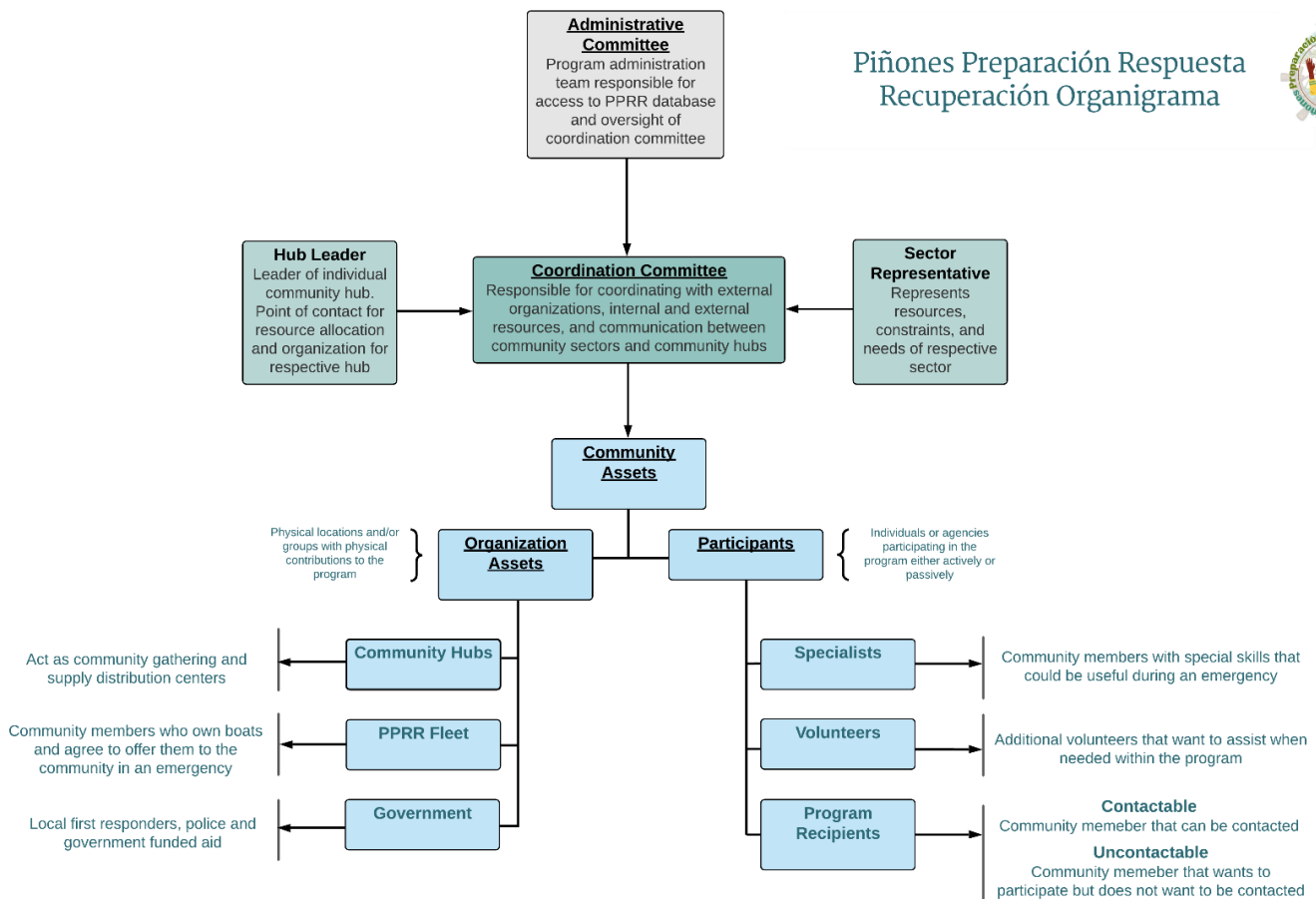


Figure 5 PPRR Organization Chart

### 5.1.3 Build Database

#### GOOGLE DRIVE

The technological architecture of the system was hosted on the cloud through the Google Drive Suite. Technologies included in this suite include Google Sheets, Google Docs, Google Slides, and other Google document creation platforms. These platforms are centralized under Google Drive, a cloud-based file storage and file sharing platform where many individuals can have

shared access to the materials. The system materials can be shared between Google accounts, allowing as many users as desired to take administrative roles. This section will discuss each platform of the system's technological side, including which technologies are used and how they link together.

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#### GOOGLE SHEETS

The primary platform used for data storage or 'database' functionality was Google Sheets. As previously mentioned, all the data collected via Google Forms would automatically find a home in a Google Sheets file somewhere in the system folder. It was decided to use Google Sheets due to its ease of access, easy maintenance, real-time updating and integration capabilities, and its low cost (it's free). These attributes make it the perfect candidate to allow efficient and easy storage of data for the use of this program.

How the data is stored in the database in tables is as follows:

1. Community Member Form Data
2. Establishment Form Data

Which will in turn be filtered into tables as follows

1. Community Leaders Table
2. Community Hub Information Table
3. Community Member Information

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#### GOOGLE FORMS

Collecting data from the community was achieved through the dispersal of questionnaires, both on paper and online. The information from these questionnaires were largely based on past experiences COPI had when helping the community in past natural disasters. The online version of the questionnaire was the primary point of data collection since it was ultimately integrated with the following aspects of the system, allowing automated updates.

The platform used for these online questionnaires was Google Forms, part of the Google Drive Suite. The team decided to use this platform for the data collection due to its streamlined ability to save data to shared documents and update it in real-time. Upon a user's submission of a new response, Google automatically creates a new entry in the database for the submission.

Backtracking a bit, since this is ultimately the first stop the data takes in the system, it is important that every person's submission makes it online into the database. This means that anytime a user opts to take the questionnaire via physical paper copy, somebody in an administrative role must manually enter the response into a new form entry so that the entry makes it in the database and is operable in future operations.

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#### REPORT GENERATION

Generating reports derived from community participant information served as another way to properly synthesize the data of involved community members, leaders, and establishments. Using automated tools like Autocrat, which is an extension for Google Sheets, the information stored in the database(s) can be pulled and inserted into report templates to easily view data in the manner(s) that provide the most insight and benefit.

#### 5.1.4 Build Community Map and Mapping System

A large aspect of the program included the creation of maps that lay out the data of the community found in the form data. The first goal of the maps was to use existing data in combination with the data procured through PPRR to analyze geographic patterns within the community to better understand the needs in general as well as in times of emergency. This goal was where a lot of the census data came into play since the United States Census Bureau has databases online that easily interface with GIS platforms. The second goal of the created maps was to create informatics and easily digestible media to display the established community hubs throughout the community as well as sectors of the community that would belong to each community hub. These maps also have instructions included on what to do in emergency situations as well as eventually emergency evacuation routes that have been deemed possibilities in times of dire need.

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#### GOOGLE MY MAPS

Google My Maps was also a greatly beneficial mapping platform used in this program. More public-facing maps were done in My Maps due to its ease of use, ease of continuation and maintenance, and its easy integration with Google's cloud suite platform Google Drive. Also, My Map's simplicity and familiarity (since it's basically Google Maps with a customization plugin) make it a great mapping medium for use in emergency situations.

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#### USE QGIS TO MAP DEMOGRAPHIC DATA FOR GRANTS

The QGIS platform was used for the more data-oriented maps created. An example of this would be the types of maps laying out demographic, economic, or any other purely data-driven derivative coming from secondary data. A lot of this information comes from the Census Bureau data as well as other organization data like topography, environmental, or even elements like flood risk.

#### 5.2 DISCOVER WAYS FOR FUTURE DATA COLLECTION WITHIN THE COMMUNITY

Alongside creating a map of resources, finding the most effective way to collect data for the future became a dimension of the project. It was important to obtain example data for the program as well to showcase its full capabilities. The team had tried surveying neighborhoods and posting flyers throughout the community, but these methods were largely unsuccessful. The Piñones community was not very active during the afternoon hours due to many of the community members being at work. The team also discovered that community members were not very responsive to outsiders inquiring about their community, so completing field research was best done with co-researchers. When discussing data collection with co-researchers, the team found that going door to door with forms worked best for collecting community member information.

Much of the Piñones community does not have reliable access to the internet. This creates a need for a paper version of data collection forms as well as an online version.

### 5.3 TEACH CO-RESEARCHERS AND SPONSORS HOW TO USE MAPPING TECHNOLOGY

Once the PPRR program was in place and working, teaching the sponsors and co-researchers how to use and modify it was vital. To leave the system behind, they had to understand the full functionality of the program. Several days were set aside to sit down with the sponsors and co-researchers and show them how to work the program. The team went through the system step by step and had the sponsors and co-researchers physically use the program to have experience with it before the team departed Puerto Rico.

### 5.4 DESIGN SYSTEM USER MANUAL FOR SPONSORS AND FUTURE WPI INITIATIVES

After creating the PPRR Program, the team set out to create a manual that individuals can refer to when using or creating their own emergency preparedness program. This manual includes a program outline as well as a technical outline of the system.

#### 5.4.1 Build System User Manual

Building any technical system that has intended end users that are not the individuals that created it must have documentation. Another aspect of the project was creating a user manual that serves to outline the whole PPRR program.

The first half of the manual includes an introduction of the program and a general outline. This lays out each piece of the PPRR program and explains how every part is interconnected. It describes the flow shown in Figure 5. For more detailed explanation of each part, refer to the manual linked on page one of this report. Building this section of the user manual was imperative as it includes the team's rationale and the structure of the whole program. This allows for future projects and co-researchers to build directly upon the PPRR program.

The second half of the manual includes an in-depth description of the technological side of the program. The system architecture is fully explained and follows a step-by-step outline for how to use the program. This allows for any individual using the program or creating a similar program to refer to the manual for clear direction.

Another part of the manual explains recommendations for future programs. These are recommendations that the team found would be promising for future projects.

### 5.5 RECOMMENDATIONS

#### COLLECTING DATA IN A COMMUNITY

1. Use Google Forms when collecting data that needs to be uploaded into a system: The use of google forms is quick and easily accessible through a smartphone or computer. The data is easily stored and displayed. Google also offers multiple ways to set up and organize questions you want to ask on each form. (If it is necessary you can also have a nicely formatted printed copy of your form).

2. Either go door to door, have a community event, or interact among known locals to gather data. Don't just walk around the community: When walking around neighborhoods it is very unlikely that people will be outside on the streets, which can cause delays in data collection. We recommend going door to door or having an event where community members can gather.

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#### DEVELOPING MAPPING CAPABILITES

1. Use "blocks" or areas to map individuals, not exact addresses, or locations: Since many houses and buildings in Piñones do not have exact addresses, the actual mapping of an area would be better done in "blocks" or outlines instead of exact addresses. It is also important to not violate community member's privacy by mapping their exact locations. Having general areas is enough for COPI to know which communities will need resources and how many resources are needed at that "block".

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#### USER MANUAL

1. Have step by step process for how to use Google Sheets and Google Forms: Having a step-by-step explanation in the manual for google sheets and forms will close any gaps that the project leads have with the google database. Any questions they have will be answered directly in the manual.

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#### CREATING A DATABASE

1. Link Google Forms to a Google Sheets: This helps with organization and automatic updates from google forms to an organized database. We recommend linking the two for ease of use.
2. Manually enter coordinates or addresses into map: In areas without exact addresses, individuals will need to manually enter coordinates into Google My Maps to pinpoint specific places on a map.

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#### FOR WPI

1. Research possibility of other IQP groups continuing the data collection side of the project: The database is ready for data entry so another WPI project could potentially be adding data to the system and covering more ground in the actual resource side of the database.
2. Research potentially updating the maps and database into a more complex system: Given more time, another WPI project could update the database and maps into a more advanced system that is still easy to use. Another platform could be used to create such a system.

## CHAPTER 6: CONCLUSIONS

The main goal of this project was to create an emergency awareness and preparedness program for the community of Piñones. Piñones has been historically left to recover from disasters on its own without the help of government or outside aid. The emergency program is designed to mitigate response and recovery time by using a community-based network, with COPI being at the forefront of the organization.

While working with COPI and sponsors, the importance of togetherness throughout the community of Piñones was unmistakable. Community stories were shared, ideas were heard, and individuals were open to new opinions. As a new group of students working in Piñones, the project group was met with open arms by individuals eager to help make change throughout the community.

When creating the PPRR program sponsors and co-researchers helped the team become immersed within the community. This brought new and exciting aspects toward the project when working on the program. The program is expected to continue and be built upon in future projects by anyone who wants to contribute toward preparing the community of Piñones for times of emergency. As the program gets handed over, the team would like to give a special thank you to the co-researchers on the project, they have been great partners and will continue to bring change toward the PPRR program.

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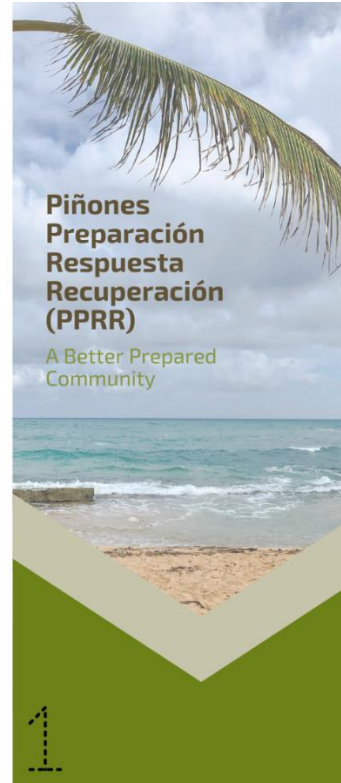


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A Better Prepared Community

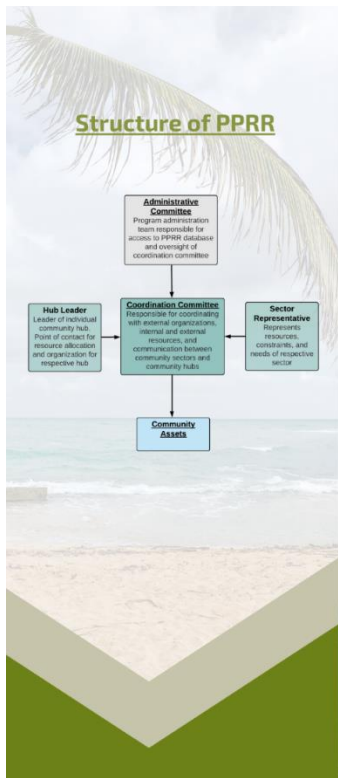


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1



**About PPRR**

Piñones Preparación Respuesta Recuperación is working to create a functioning program that will allow COPI and their supporting team to pinpoint where resources are needed during emergencies. The program will create a network of assets in each sector. Each sector of Piñones will have a designated sector representative who will be part of a coordinating committee and be responsible for their identified sector. Within each sector, smaller establishments will be identified as community gathering and supply collection centers (hubs) during emergencies.

**Our Mission and Vision**

Our mission is to raise community awareness and preparedness for times of emergency and establish a better prepared community. With knowledge of the needs of the community, we can create an asset and network map for community emergency preparedness, response and recovery.



**Join Us**

Scan the QR code below to participate in PPRR as a sector representative, hub leader or volunteer.

**QR Code**





**PPRR**  
A Better Prepared  
Community



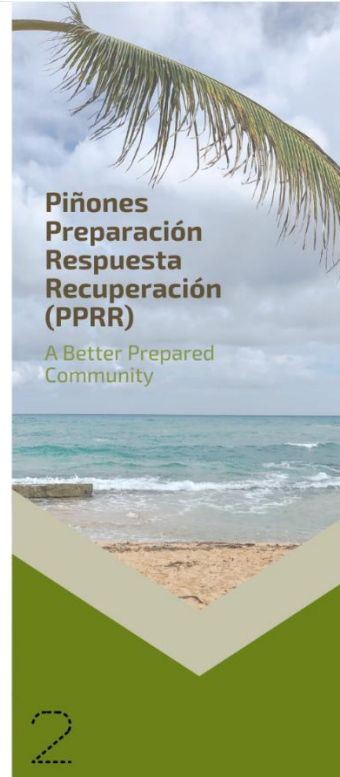
**COPI**

Corporación Piñones Se Integra

PR 187 Km 4.2 Sector Boca de Cangrejo Loíza PR 00772

**Contact Us**

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**About PPRR**

Piñones Preparación Respuesta Recuperación is working to create a functioning program that will allow COPI and their supporting team to pinpoint where resources are needed during emergencies. Knowing the special skills and needs of community members in Piñones will greatly improve how we respond during an emergency and improve resource distribution. This program is meant to establish a better connection between community members and leaders and raise awareness for emergency preparedness.

**Our Mission and Vision**

Our mission is to raise community awareness and preparedness for times of emergency and establish a better prepared community. With knowledge of the needs of the community, we can create an asset and network map for community emergency preparedness, response and recovery.



**Join Us**

If you have special needs or skills and would like to join PPRR, scan the QR code below where we will privately record this information so we can respond effectively in an emergency.

**QR Code**

