STRENGTHENING EMERGENCY PREPARATION AND MANAGEMENT IN THE LA GOYCO COMMUNITY

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TALLER COMUNIDAD LA GOYCO INC.

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Figure 1: Street view image of La Goyco

ABSTRACT

This project aimed to strengthen Machuchal community resilience through a natural disaster response program. Located in Santurce, Puerto Rico, the Machuchal community is home to Taller Comunidad La Goyco, a rescued school turned community center that embodies a passion for culture and unity. In collaboration with La Goyco, our team developed pre and post-disaster resiliency plans including a wellness program, an emergency inventory system, internal operational guides, and community engagement materials. Strategic disaster planning is essential for an island facing increased risks due to climate change. La Goyco's initiative, set to benefit an estimated 3000 residents, fosters thoughtful organization, community perspectives, readiness, and lasting partnerships during crises.

EXECUTIVE SUMMARY

Figure 2: Colorful Hallway in La Goyco

INTRODUCTION

In the heart of bustling Calle Loíza stands Taller Comunidad La Goyco, a vibrant, community center, embodying the rich culture and colors of the area. Thriving small businesses surround La Goyco, forming a lively hub cherished by the entire community. Within La Goyco, the hardworking staff are always brainstorming, hosting events, and performing hands-on work in the pursuit of expanding cultural and community inclusion as well as social justice. Born from the tragedy of Hurricane Maria, La Goyco is leading community resilience efforts for the Machuchal area. The island's geographical location in Hurricane Alley makes it more susceptible to frequent and severe storms, often resulting in widespread devastation. Puerto Rico has seen an increasing number of powerful hurricanes, with Hurricane Maria alone costing an estimated $113.4 billion in damages. Given escalating impacts, hurricane preparedness and relief are increasingly pressing issues for residents and community leaders. With insufficient efforts from both the government and external organizations, La Goyco has taken on the responsibility of forming a community-led disaster response program. Our team collaboratively developed "La Respuesta Comunitaria Ante Desastres," or Community Disaster Response, a program establishing pre and post-hurricane procedures and systems for La Goyco and Machuchal residents. .

Figure 3. Map of the Machuchal Community that Taller Comunidad La Goyco serves.

MISSION, OBJECTIVES, & METHODS

The program strives to strengthen emergency management and planning for La Goyco's resilience center. Providing resources such as an inventory for emergency supplies, community wellness checks, and coordinated volunteer efforts, La Goyco's resilience hub aims to bring a sense of solidarity and togetherness to the Machuchal community in times of need. Our objectives in developing this program included:

- Develop a Resilience Hub, incorporating emergency inventory management systems and supply distribution procedures.
- Develop a community wellness program in which La Goyco can evaluate potential household risk factors pre-disaster and conduct follow-up wellness checks post-disaster prioritizing households with the most vulnerability.

- Create an operational disaster preparedness plan, including defined volunteer roles and teams, pre and post-disaster management guides for the resilience hub, and supplemental training materials.
- Form community engagement materials, including posters, brochures, and social media content to educate residents on household natural disaster preparedness.

In developing these goals, our team engaged in archival and ethnographic research as well as conducting interviews with community leaders. Our collaborative efforts with La Goyco directors and employees allowed us to incorporate community perspectives, and cater our program to fit the unique goals and requirements of the community.

RESULTS, FINDINGS, & ANALYSIS

Working with Taller Comunidad La Goyco, our team formed relationships with numerous hardworking and dedicated employees and volunteers, all passionate about community-based natural disaster preparedness. Our sponsor meetings were supplemented by the meaningful interactions we had with other community members. Working in the repurposed classrooms of the rescued school allowed us to form a deeper understanding of the essence of the community. This deeper understanding fueled our passion for the project, empowering us to create enduring and reflective products.

Finding 1: Preparatory Work Strengthens Community Assurance

Throughout our Interactive Qualifying Project, we learned invaluable information regarding Puerto Rico's rich history, culture, and other information associated with our project. We studied previous natural disaster responses in Puerto Rico, emergency management and organization, and resilience centers, while collecting data and working on community mapping exercises. This data provided us with valuable insights into our collaborations with La Goyco and became essential information for our emergency preparation and response plan. Natural disasters are unpredictable and present the potential for widespread devastation, which highlights the critical need for proactive planning and preparedness efforts. These efforts, when effectively implemented, equip communities with the necessary tools and knowledge to mitigate risks, reduce impacts, and save valuable time before disaster strikes. Consequently, residents gain increased confidence and assurance, fostering a sense of neighborly support both before and after disasters.

Finding 2: Community Input Drives Better Planning

Throughout working with La Goyco and the Machuchal community, the value of incorporating community perspectives as plans are developed emerged as a crucial step in formulating thoughtful plans. Proposals formed by the community, for the community, are a way to ensure plans and designs will have a positive impact on the people they intend to serve.

This lesson became apparent to our group after attending a community discussion around the redevelopment of Calle Loíza, the road on which La Goyco is located. Today, Calle Loíza is home to thriving small businesses, with a historic, neighborhood feel. Filled with color and culture, Calle Loíza somehow balances the excitement of a bustling city with the calmness and intimacy of a small town, catering to community members of all ages. Upon arrival at the meeting, community members were greeted by government-contracted engineers tasked with designing the refurbishment of Calle Loíza. As the presentation began, designs of an unrecognizable Calle Loíza filled the screen. As the meeting neared completion, community members were shocked to see that design finalization would occur that same month, without ever having input from community perspectives. Many individuals voiced distrust towards the plan, explaining that the core concept was not representative of community needs, but rather catering to tourists and mainland investors. Due to the short timeline, community perspectives and ideas were deficiently considered, reinforcing feelings of neglect and dismay.

Witnessing the dynamic between the presenters and the audience of community members served as a valuable lesson for our group. Embracing ideas formed with lived experience makes plans and proposals more authentic and purposeful.

With each of our deliverables, we consulted the community, speaking to Goyco employees, volunteers, and affiliates. Each step of the way an effort was made to carefully consider the vision of those who the plan was being created for.

Figure 4: Collaborative Emergency Preparedness Efforts were undertaken with La Goyco

Finding 3: Organization and Maintenance Brings Efficiency to Disaster Relief
Through talking with our liaisons, they stressed the importance of order and organization when dealing with natural disasters. Mariana Reyes, executive director of La Goyco, expressed that if there is no existing plan or organization, there will be a lack of clarity among both employees and residents regarding the proper protocols. Having a well-structured plan is essential for a quick and efficient disaster response. These themes became prevalent as we began our emergency supply efforts. As we took an inventory of La Goyco's resilience hub, we discovered a cluttered environment with miscellaneous items that had remained unused for years. In one sponsor meeting, we emphasized the value of an organized inventory in helping to

prepare for natural disasters, prompting our creation of a more methodological emergency supply system.

We identified the need for a simple way to keep track of items in their inventory that would allow for more organization and preparation, consciously choosing programs with accessibility and familiarity in mind. Before and after natural disasters, maintaining storage and orderly distribution will be crucial to mitigating chaos.

Finding 4: Partnerships Forge a Comprehensive Network of Resources
Upon entering La Goyco, an undeniable sense of resiliency and empowerment is prevalent. Our experience with La Goyco revealed that their strength as a united entity comes from the unique backgrounds and past experiences of its members and affiliates. Their resourcefulness and success can largely be attributed to this diverse network. These employees and volunteers can lead teams in their field of knowledge. La Goyco has also developed strong connections externally, even hosting Vice President Kamala Harris during her visit to Puerto Rico, elevating their standing as a community workshop.

Bettering the community requires the collective efforts of many individuals. La Goyco recognizes this notion and exemplifies it by extending their partnerships and utilizing all available resources. La Goyco's resourcefulness reflects their resilience and creativity, contributing to their continued progress within the community. These actions are vital in the face of natural disasters when community togetherness and support are crucial. La Goyco has integrated this approach into their daily operations, enhancing their efficiency in disaster relief efforts.

OUTCOMES, CONCLUSIONS, AND RECOMMENDATIONS

The many invaluable lessons and insights discovered throughout our work with La Goyco shaped the development of our final deliverables. Focusing on organization and sustainability, our team's goals were to create final products to aid La Goyco in a way that considers programs, strengths, and limitations unique to their organization.

These deliverables began with an understanding and development of their emergency supplies and inventory system. We explored La Goyco's inventory, noting all current supplies. Another aspect of La Goyco's resilience hub is the organization of emergency volunteer teams. Our team worked on defining clear volunteer roles needed in the event of an emergency. In collaboration with La Goyco, it was found that many of La Goyco's resilience volunteers function as an emergency response team, conducting post-disaster wellness checks on individuals. To enhance this process, our team created a community wellness program using Google Forms, Sheets, and MyMaps. Pre-disaster resident enrollment will allow La Goyco to identify households with higher medical or structural risks, facilitating post-disaster prioritization based on household vulnerability. The program launch will allow La Goyco to ensure the safety of upwards of 3000 residents.

To encompass our project developments and programs, we compiled our efforts into a comprehensive La Goyco Emergency Operational Plan for La Goyco's employees and volunteers. This Google Document-based guide includes pre- and post-disaster checklists for La Goyco's resilience hub operations. Additionally, this guide details post-disaster volunteer opportunities and teams, the inventory system, and the wellness program. Training materials are also incorporated throughout the document for user convenience.

Lately, to capture the community engagement aspects of La Goyco's mission, we developed the Machuchal Community Disaster Preparedness Plan. This distributable guide provides a comprehensive set of pre-, during-, and post-disaster procedures for individuals and households. To ensure the information is distributed to as many people as possible, relevant posters, brochures, and social media formats were created in Canva.

In our final considerations, we prioritized comfort and accessibility. We converted materials into different formats to ensure accessibility, including paper versions in case of internet connection loss. We also produced English and Spanish versions of all deliverables to address the area's language diversity.

Reflecting on our time in San Juan, we were inspired by La Goyco's passion for fostering community unity. The opportunity to collaborate with so many dedicated employees has impacted our lives in the best ways. We are confident that "Respuesta Comunitaria Ante Desastres" will positively impact the Machuchal community, advancing toward a more prosperous and united future.

Figure 5: Walkway and seating area in La Goyco

ACKNOWLEDGEMENTS

Figure 6: Our team walking to Goyco on our first day

1.0 INTRODUCTION

The In the heart of bustling Calle Loíza stands Taller Comunidad La Goyco, a vibrant, blue, rescued school turned community center, embodying the rich culture and colors of the area. Thriving small businesses surround La Goyco, forming a lively hub cherished by the entire community. Within La Goyco the hardworking staff are always brainstorming, hosting events, and performing hands-on work in the pursuit of expanding cultural and community togetherness. Upon our arrival we were graciously welcomed by the staff members and volunteers, eager to teach us more about all the organization has to offer. Equally eager to learn, we immersed ourselves in a significant cultural activity, Bomba, by participating in one of La Goyco's open classes. The welcoming and encouraging nature of the other attendees and skillful instructor empowered us to actively delve deeper into learning about Puerto Rico and the community. As we gathered around the Bomba circle, a fusion of beats and rhythms came together, crafting a captivating emblem of Puerto Rican culture. With maracas shaking and hands in motion, our contribution to the song was warmly embraced. The sense of community we experienced during that short hour just scratched the surface of the deep sense of community closeness in the Machuchal area. Throughout our project, this demonstration of unity and inclusion inspired our collaboration with La Goyco.

1.1 SANTURCE AND THE MACHUCHAL COMMUNITY

Santurce and the Machuchal Community are located along the coast of the northeastern sector of San Juan. The streets are lined with beautiful, vibrant murals where Plena and Bomba music can often be heard in the air. These are two culturally significant music and art forms prevalent in Puerto Rico, featuring a blend of percussion instruments, vocals, and dance in their performances. These defining cultural aspects help to depict the neighborhood's history and identity. Santurce is home to over 65,000 individuals and spans 5.3 square miles (Census Profile, n.d.). 48.3% of the population lives under the poverty line(Census Profile, n.d.).
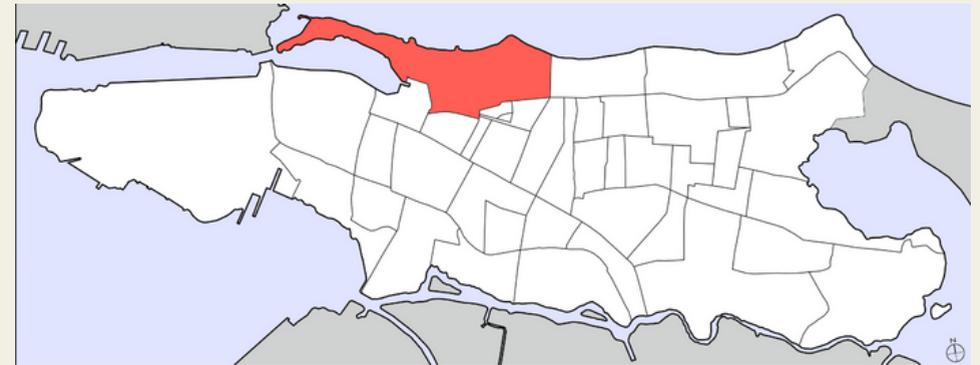
Figure 7: Map of San Juan, Puerto Rico, highlighting Santurce
https://en-academic.com/dic.nsf/enwiki/11570932

Despite the ongoing social and economic challenges the area faces, this community has always maintained a sense of resiliency. In the midst of this urban landscape, community leaders can be seen advocating for education, the preservation of history while continuing to share its rich culture with those in the community. These continued efforts to progress the Machuchal Community forward have truly united all residents and inspired surrounding areas. In the summer of each year, Santurce becomes home to "Santurce es Ley", the largest urban art festival in Puerto Rico and the Caribbean. Both local and international muralists participate and create vibrant and colorful murals portraying Puerto Rican culture.

Figure 8: Mural in Santurce
https://www.bienvenidospuertorico.net/santurce-es-ley-celebrates-artistic-empowerment-through-amazing-murals/

Figure 9: Mural in Santurce
https://www.thevandallist.com/wp-content/uploads/2014/08/Cyrcle-3.jpg

1.2 SPONSOR BACKGROUND

In the middle of vibrant San Juan, Puerto Rico sits Taller Communidad La Goyco. La Goyco is a nonprofit organization founded in 2018 by a group of community leaders and is based out of the former Pedro G. Goyco Elementary School, located in the Santurce sector of San Juan, which closed in 2015. The organization focuses on supporting the community by developing health, education, and cultural programs on topics including computer science, writing, art, theater, Bomba, recycling, social justice, and many others. The executive director and co-founder, Mariana Reyes Angelero has worked with Worcester Polytechnic Institute (WPI) students in Puerto Rico for the past three years.

Taller Comunidad La Goyco's mission statement explains that their community center is "born of community management anchored in the diversity that characterizes our environment and committed to the sense of solidarity that represents the highest ideals of coexistence. Aware of the plurality of needs of the sector, we dedicate ourselves to the creation of programs, initiatives, and opportunities that highlight the historical, social, and potential wealth of the Machuchal Community and the Calle Loíza sector in Santurce, Puerto Rico" (Taller Comunidad La Goyco, n.d.). That said, La Goyco could not operate without the hardworking and dedicated individuals working with Mariana. We were lucky enough to be able to collaborate with a few of these individuals, some of which include Ricardo (Ricky) Otero, Johanna Domingueza, Javier (Javi) Rosselló, Talía Lierca, Eunice Jiménez and Pepín Lugo. Ricky and Pepín are the lead physical plant coordinators, they maintain the grounds and manage all custodial tasks. Javi manages La Goyco's inventory and glass recycling program; glass bottles collected from the community are turned into sand for various purposes. Talía, Johanna, and Eunice worked with us to develop a community mapping system. We worked closely with all of these individuals

throughout our time in San Juan and enjoyed being in their presence as they are dedicated to and care deeply about their work. As a nonprofit La Goyco relies heavily on volunteers and donations. The rooms of the building are used as workshops for local artists, musicians, and other small businesses to showcase the history and the social potential of the Machuchal Community. Taller Comunidad La Goyco is also significantly involved in emergency preparedness and offering aid and support to the local community following natural disasters that hit the island. Over the past few years, they have implemented solar panels and rainwater collection systems to ensure their community can rely on them in times of need.

Figure 10: Image of the individuals who work closely with La Goyco (from the La Goyco website)
https://www.lagoyco.org/somos

1.3 PROJECT INTRODUCTION

Working alongside the La Goyco Emergency Preparedness Committee, this project hopes to answer the following research question: How are operational, supply, and community systems developed to ensure the success of emergency management plans and resilience centers? Furthermore, how can we develop actionable and useful plans specific to the La Goyco community? To ensure success, the following objectives for this project are: Develop a Resilience Hub, incorporating emergency inventory management systems, and supply distribution procedures.

1. Develop a community wellness program in which La Goyco can evaluate potential household risk factors pre-disaster and conduct follow-up wellness checks post-disaster, prioritizing households with the most vulnerability.
2. Create an operational disaster preparedness plan, including defined volunteer roles and teams, pre and post-disaster management guides for the resilience hub, and supplemental training materials.
3. Form community engagement materials, including posters, brochures, and social media content to inform residents on household natural disaster preparedness.

Through this collaborative effort, the implication of an emergency preparedness plan for the community will be co-developed, functionally operating out of a resilience hub. By integrating this plan into the surrounding area, a safer and more prepared community will form. Our goal is to develop our plan in collaboration with community members, volunteers, and employees to ensure that the systems we set in place are sustainable. La Goyco has historically been a spot for the entire community to come together. Our joint mission through this project is to ensure the community is protected and prepared for emergencies.

Figure 11: Tito Matos Mural in the La Goyco Courtyard

2.0 LITERATURE REVIEW

Our Project goal is to strengthen emergency management and planning for La Goyco's resilience center. Archival research was done on the topics of emergency response in Puerto Rico, emergency management, operations, supplies, community involvement, resilience centers, data collection, and mapping. Researching emergency response taught us about the problems Puerto Rico has faced after natural disasters. This research also provides insight into what can be improved in emergency response and disaster relief. The sources on mapping and data collection talk about the important features of mapping that make the application useful during emergencies. Various sources provided input on the importance of resilience centers in small communities neglected by the government.

2.1 EMERGENCY RESPONSES IN PUERTO RICO

Emergency response in Puerto Rico has been a subject of discussion for many years, particularly in the wake of natural disasters such as hurricanes, floods, and earthquakes. The island's geographical location makes it more susceptible to frequent and severe storms, often resulting in widespread devastation. Puerto Rico has seen an increase in the amount of powerful hurricanes that have caused immense damage throughout the past decade, including Hurricane Fiona, Hurricane Irma, and Hurricane Maria. Climate change is partially to blame for this increase in storms. Global warming has been a result of humans' overuse of natural resources including oil and natural gas. We have already seen prevalent examples of the effects that global warming has had on the earth in the form of natural disasters. "Climate risks such as sea level rise, increases in temp-

erature and more erratic rainfall, often experienced as more frequent and extreme weather events such as storms, floods, and droughts" (United States Climate Change Data | Emissions and Policies, n.d.). Throughout the past few decades, this increase in damage has been notable. "In 2022, the President declared 47 major climate disasters, 10 emergencies, and 33 Fire Management Assistance Grants" resulting in 474 deaths and totalling to $165 billion (FEMA, 2023). The figures below present data visualizing the most costly and deadly hurricanes in American history.
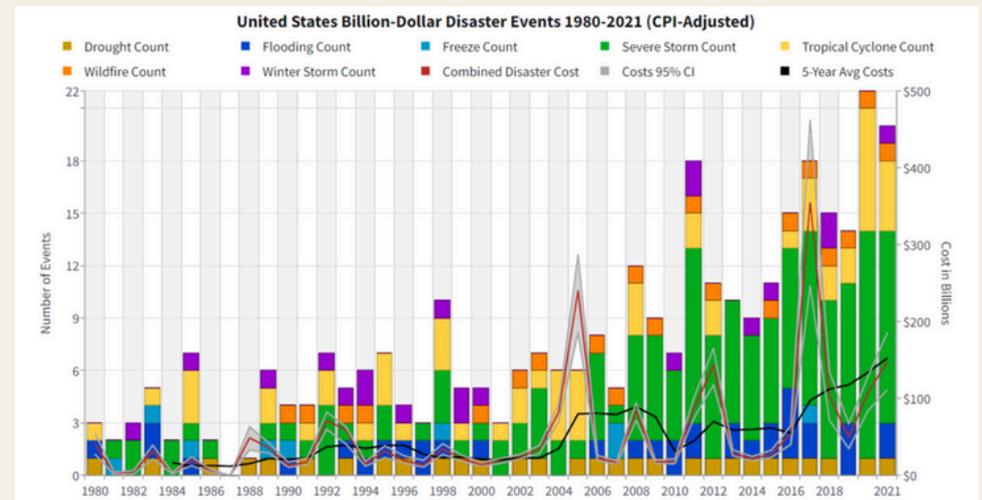
Figure 12: Graph portraying data on damage from natural disasters in the United States in the past 40 years, Source: https://www.ncei.noaa.gov/news/calculating-cost-weather-and-climate -disasters? position=1&list=vJuGft_KPGAaLORH_YGD1Sj2deIZc9IVUZO7HbF2 QTU

The Costliest and Deadliest Hurricanes to Hit the U.S.

U.S. damages and death tolls for the costliest hurricanes on record to impact the U.S.

■ Insured property damage (in $b)*   ■ Total economic damage (in $b)*   ● U.S. Deaths**

	Insured property damage (in $b)*	Total economic damage (in $b)*	U.S. Deaths**
Katrina 2005	53	170	1,833
Harvey 2017	21	131	103
Maria 2017	31	95	2,900
Sandy 2012	21	74	159
Irma 2017	31	53	95
Andrew 1992	26	51	65
Ike 2008	21	37	101
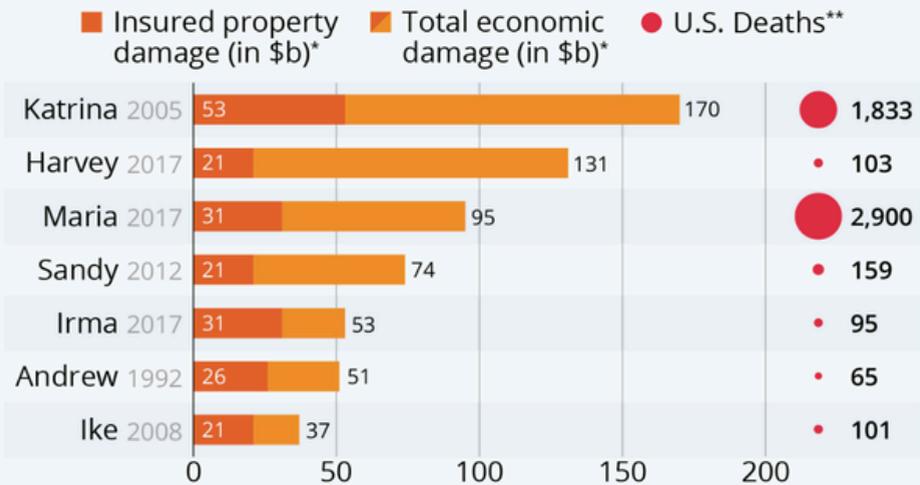
* Adjusted for inflation   ** Mainland and territories (Maria: minimum of deaths)
Sources: NOAA, International Insurance Institute

Figure 13: Description of hurricanes that have impacted the United States and their associated property damage cost and loss of life totals, Source: https://www.statista.com/chart/22748/us- damages-death-tolls-costliest –hurricanes –in-the-us/

This increase in global warming and climate change has increased the frequency and strength of natural disasters when they hit. The need for efficient emergency response in the United States is a prevalent issue. Puerto Rico, partially due to its tropical location in the Caribbean Sea, has made it subject to many tropical storms and hurricanes. It is even more imperative that the individuals living on the island be prepared for natural disasters when they occur.

Hurricane Maria is one example of a powerful natural disaster that hit the Caribbean and southern United States in September 2017. The Category Five hurricane devastated the entire island of Puerto Rico, impacting the lives of all 3.4 million inhabitants, damaging or destroying nearly half a million homes, and leaving the community to slowly rebuild from the wreckage (Zorrilla, 2017).

Figure 14: Image taken in the Machuchal Community of abandoned buildings

It is one of the deadliest natural disasters in U.S. history, with an official death toll estimated at close to 3,000 individuals in Puerto Rico alone, and was also the tenth–most intense Atlantic hurricane on record in the world (García, I., et al., 2020). Out of the island's 69 hospitals, only three were functioning four days after the hurricane. "As of 16 days after the hurricane, 25 hospitals were working, only 9.2% of people had power, 54% had water, 45% had cell phone service, and the Federal Emergency Management Agency (FEMA) had distributed 433,000 food packages and 42,000 gallons of water. Puerto Rico clearly faces a long road to recovery" (Zorrilla, 2017). While 433,000 food packages may seem like a lot, many of the 3.4 million inhabitants

were still going hungry. This is just one example of an emergency in which community organizations in Puerto Rico would play a key role in aiding the community. During our time on the island, we spoke to different individuals about Hurricane Maria, often being described as a traumatic experience. In these discussions we learned, many areas were without power for roughly six months leaving abandoned buildings scattered throughout and some areas to never recover.

Figure 15: Image of abandoned building in Machuchal Community

Figure 16: Image of a front porch of an abandoned home in Machhuchal Community

Many nonprofit community-based organizations in Puerto Rico prepare to face natural emergencies in the form of hurricanes, droughts, flooding, and domestic issues related to poverty. Underlying economic issues like the Puerto Rican financial crisis where it was determined that Puerto Rico owed over $100 billion in bonds and unpaid pensions debts (Rodríguez-Díaz, 2018). The water and power grid in Puerto Rico had not been maintained adequately as a result of the United States government demanding Puerto Rico to reduce spending and shrink the budget deficit. "The US Geological Survey (USGS) abandoned 177 hydrologic stations in July [2017] in a bid to force the local government to pay the 2 million dollars it is owed" (S. Dietrich et al., 2018). As of 2023, FEMA's Hazard Mitigation Grant project invested $122 million into 35 projects in Puerto Rico to address flooding, climate change, and improve stormwater drainage

systems (FEMA Addresses Flood Risks in 25 Municipalities | FEMA, 2023). Climate change is linked to erosion, flooding, and landslides, all of which are major concerns in Puerto Rico. The lack of government funding, whether federal or local, makes it difficult for communities to be prepared for natural disasters like Hurricane Maria and the aftermath that followed (Engelman et al., 2022; Rodríguez-Díaz, 2018). Thus, Puerto Rico is increasingly reliant on community organizations to provide aid to communities.

Community organizations played a large role in Puerto Rico's reconstruction following Hurricane Maria. It brought many individuals together and allowed them to overcome adversity to rebuild the communities. This involved the people living on the island as well as Puerto Ricans living in the United States who offered their time and money to help those in need (Rodríguez-Díaz, 2018). A strong community network created by the overall united feeling of loss was critical following Hurricane Maria and created a sense of solidarity that brought people together. Non-profit community centers provided much-needed support to locals in Puerto Rico as well. Many of the community-based organizations (CBOs) in Puerto Rico rely on volunteers to run and maintain their centers. Immediately following Hurricane Maria, community center volunteers would deliver food to those in need who did not have electricity in their homes, and deliver supplies like food, water, medications, diapers, and other necessities (Engelman, et al., 2022; García, et al., 2020). Many elderly and disabled individuals were homebound and relied on these deliveries following Hurricane Maria as other forms of aid were slow and unreliable, often taking weeks. Many of these residents have health issues that may rely on power. Oftentimes medications like insulin need to be refrigerated or blood oxygen monitors and other medical devices need to be charged. CBOs often try to aid individuals in these challenging medical situations.

There were some concerns these community centers discovered in the wake of Hurricane Maria including communication and transportation issues resulting from downed cell towers and debris in the roads (Engelman et al., 2022; García et al., 2020; Zorrilla, 2017). There was also a lack of government support and a lack of internet access that created a challenge in reaching the population in need. There were multiple studies done on the importance of community centers in Puerto Rico where they were asked questions regarding what needed improvement to better handle future emergencies. Demographic data received from the CBOs found that 95% of community centers provided services to the elderly (Engelman, et al., 2022). Many respondents said more staff training for mental health, emergency preparation, and elderly care (Engelman, et al., 2022; García, et al., 2020).

Hurricane Maria shed light on the important role that community centers play during emergencies, but it is just one example. Puerto Rico is subject to many different emergencies like heat waves, droughts, floods, and domestic emergencies like domestic violence, homelessness, and challenges of poverty. The poverty rate is 39.5% in San Juan, which is almost twice the rate of Mississippi, the state with the highest poverty rate in the U.S., with a rate of 19.1% (Census Bureau Data, 2023). Poverty affects how individuals manage emergencies. With such high poverty rates in San Juan, they may recover slower. Community centers serve as essential hubs as they partake in food distribution, offer medical assistance, and community support, and act as resilience hubs and sanctuaries during emergencies. The current state of Puerto Rico's economy has made federal emergency response difficult, making these community centers a critical component of the communities' emergency response and recovery efforts. Many resilience centers like La Goyco face numerous challenges but with further research, funding, and determination they can strengthen their disaster preparedness programs before another major emergency arises.

2.2 EMERGENCY MANAGEMENT: OPERATIONS, SUPPLY, AND COMMUNITY INVOLVEMENT

In creating a thoughtful and strategic emergency management plan, operations, supply, and community factors must be considered. With a multitude of goals and objectives to evaluate in the event of an emergency, it is important to prioritize. The weighting of these goals can be done via MCDM or multi-criteria decision-making, a method of programmable decision-making that has been gaining increasing popularity in the field of disaster management (Cavdur et al., 2021; Choukolaei et al., 2023, Manyaga et al., 2020). MCDM is an area of research that considers different goals, objectives, and constraints to arrive at an optimal decision. The broad and versatile nature of MCDM makes it applicable to most decisions that involve choosing between alternatives or ranking different options. Within the scope of disaster management, MCDM can be used in all four stages of a disaster, encompassing mitigation, preparation, response, and recovery (Manyaga et al., 2020). MCDM also has the potential to aid in decisions regarding different facets of the field, including, but not limited to, supplies and inventory, resource distribution, infrastructure systems, volunteer management as well as financial opportunities. An example of this could look like a community center using MCDM to decide between different supplier options for water bottles based on supplier cost, location, and fulfillment capacities. The MCDM program will consider each variable, constraint, and objective to choose the optimal supplier or output a supplier ranking. While the method can become complex with more variables to consider, it is an effective and efficient approach to emergency preparedness decision-making (Cavdur et al., 2021; Choukolaei et al., 2023, Manyaga et al., 2020).

In addition to priority assessment, other analysis methods may be used to pinpoint specific vulnerabilities in the area of interest. Less technical methods, such as SWOT, or Strength Weakness Opportunity Threat, can be used to encompass the needs of the community at risk, developing a personalized disaster management strategy (Wang et al., 2023). Using SWOT can be a helpful first step in identifying the status of emergency preparedness in a community. For example, SWOT may identify infrastructure resilience as a community strength and supply management as a weakness. Identifying what aspects of emergency planning in the community need improvement can help disaster managers prioritize development. While MCDM is a quantitative approach, SWOT is a qualitative approach, hence, experts need not choose one over the other (Wang et al., 2023). Both methods could be used together in a complimentary manner when making decisions regarding emergency management. SWOT can be used as a preliminary step to MCDM, identifying which systems require development. MCDM would then work towards making optimal decisions for the development of the relevant systems.

A common consensus among emergency preparedness experts is the necessity for community-level preparation (Cadvur et al., 2021; Farazmand, 2023; FEMA, 2022; Pagán et al., 2024; Wang et al., 2023). While residents of the community are most at risk in the event of an emergency, they are also the most qualified to understand their community's vulnerabilities and strengths. However, there are also cons to giving community members sole responsibility for disaster management, which will be discussed later in section 2.3. Individuals from the community are also the most accessible first responders, likely taking action before larger government agencies can provide aid (Farazmand, 2023). Due to their advantageous proximity, the community must establish a strategic system that has the ability to be communicated to all residents. This includes establishing

community drills (Wang et al., 2023) as well as a preparedness education system (Farazmand, 2023; Wang et al., 2023). These local systems can identify the most vulnerable areas and problem-solve accordingly (Pagán et al., 2024).

On top of recognizing susceptibilities, determining a community's capacity for aid is also a fundamental aspect of an emergency management plan (Cadvur et al., 2021; Farazmand, 2023; FEMA, 2022). Asking questions regarding resource storage and allocation capacity can help to set realistic expectations and regulations. Having a strong procedure for resource ordering, storage, and distribution is outlined extensively in FEMA's Distribution Management guide. Regarding resource ordering, ensuring multiple sourcing structures decreases the risk of supply shortages (FEMA, 2022). The inventory and distribution procedures can be organized via scalable inventory management software, and the allocation of resources can go hand in hand with health and wellness checks on the most vulnerable members of the community. This allows for volunteers to complete two goals, resource dispersal, and community wellness checks, in one action. While the most at-risk members of the community are being taken care of individually, mass distribution can occur at centralized locations (Cadvur et al., 2021; FEMA, 2022).

Overall, Emergency Management encompasses a large scope of operations and supply aspects. CBOs can customize their emergency plan to fit the specific needs and priorities in their communities.

2.3 GOVERNMENT-LED AND COMMUNITY-LED EMERGENCY RESPONSES

While unified community systems are critical, communication with larger aid organizations also plays a part in the overall success of a region during and after an emergency. Fostering a relationship between government agencies, non-governmental organizations, and CBOs is advantageous to the government, NGOs, and residents of the community (Farazmand, 2023; Pagán et al., 2024; Wang et al., 2023). Larger agencies can gain better insight into the needs and challenges within the community and CBOs can gain access to more resources, including funding, supplies, volunteers, and organization. Each level of the emergency preparedness hierarchy in Puerto Rico serves a specific purpose (Pagán et al., 2024). While communication between these groups is valuable, coordinated plans and efforts involving all levels can be especially rewarding (Farazmand, 2023; Pagán et al., 2024). Affiliations between levels can be strengthened by ties to CCS, or Community Service Councils, which act as links between local organizations and government organizations, often giving smaller establishments access to more resources (Pagán et al., 2024). Inter-organization relationships, as well as connections with residents, can play an important part in ensuring a widespread and collaborative understanding throughout the community (Farazmand, 2023; Wang et al., 2023).

With these emergency management hierarchies in mind, it is important to recognize the potential limitations of community-based preparation. While those in the community may be most familiar with its vulnerabilities and assets, the community may not be experts in determining how to best serve and utilize these groups. Residents may have less technical experience

than experts in the field who represent larger government agencies. In addition, some communities may not have the economic, educational, or technological resources to take action themselves, ultimately resulting in larger losses and recovery periods (Manyaga et al., 2020). In addition, social issues and inequities in certain areas may challenge forming a unified community front. While a community with extensive resources and experts is ideal for emergency preparation, we must keep in mind that this is not always the reality of the situation. Outside help from the government or larger organizations can also be a key component in emergency response success, depending on the status and limitations of community resources and dynamics, and the event's severity.

Government-led emergency responses can provide benefits for affected areas after an emergency, because of their access to a vast amount of resources including budgets and funding, logistical management, and experienced personnel. FEMA's resources and budget are provided via the government's Disaster Relief Fund or DRF. The DRF allows FEMA to contribute to the improvement of resiliency infrastructure, repairing properties and homes, clearing debris, and contributing to disaster prevention efforts (Sperl, 2022). In addition to government funding and resources, FEMA hires experts in emergency preparation, management, and relief. FEMA's Logistics Management Department serves as a prime example of the abundance of disaster relief expertise available. This department is responsible for organizing and strategizing for resource distribution, supply chain management, infrastructure planning, and workforce management (FEMA, 2023). This level of preparation is meantto allow government organizations to quickly and adequately provide aid in the event of a natural disaster. The ability to focus on strategy and organization is a luxury that community-based organizations cannot afford to pour as much time and money

into. While the idea of a government-led response seems favorable, oftentimes the distribution of resources and funding does not provide adequate aid during times of need. Hurricane Maria, as previously mentioned, serves as a key example of the misuse and misdirection of government-led relief. Unfortunately, government funding is often distributed inequitably, typically better serving wealthier communities and areas (Manuele & Haggerty, 2022). While Hurricanes Maria, Irma, and Harvey cost FEMA $245 billion, communities in Puerto Rico still struggled to repair and recover from damages (Manuele & Haggerty, 2022). Certain communities were especially underserved, with rural communities receiving the least aid.

A collaborative and organized combination of both government and community-based efforts would allow for a more comprehensive and focused approach to emergency management. A community-led collaboration with the government would allow for the community to best inform the government of their needs and deficiencies so that the government is informed on the most effective way they can provide aid. The strategies and expert opinions above and in section 2.2 not only apply to emergency management plans and systems but can also be utilized in the organization of emergency centers, also known as resilience centers.

2.4 RESILIENCE/EMERGENCY CENTERS

Resilience centers are another form of aid that allows smaller communities to better prepare for natural disasters. They serve the community in times of need by providing necessary supplies (i.e. food, bottled water) shelter, and first aid to those in need (Center, A. D. P. 2003; de Roode, et al 2020; Wilken, et al 2023). As described in section 2.3, resilience centers may be a much more effective method of providing aid on a smaller scale

compared to the government, often relying on community volunteers who are readily available. Community education on emergency preparedness is also an important aspect of resilience centers. Community members need to be educated on emergency preparedness so that when an emergency presents itself, they know what they need to do individually and what they could potentially help their fellow community members with.

These resilience centers need to be as self-sufficient as possible as the United States government has provided little aid in the past (Blackout In Puerto Rico, 2019). Through systemic racism and colonialism, the United States has perpetually prioritized the mainland, often leaving large margins of Puerto Rican society underdeveloped and in poverty. Over the years systemic racism in disaster relief has furthered the wealth gap; white Americans have been able to maintain their high status while minorities are left with a fraction of the aid and support they need to overcome poverty (Baja, K. 2022). This is why community resilience centers are so important, they foster inclusion among all community members regardless of race (Wilken, et al 2023; Baja, K. 2022). This comradery between community members acts as a support system for all its residents (Wilken, et al 2023; Baja, K. 2022). This unity formed amongst the community allows them to be resilient, not just during times of disaster but also in everyday life (de Roode, et al 2020; Wilken, et al 2023; Baja, K. 2022).

After a natural disaster, residents of small communities are unable to rely on the Puerto Rican government for immediate aid. The often inconsistent disaster response is due to the weak financial situation of their government. "The island's troubles have their origin in an era of corporate tax incentives in the 1970s that exempted firms from paying federal taxes on profits earned in Puerto Rico" ("Why Puerto Rico Is in Trouble," n.d.). This incentivized companies to take their business to Puerto Rico, but

as the tax breaks were slowly removed to lessen national debt it took a toll on Puerto Rico's economy. However, "the Puerto [Rican] government continued to borrow recklessly to balance its budget by issuing bonds that [were] exempt from state, local, and federal taxes in America" ("Why Puerto Rico Is in Trouble," n.d.). This has furthered the problem with Puerto Rico's economy, as their debt has had many negative impacts on the island. This irresponsible spending by the state government followed by severe austerity measures has caused distrust by the people of Puerto Rico. To recover from this government debt, "a group of billionaire hedge fund managers" called for the laying off of teachers, and closing down of schools ("Why Puerto Rico is in Trouble", n.d.). Shutting down schools directly affects small communities, forcing residents to find new schools often outside their local community for their children to attend.

When resilience centers are not under threat of a natural disaster they serve as a place for community cohesion (Wilken, et al 2023; de Roode et al 2020). While government priorities may be elsewhere, community members must embody trust to create a supportive network (Baja, K. 2022). Resilience centers often host events and gatherings that bring the community together in support of diversity, equity, and inclusion (de Roode et al 2020; Villa, et al 2023). By doing so, community members become more trusting in their resilience centers and may be more likely to utilize it when an emergency presents itself (de Roode et al 2020). As a result, the aspect of familiarity makes resilience centers more effective during natural disasters.

With a lack of enrollment and poor test scores from students, the Pedro G. Goyco Elementary School closed for good in 2015. This was a big loss for families in the community with young children who no longer have a school to go to. These families received no warning that the school would be closed leaving them no choice but to find new schools outside the community.

The community did not give up on the space, banding together to unite the community and provide aid during natural disasters. The community gained ownership of the school in 2020 furthering their resilience. Taller Comunidad La Goyco now serves the community by offering workshops, community meetings, and fairs, along with relief after natural disasters. La Goyco can effectively advocate for the values, ideas, and vulnerabilities of the community to the government.

2.5 DATA COLLECTION AND MAPPING

The process of obtaining data prior to, during, and after a natural disaster is what keeps people safe and protected. Without this data collection process, emergency management plans would not be able to effectively be implicated. Procuring this information in databases that are accessible to those in times of emergency is essential to the success of these preparation tactics. One concept that is widely agreed upon is the necessary element of technology throughout emergency data collection (Mishalani et al., 2008; (Choukolaei et al., 2023; Participatory Mapping to Empower Communities – La Perla, n.d.; Puerto Rico Community Mapping Collaboration, 2023; TipTags, 2020; Walker et al., 2014). Prior to 2010, with limited technical resources, manually transcribing all records was the primary method. With the implementation of technology, records can be collected in a timelier manner, detail more precise information, and be shared in real time (Walker et al., 2014). This advancement in efficiency and accuracy offers emergency management teams the opportunity to make decisions earlier, provide more information to the community, and make well-informed choices.

In terms of preparatory work, technological influences can serve as a method to highlight vulnerable areas with fewer resources. That way, when a natural disaster strikes, emergency response teams and resources can be distributed effectively. When the Community Planning and Capacity Building (CPCB) team sought to educate 65 municipalities within Puerto Rico, tremendous strides were taken. After the workshops on mapping assistance, these groups were able to implicate their own systems and identify "at-risk" areas (Puerto Rico Community Mapping Collaboration, 2023). These initiatives, both in mapping advancements as well as educational training, would soon identify a wide range of vulnerabilities that could be addressed, such as flood mitigation plans, erosion correction plans, and more (Choukolaei et al., 2023; Participatory Mapping to Empower Communities – La Perla, n.d.; Puerto Rico Community Mapping Collaboration, 2023). With that, these municipalities were able to operate on their own and address the problems most pertinent in their communities.

Once the natural disaster has begun, access to up-to-date data allows for operational, supply, and community systems to operate at their full capacity. In the event of an emergency, community norms may be subject to change. The assessment of common resources must be completed using the MCDM techniques outlined in earlier sections (Ariav et al., 2001; Choukolaei et al., 2023; Mishalani et al., 2008; Walker et al., 2014). These techniques allow for resources to be devoted to higher priorities, based on proximity, need, use, and potential impact, to ensure resources are being exhausted effectively and efficiently (Ariav et al., 2001; Cavdur et al., 2021; Choukolaei et al., 2023; Rajan et al., 1990; Wang et al., 2023). Without timely, precise, or shared data, the value of issues cannot be weighed which can equate to severe problems going unaddressed.

While technological implications are widely endorsed by researchers alike, the features of these data-collecting devices often differ as to when they are being used. Systems that rely on the internet are often a point of dispute and in some cases,

Some researchers suggest systems that use the internet offer many more features (Adams et al., 2023). Those who promote systems that can operate off of cellular data note that "more features" are of no value if the system cannot function in the event of an emergency. To this, systems that have additive features when using the internet, but can still operate at a base level on cellular data, tend to appeal to most in catastrophic data collection conversations (TipTags, 2020; Walker et al., 2014). Furthermore, if communication can be acquired between systems, it brings forth the question if multiple data collection methods could be implicated but during different times of emergency preparedness planning. This would include before versus during and after a catastrophic event.

Efficient data collection means can have substantial impacts on the effectiveness of operational, supply, and community systems. The use of technology in emergency data collection can help to ensure the success of emergency management plans by providing precise, accurate information in real-time. These contributions can highlight where vulnerabilities are, impact where resources are devoted, how decisions are made, and ultimately the safety of the masses.

2.6 SUMMARY

Since Hurricane Maria devastated the island in 2017, La Goyco has been helping the community in recovery efforts, making large strides in emergency resilience. We will be working collaboratively with La Goyco's Emergency Preparedness Committee to identify ways to improve their emergency response efforts. Being able to keep track of supplies, volunteers and other community resources is important when preparing for a natural disaster. With the change in climate affecting global warming, small communities in tropical areas must be prepared

or more frequent and potentially violent storms. Through our research into previous natural disasters, emergency management, resilience centers, and community mapping, we plan to support La Goyco in their mission to create a more prepared community.

Figure 17: Image of our team during a meeting with our sponsors

3.0 METHODOLOGY
3.1 OBJECTIVES

The primary goal of this project is to work alongside Taller Comunidad La Goyco to strengthen their community-based emergency preparation and develop management systems that support community resilience efforts. We approached this project with the following objectives:

In more detail, the objectives can be defined as follows:

1. Develop a Resilience Hub, incorporating emergency inventory management systems, and supply distribution procedures.
2. Develop a community wellness program in which La Goyco can evaluate potential household risk factors pre-disaster and conduct follow-up wellness checks post-disaster, prioritizing households with the most vulnerability.
3. Create an operational disaster preparedness plan, including defined volunteer roles and teams, pre and post-disaster management guides for the resilience hub, and supplemental training materials.
4. Form community engagement materials, including posters, brochures, and social media content to inform residents on household natural disaster preparedness.

Using the methods outlined below, we were able to gather information and strategies relating to community-based emergency preparedness and response, resilience centers, data mapping and collection systems, and community engagement. These research methods provided us with a comprehensive understanding of past events and current systems, which allowed us to better support La Goyco in their mission and better to equip the community in the event of an emergency.

3.2 OVERVIEW OF METHODS

For this project, we used a series of archival research, interviews, ethnographies, and mapping techniques to accomplish our defined project goals and objectives. These techniques allowed us to gain a more comprehensive understanding of the topics of resilience hubs, emergency preparedness and recovery, community engagement, and data collection systems. Learning from experts, whether via archival study or interviews, equipped us to better assist La Goyco in pursuing their goals. In supporting our liaison, we also developed ethnographic evidence and participatory action research to add authenticity and better embed our research findings into the Puerto Rican community. In this section, we will outline the pros, cons, strengths, and limitations of each method, provide corresponding information we have learned throughout our research, and how we applied each method to our project. Through our multi-method approach, we have undergone a thorough triangulation of sources and strategies, to ensure more robust conclusions and understandings of the problems and solutions in which we were able to attain.

3.3 ARCHIVAL RESEARCH

Archival research is one of the fundamental methods in use for this project. The method is unobtrusive and consists of examining primary sources, documents, objects, and more (Berg & Lune, 2017). This research method was used to gain a thorough understanding of the integral topics and components related to our objectives. In doing so, we meticulously reviewed sources to discover patterns and to notice points of disagreement between experts. We also prioritized contemporary sources, verifying the credibility of the source and its publisher. Strategies like seeking

peer-reviewed sources, sources from government organizations, and contemporary sources, have enhanced the credibility of our own work. There have been numerous benefits of using archival research including its unobtrusive nature, ability to provide depth and foundational understanding as well as illustrating the state of the field. A drawback to using archival research is that it is subject to selection bias, meaning the sources selected may not be reflective of all perspectives (Lustick, 1996). We have combatted this by engaging in triangulation. To accomplish this, we have prioritized the use of multiple sources that most closely represent the diversity seen in the field. We have also "demonstrate[d] self-consciousness in the selection of source material," emphasizing variation in the sample of sources regardless of personal hypotheses or theories (Lustick, 1996, p. 614). In doing so, we recognized and took note of where the majority of the research was coming from, and prioritized peer-reviewed sources and credible publishers and authors, to strengthen the outcomes of our project.

Archival research has served as the primary research method pre-departure for our project objectives. In the field, archival research has continued to supplement our project. Choosing information from a variety of different databases and search engines has aided in mitigating selection bias. The information collected during this process was then analyzed for related content and incorporated into our research and report. Ultimately, the archival information collected has strenghtened our objectives, findings, and understanding of the community allowing us to support La Goyco in their goals.

Our approach to Archival research has predominantly included using the WPI Gordon Library website, and Google Scholar, finding related government sources, such as FEMA, and examining previous IQP reports. Much of our archival research has included examining both larger and smaller disaster relief sources. These have included larger organizations such as Red Cross, FEMA, and NMEAD, and smaller groups like Estuario and CERT. Recommendations from each of these sources have informed our Disaster Preparation Plans.

3.4 SEMI-STRUCTURED INTERVIEWS

Semi-structured interviews are a widely used research method characterized by a blend of predetermined and open-ended questions leading to a genuine conversation (Berg & Lune, 2017). Unlike a structured interview with a strict question format, a semi-structured interview offers a balance between flexibility and consistency allowing the parties involved to discuss topics deeply, maintain control over the interview process, and allow room for follow-up questions. This approach offered important data that allowed for a deeper understanding of the subject at hand while simultaneously allowing us to adapt the questions in real time and promote the discovery of new insights. This flexibility could introduce variability in data collection and lead to potential inconsistencies in the information gathered as some information may not have been discussed during all interviews. The data analysis of a semi-structured interview was often time-consuming and required careful consideration and interpretation to identify valuable information, patterns, and themes. Despite these challenges, semi-structured interviews were a key tool in our qualitative approach to our research and offered the flexibility we needed to uncover in-depth insights into the topic at hand.

When conducting a semi-structured interview, creating a comfortable environment and pleasantries were the keys to developing a connection with the individual and advancing open-ended dialogue. Active listening allowed the participants space to share their experiences and thoughts in a safe setting (Berg & Lune, 2017). Our team aimed to coordinate our appearances with the interview style and promote a relaxing

comfortable atmosphere. Prioritizing important questions, and knowing why each was significant to the research helped with productive interviews. Having a good understanding of the interviewee's background was also essential. Individuals may be sharing highly personal information like traumatic experiences, and having an understanding of their background helped to enhance engagement and promote meaningful conversation. When conducting a semi-structured interview the individuals we engaged with were primarily community leaders and residents, having strong knowledge and passion for the topic. "Interviewers [must] make adjustments throughout the interview consisting largely of switching from one role to another or altering their style of speech, manner, or set of lines" (Berg & Lune, 2017, p. 85). While semi-structured interviews offer in-depth insights and build relationships, it is crucial to acknowledge their limitations. This includes potential selection bias and only receiving the singular perspective of a participant. To alleviate these drawbacks, we must triangulate sources by trying to interview multiple participants and remain mindful of potential conflicts of interest.

Semi-structured interviews are related to multiple of our project objectives as feedback from the individuals who will be using and participating in the emergency preparation programs provided good insights as to what we needed to implement while at La Goyco. Our approach to semi-structured interviews included a loose set of interview questions that were readily adaptable to gain a better understanding of the topic at hand. The interview questions and consent forms we used when conducting interviews are listed in Appendix A (interview questions) and Appendix B (consent form). We performed these interviews with various people within La Goyco and had conversations with individuals in the surrounding areas. The conversations we had provided valuable insight into how Hurricane Maria affected everyone in Puerto Rico and what the aftermath of Hurricane

Maria looked like from an aspiring resilience hub's perspective. To avoid selection bias we interviewed a variety of individuals. After analyzing the data collected, the information was incorporated into our research and report.

Throughout this project, we have had consistent weekly interviews with Mariana regarding the progress of our deliverables. We have learned about her experience throughout Hurricane Maria and the years following. Her passion for community resiliency has inspired and influenced many components of our Community Disaster Response program. We also conducted interviews with Johanna regarding community mapping and engagement, hearing her thoughts on community wellbeing. Ricky and Javi have also been consulted on topics of infrastructure and inventory, giving us an inside look on the specific organizational needs and limitations of La Goyco. Their experiences have also provided insight into the severity of disaster effects, noting the prevalence of transportation and communication obstructions.

3.5 ETHNOGRAPHIES

Ethnographies are a method of studying one's culture by immersing themselves in said culture. This is effective when a researcher "abandons the idea of absolute objectivity or scientific neutrality and attempts to merge himself or herself into the culture being studied" (Berg & Lune, 2017). By doing so, a researcher can gather useful information on the community or culture that they are studying. By immersing yourself in a community you can see how people interact with each other and how they go about their daily lives. For example, during a community meeting discussing the possibility of road reconstruction, we observed a noticeable lack of support for the "modernization" of the community. Some of the plans for the

street include improved sidewalks and roadways, relocation of utilities underground, and improvements to stop lights and intersections. Many of these infrastructure improvements would greatly help the large elderly population. From an outsider's perspective, their lack of interest came across as a bit unexpected, but it allowed us to understand how passionate the residents are about maintaining the community feel in Machuchal. They expressed their concerns regarding how urbanization would bring more tourists to the area and how the modernization of Calle Loíza would affect various aspects of their lives. There are already roughly 600 Airbnbs within the area that La Goyco serves and this new development may push more individuals out of their homes as the area becomes more appealing and accessible to land developers. This shows the sacrifices the community is willing to take to prevent its residents from being displaced. Thus proving that this method of research has been important in creating an emergency response plan for a community. We have seen how the community operates and prepares for natural disasters, including available resources and supplies. From an outside perspective, it has been important to first get to know the community to learn about its strengths and limitations. Ethnographies are effective as we have been able to see and experience the area firsthand rather than just archival research.

Ethnographies allow us, the researchers, to come away with new ideas taught to us by the community or culture we are studying (Berg & Lune, 2017, p. 135). Ethnographies have shown us different ideas and experiences the community has had which we would have never known without getting to know them. Ethnographies do not always go as planned, "[we] may spend months collecting copious amounts of data without ever realizing that people are avoiding [us] or [our] guide, or hiding crucial topics from [us] because of the fear that [we] will share too much with [our] guide" (Berg & Lune, 2017, p. 135). Therefore it has been important to develop trust and bonds with community members,

in efforts of quality research. Although ethnographies allow us to see the place and culture firsthand, we can not always control the people we interact with. It is important to acknowledge that people in the community might feel uncomfortable by our presence which may cause them to act differently.

Ethnographies have been of great value in achieving our project objectives. It is important to acknowledge the kinds of resources and limitations a community has. Our ethnographies have helped us to develop an emergency response plan that accounts for the community's needs and resources. For example, if they do not have access to certain software, the product we produce will not be useful to them. For our ethnographies to be effective, we have done our best to abandon our previous assumptions and notions about the community to truly see how they live and how we, as outsiders, can work alongside them. Our ethnographies have allowed us to see what aspects make the community who they are to take their values and ideas into consideration when developing the emergency preparedness plan.

3.6 MAPPING

Mapping serves a multitude of benefits, both in research and data collection in the field. Inherently, mapping is a tool used to visually display collected data, that can then be analyzed for trends. For La Goyco, mapping was used in conjunction with the Community Wellness Program, to enhance visual aspects of the program and assist in efficient, timely responses. The possibilities for what assets or functions a map can be designed to display are endless. This method of information transfer offers additional advantages as the content can be distributed in multiple forms. Some examples are printed posters with set markers or areas shown, updating databases, clickable markers on websites, etc. (Advancing Community Climate Adaptation, 2024; Participatory Mapping to Empower Communities, 2024).

These different distribution tactics allow for more important information to reach different demographics. Furthermore, mapping efforts can be used by different demographics, meaning they could be used by the common household, community-based organizations, or emergency response teams. Conducting ourselves in an ethical matter is crucial while collecting data for mapping purposes. With Puerto Rico's history of being a common location where uninformed experiments were facilitated, we had to be conscientious of our impact and participants' willingness to share personal information. For this reason, many questions on the Community Wellness Program were developed to not be required, allowing the participants to share the information that they felt comfortable doing so. Additionally, the limitations of both La Goyco and the program were explicitly stated, in efforts of setting clear expectations for both parties. During our time collecting data, we had the opportunity to set a better standard, collect data in an informed and consensual manner, and build bonds with community members.

Many platforms, such as My Maps, offer a plethora of accessible features but cannot operate without the Internet. Other platforms that can operate without the internet or wifi often are unaffordable for community-based organizations. Therefore, free, user-friendly platforms are often resorted to. In short, mapping techniques serve many people in different ways, have the opportunity to display a vast amount of information, and can distribute this information in varying ways. This resource has been an essential visual display tool when linking information to locations.

3.7 ETHICS

When conducting any research, it is of the utmost importance to do so ethically. Ethical research refers to upholding, acknowledging, or disclosing "honesty; openness of intent; respect for subjects; issues of privacy, anonymity, and confidentiality; the intent of the research; and the willingness of subjects to participate voluntarily in the study are appraised" (Berg & Lune, 2017, p. 34). It is important to recognize Puerto Rico's past experiences with others administering tests on the island. Examples of these include involuntary and non-consensual sterilizations between the 1930s and 1970s, and the long-lasting effects of the U.S. Navy testing military-grade weapons in Vieques (Coqui, 2023; AJ+, 2019). Therefore, it is crucial to take more precautions when interacting with community members compared to common ethical standards, seeing as Puerto Rico has been wronged in the past. To ensure this wrongdoing is avoided, we have disclosed all information about our study in our Informed Consent Agreement for Participation in Research (Appendix B), which details that all information collected will remain private and stored in a Google Drive, accessible only by the WPI La Goyco team and Taller Comunidad La Goyco emergency preparedness team.

Furthermore, anonymity has been granted to any participant for any willingly provided information, with the right to retract from the research at any given time. Additionally, in all interactions we have remained nonjudgmental and understanding, acknowledging the potential for underlying traumas, unwillingness to share experiences, and lack of trust with participants. We aimed to collaborate alongside our sponsors and community, not to impose or cause harm to the community. In doing so, research should balance all related risks with the benefits of the potential outcomes. This analysis of weighing the potential benefits of the research and the potential risks should be done on the participant's own accord (Berg & Lune, 2017, p. 50).

3.8 SECTION CONCLUSION

In using an array of research methodologies, including archival research, interviews, ethnographies, and mapping techniques, we advanced our project goals and objectives. Each of these methodologies has offered unique strengths in uncovering information that is important to resilience hubs, emergency preparedness and recovery, community engagement, and data collection systems. However, it has been critical to acknowledge the limitations of each method. Archival research and interviews offer valuable information in the form of historical and first-hand perspectives, but the authenticity of the research and potential biases are limitations of this method. Ethnographies provide a substantial understanding of our surroundings and a faster way of collecting data, however, selection and observer bias remains a concern. Mapping uses semi-structured interviews and surveys to create a physical representation and location of the collected data. However, language barriers and a lack of cell reception have been challenges we experienced. The methods described in this section were used throughout our research. By using a multi-method approach, we navigated these limitations and augmented our findings through the triangulation of sources and strategies.


Figure 18: Tapestry located in the entrance of La Goyco
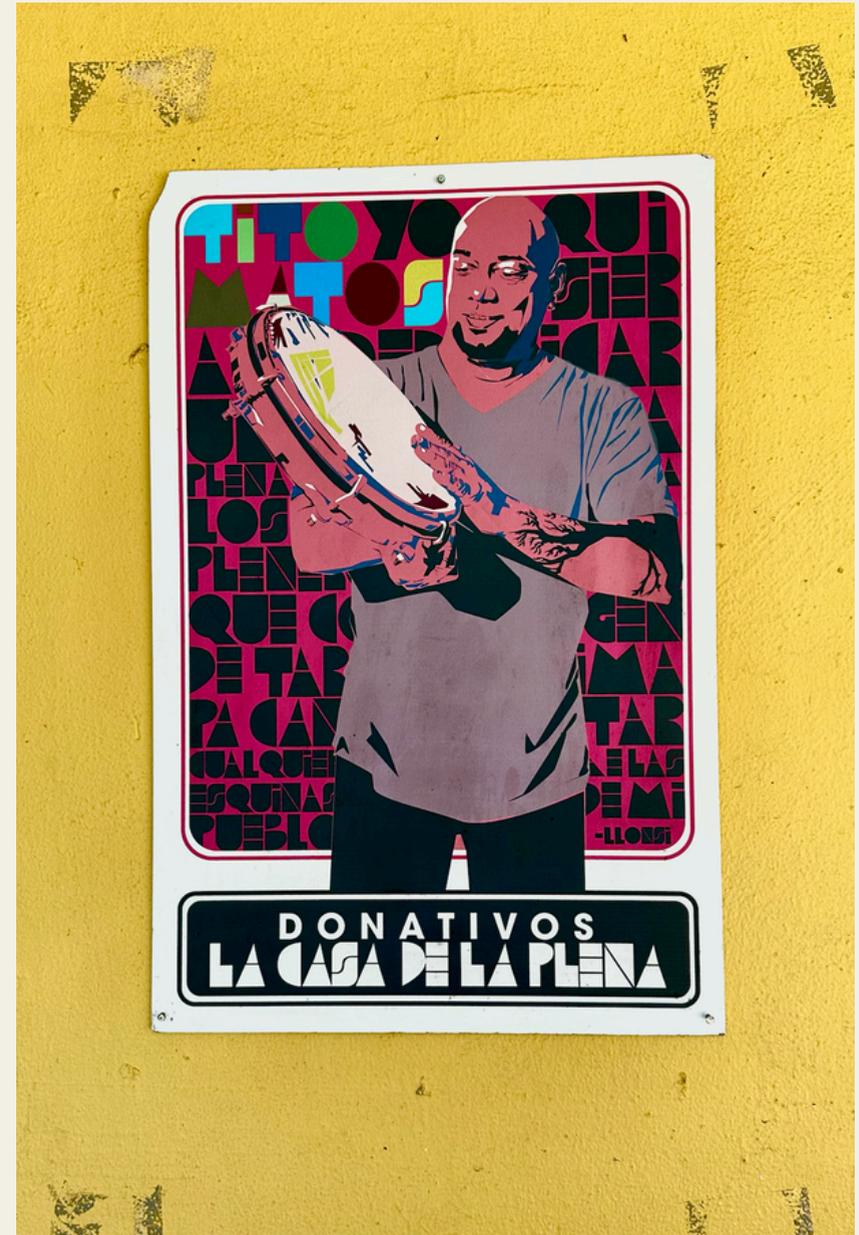
Figure 19: La Casa De La Plena Poster

4.0 FINDINGS

Working with Taller Comunidad La Goyco, our team formed relationships with numerous hardworking and dedicated employees and volunteers, all passionate about community-based natural disaster preparedness. Based out of a bright and airy former classroom, working at La Goyco allowed us to immerse ourselves into the Machuchal Community. Our open-door policy led us to meet many creators and business owners, giving us insight into the thriving rescued school environment. Our weekly sponsor meetings were supplemented by the meaningful interactions we had with other community members. The colorful doors and artwork that adorned La Goyco's halls along with the structure's bright and inviting blue exterior allowed us to form a deeper understanding of the resilience of the community. This deeper understanding fueled our passion for the project, empowering us to create enduring and reflective products.

Figure 20: Colorful hallway in La Goyco

Collaborating with La Goyco provided numerous invaluable lessons and insights, ultimately shaping the development of our final deliverables. With a focus on natural disaster preparation and relief, our team worked towards strengthening La Goyco's resilience hub and emergency operations. Focusing on organization and sustainability, our team's goals were to create final products to aid La Goyco in a way that considers programs, strengths, and limitations unique to their organization.

These deliverables began with an understanding and development of their emergency supplies and inventory system. La Goyco's two resilience supply rooms were explored as we noted all their current items. After absorbing and understanding La Goyco's mission for emergency inventory, we created a Google Sheets and Forms-based system to manage inventory, prioritizing efficiency, ease of use, and conciseness. Upon creating this system we consulted with La Goyco volunteers and employees, ensuring its relevancy to their operational style. Later, an analysis was done to determine which items La Goyco may want to invest more in to prepare the community for future emergencies and disasters. After developing this comprehensive supply list, the supplies in the resilience rooms were strategically organized and a maintenance plan was developed for upkeep the system.

Expanding La Goyco's emergency volunteer program was an aspect of the project that was cultivated throughout the term. Our team worked on defining clear volunteer roles needed in the event of an emergency, along with relevant signage to be used by employees and volunteers. Part of these efforts was to expand La Goyco's emergency response team. In doing so we collaborated with employees and volunteers to determine that community wellness checks were a priority for post-disaster relief efforts. To address this, our team designed the Community Wellness Program, where new community members will utilize a

a simple Google Form to complete intake. In this form residential statuses, medical information, skill sets, available resources, and infrastructure evaluation will be noted, all in effort of creating a baseline prior to a natural disaster. Post-natural disaster these results can be compared to information uploaded from a Wellness Check, either completed on a physical form, when the internet may not be accessible, or a Google Form that will automatically be uploaded to a Google Sheet and mapped using My Maps. This wellness program assesses potential risks, such as medical or infrastructure vulnerability, so that La Goyco can assess the priority level of certain households in the community. This proactive program ensures the basic necessities of community members are met and where resources and volunteers can be pulled from in the event of a natural disaster by creating a supportive network.

To encompass our project developments and deliverables, we compiled our efforts into a comprehensive La Goyco Emergency Operational Plan, intended for La Goyco's employees and volunteers to reference. Found in this Google Document-based guide is a pre- and post-disaster checklist for the operations of La Goyco's resilience hub. Also included are details of post-disaster volunteer opportunities and teams, the inventory system, and the wellness program. Access to training materials is also incorporated throughout the document to ensure ease of use.

A second all-encompassing guide is our Machuchal Community Disaster Preparedness Plan, designed for distribution to the Machuchal Community in the event of a natural disaster. This guide embraces La Goyco's mission of community togetherness, highlighting what individual households can do before, during, and after an emergency but also detailing available community resources. Along with this, relevant posters, brochures, and social media formats were created in Canva for a more accessible way to view the information, with ease of distribution in mind. In finalizing these deliverables, we considered the community's

comfort level in speaking different languages, leading us to provide both a Spanish and English version of all documents.
Ultimately, the process of producing each of these deliverables led to the discovery of four major findings, which we will now discuss.

4.1 PREPARATORY WORK STRENGTHENS COMMUNITY ASSURANCE

When discussing disaster management, the importance of preparatory work and thorough archival research before on-site operations cannot be overstated. We conducted preparatory work throughout the first seven weeks of this project. During this time we learned invaluable information regarding Puerto Rico's rich history, culture, and other topics associated with our project. There was a large need for archival research in our project as it provided us with a strong foundation to continue our work on-site. Information regarding prior natural disaster responses in Puerto Rico, data collection, mapping, emergency management and organization, and resilience centers provided us with valuable insight into what we would do when collaborating with La Goyco. This would go on to be crucial when developing an emergency preparation and response plan with La Goyco. Natural disasters are unpredictable and often present the potential for widespread devastation. This highlights the critical need for proactive planning and preparedness efforts. Whether it be managing an organized inventory system or a mapping system used to assess at-risk individuals, the groundwork laid before a disaster strikes is detrimental to ensuring an efficient and effective response. In this context, the value of having deliverables designed to be maintained and updated as time continues is evident. This equips communities

with the necessary tools and knowledge to mitigate risks, reduce impacts, and ultimately enhance overall resilience.

Having a prior understanding of information about natural disasters would help us better prepare and distribute accurate information to community members. Our project relied on collaboration with La Goyco to develop an emergency preparedness system for the community they serve. Preparation is necessary as it allows individuals to make informed decisions regarding their and their families' future safety during an emergency. Proper preparation can help mitigate risks that could easily be avoided. For example, an evacuation plan in the event of flooding and tsunamis, and emergency communication plans are other aspects of proper natural disaster preparation. These emphasize the critical importance of preparatory work and research in disaster management, highlighting the benefits of proactive planning and preparedness efforts for both responders and affected individuals.

4.2 COMMUNITY INPUT DRIVES BETTER PLANNING

Throughout working with La Goyco and the Machuchal Community, the value of incorporating community perspectives as plans are developed emerged as a crucial step in formulating thoughtful programs. Proposals formed by the community, for the community, are a way to ensure plans and designs will have a positive impact on the people they intend to serve.

This lesson became apparent to our group after attending a community discussion around the redevelopment of Calle Loíza. Today, Calle Loíza is home to thriving small businesses, with a historic, neighborhood feel. Cars line the streets and murals adorn the walls of many of the buildings. Filled with color and culture, Calle Loíza somehow balances the excitement of a bustling city with the calmness and intimacy of a small town, catering to community members of all ages.

Figure 21: Vibrant Mural on Calle Loíza

Upon arrival at the meeting, around forty community members gathered in La Goyco's community kitchen in anticipation. They were greeted by government-contracted engineers, who had designed a refurbishment of Calle Loíza. As the presentation began, a sleek PowerPoint was projected onto the wall with designs of an unrecognizable Calle Loíza. As the engineers flipped through their slides ideas such as "urban modernization" and "technological integration" were prioritized. The engineers sought to increase pedestrian mobility, green spaces, and functional utilities. The community patiently listened as the details and core concepts were presented. Finally, the engineers flipped to the last slide, encompassing a timeline for the project's development. Community members were shocked to see that design finalization would occur that very same month, without ever having input from community perspectives. Several hands in the room immediately raised, ready to express their passionate concerns regarding such a development. Many individuals expressed distrust towards the plan, explaining that the core concept was not representative of community needs,

but rather catering to tourists. They further explained that these proposed changes would promote the dislocation and displacement of many individuals, as lots of the features would be attractive to mainland investors, ultimately increasing the cost of living for locals. Many community members referenced the Condado area as an example of this phenomenon, an area that underwent the same modernization and is now overrun with tourists, Airbnb, expensive accommodations, and pricey shops. With an already increasing number of Airbnbs in the Machuchal Community, around 600 according to Mariana the community's concerns are not unfounded. Mariana also mentioned that certain volunteers at La Goyco have already been forced to relocate outside of the community due to rising costs. Overall, the community's lack of trust in the government became a major topic of conversation at the meeting, leaving many individuals feeling neglected and marginalized by their own leaders. In addition, the short timeline left no room for including community perspectives and ideas in the plan, further solidifying a feeling of distrust and dismay.

Other community members contributed concerns relating to more technical details of the plan, such as the proposed parking system. Many individuals in the area rely heavily on cars to navigate, and in turn, accessible and plentiful parking is a necessity for the community. The proposed plan decreased the number of parking spots by forty, which community members pointed out would only increase traffic congestion and frustration among drivers, especially since there is a lack of public transportation in the area. Mariana proposed parking be added to one of the new greenspace parks to accommodate drivers in the community; it is unknown whether these ideas will be considered in the final design.

It is important to note that much of the community would love to see updates and maintenance on Calle Loíza, lots of them are hoping for restructured sidewalks, the improvement of utility management, and more greenery. They expressed a need for a balance between maintenance and modernization, hoping to avoid the area becoming a tourist attraction.

Witnessing the dynamic between the presenters and the audience of community members served as a valuable lesson for our group: the importance of incorporating community perspectives and ideas into any plan designed to serve the community. Embracing ideas formed with lived experience serves to make plans and proposals more authentic and purposeful. With each of our deliverables, we consulted with the community, speaking to Goyco employees, volunteers, and affiliates. Each step of the way an effort was made to carefully consider the vision of those who the plan was being created for. As we developed the La Goyco Emergency Operational Plan, functionality and relevance to Goyco's organizational structure, strengths, and limitations were at the forefront of the writing process. Insights were gathered through numerous meetings with several Goyco employees and volunteers to create a sustainable and valuable final product.

4.3 ORGANIZATION AND MAINTENANCE BRINGS EFFICIENCY TO DISASTER RELIEF

During our first tour of La Goyco, we were able to explore all that it has to offer, from small businesses to community classes in yoga, Bomba, and Plena. Along with the cultural programs, La Goyco has a full-size kitchen and many cooking supplies and utensils. However, all their supplies had been unorganized and scattered in their inventory room with no methods of keeping track of it all. The first day we wrote down everything they had; we found cans of food that had expired taking up space. There were also a few unrelated items that did not belong with the other supplies. When we talked with Javi, who is in charge of the

inventory and supply room, he said that some of the items, like one of the many coffee makers, are not used anymore. In one of our meetings with Mariana, she explained to us the value of an organized inventory in helping to prepare for natural disasters along with the everyday operation of La Goyco.

We identified the need for a simple way to keep track of items in their inventory that would allow for more organization and preparation. Through conversation with La Goyco employees, we found that Google Sheets works best, because of its familiarity and its cost free accessibility. We wanted to create multiple ways of entering information so we created a Google Form for adding and subtracting items from their inventory as well as a form that adds a new item into the sheet. There is also the option to edit the inventory system manually when supply distribution quantities are large. To further simplify the system, we created QR codes for the form and a clearly labeled poster with all of them in one place. Ease of use was one of our top priorities as we didn't want the organization to be cumbersome or overbearing, leading to user fatigue.

Through talking with our liaisons they have stressed the importance of order and organization when dealing with natural disasters. Mariana has expressed that if there is no plan or organization, there is a lack of clarity among both employees and residents regarding the proper protocol. Having a well-structured plan and having knowledge on the location and quantities of items is helpful for a quick and efficient disaster response. After natural disasters, it will be important to account for any discrepancies that may have occurred during the chaos of the disaster. Keeping the inventory accurate and up to date aids in the maintenance of the organization system, leading to more informed disaster responses.

4.4 PARTNERSHIPS FORGE A COMPREHENSIVE NETWORK OF RESOURCES

Walking into La Goyco, an undeniable sense of resiliency and empowerment is prevalent. This is a similar ideal amongst many organizations that have spawned out of rescued schools and other communities. The people who come together for this mission are inevitably selfless individuals. Yet, through our time working with La Goyco, it has become apparent that their strength as a united entity comes from their unique background and past experiences. La Goyco's networking capabilities have drastically contributed to their resourcefulness and success over the years.

La Goyco has always been centered around collaboration and using the resources available to them. Ricky, in particular, has prioritized the reuse of community items. Often looking to community members for items that may be needed for a project or reaching out to neighbors when La Goyco needs volunteers. The notion of "reuse" is instilled in La Goyco's culture. hen walking through the community garden glass bottles will line the plant beds exposing a clear walkway of "sand" created by ground glass bottles. This reinvented sand is provided as sandbags to the surrounding areas in times of flooding. This concept sets the precedent of looking inward to find things versus creating new, which is made possible due to La Goyco's ability to outsource to the community and other collaborators. Creating deeply built bonds is not an easy process, but being attentive and willing to participate in new activities has helped this initiative. This was overwhelmingly made obvious when we went to join a bomba class that La Goyco was hosting. While we

had never practiced the drumming style before, by showing up and putting ourselves in a new environment, our initial effort was warmly received. We were welcomed in and taught the basics. Everyone is excited to show others something that they are passionate about. This was evident in the bomba class, as we could tell others were excited to teach us more about their culture. From here friendships were formed and maintained throughout the entirety of the project, getting friendly waves through the halls and being offered a variety of desserts regularly. Investment in others can go a long way in forging relationships.

La Goyco has pulled in a variety of community members with diverse backgrounds and experiences. By doing so, these employees and volunteers can lead teams in their field of knowledge. La Goyco has also been able to develop strong connections externally, which has elevated their status as a community workshop. These collaborators offer new knowledge, much like how La Goyco has taught us so much about community centers throughout Puerto Rico.

One person alone cannot set out to change an entire community. La Goyco recognizes this notion and exemplifies it by extending their partnerships and relying on all possible resources available to them. This resourcefulness speaks volumes to La Goyco's creativity and resilience but also can be attributed to their continuous progress in the community. These types of actions as an organization are vital in the face of a natural disaster when it is necessary for everyone to come together to support one another. La Goyco has instilled this course of action into their day-to-day work making disaster-relief efforts all the more efficient. La Goyco is truly a great example of an organization designed by and made for the community.

4.5 CONCLUSION

In this project, we worked alongside Taller Comunidad La Goyco to develop their natural disaster response program. Since their founding, La Goyco has been dedicated to creating programs, initiatives, and opportunities for the Machuchal Community. Beyond their community programs including topics in health, education, and culture there has been a growing understanding of the need to expand into natural disaster preparedness and response. Puerto Rico is located in a tropical climate often impacted by powerful natural disasters. Through our time with La Goyco, we developed various components into La Goyco's existing framework, including an emergency supply inventory, an all-inclusive emergency plan for La Goyco and the community it serves, and a wellness program. Each of these components was designed to effectively and efficiently manage a resilience center in the event of a natural disaster.

In terms of future collaboration with La Goyco, we see potential in developing a participation management system similar to the volunteer system they currently utilize but for the general public and other individuals who partake in events at La Goyco. This may be beneficial when applying for future grants for programs and funding for more permanent staffing positions. This project provided us the opportunity to work alongside a community organization to develop a program that will be beneficial and have a positive impact on the Machuchal Community. We are proud of the work we accomplished in the short time we have had here. Our collective ability to overcome time constraints highlighted the importance of collaboration, creativity, and resilience. Overall, this experience has enriched our educational experience, providing us with invaluable skills and insights that expand beyond traditional classroom learning.

Throughout the development of this project, we learned many

valuable lessons that highlight the importance of community-driven initiatives, efficient organization, strategic partnerships, and importance of preparatory measures in disaster management. We also reflected on our time in San Juan. We found La Goyco's passion for fostering community unity and the dedication to their work truly inspiring. Their resourcefulness in serving their community is admirable. In the time since they were founded, they have grown into a strong organization adored by the community. When working with them, we thoroughly enjoyed learning about the community's traditions and culture and felt incredibly welcomed. We were lucky to have worked with many wonderful individuals who have impacted our lives in the best ways. We firmly believe that the emergency response program we developed will have a positive impact on the Machuchal Community. We are excited to be part of this journey toward a more prosperous and united future.

Figure 22: Photo of our team with Mariana and Eunice

Figure 23: Image of our team during a sponsor meeting

5.0 IMPACT AND LIMITATIONS

Despite our thorough and concentrated preparation as a team, a major limitation of our project is our eight-week timeline. While we strived to accomplish all our deliverables, we understand how completing all of these as diligently and meticulously as they deserve was a challenge, causing us to narrow our focus. With each deliverable requiring extensive research, analysis, collaboration, development, and finalization, our timeline has been a major constraint. To combat this, we have gained a better understanding of La Goyco's prioritization of goals to ensure that the most pressing issues captured our attention. Another major challenge that was considered was finding a balance between online and paper resources. While technology may provide an extensive number of opportunities and features, it is important to keep in mind the comfort and accessibility of the community. The Santurce community consists of many elderly people who do not feel comfortable using technology, which has to be assessed when developing some of our more tech-dependent plans. In efforts to resolve this challenge, we have developed training to ensure the effective use of any technology-based solutions. In addition, during an emergency event, residents may not have access to Wifi or cell phone service, rendering technology-based systems unproductive. Another limitation is the language barrier. Since none of our group members speak Spanish fluently, it has been important that when conducting interviews or interacting with residents we make an effort to make people feel comfortable and heard. To further combat this, we have utilized a translator when necessary as well as developed and practiced our own Spanish skills throughout the term.

Despite these challenges, this project has produced a positive impact on the surrounding community. This project has served to better equip the community in the event of an emergency, strengthening procedures and strategies to become more organized and effective. This has been accomplished through a series of systematic and physical developments, including management, inventory systems, and community engagement programs. The collaboration between Machuchal locals and WPI students has fostered the development of a more thoughtful and comprehensive final product. Implementing local beliefs and expertise has allowed our deliverables to better suit community needs, catering to their specific assets, limitations, and goals. While members of La Goyco are occupied running day-to-day operations, the WPI team has been able to invest more focus and attention into aiding La Goyco in fulfilling their objectives. Overall, we hope for this project to achieve a lasting impact on emergency preparedness for the Santurce community. Ultimately, producing self-sustainable systems, programs, and tools that aid in disaster preparation, management, and relief efforts, catering specifically to community needs.

Figure 24: Image of our team after our final presentation

Figure 25: Image of our team after our final presentation

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6.0 APPENDICES
6.1 APPENDIX A SEMI-STRUCTURED INTERVIEW EXAMPLE QUESTIONS

QUESTIONS FOR EMERGENCY MANAGEMENT EXPERTS AND TEAMS:

- What are the key components of a successful supply inventory and distribution system?
  - ¿Cuáles son los componentes clave de un sistema exitoso de inventario y distribución de suministros?
- How can communities improve their organization and preparedness strategies before a natural disaster?
  - ¿Cómo pueden las comunidades mejorar su organización y estrategias de preparación ante un desastre natural?
- How can individual households best strategize and prepare for an emergency?
  - ¿Cuál es la mejor manera de elaborar estrategias y prepararse para una emergencia?
- In your experience, what aspects of emergency preparation in Puerto Rico have been overlooked or underdeveloped in the past? What major steps would you take to make improvements?
  - En su experiencia, ¿qué aspectos de la preparación para emergencias en Puerto Rico han sido pasados por alto o subdesarrollados en el pasado? ¿Qué pasos importantes tomaría para hacer mejoras?
- In the event of a hurricane in Puerto Rico, what are the most critical supplies needed?
  - En caso de un huracán en Puerto Rico, ¿cuáles son los suministros más críticos que se necesitan?
- How can the community best utilize mapping systems in the event of an emergency?
  - ¿Cómo puede la comunidad utilizar mejor los sistemas de mapeo en caso de una emergencia?

- What are the best methods of conducting risk assessments both pre and post emergency events?
  - ¿Cuáles son los mejores métodos para realizar evaluaciones de riesgos antes y después de los eventos de emergencia?
- In your experience, how have you prioritized responses and allocated resources in the event of an emergency?
  - En su experiencia, ¿cómo han priorizado las respuestas y asignado los recursos en caso de emergencia?

QUESTIONS FOR COMMUNITY CENTER FOUNDERS AND EMPLOYEES:

- How did your mission to help the community begin?
  - ¿Cómo comenzó su misión de ayudar a la comunidad?
- Does your organization play an active role in emergency preparation and response?
  - ¿Su organización desempeña un papel activo en la preparación y respuesta ante emergencias?
- What are the key resources you currently provide for the community? What resources do you want to provide in the future?
  - ¿Cuáles son los recursos clave que actualmente proporciona a la comunidad? ¿Qué recursos quiere proporcionar en el futuro?
- What programs and events do you currently hold for the community? What events and programs do you want to hold in the future?
  - ¿Qué programas y eventos realizan actualmente para la comunidad? ¿Qué eventos y programas quieres realizar en el futuro?
- What strategies do you use to circulate important information throughout the community?
  - ¿Qué estrategias utiliza para hacer circular información importante en toda la comunidad?

- What are your most critical resources?
  - ¿Cuáles son sus recursos más críticos?
- What is your current system for managing volunteers?
  - ¿Cuál es su sistema actual de gestión de voluntarios?
- What is your current system for managing supplies?
  - ¿Cuál es su sistema actual para la gestión de suministros?
- Are you currently using a digital mapping system or data collection system? If so, what role does this play in your emergency response plan?
  - ¿Está utilizando actualmente un sistema de cartografía digital o un sistema de recopilación de datos? Si es así, ¿qué papel desempeña esto en su plan de respuesta a emergencias?

QUESTIONS FOR COMMUNITY MEMBERS:
- Do you engage with local community centers? Have you engaged with La Goyco?
  - ¿Te relacionas con los centros comunitarios locales? ¿Has colaborado con La Goyco?
- Which events and resources provided by local community centers do you engage with the most?
  - ¿Con qué eventos y recursos proporcionados por los centros comunitarios locales participa más?
- Have you received aid or support from a local community center before, during, or after an emergency?
  - ¿Ha recibido ayuda o apoyo de un centro comunitario local antes, durante o después de una emergencia?
- How do you feel community centers could best provide support in the event of an emergency?
  - ¿Cómo cree que los centros comunitarios podrían brindar mejor apoyo en caso de una emergencia?
- Are you familiar with Google products, such as google maps? Have you ever utilized Google maps in the event of an emergency?
  - ¿Está familiarizado con los productos de Google, como Google Maps? ¿Alguna vez has utilizado Google Maps en caso de emergencia?

6.2 APPENDIX A INFORMED CONSENT AGREEMENT AND PARTICIPATION IN RESEARCH

Informed Consent Agreement for Participation in Research
Acuerdo de consentimiento informado para participar en una investigación

Study Investigator: Melissa Hasbrouck, Jenna Marcinkowski, Jordan Brown, Karl Schletzbaum
Investigador del estudio: Melissa Hasbrouck, Jenna Marcinkowski, Jordan Brown, Karl Schletzbaum

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Title of Research Study: Strengthening Emergency Preparation and Management for the La Goyco Community

Título del Estudio de Investigación: Fortalecimiento de la Preparación y Gestión de Emergencias para la Comunidad de La Goyco

Sponsor: Worcester Polytechnic Institute (WPI) and Taller Communidad La Goyco

Patrocinador: Instituto Politécnico de Worcester (WPI) y Taller Comunidad La Goyco

You are being asked to participate in a research study. Before you agree, however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Se le pide que participe en un estudio de investigación. Sin embargo, antes de estar de acuerdo, debe estar completamente informado sobre el propósito del estudio, los procedimientos a seguir y los beneficios, riesgos o molestias que pueda experimentar como resultado de su participación. Este formulario presenta información sobre el estudio para que usted pueda tomar una decisión completamente informada con respecto a su participación.

Purpose of the study: The purpose of this study is to learn more about emergency situations and emergency preparedness in Puerto Rico. This information will be used to aid our sponsor, Taller Comunidad La Goyco, in developing an emergency preparedness plan and resilience hub for their community in San Juan, Puerto Rico.

Propósito del estudio: El propósito de este estudio es aprender más sobre situaciones de emergencia y preparación para emergencias en Puerto Rico. Esta información será utilizada para ayudar a nuestro patrocinador, Taller Comunidad La Goyco, en el desarrollo de un plan de preparación para emergencias y centro de resiliencia para su comunidad en San Juan, Puerto Rico.

Procedures to be followed: Through the use of various forms of interviews (semi-structured interviews) research regarding previous emergency situation responses in San Juan will be conducted. This study will be conducted during a 7 week period of time (March 11th-May 1st), if you consent to this study the interviews will take roughly 15 minutes to 1 hour. The questions asked may request information including previous natural disasters like Hurricane Maria, emergency management and preparedness, and statistical information on management systems in place. If at any point in time you no longer wish to participate in the study and would like to resign consent to the data given, the data taken will become void and will not be used in the study.

Procedimientos a seguir: Mediante el uso de diversas formas de entrevistas (entrevistas semiestructuradas y grupos focales) se realizará investigación sobre respuestas previas a situaciones de emergencia en San Juan. Este estudio se llevará a cabo durante un período de tiempo de 7 semanas (11 de marzo al 1 de mayo), si usted acepta este estudio, las entrevistas tomarán aproximadamente de 15 minutos a 1 hora. Las preguntas hechas pueden solicitar información que incluya desastres naturales anteriores como el huracán María, manejo y preparación para emergencias, e información estadística sobre los sistemas de gestión existentes. Si en algún momento ya no desea participar en el estudio y desea renunciar al consentimiento a los datos proporcionados, los datos tomados quedarán nulos y no serán utilizados en el estudio.

Risks to study participants: We will be discussing topics that may cause individuals emotion discomfort. These include past and future natural disasters and past and future disaster relief methods. The data collected may be used for community mapping purposes and may be viewed by the project-specific WPI La Goyco team and Taller Comunidad La Goyco

emergency preparedness team. The data collected may include personal information, but will only be distributed further if additional consent is received.

Riesgos para los participantes del estudio: Discutiremos temas que pueden causar malestar emocional a las personas. Estos incluyen desastres naturales pasados y futuros y métodos de socorro en casos de desastre pasados y futuros. Los datos recopilados pueden ser utilizados para fines de mapeo de la comunidad y pueden ser vistos por el equipo de WPI La Goyco específico del proyecto y el equipo de preparación para emergencias de Taller Comunidad La Goyco. Los datos recopilados pueden incluir información personal, pero solo se distribuirán más si se recibe el consentimiento adicional.

Benefits to research participants and others: Through participating in this study, you will provide vital information into the scope of emergency preparedness in Puerto Rico. This information will be used to develop and improve current emergency preparedness practices alongside Taller Comunidad La Goyco's emergency preparedness team. Individuals' contributions will help to further strengthen preparedness in the surrounding communities.

Beneficios para los participantes de la investigación y otros: Al participar en este estudio, usted proporcionará información vital sobre el alcance de la preparación para emergencias en Puerto Rico. Esta información se utilizará para desarrollar y mejorar las prácticas actuales de preparación para emergencias junto con el equipo de preparación para emergencias de Taller Comunidad La Goyco. Las contribuciones de los individuos ayudarán a fortalecer aún más la preparación en las comunidades circundantes.

Alternative procedures or treatments available to potential research participants: If necessary, the interview may require a translator who speaks both Spanish and English. This will be done to mitigate confusion and to allow participants to feel more comfortable. Also, to ensure that the information is received accurately.

Procedimientos o tratamientos alternativos disponibles para los posibles participantes de la investigación: Si es necesario, la entrevista puede requerir un traductor que hable español e inglés. Esto se hará para mitigar la confusión y permitir que los participantes se sientan más cómodos. Además, para asegurar que la información se recibe con precisión.

Record keeping and confidentiality: All records will be accessible by the WPI La Goyco

team, consisting of four students and two advisors, as well as members of Taller Comunidad La Goyco's emergency preparedness team. Information expected to be reported is the name of the participant (if willing), participant contact information (if willing), participant age and additional information regarding lifestyle (if willing). Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or it's designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identify you by name. Any publication or presentation of the data will not identify you.

Mantenimiento de registros y confidencialidad: Todos los registros serán accesibles por el equipo de WPI La Goyco, compuesto por cuatro estudiantes y dos asesores, así como miembros del equipo de preparación para emergencias de Taller Comunidad La Goyco. La información que se espera que se informe es el nombre del participante (si lo desea), la información de contacto del participante (si lo desea), la edad del participante y la información adicional sobre el estilo de vida (si lo desea). Los registros de su participación en este estudio se mantendrán confidenciales en la medida en que lo permita la ley. Sin embargo, los investigadores del estudio, el patrocinador o su designado y, bajo ciertas circunstancias, la Junta de Revisión Institucional del Instituto Politécnico de Worcester (WPI IRB) podrán inspeccionar y tener acceso a datos confidenciales que lo identifiquen por su nombre. Cualquier publicación o presentación de los datos no le identificará.

Compensation or treatment in the event of injury: Participation in this study is considered minimal risk. You do not give up any of your legal rights by verbally consenting to this statement.

Indemnización o tratamiento en caso de lesión: La participación en este estudio se considera de riesgo mínimo. Usted no renuncia a ninguno de sus derechos legales al dar su consentimiento verbal a esta declaración.

For more information about this research or about the rights of research participants, or in case of research-related injury, contact:

Para obtener más información sobre esta investigación o sobre los derechos de los participantes en la investigación, o en caso de lesiones relacionadas con la investigación, póngase en contacto con:

6.2 APPENDIX A INFORMED CONSENT AGREEMENT AND PARTICIPATION IN RESEARCH

WPI La Goyco Student team: Email: gr-pr24d-goyco@wpi.edu

Equipo estudiantil de WPI La Goyco: Correo electrónico: gr-pr24d-goyco-wpi.edu

IRB Manager: Ruth McKeogh, Tel. 508 831- 6699, Email: irb@wpi.edu

Gerente del IRB: Ruth McKeogh, Tel. 508 831- 6699, Correo electrónico: irb-wpi.edu

Human Protection Administrator: Gabriel Johnson, Tel. 508-831-4989, Email: gjohnson@wpi.edu.

Administrador de Protección Humana: Gabriel Johnson, Tel. 508-831-4989, Correo electrónico: gjohnson-wpi.edu.

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

Su participación en esta investigación es voluntaria. Su negativa a participar no dará lugar a ninguna sanción para usted ni a ninguna pérdida de beneficios a los que usted pueda tener derecho de otra manera. Usted puede decidir dejar de participar en la investigación en cualquier momento sin penalización o pérdida de otros beneficios. Los investigadores del proyecto conservan el derecho de cancelar o posponer los procedimientos experimentales en cualquier momento que lo consideran oportuno.

By verbally consenting, you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before consenting.

Al consentir verbalmente, usted reconoce que ha sido informado y da su consentimiento para ser un participante en el estudio descrito anteriormente. Asegúrese de que sus preguntas sean respondidas a su satisfacción antes de consentir.