



Identifying Institutional Barriers to Housing Reconstruction In Puerto Rico After Hurricanes Irma and Maria

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Acknowledgments

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Executive Summary

Puerto Rico has been in a long process of recovery after the devastating hurricanes Irma and Maria in September 2017. Within this, housing reconstruction has acquired special attention because of its vital nature to ensure families can stay in their communities and recover, and the overwhelming safety and mental health concerns as residents attempt to return to normalcy. However, homeowners have encountered serious setbacks in the housing reconstruction process, many of which are poorly understood. This study aims to identify the most salient barriers to housing reconstruction in the process of recovering from Hurricanes Irma and Maria. Methods include 29 interviews with reconstruction stakeholders in Puerto Rico, analyzed by coding for major themes. Results include a categorical framework of the most salient institutional barriers to housing reconstruction, from the perception of reconstruction stakeholders based in Puerto Rico that have worked extensively in the recovery after Hurricanes Irma and Maria. These barriers inform a list of recommendations to institutions for a more effective and accessible housing reconstruction process. These recommendations include adaptation of regulation and policy, capacity building, and suggestions for improved efficiency.



Figure 1. Houses in Puerto Rico in various states - abandonment (top left), temporary repairs (top right), reconstruction (bottom)

Introduction

When Hurricanes Irma and Maria devastated Puerto Rico in September 2017, safe and resilient housing immediately became an issue for long-term recovery. According to the United Nations, housing is a basic human right and adequate housing is defined on many levels, including creating a space of security, peace, and dignity. (Office of the United Nations High Commissioner for Human Rights, 2014). However, inefficiencies in the recovery process and misaligned regulation and policy in the recovery threatens Puerto Ricans' access to adequate housing.

Therefore, due to many interwoven drivers, including but not limited to, bureaucratic red tape and financial instability, a high percentage of housing reconstruction has been conducted using informal methods, such as without the use of a contractor or building permits. The local Puerto Rican and federal governments have publicly stated a goal to prioritize understanding and confronting the issue of informal reconstruction, specifically through the newly created Central Office of Recovery, Reconstruction, and Resiliency (COR3). This office has released an economic and recovery report that details managing informal reconstruction as one of their priorities in the long-term recovery process (COR3, 2018). The need to address informality in the reconstruction process is reiterated throughout multiple local and international organizations in Puerto Rico in their published advocacy plans and goal statements, including Habitat for Humanity International PR, LLC (a local branch of Habitat for Humanity International, set up in Puerto Rico for the express purpose of implementing a multi-faceted five-year disaster recovery program focused on housing). While it is well documented that informal reconstruction is a major issue in the recovery process and has deeply ingrained drivers within the economy, policy, and culture of Puerto Rico (Viglucchi, 2018), uncertainty and disagreement remains in how best to approach this issue.

Before this issue can be resolved, we must first understand barriers to housing reconstruction that have been encountered by homeowners, that may be encouraging these informal actions. There are many regulations and policies that govern the reconstruction process, however many have become inaccessible or undesirable to the average homeowner in Puerto Rico attempting to reconstruct their home. It is largely institutions that are defining and regulating this reconstruction process, therefore this study focuses on the barriers to do with institutions. Institutions in this context has been defined as organizations or agencies that have written regulation for and/or have authoritative power in the reconstruction process. In general, institutions involved in disaster recovery aim to organize the reconstruction process, support safe building practices, and promote official documentation of ownership and construction work. In their essence they support positive goals, however as recovery in Puerto Rico has progressed, it has become apparent that they are not adequately adapting to contextual needs, and for a number of reasons remain inaccessible to a significant portion of the population (Resilient Puerto Rico Advisory Commission, 2018). In effect, for example, many families do not understand why they are disqualified from aid if they do not possess official land tenure documents, when the land has been socially identified as in their ownership for generations. Further, specific policy dictating housing reconstruction can often, whether intentionally or unintentionally, marginalize certain segments of the population and intensify pre-existing socioeconomic vulnerabilities, creating a barrier to accessing resources for housing reconstruction (Ingram et al., 2006).

In order for a recovery process to be safe, yet practical to the context in which it occurs, it is paramount that there is a common vision for what is needed that meets the reality of the situation at hand. Forceful policy enforcement without understanding and attempting to adapt to the realities

of a context where many have found it impossible to conform, only increases the occurrence of informal practices and reduces the ability to build trust between communities and those attempting to regulate the reconstruction process. Furthermore, inappropriate policy, in regards to home ownership and reconstruction, can cause significant time and money waste, and when attempts have been made to adapt policy to consider local needs, multiple benefits were seen. For example, after the 2004 tsunami in Sri Lanka, a hazard mitigation relocation policy that forced families out of a coastline buffer zone affected proportionally more low-income households and has been cited as a significant factor for a delayed and unequitable recovery process (Ophiyandri et al., 2013).

However, the recovery process is still delayed and largely inefficient to this day, over two years since the hurricanes. Further, the Island of Puerto Rico was affected by a series of powerful earthquakes in January 2020, causing serious damage in the Southwestern region and further work for housing reconstruction. It is relevant at this time to improve understanding of the barriers that have been encountered in the reconstruction process after the hurricanes in hopes of improving robustness of institutions in the case of another disaster event.

This study aims to identify the most salient institutional barriers encountered by homeowners who are trying to reconstruct their homes after the 2017 hurricanes, and to answer the question “In what ways do institutions create a barrier for homeowners in Puerto Rico attempting to reconstruct after Hurricanes Irma and Maria?”

The dependent variable in this study is housing reconstruction, defined as any work to repair damages incurred during Hurricanes Irma and Maria.

Data were collected via semi-structured interviews with reconstruction stakeholders who have experience obtaining permits, working with building codes or land tenure rights. They include engineers, contractors, architects, government employees, housing NGO directors and employees, community/urban planners, a lawyer, think tank employee, engineering professor, and housing appraiser. Data was analyzed by two coders, including the author and a Puerto Rican undergraduate political science student, who collaboratively identified and categorized the most salient institutional barriers.

Findings are presented as a categorical framework of barriers experienced by homeowners reconstructing their homes’ damage resulting from Hurricanes Irma and Maria. The goal of this study is to inform local policy makers and organizations working to reconstruct housing in Puerto Rico about the most frequent barriers that homeowners have encountered while attempting to reconstruct their homes. This will serve as a step towards improving awareness about the experiences of the average homeowner trying to rebuild their home, which, we hope, will in turn improve accessibility of policy and informed decision making about where to allocate resources.

Literature Review

Post-Disaster Housing Reconstruction

Post-disaster housing reconstruction can take many forms, most commonly differentiated as either donor-driven, or owner-driven (Karunasena & Rameezdeen, 2010). There are many donor agencies that supply new housing for people who have lost their homes or the ability to live in

them safely, while some housing is rebuilt by individuals, using their own resources and/or resources from their communities.

One very prominent form of post-disaster reconstruction, particularly in socioeconomically vulnerable communities, is informal housing reconstruction. When homeowners encounter barriers to formal reconstruction, many choose to engage in informal reconstruction methods. This is particularly true for Puerto Rico, where over 50% of housing before the hurricanes was categorized as informal (Viglucchi, 2018). Informality in housing occurs on a continuum and can take varying levels of visibility. These range from development of housing outside of official jurisdiction but otherwise looks identical to formal housing, to strong cultures of informality that are visible throughout the neighborhood (Harris, 2018). This informality extends into reconstruction post-disaster, as many families are forced to or otherwise decide to reconstruct outside of official regulation, and can take the same form as described above. When facing a difficult reconstruction process, informal reconstruction is often the only method to initiate or progress with reconstruction. For the purpose of this research, informal reconstruction is defined utilizing the practical definition of a formal house used by the Puerto Rican state government. Therefore, informal housing reconstruction includes the four following dimensions of informality: no use of an engineer or architect, no use of building codes, no building permits, and no proof of land tenure (Algoed & Hernandez Torrales, 2019; Government of Puerto Rico, Department of Housing, 2018).

Informality in housing is widespread; estimates suggest that by 2020 roughly 1 billion people worldwide live in some form of informal housing. In Puerto Rico specifically, roughly 50% of housing pre-Hurricane Maria was categorized as informally constructed. Since then, large numbers of residents across the three islands of Puerto Rico are reconstructing with the same informality that existed before the hurricane (Viglucchi, 2018).

Informal reconstruction can offer many benefits to a homeowner struggling to rebuild, in fact a study of NGO decision making post-disaster found a consensus that self-built, volunteer-built, and community-built homes were the preferable decision when it comes to rebuilding housing (Hayles, 2010). These are preferred to ensure the social and cultural appropriateness of the end product for optimal functionality. At the same time, post-disaster reconstruction interventions can be very effective in reducing vulnerabilities of residents living in informal housing (Doberstein & Stager, 2013), thus post-disaster scenarios offer a unique opportunity to restructure housing. While many residents in informal housing build back with the same informal practices before, disasters can also often cause great change to the level of informality. Both because the existing vulnerabilities become much more visible, and the event brings in large volumes of funding that communities and local governments rarely have access to (Doberstein & Stager, 2013).

While some guidelines do exist (Doberstein & Stager, 2013), those authors note there is limited understanding of how to reduce vulnerability for residents in the reconstruction process, specifically for those living in vulnerable areas.

While it is clear that informal housing exists globally at significant rates, we are still trying to understand the complex and interwoven motivations for rebuilding informally after a disaster. This study departs from the existing literature to understand how institutions may have encouraged the

high levels of informal post-disaster reconstruction through their own barriers to reconstructing within the existing formal framework.

Institutional Barriers to Housing Reconstruction

There has been extensive work to identify and categorize institutional barriers in the aftermath of disaster. For example, the Handbook for Reconstructing After Disasters notes that barriers to reconstruction due to weaknesses in institutions are common and can have serious consequences for effective reconstruction outcomes (Jha, 2010). While there are many institutional barriers that are unique to each country and reconstruction process, they noted a number of commonly occurring institutional weaknesses. These include zoning issues, that is the zoning is either nonexistent or not enforced, as well as frequent changes to building codes, and recovery plans that are incomplete, inappropriate, or non-existent (Jha, 2010). Further, previous studies highlight that limitations in collaboration and open communication amongst institutions decreases capacity in the aftermath of a disaster (Seville et al., 2008), and often creates significant barriers to efficient and effective reconstruction outcomes. A reconstruction study in Kenya in 2008 highlighted the need for people-centered approaches in institutions to allow individuals the decision making power and links to sustainable livelihoods in the aftermath of disaster (Aubrey, 2010).

Lack of resources, particularly time, was seen as a major barrier to reconstruction in other disaster scenarios (Hayles, 2010). Sectionalisation of funding from donors, so there was no flexibility when it comes to budget decisions also limited the capacity of institutions attempting to assist in the reconstruction process (Hayles, 2010).

Government and local institutions play the largest role and carry the most responsibility in protecting the livelihoods of communities and individual residents. Studies show that the free market will not supply sufficient resources and financial support for all desired reconstruction activities, thus it is the responsibility of the aforementioned institutions to maintain consistent attention to this, instead of reactionary activities after an event occurs (Christoplos et al., 2001). This is to say, that government programs and intervention is required in a disaster event to supply access to safe, resilient, and affordable housing for populations who may not be able to afford reconstruction services, materials, and labor supplied at free market prices. Furthermore, in the immediate aftermath of a disaster there is commonly large outcry for the removal of institutional barriers to improve the recovery process in disaster scenarios to come, however building the political capacity and will can often be a barrier to bring this to realization (Christoplos et al., 2001).

Previous disasters have uncovered significant institutional barriers to reconstruction, and while there are many that span most post-disaster scenarios, the unique context of each disaster recovery scenario highlights distinct experienced barriers. Disaster can often work as a catalyst for change, as problem areas are experienced intensely and highlighted as priorities for improvement (Jha, 2010). Identifying barriers due to institutional weakness is vital for long-term efforts to improve the recovery process, thus this study aims to enumerate the specific institutional barriers that were prevalent in Puerto Rico in the recovery process post-Hurricane Maria. Contextual understanding is pivotal to painting a holistic picture of the recovery process and strengthening weaker institutional areas for to improve the effectiveness and efficiency of the recovery process in the case of future disaster events.

Methodology

Data Collection

Data were collected through interviews with disaster recovery and reconstruction stakeholders (N=29) focusing on barriers to reconstruction in the context of Puerto Rico after Hurricanes Irma and Maria. This study was reviewed by the Iowa State Institutional Review Board (IRB) to ensure ethical research with human subjects. This study is included as a modification of study number 18-111-00 and deemed exempt from full review. These interviews occurred between July and October 2019 face-to-face in Puerto Rico and over the phone. Interviews were conducted in English or Spanish or a combination of the two, according to the preference of the participant. Participants were identified through local organizations, government offices, press sources, the disaster recovery academic community, and snowball sampling. The roles of interviewees are broken into the following categories. These positions are either paid or pro bono. Note, some participants fit into multiple categories but are categorized here under their main role.

Table 1. Interview Participants

Interviewee profession/role	Number of participants
Engineer/contractor	7
Architect	4
Government employee	4
Housing services NGO director	4
Housing services NGO employee	4
Community/urban planner	2
Lawyer	1
Think tank employee	1
Engineering professor	1
Housing appraiser	1
Total	29

Interviews were co-facilitated by the lead author and a Puerto Rican political science undergraduate student. Interviews were semi-structured with questions grouped under the following themes:

- **Participant Introduction** including questions regarding where they work, their specific role, and how long they have worked there.
- **Barriers to reconstruction and available resources** with questions such as “Can you list the possible barriers to homeowners trying to rebuild after the hurricanes?” and dissecting multiple facets of housing reconstruction, including building codes, use of engineer/architect/contractor, permits, and proving land tenure.
- **Policy and reality misalignment** including questions such as “Are there reconstruction policies that do not address the needs of homeowners trying to rebuild after the hurricane?”, and “In what ways do the rules that homeowners are expected to follow when they attempt to reconstruct their homes not reflect the Puerto Rican reality and constraints?”.
- **Personal experience** questions such as “Have you worked with informal housing reconstruction in your role at this organization?”, and “Have you, or someone you know, encountered a time where you were unable to, or had a difficult time navigating the reconstruction process?”

- **Recommendations for the reconstruction process are solicited via** the question “How could the process of reconstruction be more accessible to everybody?”
- Finally, an optional section at the end of the interview: **Definitions of housing concepts with** questions such as “How do you define an informal house?” with follow up questions inquiring about the legal definition and how the people of Puerto Rico have defined it, and “What does it mean to own a house?” with the same follow-up questions as above.

The interview protocol, including the interview questions, is attached in appendix 1 (English) and appendix 2 (Spanish).

Data Analysis

The qualitative data were analyzed with coding of major themes using inductive and deductive coding. Coding was completed by the author and a Puerto Rican undergraduate research assistant who was present at and translated for many of the interviews.

Findings

Identified barriers have been organized via a basic categorical framework, and fall under two main categories: misaligned regulation/policy, and inefficiencies in the recovery process, portrayed in the following hierarchy, Figure 2. These two categories are broken down and detailed further in Figure 3 and Figure 4.

Figure 2. Institutional barriers - Overarching organization

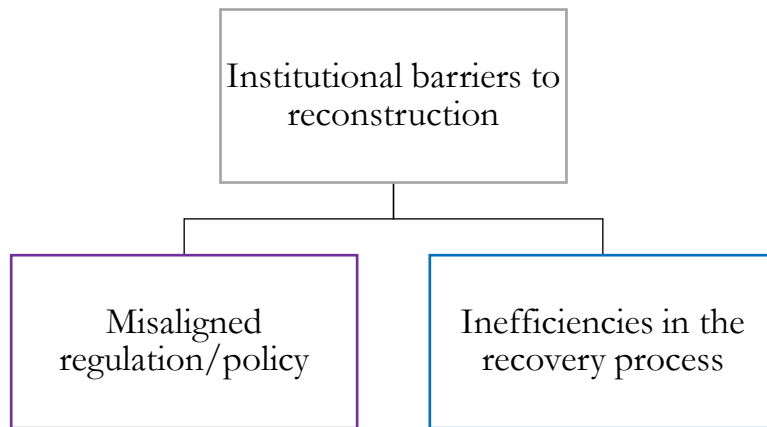


Figure 3. Institutional barriers – Misaligned regulation/policy

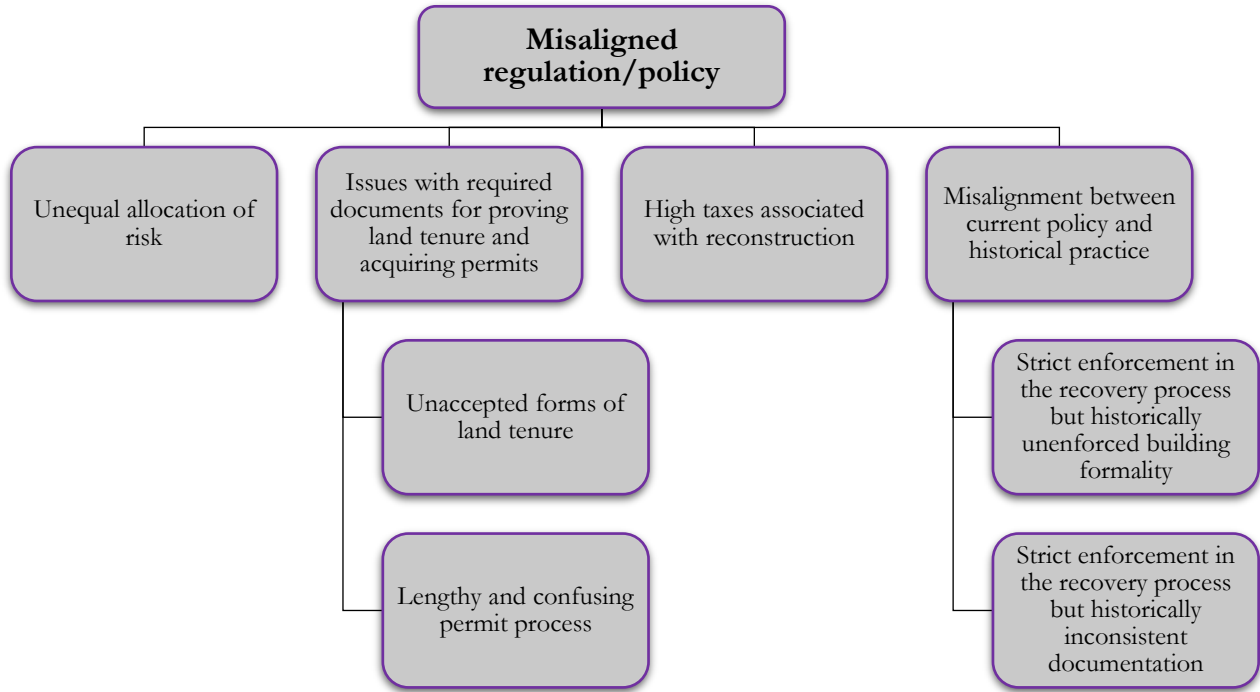
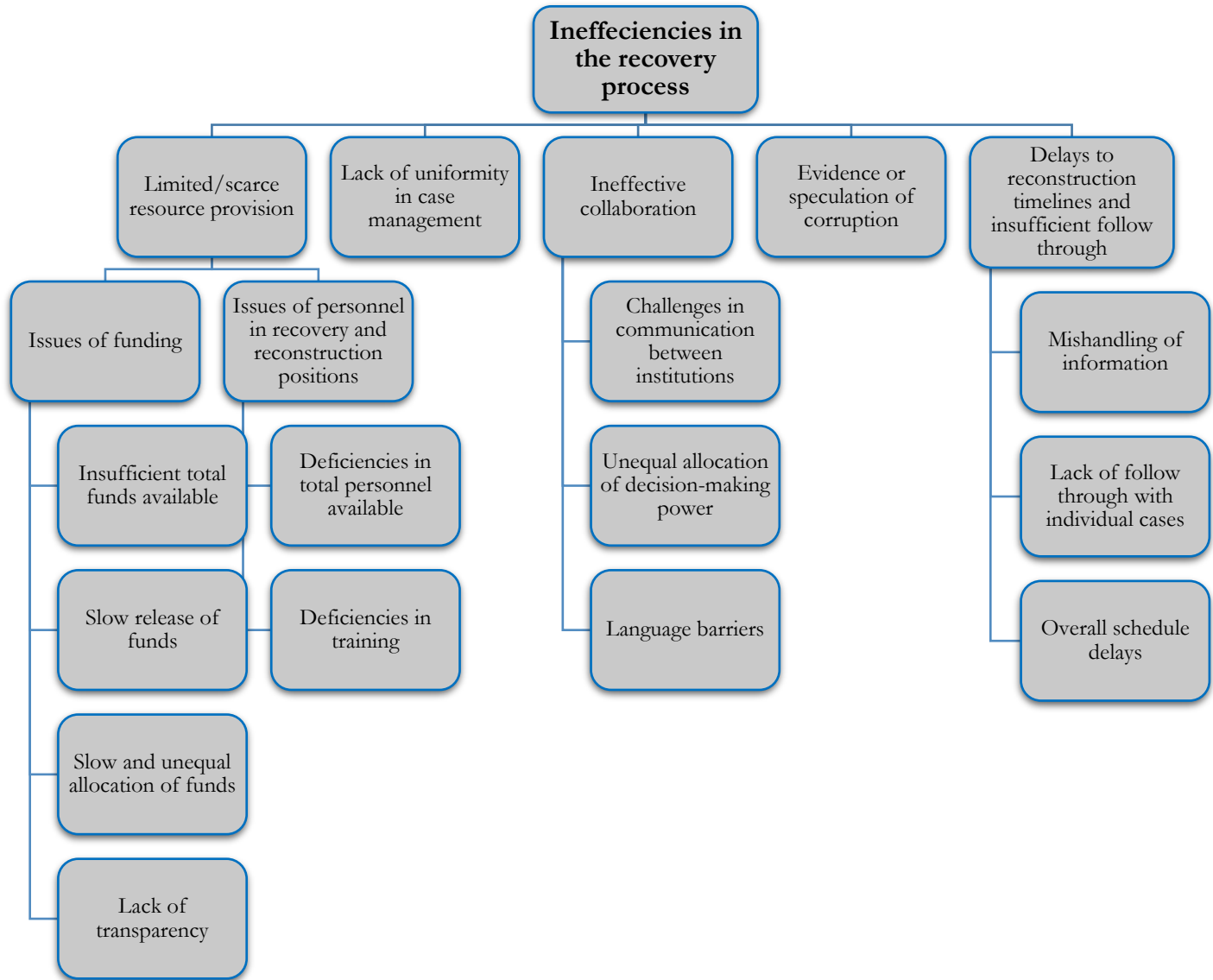


Figure 4. Institutional barriers – Inefficiencies in the recovery process



Four types of institutions were identified as playing the biggest roles in creating or maintaining barriers to reconstruction: the **federal government** and related authority figures and agencies, such as the Federal Emergency Management Agency (FEMA) and the United States Department of Housing and Urban Development (HUD). This includes their related reconstruction programs, such as Tu Hogar Renace, the Puerto Rico instalment of the FEMA Sheltering and Temporary Essential Power (STEP) program to provide short term repairs (National Low Income Housing Coalition, 2017). **State government**, which includes government over the Commonwealth of Puerto Rico, **local government** including individual municipal governments; and finally **non-profit organizations**, including international and local groups that were established prior to or after the hurricanes. There are many other institutions that have acted as reconstruction stakeholders, however results centered around these four categories of institutions.

Major barriers to housing reconstruction during recovery from Hurricanes Irma and Maria were identified by stakeholders from each of these four types of institutions. These barriers were categorized under the two macrocodes of misaligned regulation/policy, and inefficiencies in the recovery process. **Misaligned regulation/policy** includes barriers related to the written rules governing the reconstruction process, either written into law (regulation), or adopted and upheld by the authority but not necessarily written into law (policy). Specifically, cases where regulation and policy did not align with the contextual reality of the recovery process and were not effective in progressing towards the intended goal of the regulation/policy. **Inefficiencies in the recovery process** includes barriers that occurred due to actions, decisions, or circumstances that led to an undesired outcome. It is important to note that many of the barriers are multi-category, however for the purpose of organization have been categorized under the most applicable macrocode.

Within these categories, interview participants described multiple subcategories that will be explored in the following sections.

Misaligned Regulation/Policy

Unequal allocation of risk

Many of the interviewed contractors perceived serious risks involved in contracting with the government-run reconstruction programs. Primarily, current policy dictates that contractors will be reimbursed after the work is completed; however, contractors described significant delays in payments, reducing their capacity to take on more work. Further, reimbursement amounts are based on standard material prices which is not reflective of the increased costs of materials in a disaster scenario, therefore contractors tended to lose money when they were paying more for materials than what they were being reimbursed. Unequal risk is placed on the contractor in taking on reconstruction projects, which has caused contractors to cut corners, abandon work, or decline to take on more projects, reducing the services available to homeowners, and follow through to completing projects.

Further, engineers that were interviewed expressed that taking on risky projects, which most often includes homes owned by those resident-homeowners with the greatest need was not an ideal economic decision for a variety of reasons, most notable among them the allocation of risk and burden. These types of projects included ‘formalizing’ informal housing. For example, some engineers described scenarios where homeowners of informally-constructed homes approached

them with the financial resources to redesign or rebuild their homes, and they neglected the offers feeling that this presented a high risk, low reward scenario that they were not willing to take on. Current policy dictates all risk to the engineer working on the house, thus once they begin the process all risk involved with working on an existing precarious home including safety issues and code compliance, falls on the engineer. Therefore, if they discover irreconcilable dangers and are unable to bring them up to code, the responsibility still falls on the engineer who is then vulnerable to being fined or otherwise reprimanded by governing institutions. This policy drastically reduces incentive for engineers to work on formalizing informal homes, or doing reconstruction work on otherwise risky homes.

Issues with required documents for proving land tenure and acquiring permits

Unaccepted forms of land tenure: Immediately after the hurricanes, FEMA required legal titles and deeds qualify for assistance, and did not acknowledge alternate methods for proving land and house ownership. In fact, historically Puerto Rico has had multiple methods for proving right to place, such as proof of electricity and water utility payments. One participant noted that the federal government has clear distinctions between ownership and occupancy, however historically in Puerto Rico these are not as defined. FEMA was delayed in accepting other forms of proof of right to place, often disqualifying homeowners from assistance if they did not possess a legal title. Then, at the time that they publicly announced they would begin accepting other forms of proof, respondents felt they did not do adequate outreach to homeowners that had been denied because of this issue to notify them that they could make an appeal. Further, they did not reopen the cases that had been denied due to lack of such documentation.

Lengthy and confusing permit process: The construction permit process requires 26 steps and approval is a very lengthy process. Many participants noted the difficulties homeowners have faced in navigating this process and that, as a result, many often decide to discontinue the process before it is completed.

High taxes associated with reconstruction

Many families are in a dire situation post-disaster and barely have enough financial resources to do basic reconstruction to return their home to a baseline livable state. Interview participants noted that high taxes associated with reconstruction created a barrier particular to lower-income households attempting to engage in vital reconstruction activities. While the interviewees could not state specific values for tax rates, they described multiple scenarios where homeowners began the reconstruction process using formal methods, however in the end decided to forego this process as the value they would be paying in taxes placed them above their reconstruction budget.

Misalignment between current policy and historical practice

Strict enforcement in the recovery process but historically unenforced building formality: Puerto Rico has a long history of informality when it comes to housing construction and regulation. Participants noted that this has gone unchecked for many decades, thus it is difficult to regulate now and currently disqualifies many households from receiving public aid.

Strict enforcement in the recovery process but historically inconsistent documentation: Further, one participant explained that the history of inconsistency in Puerto Rico poses a significant barrier, specifically in the regulation actions taken after Hurricanes Irma and Maria. One way in

which this manifested was the frequent renaming of streets without a consistent updating system for addresses. Therefore, residences had multiple ‘official’ addresses that existed and were on official record, for example for different utilities. This has caused issues because homeowners do not know which address to put on official documentation, and often their addresses across multiple official documents do not match, sometimes confusing case managers and disqualifying them unnecessarily from receiving assistance.

Inefficiencies in the Recovery Process

Limited/scarc resource provision

Issues of funding

Insufficient total funds available: There is never enough money in a post-disaster situation. There is too much need and the required activities, particularly for construction, are often expensive in nature. This was true for Puerto Rico after Hurricanes Irma and Maria, where many participants described evidence of insufficient funds available on all fronts, which stems from insufficient funds allocated from the federal government. This meant there were insufficient funds for a majority of households trying to recover, thus households were given amounts that would only cover small portions of the needed reconstruction work. Participants noted this encouraged homeowners to use the limited funds for immediate needs such as replacing damaged furniture, instead of partially funding a construction process they knew they would not be able to complete.

Slow release of funds: Not only was there not enough money available, but release of these funds has been delayed significantly and frequently. For example, as of mid-January 2020, \$29 billion of the total \$44 billion allocated as hurricane recovery funds to Puerto Rico has yet to be released (Singh, 2020). The inaccessibility of these funds reduces the capacity of the established institutional reconstruction and financial assistance programs, thus reducing the total volume of reconstruction that can be conducted. Further, because these funds have been delayed frequently and with little warning, there is a reduction in trust in these programs and ability to plan long-term. Many families made the decision to give up on reconstruction completely and migrate away from Puerto Rico instead of waiting for money for reconstruction that may or may not arrive.

Slow and unequal allocation of funds: Many participants explained that it was unclear how decisions regarding funding were being made. In the official recovery analysis reports, there should be a detailed breakdown of areas of highest need, who should be allocated more funds, and exactly how those are calculated. However, the state government official recovery plan only contained a single sentence that explained every area was high need, and no further information was given.

Lack of transparency: There was overwhelming speculation from participants that funds were being mishandled by authorities, however it was difficult to know because of lack of transparency in where money was allocated and exactly how it was used. This lack of transparency made planning for how much money would be available for reconstruction programs, or for local government to know what would be allocated to them, difficult and highly inaccurate.

Issues of personnel in recovery and reconstruction positions

Deficiencies in total personnel available: A participant that worked as a case manager for FEMA noted that they were severely understaffed in the recovery offices, in comparison to the need that existed. He noted that at peak times they encountered over 200 people a day in the offices and the staff worked 12 hour days, seven days a week. He noted that especially given the coaching that homeowners required to navigate the confusing application process, there were simply not enough people to give sufficient assistance to everyone who asked.

Deficiencies in training: This barrier materialized in a number of areas. Firstly, there was a general consensus that hired labor for government reconstruction programs, most notably the Tu Hogar Renace program, were not qualified and did poor work. This led many residents to patch or completely redo the work that was undertaken by the underqualified crews. Many of these ‘finished’ houses were in worse condition than immediately after the hurricanes, according to participants and homeowners. In previous research work for this project, a story was shared about a crew that did poor work on a home, and when the homeowner reported it and asked for repairs, the crew came back after hours and robbed the home as an act of vengeance. Opening your home to strangers puts one in a vulnerable position, and occurrences such as this, break trust in the program and could potentially encourage residents to forego the offered assistance and rebuild using their own, trusted resources. Second, interviewees described instances where FEMA case managers did not have appropriate contextual training to accurately understand the information presented by homeowners and accurately assist them with filling out paperwork, thus documenting inaccurate information that led to denied applications when they were fully qualified to receive assistance.

Lack of uniformity in case management

Multiple participants expressed that the resources allocated to homeowners and the way their cases were handled was often dependent upon the individuals assigned to their case. For example, although all of the inspectors received the same training, there were drastic differences in how effective and detailed they were, with those who did a poor job often adding significant delays to the recovery process for their clients.

Ineffective Collaboration

Challenges in communication between institutions: Many respondents noted the extensive lack of communication, between and among the levels of government, organizations, and community members. For example, municipalities were the closest level of government to the reality of the community members, yet most were not even consulted in the decision-making processes. They were often ‘updated’ on a need to know basis, however local government representatives noted that there were issues of resource allocation and zoning that arose in the recovery process that could have been avoided if they had had a voice in the conversation when decisions were made. For example, a planner working in local government explained how newly released FEMA flood zone maps marked areas of their municipality as flood zones that were grossly inaccurate. These new flood zone maps were being used on official decisions dictating who was required to relocate instead of rebuild, and who qualified for assistance. This is important given that those whose houses were located within a flood zone did not qualify for assistance regardless of if it flooded or not. She noted that if local government had been included in the lines of communication many of these issues could have been avoided. Therefore these inaccuracies were inhibiting an effective and inclusive reconstruction process.

Unequal allocation of decision-making power: Many government employees noted that decision making power was too centralized, especially because the system was already overwhelmed and experiencing slowdowns. Municipalities noted that many of the decisions being made by higher authorities did not reflect the reality of needs and experiences of homeowners. For example, municipal government employees noted that state government employees were attempting to initiate plans for distributing resources without consulting local government, and thus were working with outdated or insufficient information regarding the local population. The interviewees noted that resource distribution and sharing of information could be much more effective if more decisions were allocated to localized personnel.

Language barriers: There was a general consensus among interview participants that there was ineffective management of the English-Spanish language barrier between FEMA employees and other employees from the mainland, and many of the homeowners in Puerto Rico. There were insufficient Spanish speakers that often led to inaccurate information documented by inspectors, or miscommunication when it came to what resources were available to homeowners and how they could access them.

Further, a FEMA employee noted that when FEMA first deployed, a majority of their case managers were based in the mainland US and many were unfamiliar with the culture, did not speak Spanish, and were unaware of many of the issues that were occurring in the recovery process. This led to denied cases because the correct information was present on the application but misinterpreted by the case managers who only spoke English and attempted to use rudimentary translation to understand the content.

Evidence or speculation of corruption

A government scandal almost two years into the recovery process, including claims of embezzlement and corruption in the management of Hurricane Maria recovery, reduced trust in the governing institutions and their reconstruction programs. Many homeowners have opted to distance themselves from these programs, negatively impacting their ability to reconstruct.

While some participants noted that local government officials were a key mediator between the community and state government and often advocated for the rights of community members, some perceived that the local government officials (eg. mayors) added to the bureaucracy of the process. One non-profit worker explained that they had plans for low-income housing out of the flood zone prior to the hurricanes, that had been designed and approved by an engineer and included full blueprints. The last step before beginning construction was official approval. However, the mayor refused to collaborate without additional payments that were outside the standard process. Not only did this make the project budget unfeasible, but broke relationships and trust with the local government, and eventually led to discontinuation of the project. This project would have supplied safe and affordable homes to families living in housing vulnerable to the effects of a hurricane. In general, there was a consensus among participants that lack of transparency and speculation of corruption severely threatened trust in authority and their programs.

Delays and insufficient follow through

Mishandling of information: In the chaos and overwhelming need that arose in the aftermath of the hurricanes there were many cases of loss of information or incorrectly logged information that

severely hindered the reconstruction process. For example, before FEMA could deploy fully, mobile centers were established in central locations by the local government, such as town squares. They had electricity and internet connection which was not yet available to most homes, so homeowners would go to the centers to submit applications to FEMA. However, when months passed and there was no communication from FEMA, many homeowners went to the recovery centers that were later opened by FEMA and only then discovered there had never been a case opened for them. This severely delayed receiving aid they were entitled to and in some cases prevented it altogether.

Lack of follow through with individual cases: Additionally, there were issues with follow through on contracts for the Puerto Rico government-run reconstruction program, Tu Hogar Renace. This was on both levels, between the government and the hired contractor, as well as between the contractors and homeowners. Interviewed contractors noted they were still waiting for reimbursement on work they had completed months prior. This reduced contractor capacity to continue work, as well as incentive to work for the reconstruction program which many households relied on. Additionally, some contractors described that it was not uncommon for contractors to receive work from the government programs and then lose the work, often without communication from the program. In terms of contractor to homeowner communication, it was also noted that some contractors promised work that was never completed, and promised they would return and finish, and the work is still incomplete to this day, with no communication.

Overall delays in reconstruction: Participants experienced delays in all steps of the reconstruction process, from initial declaration of disaster, all the way to arrival of crews and materials to homes for reconstruction. This has encouraged homeowners to take the process into their own hands, as they can no longer wait for inconsistent and potentially nonexistent resources for reconstruction.

Recommendations

The preceding analysis has culminated in the following recommendations to post-disaster housing reconstruction, within misaligned regulation/policy, and inefficiencies in the recovery process:

Misaligned regulation/policy

1. Restructuring of the FEMA reimbursement system: the current system of reimbursing contractors after the work is completed poses a serious barrier to reconstruction. Introducing pre-pay, or incremental pay agreements would assist in contractor capacity and incentive to rebuild, especially for riskier scenarios, such as previously informal housing. This in turn could support small and medium contractors' ability to participate in the recovery process. These are the contractors that lower income homeowners might have access to outside of a disaster scenario, thus could have positive long term effects for increasing access to formal housing reconstruction, and reduce informal reconstruction. Further, improving local capacity to react to and provide services quickly after a disaster event.
2. Establishing approved forms of proving security of land tenure before a disaster scenario occurs, that is contextually and culturally appropriate: this could include documenting historical forms of proving land tenure specific to the context and making this information easily accessible. If this is not possible, steps need to be taken to formalize unofficial forms of land tenure in a way that is effective and equitable, before a disaster occurs.

Inefficiencies in the recovery process

3. Prioritize hiring local expertise and labor for any and all jobs for which it is possible, which is often more cost-effective and almost always more culturally competent. This especially includes hiring local language services such as translators and interpreters to ensure language is contextually accurate and appropriate.
4. Mandate cultural and contextual competency training for all personnel working in a specific disaster scenario, even if based elsewhere. For example, case managers reviewing files from afar should still be required to attend training for each specific context for which they manage cases. This would ideally include training on positionality and cultural humility.
5. Improve language services in institutions, for example increasing budgets for translation and interpretation. Ideally, prioritize local translators to ensure language is contextually accurate and appropriate.
6. A robust system for allocating and ensuring follow through with individual cases, to ensure there are no empty promises of returning to finish work, or households falling through the cracks of the system. This could be augmented with a training system that emphasizes the importance of effective follow through at all stages, from accepting applications to final inspection and project completion, in tandem with requirements for and enforcement of detailed documentation.

Implications

This study aimed to improve understanding of the barriers to reconstruction that were experienced by households after the 2017 hurricanes in Puerto Rico, to inform policy and develop action recommendations. In an ideal world, everyone would have official land tenure documents and

build houses to code using safe and approved materials and labor; however that is unrealistic, especially in a disaster context. Issues of access, communication, education and equity make this not only unrealistic to expect, but a social justice issue when enforced. What we should aim for are safe solutions that are also practical and accessible to the entire community, including those most marginalized. However, in order to identify such solutions, we must better understand how established processes and requirements work to marginalize or completely exclude certain households from the publicly funded, formal reconstruction processes. This can lead us to insights that converge housing policy and the practical reality of homeowners to make recovery efforts more adaptable and accessible.

Moving Forward

This research will be furthered through a household survey (N = 300) with homeowners in Puerto Rico. The survey will improve understanding of homeowner interaction with the identified barriers and highlight those barriers most salient to homeowner experience. This will assist Habitat for Humanity's Puerto Rico Recovery Program with advocacy efforts, and will be conducted in the spring of 2020.

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Appendix 1

Interview Protocol

Institutional Barriers and Informal Reconstruction in Puerto Rico

Research question:

In what ways do institutions create a barrier for rural homeowners in Puerto Rico attempting to reconstruct after Hurricanes Irma and Maria in Puerto Rico, and how does this contribute to informal housing reconstruction?

SECTION I – INSTRUCTIONS

Hello, thank you for meeting with me. My name is ___ and I am a PhD student in civil engineering at Iowa State University. I have asked to meet with you today because I am researching the institutional barriers that have kept households from being able to reconstruct after Hurricanes Irma and Maria using construction permits, building codes, contractors, or obtaining deeds to their land and house. That is, any laws, policies, or processes in place that have made access to a formal home or to reconstruct in a formal manner, difficult or impossible. Your experience and expertise working in construction, informal housing, or as a homeowner would be a very valuable addition to this project. I will be asking a series of questions regarding your experiences and opinions related to informal housing reconstruction. I want to remind you there are no right or wrong answers, you may skip any question you do not wish to answer, and you may end the interview at any time.

If it is okay with you, I will be recording our conversation. This is to ensure I document all of the details of this interview. I assure you all of your comments will remain confidential. I will be compiling a report that will contain participants' comments, but have no reference to individuals and will omit identifying factors. There is more information in this informed consent form (present the form to participant), please read through and sign at the bottom to give your consent to participate. Do you have any questions before we begin?

SECTION II – INTRODUCTION

I am going to ask you a few questions about your work experience in Puerto Rico

1. What organization do you work for, and what does this organization do?
2. Could you please tell me about your current role?
3. How many years have you held this position?

SECTION III – BARRIERS TO RECONSTRUCTION AND AVAILABLE RESOURCES

This section contains questions regarding your thoughts about current policies and processes that make it difficult for homeowners to reconstruct their homes after the hurricanes, and the resources available to help overcome those barriers. We are specifically interested in rural and low-income households.

4. Can you describe the factors that contribute to households rebuilding their houses on their own (note: or 'informal housing', depending on interviewee)?
5. Can you describe all of the possible barriers that you can think of for homeowners trying to rebuild after the hurricanes, to:
 - a. Proving home ownership?
 - i. What resources are available to assist homeowners to overcome these?
 - b. Obtaining permits for reconstruction?
 - i. What resources are available to assist homeowners to overcome these?
 - c. Working with a contractor?
 - i. What resources are available to assist homeowners to overcome these?

- d. Following building codes?
 - i. What resources are available to assist homeowners to overcome these?
- e. *[additional factor X mentioned in question 4]*
 - i. What resources are available to assist homeowners to overcome these?
- 6. Of the barriers you have listed, which do you believe is most **common** barrier for households rebuilding after the hurricanes?
- 7. Of the barriers you have listed, which do you believe is most **difficult** barrier to overcome for households rebuilding after the hurricanes?
- 8. Are there sufficient resources available for reconstruction?
 - a. If no, How does this affect who is able to reconstruct, how they do it, and their timeline?
- 9. Are there enough trained staff in the regulation agencies to enforce and oversee the rules governing the reconstruction process?

SECTION IV – POLICY AND REALITY MISALIGNMENT

This section contains questions regarding housing reconstruction policies and their accessibility by the general public that is attempting to rebuild from the hurricanes.

- 10. Are there reconstruction policies that no not address the needs of homeowners trying to rebuild after the hurricanes?
 - a. If yes, can you please tell me the specific policies and their consequences?
- 11. Are there reconstruction policies that no not address the wants of homeowners trying to rebuild after the hurricanes?
 - a. If yes, can you please tell me the specific policies and their consequences?
- 12. In what ways do the rules that homeowners are expected to follow when they attempt to reconstruct their homes **not reflect** the Puerto Rican reality and constraints?
- 13. In what ways do the rules that homeowners are expected to follow when they attempt to reconstruct their homes, **reflect** the Puerto Rican reality and constraints?

SECTION V – PERSONAL EXPERIENCE

This section is a time for you to recount specific experiences with reconstruction after the hurricanes.

- 14. Have you worked with informal housing reconstruction in your role at this organization?
- 15. Have you, or someone you know, encountered a time where you were unable to, or had a difficult time navigating the reconstruction process?
 - a. If yes, please describe the experience (*if no, move on*)
- 16. Are there different characteristics of homeowners that you think make them more likely to use informal reconstruction?
 - a. If yes, what exactly about them makes them more likely to be engaged in informal reconstruction? (if need prompting, suggest age, income level, geographic location, etc.)

SECTION VI – RECOMMENDATIONS FOR THE RECONSTRUCTION PROCESS

This last question asks for your opinions on improvements that could be made to policy governing the reconstruction process.

- 17. How could the process of reconstruction be more accessible to everybody?

This additional section is optional, only ask these questions if there is extra time or if interviewee is in a role where this is relevant

SECTION VII – DEFINITIONS OF HOUSING CONCEPTS

I am going to ask you a few questions about legal definitions and cultural definitions of concepts to do with housing.

18. How do you define an informal house?

- What is the legal definition of an informal house?
- How is an informal house defined by Puerto Rican people?

If they ask about our definition of informal: For the purpose of this study, we are defining an informal house as one that did not have construction permits, did not use a contractor, or building codes during construction, and/or the owners do not have the documents to prove ownership.

19. What does it mean to own a house?

- a. What is the legal definition of owning a house?
- b. How have the Puerto Rican people defined owning a house? (for example, inheriting land)

20. What does it mean to have a **safe** house?

- How is a **safe** house defined in regulation and policy (adjust to each participant and their experience – for engineers talk about building codes and construction methods, for laypeople discuss what rules they are expected to construct to, etc.)?
- What does the general Puerto Rican population consider a **safe** house?

Appendix 2

Protocolo de Entrevista

Barreras Institucionales y reconstrucción informal en Puerto Rico

Pregunta de investigación:

De qué maneras las instituciones crean barreras para dueños de viviendas rurales que intentan reconstruir luego de los huracanes Irma y María en Puerto Rico (PR), y cómo contribuyen a la construcción informal de viviendas?

SECCIÓN I – INSTRUCCIONES

Saludos, gracias por reunirte conmigo. Mi nombre es Jessica Talbot y soy estudiante doctoral en Ingeniería Civil en “Iowa State University”. Te hemos preguntado para reunirnos hoy porque estamos estudiando las barreras institucionales que imposibilitan los intentos de reconstrucción para dueños de viviendas rurales luego de los huracanes Irma y María en PR usando los permisos, códigos de construcción, contratistas, ó obteniendo título de propiedad. Por cuanto, cualquier política, ley, o procesos en curso que han sido de difícil ó imposible acceso a una casa formal ó construida de manera formal. Su experiencia y expertís en el campo de construcción, vivienda informal, o un dueño de hogar sería de mucho valor para nuestro proyecto. Estaré preguntándole una serie de preguntas relacionadas a sus experiencias y opiniones en reconstrucción informal de hogares. Le recuerdo que no hay respuestas correctas o incorrectas, también puede omitir cualquier pregunta que no desee contestar, y que puede terminar la entrevista en cualquier momento.

Si a usted le parece, estaré grabando nuestra conversación. Esto es para asegurarnos de que documentemos todos sus detalles de nuestra entrevista. Le aseguro que todo sus comentarios son confidenciales. Recopilaré un reporte que tendrán los comentarios de participantes, pero no hay ningún tipo de referencia a individual que se le pueda reconocer. Hay más información en nuestra hoja de consentimiento. Por favor lea cuidadosamente y firme abajo. Tiene algún tipo de pregunta antes de comenzar?

SECCIÓN II – INTRODUCCIÓN

Le voy a preguntar acerca de su experiencia de trabajo en PR.

1. ¿Cuál organización usted pertenece, y qué tipo de función su organización se dedica?
2. ¿Podría decir su posición en la misma?
3. ¿Cuántos años lleva trabajando en esta posición?

SECCIÓN III – BARRIERS TO RECONSTRUCTION AND AVAILABLE RESOURCES

Esta sección contiene preguntas relacionadas a sus opiniones con respecto a las políticas y procesos que han hecho difícil reconstruir para dueños de casa luego de los huracanes, y los recursos accesibles para ayudar a superar esas barreras.

Estamos particularmente interesados en casas rurales y de escasos recursos.

4. ¿Podría describir los factores que contribuyen a la reconstrucción de casas informales?
5. ¿Podría describir todas las barreras posibles:
 - f. ¿Comprobar título de propiedad?
 - i. ¿Podría listar todos recursos accesible para asistir a los dueños de hogar superar esto?
 - g. ¿Obtener permisos de reconstrucción?
 - i. ¿Qué recursos están accesible para asistir a los dueños de hogar superar esto?
 - h. ¿Trabajar con un contratista?

- i. ¿Qué recursos están accessible para asistir a los dueños de hogar superear ésto?
 - i. ¿Seguir los códigos de construcción?
 - i. ¿Qué recursos están accessible para asistir a los dueños de hogar superear ésto?
 - j. [additional factor X mentioned in question 4]
 - i. ¿Qué recursos están accessible para asistir a los dueños de hogar superear ésto?
- 6. De las barreras que usted mencionó, ¿cuál es la más común según su pensar?
- 7. De las barreras que usted mencionó, ¿cuál usted cree que sea la mas difícil de superar?
- 8. ¿Hay suficientes recursos para reconstrucción?
 - a. Si no, como afecta quien puede reconstruir?
 - b. Como afecta la manera en que la gente reconstruyen?
 - c. Como afecta el tiempo de reconstruir?
- 9. Hay suficiente personal capacitado en las agencias reguladoras para reforzar y supervisar las reglas formales para reconstrucción en la Isla?

SECCIÓN IV – POLÍTICA Y DISCREPANCIAS EN LA REALIDAD

Esta sección contiene preguntas relacionadas a la política de reconstrucción de hogares y su accesibilidad al público general que intenta reconstruir luego de los huracanes.

- 10. ¿Hay políticas que regulan los procesos de reconstrucción (ej. ¿Quién cualifica para asistencia de FEMA, los tipos de permisos necesarios, etc.) que no cubren las **necesidades** de los dueños de hogares?
 - a. Si ese es el caso, por favor describir las políticas específicos y sus consecuencias?
- 11. ¿Hay políticas que regulan los procesos de reconstrucción (ej. ¿Quién cualifica para asistencia de FEMA, los tipos de permisos necesarios, etc.) que no cubren lo que los dueños de hogares quieren?
 - a. Si ese es el caso, por favor describir las políticas específicos y sus consecuencias?
- 12. ¿En qué maneras las políticas de reconstrucción no refleja la realidad y restricciones a los dueños de hogar?
- 13. ¿En qué maneras las políticas de reconstrucción refleja la realidad y restricciones a los dueños de hogar?

SECCIÓN V – EXPERIENCIA PERSONAL

Esta sección es un momento para recordar alguna experiencia con reconstrucción luego de los huracanes.

- 14. ¿Ha trabajado con reconstrucción informal de viviendas en su organización?
- 15. ¿Podría describir una situación en la que usted, o alguien que usted conozca, no pudo ó tuvo un momento difícil navegando los procesos de reconstrucción?
- 16. ¿Existen algún tipo de características de dueños de hogar que sean más ó menos probables de reconstruir informalmente?
 - a. Por ejemplo, edad, nivel de ingresos, localización geográfica, idioma, etc.

SECCIÓN VI – RECOMENDACIÓN PARA LOS PROCESOS DE RECONSTRUCCIÓN

Ésta última pregunta está relacionada con sus opiniones en mejoras que pueden hacerse en el proceso de regulaciones en reconstrucción

- 17. ¿Cómo el proceso de reconstrucción podría ser más accesible para todo el mundo?

****OPCIONAL****

SECCCIÓN VII – DEFINICIONES DE CONCEPTOS DE VIVIENDA

Le preguntaré acerca de definiciones legales y culturales sobre conceptos de vivienda.

18. ¿Cómo define una vivienda informal?

- ¿Cuál es la definición legal de una vivienda informal?
- ¿Cómo se define una vivienda informal según los puertorriqueños?

Para el propósito de éste estudio, estamos definiendo una vivienda informal como una que no haya tenido permisos de construcción, no utilice un contratista, o no construyó refiriéndose a los códigos de construcción, y/o no pueden comprobar título de propiedad.

19. ¿Qué significa poseer una casa?

- a. ¿Cuál es la definición legal de poseer una casa?
- b. ¿Cómo los puertorriqueños definen poseer una vivienda (por ejemplo, heredar un terreno)?

20. ¿Qué significa tener una casa **segura**?

- ¿Cómo se define tener una casa **segura** desde la política o regulaciones?
- ¿Cómo los puertorriqueños consideran una casa **segura**?