A Neighborhood Approach to Build Resilience and Repair Shelters (NABuRRS)

Overview of the evacuation center assessments performed in Sud, Sud-est, Grand Anse and Nippes.

WORLD CONCERN DEVELOPMENT ORGANIZATION
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Contents

TABLE OF FIGURES

TABLE OF TABLES

ACRONYMS AND ABBREVIATIONS

ASEC: Municipal Section Assembly
BHA: Bureau of Humanitarians Affairs
CASEC: Board of Directors of Communal Section
DPC: Directorate of Civil Protection
DINEPA: National Directorate for Drinking Water and Sanitation
EMI: Engineering Ministries International
HH: Household
NABuRRS: Neighborhood Approach to Build Resilience and Repair Shelters
OREPA: Regional Office of Drinking Water and Sanitation
OFDA: Office of Foreign and Disaster Assistance
S&S: Shelter and Settlement
USAID: United State Agency for International Development
WASH: Water Sanitation and Hygiene
WCDO: World Concern Development Organization

I. EXECUTIVE SUMMARY

Since October 2019, World Concern Development Organization (WCDO) in partnership with Engineering Ministries International (EMI) has been implementing a project entitled "Neighborhood Approach to Building Resilience and Repairing Shelters (NABuRRS)" which is supported by the USAID Bureau for Humanitarian Affairs (BHA). The goal of the NABuRRS project is that all vulnerable populations in Haiti have access to safe shelter during severe weather events.

The assessment of provisional shelters consists of evaluating the level of disaster awareness, of carrying out a structural and water, sanitation and hygiene (WASH) assessment on the provisional shelters in the southern peninsula of Haiti. Initially, this data will be used to select the shelters to be repaired as part of the NABuRRS project. Then it can be used to plan shelter interventions in Haiti. This assessment will provide accurate information about the building structures and WASH, including access to shelters and perceptions of housing conditions.

The results of this shelter-assessment showed that:

- Nearly 9 out of 10 shelters are either a school or a church.
- Most the shelters were constructed of block bearing walls (66%).
- Most of these evacuation centers (79%) are older than 10 years.
- The shelters accessibility to people with disabilities is only 15.2%.
- Buildings were generally in fair condition (65%).
- Of seismic vulnerability, 67% of the building have low vulnerabilities.
- Chlorine is the most frequently used means of water treatment (75%).
- Approximately 45% of centers did not have an adequate number of toilets to serve the full capacity of center.
- The most known water quality issue was the presence of bacteria 61%, a large portion of centers had “other known water quality” issues (33%).

Various actions are recommended to improve infrastructure at the structural and WASH levels of shelters such as:

- Repair the shelters that can accommodate at least 100 people during a disaster.
- Make the shelters accessible to people with disabilities.
- Use an implementation of parameters that have a direct impact to control the behavior of the structure when repairing shelters with light seismic damage.
- Make walls in chain masonry during the repair of temporary shelters.
- Train skilled and unskilled workers to better build and repair shelters in the future.
- Capture rainwater in shelters and repair water storage.
- Make shelters accessible to the sanitary infrastructure.
- Train shelter managers on how to deal with mud and weeds.

II. BACKGROUND

Haiti's vulnerable communities need humanitarian assistance whenever they face or experience earthquakes, floods, landslides and hurricanes, a fact made obvious by the scale of damage caused by these natural disasters. WCDO has undertaken the "neighborhood" approach to sustainably transform communities in the southern peninsula of Haiti (Grand'Anse, Nippes, South and South East) to improve risk reduction approaches and increase community resilience. NABuRRS is supported by BHA and implemented by WCDO in partnership with EMI. Under the leadership of a steering committee formed of stakeholders (including USAID/BHA, line ministries, and civil society), WCDO and EMI will implement a phased intervention to address the need for evacuation centers in the vulnerable southern peninsula of Haiti, working with the community to assess the current state of evacuation centers. One hundred centers will be prioritized and selected for repair. This task will be implemented using local construction crews supervised by EMI and local engineers. These upgrades will include improving access routes and ensuring that centers are safe and gender sensitive.

The intervention of the NABuRRS project:

- **Shelter & Settlements:** Selected evacuation centers are adequately repaired and upgraded to meet minimum standards.
- **Water, Sanitation & Hygiene:** Selected evacuation centers are upgraded to meet minimum Sphere standards for WASH.
- **Risk Management, Policy & Practice:** Community members, local leaders, and Government of Haiti officials have neighborhood-level evacuation plans as a result of evacuation and preparedness training.

The assessment of evacuation centers was undertaken under this grant in the departments on Nippes, South, South East, and Grand'Anse. The need for assessments was determined after reviewing a previous list of shelters jointly produced by Directorate of Civil Protection (DPC) and IOM. Additionally, many of the shelters were missing critical GPS data. All had minimal reporting on the conditions of the centers, both from a shelter structure and WASH perspective.

A work plan to assess all shelters in these four districts was thus undertaken. This was accomplished by national civil engineers, one in each department, and several remote engineers from EMI to oversee and provide training and overall support. These assessments were undertaken to determine general information (such as location and use), demographic data, and structural and WASH components and conditions. It is hoped that the data from these assessments will inform the selection of centers to be upgraded by WCDO and EMI, as well as inform future work by other entities that choose to work in these areas.

III. INTRODUCTION

The project goal of NABuRRS (supported by USAID/BHA and implemented by WCDO in partnership with EMI since October 2019) is to provide vulnerable populations in Haiti with access to safe shelter during severe weather events.

The assessment report of the NABuRRS project aims to give an initial overview of the shelters surveyed in the Grand South, to present detailed analyses of the shelter situation, to identify the hazards that are affecting the shelters' security and to understand the security of community members accessing the shelter. The report also identifies important concerns and needs that need to be incorporated in the shelter strategy.

When disasters occur in the Grand South of Haiti, a significant number of households (HHs) are displaced from their homes into shelters. The need for shelters continues to grow as the population density of the Grand South increases. Evacuation centers should be in a safe area within a reasonable distance of at-risk communities, and necessary resources, such as food, water and sanitation must be available for shelters to adequately host people. Without reliable access to resources, it can be impossible to meet the basics needs of people in a shelter in a time of disaster. The shelter should be clean and in good repair. The shelter should have reasonable access to transportation services. Everyone has a right to accommodations in an adequate evacuation center; therefore, the evacuation center should ensure protection from the climate, structural hazards, and risks to health, and have access to essential services. Accessibility is another key condition, in terms of both the physical location of the dwelling or accommodation and the ease with which the space itself can be used by the affected individuals.

According to WCDO's HH baseline survey, only 5% of the population have previously used a shelter in a disaster. The vulnerable population is very susceptible when a disaster strikes due to the poor construction and exposed locations of their housing. Many houses are built with poor materials without professional or local authority supervision, failing to meet the national Haiti Building Code. People often build their homes in hazardous areas even with the threat of annual hurricane seasons, exposing the structures to the risk of severe damage. When people of an area are not prepared for an event, the damage causes a high degree of loss in terms of lives, livelihoods, and property.

The areas visited by the assessment's engineers in the South enabled us to determine the current state of the site, the means of evacuation that people can use, the organization in the evacuation center, space repartition, energy and resources management, waste management, and gender protections. Also, we determined which shelters are better adapted to host people at the time of the assessment and to prioritize shelters that have been built particularly for that matter. Note that every evacuation center has been assessed to identify its needs, its barriers and needed repairs to make the shelter able to host people.

IV. SHELTER LITERACY IN HAITI

1.1. Access to Shelter

In Haiti, shelters are far apart and the roads to get to them are often in very poor condition. Most rural areas are difficult to access, as most roads are dirt tracks. In the event of a disaster, it can be extremely difficult for a person with a disability to reach a shelter. Additionally, after the passage of hurricanes, the roads can be obstructed by trees, slopes can have landslides, and, on the plains, the roads are often flooded. Some shelters are not big enough to accommodate a large group of people, which causes overcrowding, leading to poor sanitary conditions and related risks. Some evacuation routes are not accessible, and the rural areas are damaged especially at the time of the disaster event and for the duration of the crisis.

2.2. Shelter management

People who use the shelters do not get the chance to sleep at least eight hours of sleep, they do not have enough time to get in and settled at night, and time to get ready to leave in the morning. People also need cleaning time between the day's activities and the shelter opening, and between the shelter closing and the next day's activities. At most hosted shelters, lack of good management creates the need for occasional activities that require the shelter to open an hour late or close an hour early. Shelters cannot function appropriately if the shelter hours fluctuate constantly or are consistently less than eight hours.

The shelters do not provide adequate natural or artificial illumination to permit normal indoor activities and to support the health and safety of occupants. Sufficient electrical sources are not provided to permit the use of essential electrical appliances while assuring safety from fire. The shelters do not have laundry facilities available to people or a system available for like services.

The shelters do not have a fire safety plan. Fires are usually caused by activities in the HH such as cooking. Shelters built of combustible materials are most at risk (particularly thatched roofs and timber-framed structures), where the timber truss is the base of the ridge. Fire exits are nonexistent in shelters in Haiti, and adequate emergency lighting is missing. The shelters do not comply with applicable local fire, environmental, health, and safety standards and regulations.

Shelters should not be located inside high-risk flood areas; the structures should be in the least hazardous portion of the area subject to flooding. Flood shelters are mostly in lower elevations and buildings with habitable floors are not well above the expected flood level and strong enough to withstand the water currents and debris flow.

For windstorms and hurricane shelters, buildings must have strong roofs and cladding walls with doors and windows with proper locking and shutters. Buildings are not sheltered by windbreaks, to protect them from strong winds. They can also be shielded from the wind forces by vegetation barriers. The buildings should be sheltered by the shape of the land, to protect them from strong winds and from tidal surges in coastal areas.

3.3. Structure of Shelter

In terms of structure, shelters are often poorly constructed and vulnerable to damage in a disaster event. The location and size of openings in walls have a significant effect upon the strength of a wall and its ability to resist earthquake forces. The openings in the shelters do not have enough reinforced elements to allow them to resist lateral forces. Construction reinforcements designed for simple single-story buildings are often used for buildings of two or more stories, which makes the footing or the entire building more fragile and vulnerable to earthquake. Also, building owners tend to do their construction, with poor quality concrete blocks. When this happens, the entire structure is vulnerable, with decreased wall strength to resist water pressure. When good quality concrete blocks are used, flooding and landslides cause less damage, as the blocks provide better resistance and reduced vulnerability.

Haitians often neglect to seek advice before selecting a building site. We found many building sites in exposed areas such as on the brow of a hill which makes them more vulnerable, while those sheltered by natural topography are less vulnerable. Buildings sited in gullies or in riverbeds are very vulnerable as they are subjected to severe damage by floods caused by the heavy rains which often comes with a hurricane.

4.4. WASH in the Shelters

Proper sanitation requires public cleanliness. In the shelters in Haiti, sanitation services were often found to be either non-functional or non-existent in the community. Any community effort to improve sanitation must help people overcome the challenges they face in their daily lives and more so at the time of a disaster.

Evacuees should have easy access to potable water for drinking and clean water for washing during and following disasters. Water sources are available in many shelters; however, the quality of the water remains an issue. Various sites rely on boreholes, hand wells, spring water, truck/haul and/or rainwater. The water coming from hand wells often is not drinkable but can be used for some daily activities such as cooking and cleaning.

When it comes to the type of bathing facilities that the evacuees use, one of the most common problems is a lack of well-trained managers for the facilities inspection, maintenance and cleanliness. The pit toilets are built on ground that frequently floods. Some pit toilets are located near rivers, wells or springs and tend to pollute the water. During the rainy season, as the water level rises, the ground water is at risk of contamination and can increase the risk for serious health problems.

The toilets are not built in a safe place in the shelters**.** The locations of some toilets are inappropriate, being located too close to cooking areas and are not well maintained, increasing the risk of spreading germs. Each type of toilet in the shelters has its own characteristics and drawbacks—poor hygiene, untreated sewage, and waste disposal harmful to the environment.

The bathing facilities are frequently unisex, which increases the risks of sexual assaults on women and girls. The shelters lack solid waste management, which increases air pollution and causes disease. Moreover, the facilities are not adapted for people with disabilities, making their stay in the shelter even more difficult.

V. METHODOLOGY

5.1 Shelter selection procedures

Assessments should be carried out on 666 temporary shelters on the lists of the International Organization for Migration (IOM) but, once on the field, we have been using the DPC list to compare the previous list from IOM and complete the assessment. With the help and assistance of local authorities, such as ASEC and CASEC, we have been able to identify more evacuation centers that did not make the previous list. However, some evacuation centers on the list provided by DPC were not surveyed due to their location in communal section on an island in the department.

5.2 Assessments tools

The assessments were performed visually, often with the assistance of a center/shelter manager to answer various general and demographic information questions. The program utilized to perform these assessments was Kobo Toolbox, an online data entry service and database. Once the assessments were performed and submitted, EMI was able to view the entries and provide feedback. A copy of the assessment form and a digital copy of the assessment results are included in Appendix 1.

a) Beneficiary information
b) Demographic:
c) Site
d) Energy Source
e) Water Source, Water storage, Water distribution, Water treatment,
f) Sanitation, Sanitary Block,
g) Building
h) GPS Coordinates

5.3 Period of implementation

Shelter assessments were spread over a four (4) month period, from July to November 2020.

5.4 Description of Staff Involvement.

- ✓ **Coordination and supervision:**

  Coordination was made with the assistance of the Departmental Technical Coordinator by department, a DPC representative to identify and provide the list of all the evacuation centers in the area and to be aware of the ongoing progress of the project. Internally the program coordinator along with EMI supervised the preliminary activities of the shelter assessment and provided support to the roving engineers on the run. The roving engineers provided technical supervision for the assessment engineers.

- ✓ **Quantitative data collection:**

  The assessment engineers were charged to carry out the site and building inspections, identifying the resources of energy and water. They analyzed all vulnerabilities of the site and the building and collected relevant structural information with the assistance of the representative of each shelter during the assessment. Roving engineers traveled from time to time to support the site assessment engineers and perform surveys.

5.5 Limitations and challenges of the assessment

5.5.1 Limitations of the assessment

Responsible personal or shelters managers were not present at the time of the assessment to provide enough relevant information on the shelters; for example, the age of construction or furthest community served. The lack of availability of local authority failed to boost coordination for the assessment. Shelters located on island requiring a sea crossing were not surveyed due to internal policies of WCDO, which does not allow the staff to travel across the sea. Many shelters are in remote areas and risky environments, which caused the detailed damage and needs assessment to take longer per day. Heavy rains created another problem, as higher than usual river levels impeded accessibility.

5.5.2 Challenges of the assessment

Many of the shelters included on the list cannot be considered as shelters because they were devastated by the passage of Hurricane Matthew. Some institutional officials did not want the evaluation to be done on their buildings. According to them, their non-participation is due to the poor management of the shelter by the evacuees after a previous catastrophic period. Some of the shelter managers were unavailable to collect relevant information about the shelter itself. In addition, the barriers of some of them remained closed when engineers arrived at the site. Due to problems related to COVID19, the schools were closed during the beginning of the survey.

VI. RESULT OF THE ASSESSMENT

6.1 BUILDING

Each center had at least one building for occupants to reside while they wait for storms to pass, flooding to subside, or other shelter options to become available, if their home was destroyed by an event. Each building was visually evaluated.

6.1.1 Physical Description of Shelter Buildings

The assessment of shelters in the southern peninsula of Haiti showed that more than half of the shelters (58%) are schools. While churches represent more than a quarter of the shelters. In sum, nearly 9 out of 10 shelters are either a school or a church.

Grand'Anse, 273 (38%) and South East, 188 (26%) are the 2 departments with the most shelters. A total of 707 Shelter have been evaluated in the 4 departments. (See Figure 1)

Figure 1. Primary Use of Shelters (percentage

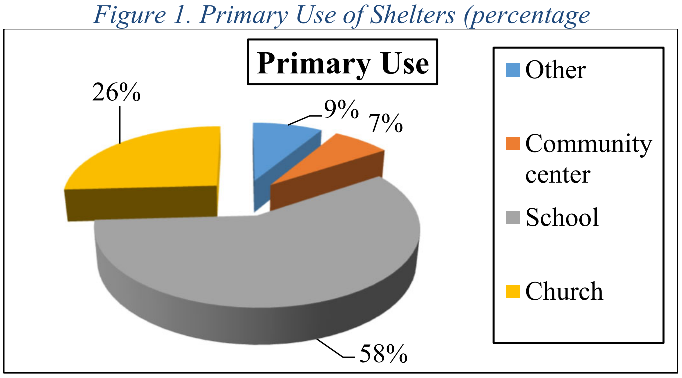
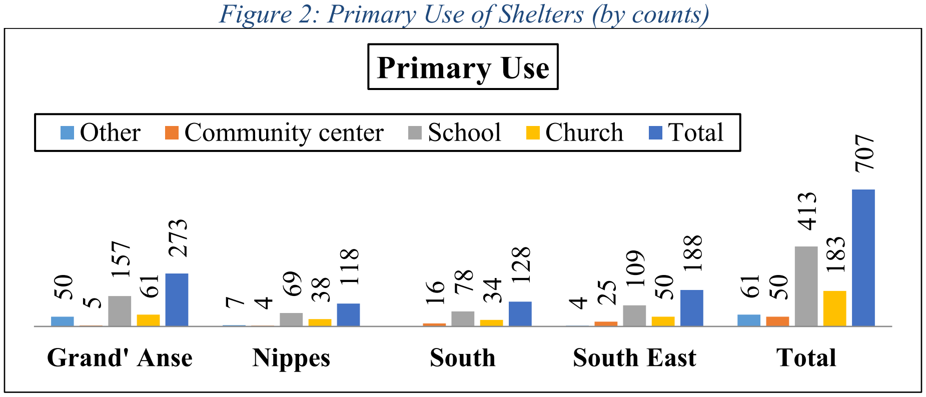


Figure 2: Primary Use of Shelters (by counts)



Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

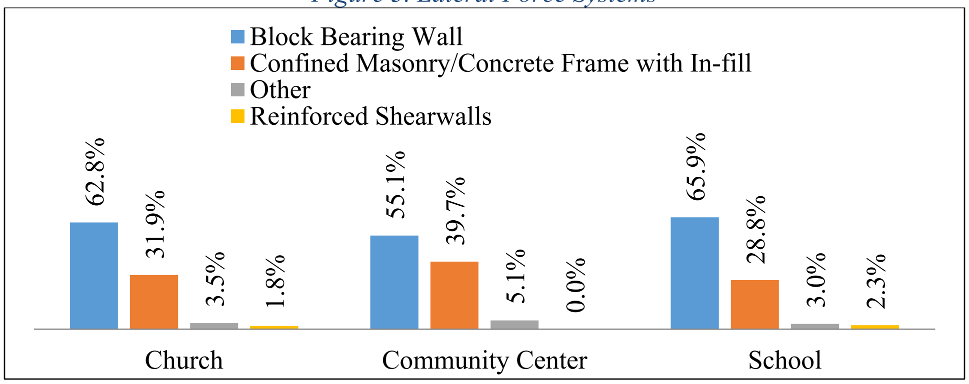
Most the shelters were constructed of block-bearing walls (66%). Notably, in the Department of South East, the pre-dominant lateral force system was confined masonry/concrete frame with infill. In all other departments, block bearing wall was the most prevalent lateral system. When we analyze the data by type of building, we can see that almost one third (1/3) of the schools and churches are built with block-bearing walls.

Table 1. Lateral Force Systems

Department	Block Bearing Wall	Confined Masonry/ Concrete Frame with In-fill	Other	Reinforced Shear walls
Grand' Anse	91.33%	2.67%	4.44%	1.56%
Nippes	57.54%	36.49%	1.40%	4.56%
South	98.90%	0.55%	0.00%	0.55%
South East	26.65%	67.01%	5.08%	1.27%
Total	**65.57%**	**29.08%**	**3.36%**	**1.98%**

Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

Figure 3. Lateral Force Systems



Source: Shelter assessment in the southern peninsula of Haiti, WCDO/ EMI, December 2020

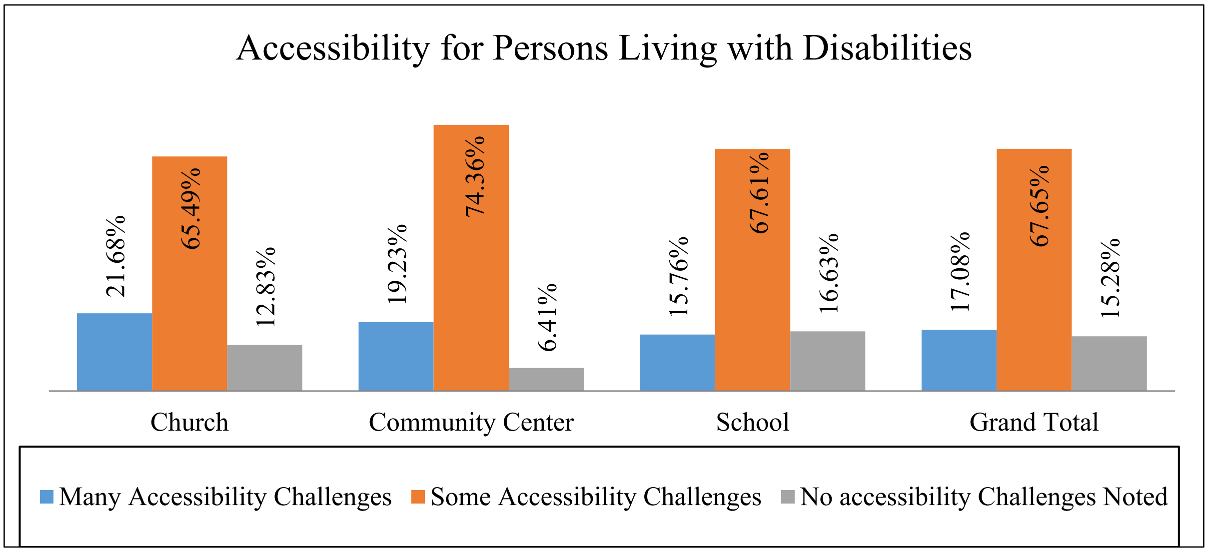
Most of these evacuation centers (79%) are older than 10 years. This means that the majority pre-date both Hurricane Matthew and the 2010 earthquake. As long as the current conditions of these centers are good or fair, this gives us greater confidence in the capacity of these centers to resist future disasters. Nearly 2 schools out of 10 that serve as shelters have been built in the last 10 years.

Table 2. Age of Construction

Department	0-4 years (post-Hurricane Matthew)	5-10 years (pre-Hurricane Matthew)	More than 10 years (pre-2010 earthquake)	Unknown
Church	3.10%	8.41%	86.73%	1.77%
Community Center	3.85%	8.97%	85.90%	1.28%
School	2.61%	17.28%	77.83%	2.28%
Total	**2.78%**	**15.11%**	**79.98%**	**2.12%**

Source: Shelter assessment in the southern peninsula of Haiti, WCDO/ EMI, December 2020

Figure 4: Accessibility for Persons Living with Disabilities



Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

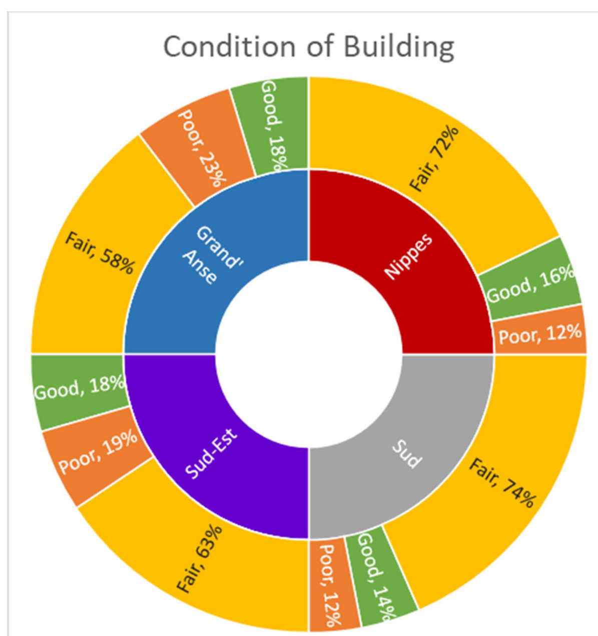
By accessibility of the buildings to persons living with disabilities, we mean that regularity of riser and tread to be respected in the construction of the staircase (height of the riser: 17.5 cm / tread: 30 cm). It is necessary to have a ramp that respects the established standards. Next to this, there must be a 2-level handrail (0.70 m and 0.90 m) accompanying the banister, door handles that are easy to grasp, crutch type, placed at a height of 0.90 m, signs at entrances, exits, emergency exits using writing dimensions adapted to the reading distances.

According to the data from this evaluation, only 15.28% of the shelters are accessible to people with disabilities. This proportion is more than 2 times lower in the community centers (6.41%) than in the whole.

6.1.2 Shelter Building Condition

Both the general condition of each building at every center was assessed as well as a determination of its seismic and wind vulnerability. Buildings were generally in fair condition (65%) but up to 18% were in poor condition (see Figure 4). Grand' Anse proved to be the department with worst condition buildings with 23% of the structures in poor condition.

Figure 5: Condition of Building



The determination of vulnerability was based on visual identification of certain vulnerabilities and does not represent an in-depth analysis of each building, as this would be extremely labor and time intensive for this phase of the project. A more in-depth analysis of some of the buildings will be performed in the detailed design phase.

From the visual assessment of vulnerability, it is evident that many buildings are not in a vulnerable state. 67% and 47% had low vulnerabilities for seismic and wind events, respectively (See figures below). However, particularly when wind is considered, 21% of buildings were considered highly vulnerable. Buildings in Nippes had the highest percentage of moderate-to-high seismic vulnerability and Grand' Anse had the highest percentage when it came to wind vulnerability.

A significant number of buildings showed vulnerabilities, the most common of which was a lack of proper connections. This will be important to address when performing the detailed design, which could reveal more significant structural vulnerabilities.

Figure 6. Seismic Vulnerability

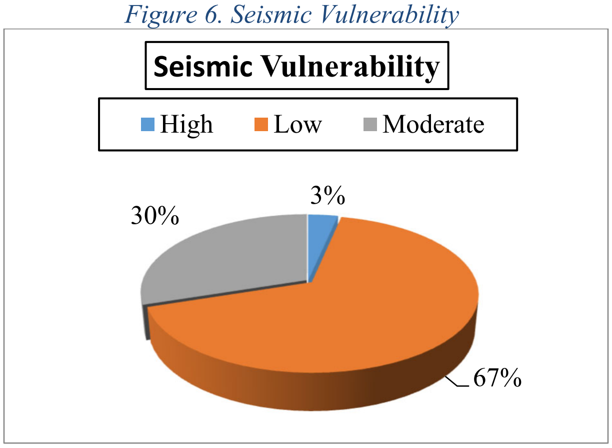
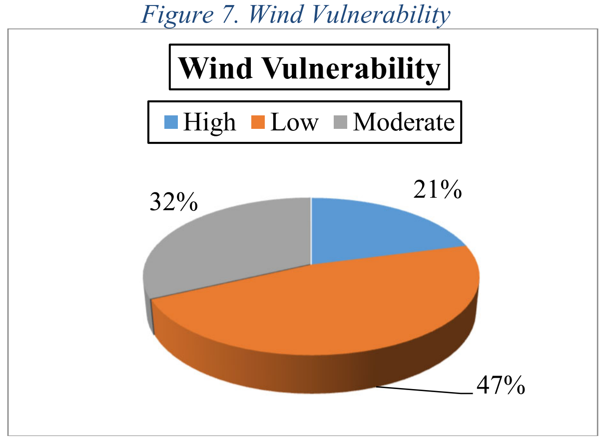


Figure 7. Wind Vulnerability



Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

6.1.3 Shelter Capacity

The assessments of these shelters took two different capacities into account. The first is the stated maximum occupancy for the primary use (i.e. school, church, etc.). The second occupancy considered is the evacuation capacity. This is determined by a SPHERE standard of at least $3.5m^2$ per occupant when considering shelter conditions. The engineers performing these assessments provided an estimate of the area for each building at each evacuation center. The total building area can then be summed and divided by $3.5m^2$ to determine the evacuation capacity of each center. The lowest evacuation capacity is 12 and the greatest is 706 and the average is 111.

414 (58%) of the centers had a capacity of less than 100 people. Our target is to upgrade shelters that can hold 100 or more persons. Sud had the highest percentage of 100+ capacity centers at 53% of centers having capacity for 100 or more. Sud-Est, Grand'Anse and Nippes had 36%, 36% and 50%, respectively.

Figure 8: Sphere Capacity (percentage)

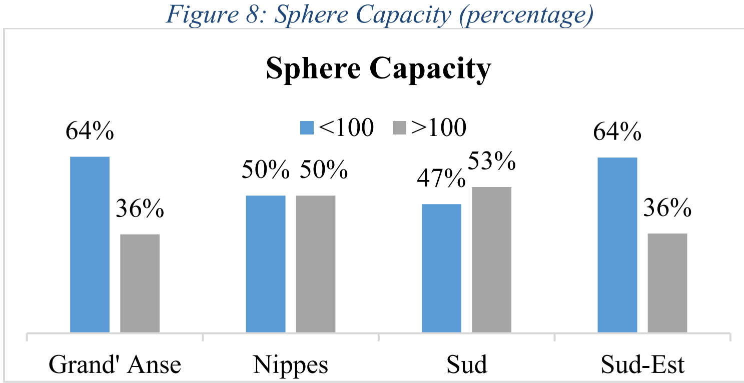
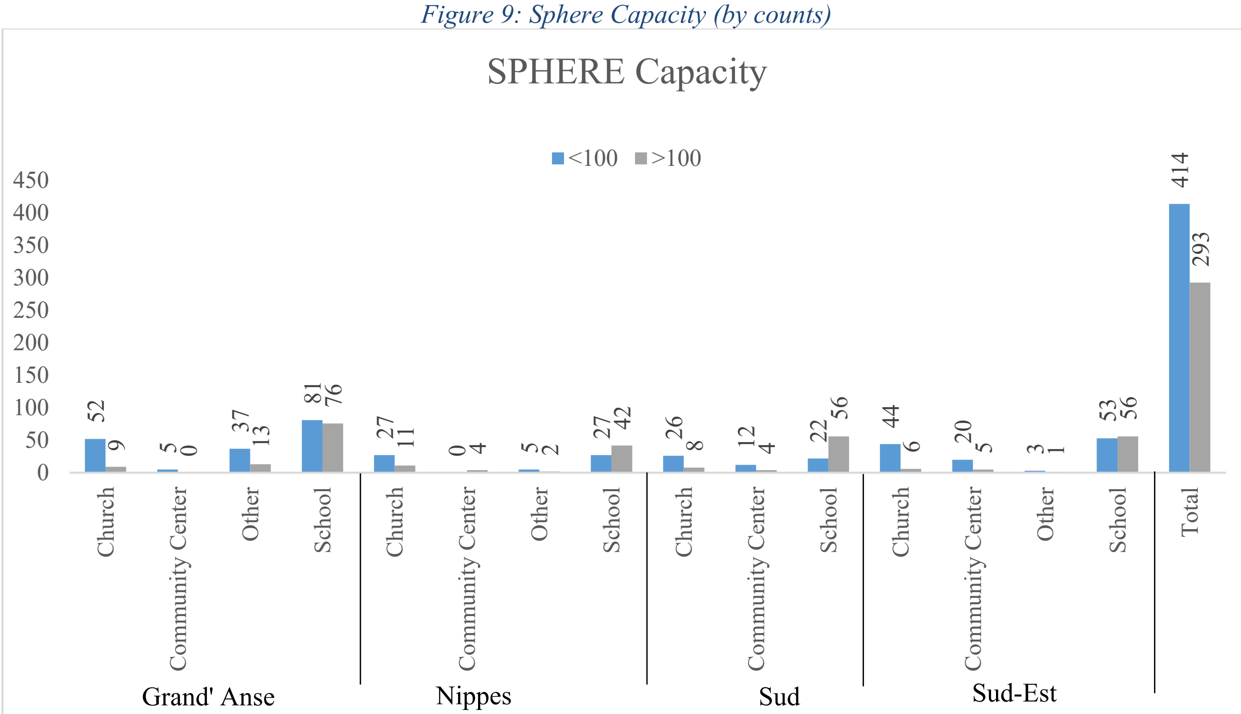


Figure 9: Sphere Capacity (by counts)



Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

6.2 WASH

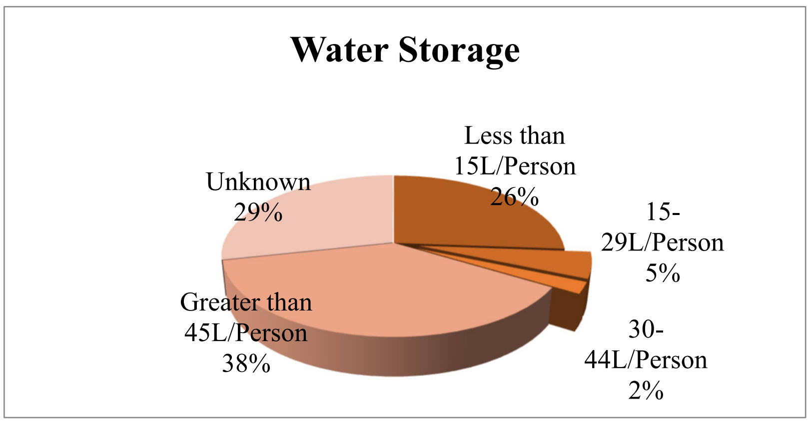
The assessments, as they pertain to WASH, looked at 4 different categories: source and storage, distribution, treatment, and sanitation.

6.2.1 Water Source and Storage

Data on the amount and condition of water storage available at evacuation centers was collected. The average amount of water storage was about $34m^3$ or 34,000 liters. Notably, there is a large percentage where the total water storage was not collected (designated as "unknown" in charts). These may be sites where it was not possible to ascertain the total storage or could have been human error when the assessment engineer forgot to enter the total water storage.

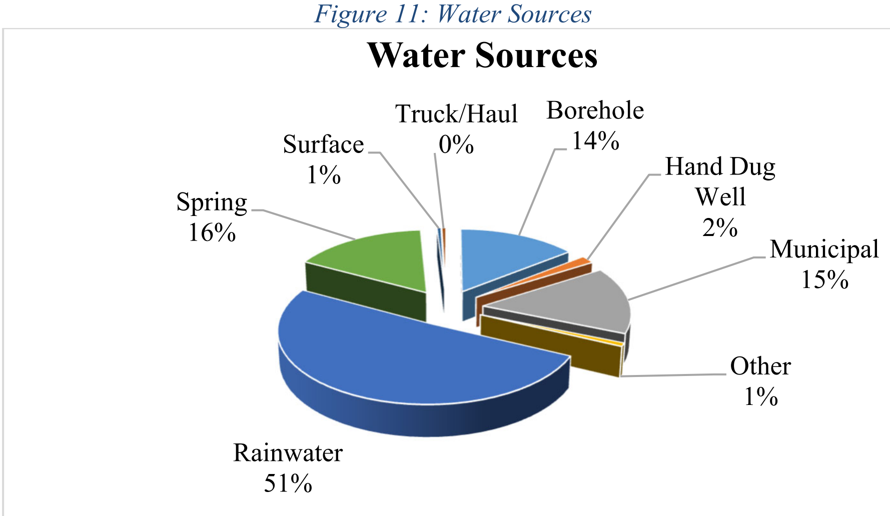
When one accounted for the SPHERE maximum occupancy, 33% of shelters had less than 45L/person (26% with less than 15L/Person, 5% with 15-29L/Person, and 2% with 30-44L/Person, see figure below). A shelter should ideally have storage adequate for 3 days with a minimum of 15L/occupant/day. This does not consider the presence of flush toilets either in which case 20L/occupant/day should be required as a minimum. 38% of shelters have this adequate storage or more. See online dashboard for finer detail of data (Linked in Appendix 1).

Figure 10. Water Storage per Person



Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

Figure 11: Water Sources



Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

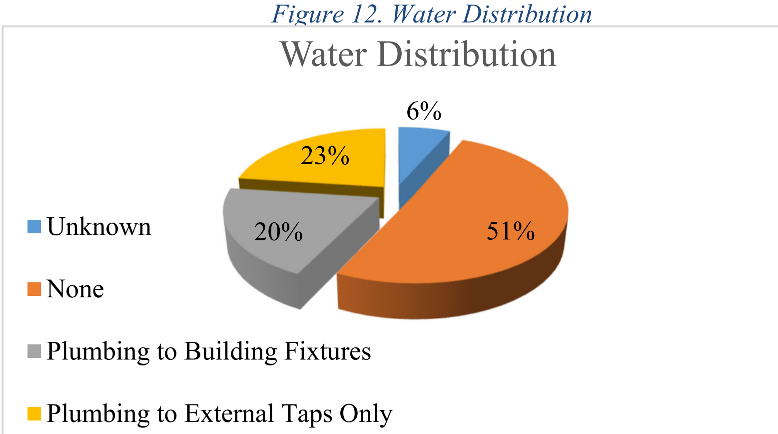
Most centers utilized rainwater catchment for their water sources (51%, see Figure 9). Other notable sources were springs, boreholes, and municipal. See online dashboard for finer detail of data. (Linked in Appendix 1)

6.2.2 Water Distribution

A large portion of the centers had no distribution system (51%, see below). While this is not the most ideal, if a plan to distribute the water to occupants manually is in place at the shelter, the presence of a distribution system is not necessary. See online dashboard for representation of data. (Linked in Appendix 1)

Where distribution systems were present, the most common material used is PVC. This is not a concern if the pipes are buried deep enough to not be disrupted by surcharges or storm events. See online dashboard for greater water distribution data. (Linked in Appendix 1)

Figure 12. Water Distribution

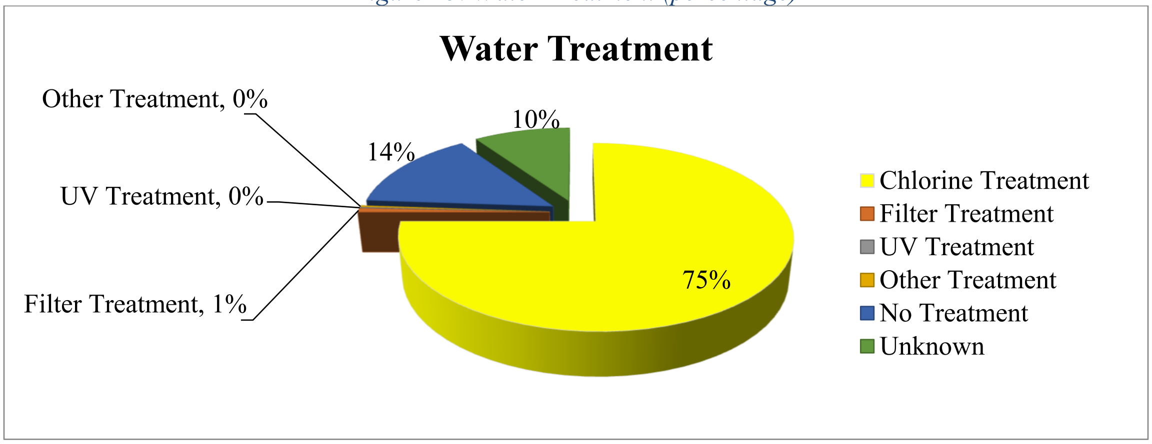


Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

6.2.3 Water Treatment

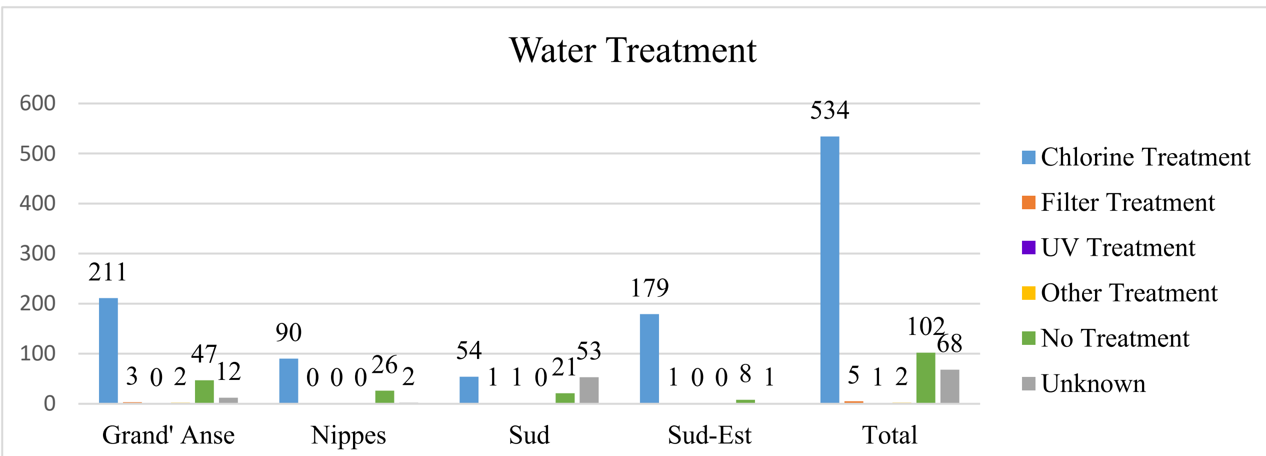
The majority of centers utilize chlorine to treat their water (75%). This is a common water treatment method in Haiti. As long as proper concentrations of chlorine are utilized, this is a safe method to treat many water contaminants. An alarming number of centers had no water treatment (14%). If any of these shelters are selected for upgrades, a water treatment system or plan is highly recommended.

Figure 13: Water Treatment (percentage)



Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

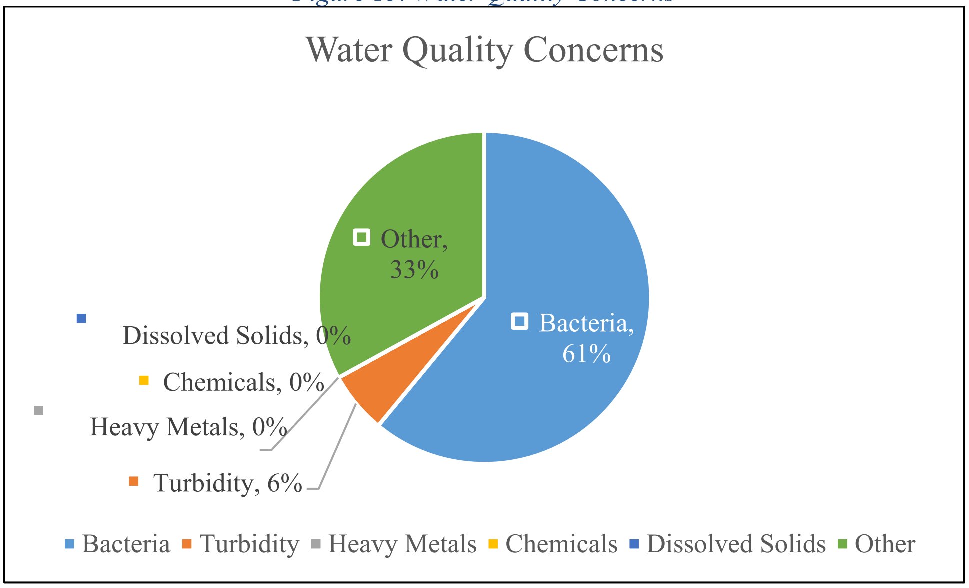
Figure 14: Water Treatment (by counts)



Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

The most commonly known water quality issue was the presence of bacteria (61%, see Figure 15). A large portion of centers had “Other known water quality” issues (33%). For those shelters selected, water testing will be conducted in the detailed assessment and proper treatment determined. See online dashboard for more water treatment data. (Linked in Appendix 1)

Figure 15: Water Quality Concerns



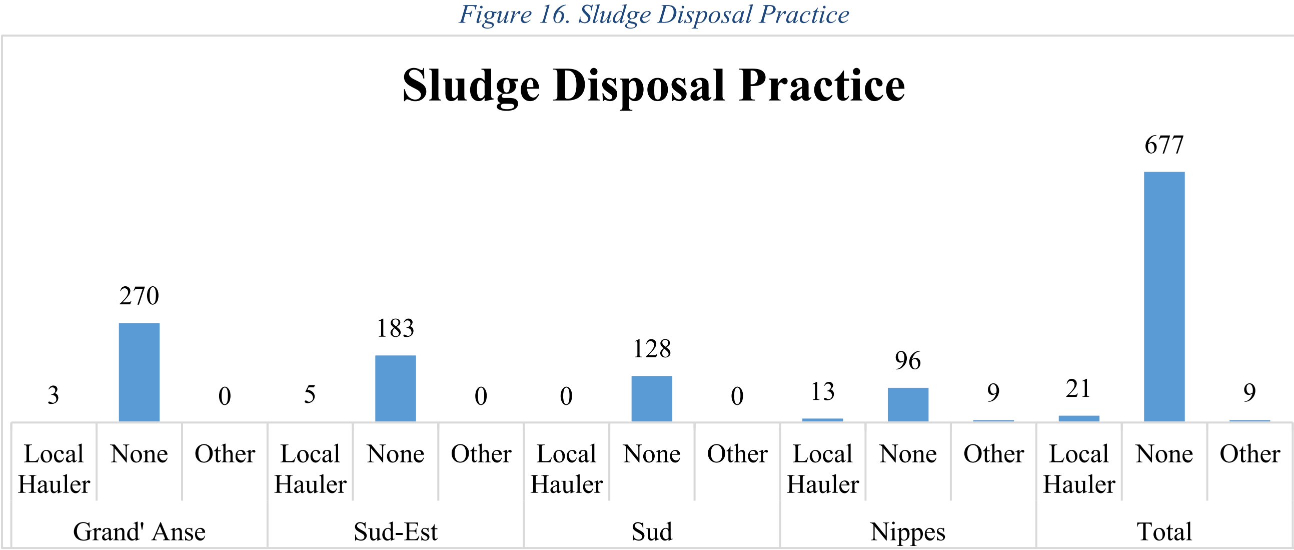
Source: Shelter assessment in the southern peninsula of Haiti, WCDO / EMI, December 2020

6.2.4 Sanitation

Conditions of sanitation facilities were also assessed during review of each evacuation center. This included determining the number and condition of sanitary blocks, number, types, and conditions of sanitary facilities within blocks as well as disposal practices.

Of note, most facilities did not have any kind of sludge disposal practice in place (96%, see Figure 12). This will be a critical area to address when upgrading facilities. Many sanitary blocks were determined to need minor repair. For selected centers, the exact type of repair necessary will be determined during the detailed assessment. See online dashboard for greater sanitation data. (Linked in Appendix 1)

Figure 16. Sludge Disposal Practice



Lastly, the number of good or fair (i.e. useable) toilets per person (when considering the SPHERE capacity) was calculated as well. Approximately 45% of centers did not have an adequate number of toilets to serve the full capacity of center (see Figure 17). This assumes a 50 occupants/toilet per SPHERE guidelines for similar buildings (i.e. transit centers). For centers selected for upgrade, toilets blocks will likely need to be added or repaired.

Figure 17: Toilet Needed (percentage)

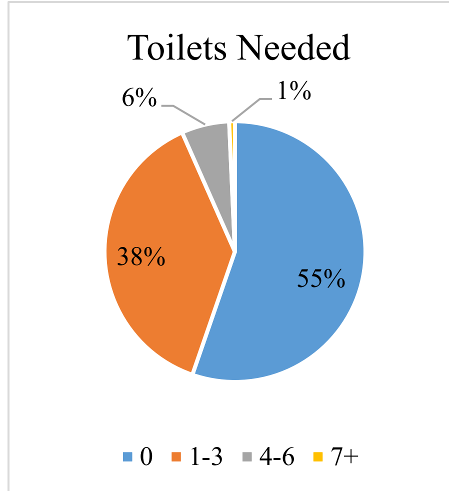
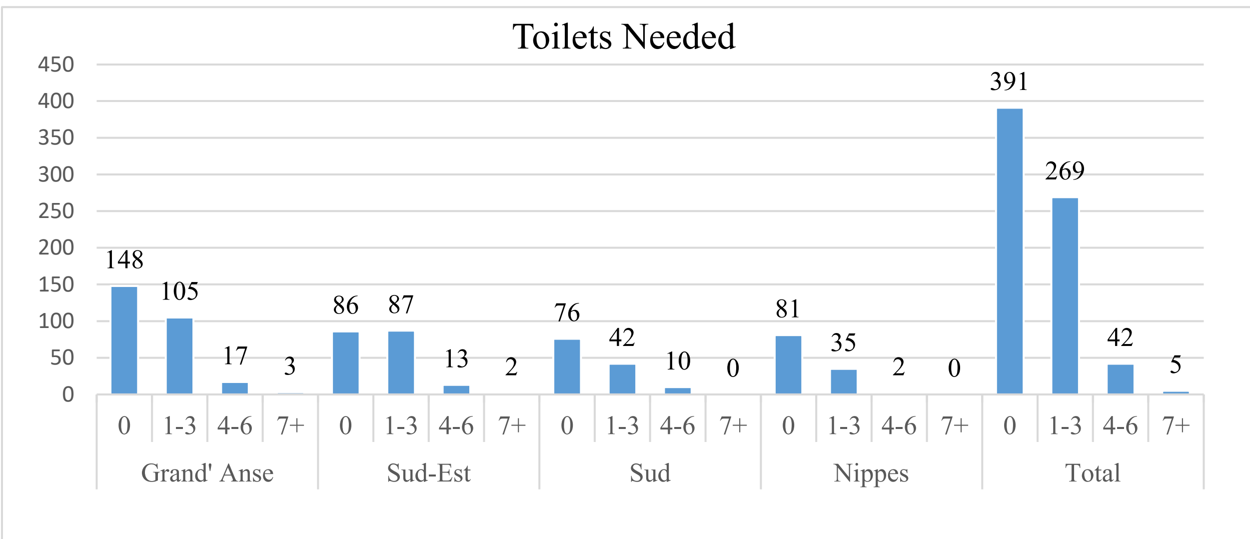


Figure 18: Toilets Needed (by count)



VII. CONCLUSIONS AND RECOMMANDATIONS

1.1. CONCLUSIONS

The Great South departments in Haiti are extremely vulnerable to natural and environmental hazards. The country is one of those with a very high environmental susceptibility. In addition to natural and environmental vulnerability, economic vulnerability contributes to social vulnerability. Under the effects of global warming in the context of climate change, cyclonic phenomena will be more and more numerous and more severe. There is therefore an urgent need to identify a strategy for reducing environmental vulnerability. This strategy is the subject of the interventions of this proposal and aims to anticipate the impacts of the flood risk which is the most recurrent due to the frequent passage of hurricanes and other cyclonic phenomena over the country. Establishment of multi-functional shelter management committees capable of accommodating evacuees and the recommended interventions contribute to building the resilience of society by allowing it to better anticipate the negative impacts of disasters. Finally, the implementation of a risk and disaster reduction strategy is also the way to restore confidence in institutions in a country known for its institutional instability.

Overall, the assessments were a success. A large amount of pertinent data was collected at each site that will inform the selection of which shelters will be upgraded. One can access the data from the reports by using the two links located here and here. Furthermore, all this data will be made public and entities can use it to inform their decisions on upgrading facilities. The assessments identified the need for upgrades both structurally and in WASH components. The number of centers that need upgrading exceeds what can be accomplished by the project.

2.2. RECOMMENDATIONS

WCDO and EMI have identified several recommendations as the result of analyzing the data presented in this report.

Shelter Recommendations

- Considering the findings of the shelter assessments and to plan for an effective implementation, it is vital to coordinate upgrading across a range of sectors (construction, WASH, shelter management) by adapting the shelter response to the characteristics of the local settlement.
- Evacuation center retrofitting and upgrading should include identification and coordination with the Technical Departmental Coordinator and other local authorities. These will accompany WCDO's technical and administrative inspections in order to monitor the implementation of the project in the municipalities and to ensure that the relationship between all the local authorities and the NGO is harmonious, fruitful and in accordance with the rights and obligations of each of them.
- All interventions should include increasing risk knowledge to promote building and settling back safer. This should be included across all three project sectors. Poor construction practices, rapid urbanization, risky settlement-siting are some of the factors that increase the level of vulnerability to shelter and settlement (S&S)-related hazards. Rehabilitation following the survey of the shelters provides a great opportunity to introduce measures aimed at mitigating the negative impact of these factors, so that future threats to S&S infrastructure and services are reduced. Disaster Risk Reduction and Risk Management measures should be incorporated into the overall strategic plan of S&S programming and implemented as soon as any retrofitting and upgrading begins, and action should be as environmentally friendly as possible.

- Several shelters are too far from concentrated population in some rural and urban areas. To promote the success of the project during the implementation phase, it is necessary to have shelters located within an appropriate distance from farthest targeted community served by the shelter. People who evacuate to the shelters during disasters should not have to walk for more than one hour (i.e. approximate 5km or less).
- Local markets should be assessed to define and determine availability of construction materials and services, to recruit skilled workers for the retrofitting program, taking into account the geographical location of the evacuation center.
- The main problem with construction in Haiti is that the structures are too frangible. Almost all the structures are built out of masonry blocks with reinforced concrete columns and beams, which are vulnerable to numerous natural hazards. In many areas, affected shelters do not comply with local construction standards or building codes, or these may not exist. Humanitarian S&S interventions and rehabilitation of temporary shelter may not always attain all these standards and requirements, but they should promote them for populations and other actors engaged in rehabilitating or constructing shelters. Improved construction and shelter practices are critical to ensuring the safety of communities, and should be promoted in future projects, even in humanitarian interventions.
- The age of construction plays an important role in a building. Prior to the earthquake, building codes in Haiti were mostly overlooked. There were no professional inspections on how the construction was undertaken. Findings from the survey shows that 65% of the buildings are in fair condition, the most common repair was of a crack in masonry wall. Based on the data collected, it can be concluded that some shelters could benefit from less expensive repairs that would significantly enhance safety, using appropriate techniques. To reduce shelters vulnerability and strengthen shelter capacity, specific appropriate techniques include reinforcing the walls of the building an identifying heavy wall in hazards areas.
- It can be elaborated that the seismic evaluation approaches have been used to specify and estimate the structure's capacity to withstand an earthquake. For the seismic vulnerability, 67% of the buildings have low vulnerabilities. Those parameters can affect the collapse of a structure moreover. For the upgrading of the shelter with light seismic damage it is necessary to design parameters that have a direct impact to control the structural behavior either by considering the past damage observations or by expecting the damaged spot in the structure.
- Living space in shelters that is 3.5 m2 according to Sphere guidelines. The project expects to retrofit 100 shelters Sufficient room allowance will be made to let people perform their basic domestic activities temporary during a disaster or a period post-disaster. Normal living space can accommodate the diverse of the needs of the

members, for sleeping, food preparation and eating. As the project does not aim at building new shelters, it should promote the upgrading of shelters that meet agreed technical conditions of adequate living space to allow house members to gather. As the living space in shelters play an important role in the response phase to avoid overcrowding.

- Many shelters have defective electricity connection, and some do not have any electricity installation. Even though the shelters in general don't have emergency lighting system installed, it is recommended to review the general electrical service installation and address alternatives for solar panel installation to respond the energy issue in evacuation shelter and enable safety lighting.
- Shelters need accessibility with security and enough protection on their access route from mud and debris. The siting, location and the settlement of the shelter is very much relevant. It is important to select shelters that are on safe access routes for repair and retrofitting. For example, WCDO and EMI recommend prioritizing shelters that have access routes safe from landslides, as landslides are almost always triggered by hurricane and heavy rains.
- Evacuation planning must be compatible with local custom. Develop project strategies that allow people more flexibility and adaption to the using of the facility.

WASH Recommendations

To ensure the provision of adequate safe water and proper hygiene and sanitation and to prevent the outbreak of related diseases, the project must address water and sanitation needs. The project will coordinate with local communities to guarantee and ensure relief supplies can be delivered promptly and effectively and water storage maintained. It is necessary to help to maintain a water system in good condition so that evacuees can afford the minimum quantity of water needed for domestic use and hygiene.

The contamination of water is an important parameter in surveying water quality. People in rural areas often use ground water which contains high level of saline, pH and other chemicals. The detailed assessment will allow us to run deep water testing and promote the use of chlorine as an efficient measure for treating water with contamination of pathogens such as bacteria and viruses.

- According to Sphere guidelines, 15 liters is the minimum average volume of water for drinking and hygiene. Many shelters have equal or less than 18 liters per person which can be considered sufficient but not enough for the use of flushing toilets. WCDO will take responsibility for selected evacuation centers and operate under the coordination of National Directorate for Drinking Water and Sanitation (DINEPA).
- Many evacuation centers do not have access to water while having the possibility to capture rainwater by the roof of their building. The solution is to capture rain when it

falls and store it until it is needed and promote the idea to build an effective design of water collector. Install rainwater catchment for every shelter that does not have access to municipal water.

- Damages in the sanitary facilities of some shelters are very common, while the building typology is in very good condition especially in rural communities. This requires intervention and awareness. Major damage to both rural and urban water systems, intermittent to no water supply, requiring extensive works and immediate intervention to ensure that at least one (1) toilet is available for twenty (20) people.
- The assessment indicated clearly that many evacuation centres do not meet certain requirements in the sanitation aspect according to Sphere guidelines. Several shelters have a gender-neutral toilet. It is important to consider gender-segregated toilets at the time of detailed and retrofitting evacuation centres and provide some technical options for adapting for people with disabilities and facilitating the availability of water for flushing toilets.
- According to the assessment, around 96% of evacuation centre do not have adequate sludge disposal. Therefore, it is important to establish disposal system in coordination with DINEPA while applying national standards. This must be done together with the collaboration with Regional Office of Drinking Water and Sanitation (OREPA) and local system specializing in waste management, management of excreta, and ground protection after the repair.

Appendix 1: Electronic Data Links:

https://app.powerbi.com/view?r=eyJrIjoiNzAzN2QxY2MtNjM5MC00MmExLTk4NGMtNTM1NjlkOWU1M
WY5IiwidCI6ImRmZGJlNDBlLWMzYjItNGYxYS1hYTM5LWY5YTQyY2NkOGEyZiIsImMiOjZ9&pageName=Re
portSection

https://app.powerbi.com/view?r=eyJrIjoiMmViZTUwMzktNDA3Ni00MzE5LTkwYTQtNmIwYzE1MTQ4MG
ZjIiwidCI6ImRmZGJlNDBlLWMzYjItNGYxYS1hYTM5LWY5YTQyY2NkOGEyZiIsImMiOjZ9

Appendix 2: Evacuation Center Assessment Form

General

Facility Number: ____________ Ownership: ____________ Date: ____________
Facility Name ____________ Time: ____________
Owner's Name: ____________ Primary Use: ____________
Owner's Phone: ____________ Owner's Email: ____________
Department: ____________ Village/Community: ____________
Latitude: ____________ N Longitude: ____________ W Elevation: ____________ m
Approximate Age of Construction: ____________ Status: ____________
Furthest Community Served: ____________ km Approximate Total Population Served: ____________
Maximum Occupancy: ____________ Male Population: ____________ Female Population: ____________
Population Under Age 5 ____________ 'opulation Over Age 60: ____________ Disabled Population: ____________
Source(s) of Population Data ____________

Site

Brief Site Description: ____________

Number of buildings: ____________ ccess Route Difficulty: ____________ Cooking Space: ____________
Topography: ____________ Site Handicap Accessibility: ____________
Landslide Vulnerability: ____________ Retaining Walls: ____________ Apparent Erosion Issues: ____________
Located Within Flood Plain: ____________ Drainage/Flooding Issues: ____________ Vector Risks: ____________
Other Safety Risks or Challenges Present: ____________ Proximity to Healthcare Services ____________ km
If yes, describe: ____________

WASH

Primary Water Source: ____________ Backup Water Source: ____________
Groundwater Depth: ____________ m Primary Source Depth: ____________ m Backup Source Depth: ____________ m
Primary Source Capacity: ____________ m^3/hr Backup Source Capacity: ____________ m^3/hr
Primary Source Availability: ____________ hr/day Backup Source Availability: ____________ hr/day
Primary Energy Source: ____________ Backup Energy Source: ____________
Primary Energy Source Availabilit ____________ hr/day ackup Energy Source Availability: ____________ hr/day
Pump: ____________ Power: ____________ kW Flow: ____________ m^3/hr Head: ____________ m
Number of Storage Tanks: ____________ Total Water Storage Capacity: ____________ m^3
Storage Tank Material: ____________ Storage Tank Condition: ____________
Location of Storage: ____________ Tank Support Condition: ____________
Distribution: ____________ Pipe Material: ____________ Number of Taps: ____________
Water Treatment: ____________ If other, describe: ____________
Water Notes: ____________

Number of Toilets: ____________ Type of Toilets: ____________ Number of Hand Washing Taps: ____________
Toilet Location: ____________ Toilet Block Condition: ____________
Handicap Accessibility of Toilet Facilit ____________ Separate Male/Female: ____________
Wastewater Disposal: ____________ Disposal System Condition: ____________
Hand Soil Classification ____________ Suitability for Onsite Disposal: ____________
Sludge Disposal Practic ____________ Solid Waste Disposal Practice: ____________
Sanitation Notes: ____________

Building1:

Number of Rooms: ________ Ground Floor Area: ________ m^2 Ground Floor Capacity ($3.5m^2$/person): ________

Number of Stories: ________ Total Building Area: ________ m^2 Total Building Capacity ($3.5m^2$/person): ________

Floor Plan Sketch (with dimensions)

Wall Construction: ________

If other, describe: ________

Ground Floor Construction: ________

If other, describe: ________

Roof Construction: ________

If other, describe: ________

Roof type: ________

If other, describe: ________

Lateral Force System: ________

If other, describe: ________

Seismic Vulnerability Rating: ________ Condition of building: ________

Wind Vulnerability Rating: ________

Vulnerabilities/Damages Observed: ________

Foundation Work Needed: ________ Roof Replacement Needed: ________

Roof to Wall Attachments Needed: ________ Beam Repairs Needed: ________

Wall Work Needed: ________

Handicap Accessibility of Building: ________

Additional Notes: ________

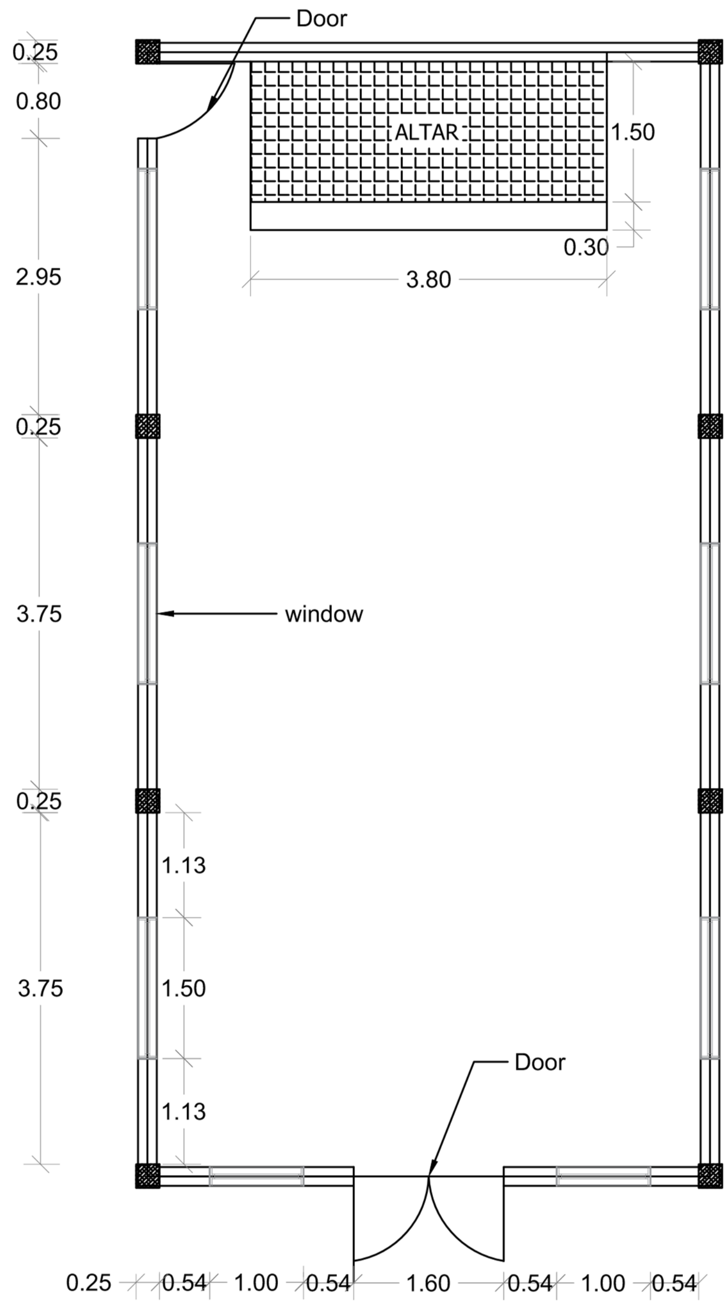
Building

GPS Location

latitude (x.y °) ________ altitude (m) ________

longitude (x.y °) ________ accuracy (m) ________

Appendix 2: Sketch of "Église Baptiste Monneron, Miragoane, Department of Nippes"



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4. Cours d'Abris Gestion des Abris Matériel de Référence Générale, Mai 2010
5. WCDO NABuRRS 72OFDA19CA00087 Baseline Report
6. Shelter Assessment on the field (Nippes, Sud-Est, Sud, Grand'Anse)