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AFTER HURRICANE MATTHEW

RESOURCES, CAPACITIES, AND PATHWAYS TO RECOVERY AND RECONSTRUCTION OF DEVASTATED COMMUNITIES IN HAITI

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After Hurricane Matthew:
Resources, Capacities, and Pathways to Recovery and Reconstruction of Devastated Communities in Haiti

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May 2017
Port-au-Prince, Haiti

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EXECUTIVE SUMMARY

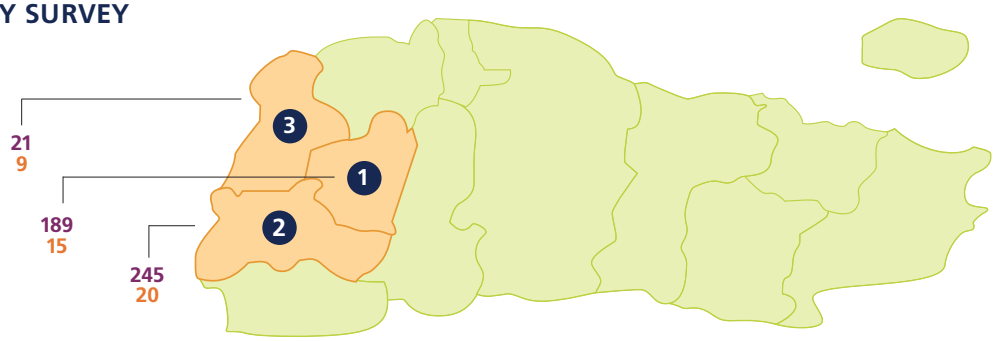
On October 4, 2016, a category 4 storm, Hurricane Matthew, devastated the southern region of Haiti. In its aftermath, the Interuniversity Institute for Research and Development (INURED) in collaboration with the Center for Haitian Studies (CHS) and Project Medishare (Medishare) implemented a post-disaster study in the most affected regions of the departments of Grande-Anse and Sud. The objectives of this mixed methods study, which included surveys, focus group discussions, in-depth interviews, ethnographic observation, and mapping, were to (a) determine the impact of the disaster on affected communities, (b) assess these communities' perceived needs, and (c) identify and map local resources and assets that are critical for an equitable recovery and reconstruction. The findings revealed that while disaster remains an existential threat to Haiti due to its geographic location, high levels of poverty, institutional fragility, minimal resources, deforestation, poor urban planning, limited infrastructure, and the threat of climate change, limited investments have been made in disaster preparedness. Less than half of all survey participants reported that disaster warning systems existed, and many of these individuals questioned their efficacy. While the Haitian government reported that there were more than 1,300 temporary shelters nationwide, survey and ethnographic data revealed that the dilapidated shelter system, which reflected poor construction practices throughout the country, contributed to the population's vulnerability during the disaster.

POST-DISASTER STUDY SURVEY

Grande-Anse Department

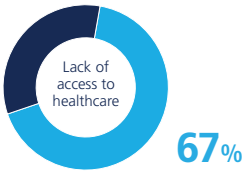
1. Chambellan
2. Anse d'Hainault
3. Dame Marie

Household Surveys
Community Leader Surveys



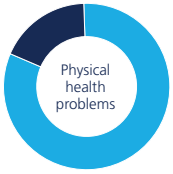
FINDINGS (BASED ON SURVEY RESPONSES)

HEALTHCARE



67%

PHYSICAL HEALTH

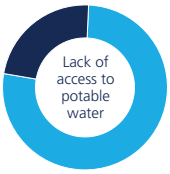


82%

MENTAL HEALTH

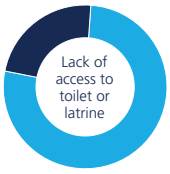
64%

POTABLE WATER



77%

TOILET OR LATRINE

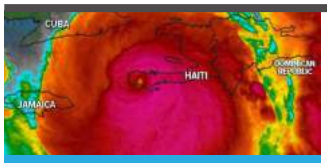


76%

RECOMMENDATIONS

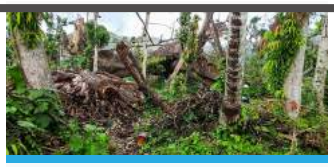
- The Government of Haiti (GoH) should establish agricultural banks that provide loans to local farmers associations, women's organizations, and cooperatives.
- The GoH should hire agricultural extension workers and veterinarians to revitalize crop production and animal husbandry in the impacted communes.
- The Ministry of Agriculture (MOA) should collaborate with the faculty of agronomy at universities to conduct scientific investigations to identify solutions to pest threats to agriculture and livestock in the impacted areas.
- The MoA should collaborate with the faculty of agronomy at universities to survey and catalog rare, indigenous trees that have been destroyed in the region for replanting and reforestation.
- The GoH should earmark funds to provide free schooling and supplies to the victims of the disaster.

PROJECT TIMELINE



OCT 4
2016

Hurricane Matthew hits southern region of Haiti



OCT 10
2016

INURED self-funds a preliminary assessment of the impact of Hurricane Matthew on the Grand Sud

NOV
2016

CHS and Medishare grant funds to help INURED implement the study

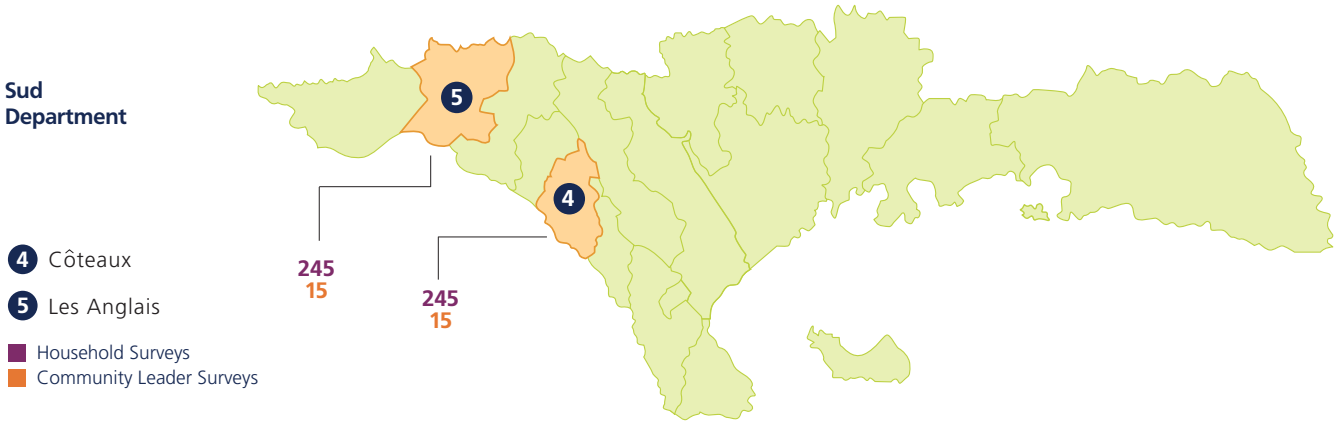
DEC
2016

Study implementation begins

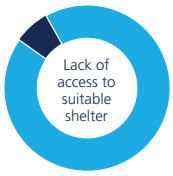
AFTER HURRICANE MATTHEW

The impact of the disaster continues to be felt more than 6 months later. Many have lost family members who have not been accounted for in official reports. The majority of study participants still lacked a suitable place to live (93%), access to potable water (77%), and a toilet or latrine (76%). The majority (82%) of study participants reported suffering post-Matthew illnesses ranging from dysentery to malaria. Not surprisingly, study results also show a positive correlation between lack of access to proper sanitation and poor physical health. Most notable is that the level of devastation caused by the hurricane resulted in 78% of study participants suffering from distress, and 64% reported that at least one member of their household experienced mental health issues. The damage done to the environment devastated the agricultural and fisheries sectors, posing immediate threats of food security (for 96% of participants), and loss of economic livelihood (for 90% of participants).

In the face of such great need, aid has been consistently characterized as insufficient, which has been followed by accusations of the politicization of aid. Thus, any intervention that aims to assist communities in recovering and rebuilding must, necessarily, build on existing community assets: land ownership, which can serve as the basis for the development of financial instruments (e.g., loans, credit) and enable individuals to relaunch gainful economic activities; cooperative networks, which can be used as leverage to promote community-based recovery and reconstruction initiatives; and local capacity, which must be used to strengthen local skills and leadership while also promoting the long-term sustainability of projects.



SUITABLE SHELTER



93%

- The GoH, international organizations, and NGOs must maximize the use of local materials from the communes they serve in construction and other forms of intervention.

FOOD

96%

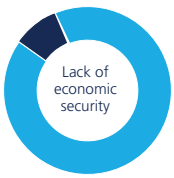
- The GoH, international organizations, and NGOs must commit to hiring local professionals from affected areas in reconstruction and infrastructure projects.

RELIEF AID

79%

- The Ministry of Education should support school canteens that use local agricultural products.

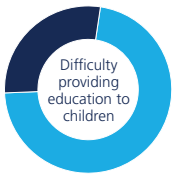
ECONOMIC SECURITY



90%

- The GoH, international organizations, and NGOs should provide tools for debris removal.

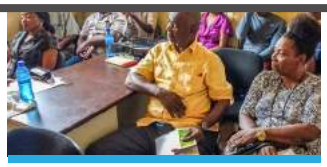
CHILDREN'S EDUCATION



73%

- The GoH should establish mini-health clinics in the communal sections staffed by community health volunteers.

Source: Mapping Assets-Access for Equitable Recovery and Reconstruction Study 2017.



FEB
2017

Study implementation ends.

Presentation of preliminary results to the Consortium of civil society organizations in Haiti

MAR
2017

Presentation of preliminary results with the Consortium of civil society organizations to Haiti's Prime Minister.

Restitution meetings of preliminary study results conducted with mayors' offices in Anse d'Hainault, Chambellan, Côteaux, Dame Marie, and Les Anglais.

APR 9-10
2017

Project Medishare medical mission in Chambellan in response to study results

APR 27
2017

University of Miami Institute for Advanced Study of the Americas Town Hall meeting to disseminate study results

“The study is significant because it implicates the communities most affected by Hurricane Matthew in local recovery and reconstruction efforts. It lays the groundwork for better understanding of disaster preparedness and recovery among vulnerable communities.”

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“In just under 15 years, Haiti has experienced eight major disasters, including Hurricane Matthew, affecting more than half of its population and to which over 229,000 deaths have been attributed.”

Marcelin, Cela & Schultz, 2016

INTRODUCTION

Large-scale disasters, which exceed the current coping capacity of socio-ecological systems, are increasing. An important feature of these disasters is the striking inequality between vulnerable groups in urban and rural areas most exposed to them and those better positioned to prepare for and respond to these events. Compounding this unequal impact on vulnerable communities are the fragilities of weak governance and civic institutions in Haiti. An even larger gap exists for remote communities that have extremely poor resources and infrastructure, low levels of formal literacy, and high levels of social and cultural marginalization. In just under 15 years, Haiti has experienced eight major disasters, including Hurricane Matthew, affecting more than half of its population and to which over 229,000 deaths have been attributed (Marcelin, Cela, & Schultz, 2016). The economic losses resulting from these disasters surpassed those from 1950 to 2000 about 20 times (World Bank, 2015). For each of these major events, billions of dollars have been spent by the local government, humanitarian aid organizations, and international donors. Too often, these responses have failed to recognize and bypassed local assets and capacity, thereby exacerbating the vulnerability of the Haitian population.

In the aftermath of Hurricane Matthew, INURED collaborated with the Center for Haitian Studies in Miami and Project Medishare around the development and implementation of a post-disaster study in Haiti. The overall objectives of the study were to (a) determine through quantitative and ethnographic approaches the impact of the disaster on the affected communities in the Sud and Grande-Anse, (b) assess the perceived needs of those communities, and (c) identify and map local resources as assets that are critical for an equitable recovery and reconstruction. The study was based on the conceptual model Assets-Access-Time approach, which posits at its core the notion that each household, community, and locality has a basic bundle (Rubin, 2009) of resources (assets) and human and social capacity (access) that can be inventoried and defined in operational terms (Siembieda, 2010) for a sequential (time) planned recovery and reconstruction (Olshansky, Hopkins, & Johnson, 2015). Understanding the nature and function of these assets and the ways capacity is constructed can lead to innovative methods of productive knowledge sharing, mitigating vulnerability through integrated and adaptive risk governance (Chaffin & Gunderson, 2016). Thus, the following research question guided this study: What is the nature of the affected communities' assets, local capacity, and time compression, and how can this knowledge be leveraged to respond to the perceived needs for an equitable recovery in the affected areas in southern Haiti?

The study is significant because it implicates the communities most affected by Hurricane Matthew in local recovery and reconstruction efforts. The participatory approach and community level of analysis constitute an innovative framework for a theoretical understanding of local capacity in fragile contexts where level and type of risks often exceed the capacity of coping mechanisms within vulnerable populations. The research strategy embraced in this study lays the groundwork for better understanding of disaster preparedness and recovery among vulnerable communities. It is our hope that the study will inform the design of disaster-related support systems at the state and local government levels in communities across Haiti. Data from this study can help leverage and align local communities' perceived needs with available institutional resources from national and international organizations. The results also provide pathways for strengthening the feedback mechanism between poor communities and government entities in terms of communication and cultural practices.

“[The Haitian population is] one of the most exposed in the world to natural disasters [with] a higher number of disasters per km² than any other country in the Caribbean and Central America.”

World Bank, 2015:14

BACKGROUND: THE IMPACT OF NATURAL DISASTERS ON HAITI

Roofless public school, Côteaux, February 2017

Political, economic, and social instability have been a constant feature of social life in Haiti for the past several decades. Haiti ranks poorly in terms of political rights and civil liberties (Freedom House, 2015). The labor market absorptive capacity remains limited, while investments in public services such as health and education have been among the lowest in the Caribbean region (UNESCO, 2013; World Bank, 2015; WHO, 2015). Further, weak governance has resulted in poor urban planning, over-centralization of services, massive deforestation, and disproportionate migration from rural areas to urban centers. These factors exacerbate the threat of climate change while rendering the Haitian population "one of the most exposed in the world to natural disasters" with "a higher number of disasters per km^2" than any country in the Caribbean and Central America (World Bank, 2015:14). Combined, these factors have made complex emergencies an existential threat for Haitian society and its core institutions. This is evident when one examines the impact of natural disasters on Haiti over the past 12-year period (see Table 1).

Extreme poverty disproportionately affects Haitians living in rural areas such as those directly affected by Hurricane Matthew in the southern region of Haiti. Limited access to safety nets render the average Haitian vulnerable to the damage, and disruptions of daily life, caused by natural disasters (Shultz, Cela, Marcelin et. al., 2016). The impact of Hurricane Matthew on the southern region of Haiti is set to continue this trend with total estimated damages of USD 2.78 billion (Government of Haiti [GoH], 2017).

The amount of resources required to mitigate and prevent risks as well as to respond to serial disasters in Haiti exceeds what international organizations and donors have made available to the country through their aid packages. This reality calls for Haitians, through their government, civic and social institutions, at both national and community levels, to make risk mitigation and preparedness a central priority as well as an integrative part of the country's development. This study set out to identify the resources and assets upon which the communities most affected by Hurricane Matthew as well as external and national institutions can build recovery and reconstruction efforts. It is also an attempt to engage Haitian institutions and civil society organizations as well as international partners working in Haiti in critical reflection on how to reduce risks and prepare for future disaster events in the country.

TABLE 1: SUMMARY OF DISASTERS IN HAITI OVER THE PAST 12 YEARS

Event	Effect on GDP	Individuals Affected	Death Toll
2004 Hurricane Jeanne*	7%	300,000	5,000
2007 Hurricanes Dean & Noel*	2%	194,000	330
2008 Hurricanes Fay, Gustav, Hanna, and Ike*	15%	1,000,000	800
2010 Earthquake*	100%	2,000,000	222,500
2010 Cholera Epidemic**	No data	794,683†	9,495
2010 Hurricane Tomas***	No data	No data	35
2016 Hurricane Matthew*	25%	2,100,000	546
TOTAL		**5,594,000**	**238,706**

Sources: *Government of Haiti, 2010, 2016; **MSPP, 2016, 2017; †Suspected cases between 2010 and 2016 (MSPP, 2016) ***Pasch and Kimberlain, 2011.

“If you declare an area uninhabitable, you must have a place to relocate residents. They want us to relocate coastal residents, but to where?”

Mayor of Côteaux

HURRICANE MATTHEW: POST-DISASTER STUDY

Fieldwork site in Mathieu, Côteaux, February 2017

Methodology

The study employed a multidisciplinary and participatory approach that included ethnography, household surveys, community leader surveys, community and household asset-access mapping, as well as historical and political analysis. A participatory needs assessment was conducted that entailed listening to local constituents' perspectives on the impact of Hurricane Matthew on their lives as well as community needs to inform recovery and reconstruction efforts.

Quantitative Data:

The community leader and household surveys drew from the Humanitarian Emergency Settings Perceived Needs Scale (HESPER), developed by the World Health Organization (WHO), adapted after Haiti's 2010 earthquake. INURED, with the written authorization of WHO, modified the HESPER tool for this study. The surveys also included a module that drew from an Assets-Access instrument, also adapted by INURED. A post-disaster interview schedule was also developed by INURED. All instruments were pilot tested in Haitian Créole.

Sampling strategy for household survey:

Several observations have guided the sampling scheme for this study. First, there was no list of households available in the post-disaster context of the study. Second, the population was largely spread out in shelters and/or makeshift camps in both rural and urban areas impacted by the disaster. Third, we took into account results from the government of Haiti's Post Disaster Needs Assessment (PDNA), implemented from October 8 to November 28, 2016 (GoH, 2017), which documented that the severity of the disaster was, within all proportions, equally distributed in the Sud and Grande-Anse. Based on these observations, the preferred sampling scheme consisted of cluster sampling at three levels of stratification. At the first level, a commune and its communal sections were selected randomly from the list of impacted communes in the administrative/geographic divisions in the Sud and Grande-Anse (see Figure 1 for administrative division and sample in Table 2). Within the selected commune and its communal sections were defined segments of what the Institut Haïtien de Statistique et d'Informatique (IHSI, 2003) called the sections d'énumérations (SDE). At the second level, clusters have been chosen randomly in the list of SDEs for these communes. At a third level, within each selected cluster, 21 *ménages* [households] have been chosen randomly in a way that each household has an equal chance to be represented. Shelters and makeshift camps have been included in the study in order to provide representative communal estimates. Given that this population is in flux, we have used the most updated data from the United Nations' Office for the Coordination of Humanitarian Affairs (OCHA) to determine final sample size estimates. For the survey aspect of this study, we have used one (1) eligible respondent per household to answer the questionnaires.

In total, 984 household surveys and 69 community leader surveys were completed across 25 localities in the Grande-Anse and Sud departments. Inclusion criteria for this study were males and females age 18 and over living in selected communes. Males and females with mental disabilities who did not have the capacity to understand the questions being asked were excluded. Selection of community leaders was purposeful. The community leader and household surveys were implemented in five communes, 12 communal sections, and 25 localities (see Table 2).

TABLE 2: HOUSEHOLD SURVEY SITE SELECTION

Department	Locality	Communal Sections Covered	Actual # of household surveys	Scheduled # of household surveys	Actual # of community leader surveys
Grand-Anse	Chambellan	1st and 2nd	189	189	15
	Anse d'Hainault	1st, 3rd and 4th	255	245	15
	Dame Marie*	1st (Barriadèle)	21	21	9
Sud	Côteaux	4th, 5th and 6th	245	245	15
	Les Anglais	1st, 2nd and 3rd	274	245	15
Total			**984**	**945**	**69**

***Dame Marie was selected for ethnographic approach only, except for the 1st communal section of Barriadèle.**

Highway in Sud department, January 2017

Qualitative Data:

The qualitative aspect of the study included 23 focus group discussions, 60 in-depth interviews, ethnographic observations, and mapping.

Human subject protection:

An Institutional Review Board (IRB) protocol was developed and IRB authorization was obtained through INURED's IRB, which is federally recognized in the United States.

Field Teams:

Fieldwork was conducted by five field teams: four survey teams and one ethnographic team. Survey teams consisted of one INURED field supervisor and five surveyors, while the ethnographic team included six INURED researchers. INURED used a participatory model that included 20 community members trained to serve as surveyors in their respective localities. Training was provided in Port-au-Prince to INURED's supervisors and the ethnographic team. Training for community members was provided in Les Anglais for the Les Anglais and Côteaux teams and in Anse d'Hainault for the Anse d'Hainault/Dame Marie and Chambellan teams. INURED supervisors and ethnographers participated in both trainings.

Damaged road in Port Salut, February 2017

Findings

Characteristics of Study Participants:

Just under 1,000 households (984) participated in the Mapping Assets-Access for Equitable Recovery and Reconstruction study. Across localities, women represented just over three-fifths (61.5%) of all participants in the household survey. Heads of households aged 45 or over represented just over half (52%) of the sample. Just under half (48.75%) of all participants reported living in a household with four to six additional family members, which is consistent with national census data (Ministère de la Santé Publique et de la Population [MSPP], 2013).

Study participants' level of education was low across sites. In Les Anglais, 32% of all participants had no formal schooling, while 29% reported having started but not completed primary school. In the remaining three localities, the majority of participants reported some primary level schooling, with Chambellan reporting the highest rates at 45%, followed by Anse d'Hainault and Côteaux at 33% and 30%, respectively. While most participants in the three localities had some form of schooling, a significant portion of study participants reported no formal schooling (see Table 3).

The majority of study participants (70%) reported that they or a family member owned the land on which they lived, with Chambellan reporting the highest rate of land ownership at just under 80% and Les Anglais reporting the lowest at 60%.

Disaster Preparedness:

Survey participants were asked which hazards posed the greatest threat to their communities. Included among the choice options were flooding, hurricanes, earthquakes, tidal waves/tsunamis, and landslides. Participants from coastal towns such as Anse d'Hainault and Côteaux reported hurricanes and tidal waves/tsunamis as the greatest threat to their communities. In both towns, residential communities have been established within yards of the sea. The mayors' offices grappled with how to protect these residents: "If you declare an area uninhabitable, you must

TABLE 3: PARTICIPANTS' LEVEL OF EDUCATION

Education	Anse d'Hainault	Chambellan	Côteaux	Les Anglais
Some primary	33%	45%	30%	29%
Completed Primary	10%	10%	12%	12%
Some Secondary	19%	17%	25%	18%
Completed Secondary	4%	5%	5%	7%
Some University	3%	2%	3%	0%
Completed University	4%	0%	3%	2%
No Formal Schooling	27%	21%	21%	32%

Source: Mapping Assets-Access for Equitable Recovery and Reconstruction Study, 2017.

have a place to relocate residents. They want us to relocate coastal residents, but to where?" (Mayor of Côteaux). Both towns had large seaside populations that were hard hit by Hurricane Matthew. However, concerns regarding relocation were not limited to residences but also included communal spaces. Anse d'Hainault and Côteaux had seaside cemeteries that posed unique challenges that were only heightened in the aftermath of the 2016 disaster, as this community leader in Anse d'Hainault pointed out: "The cemetery needs a new location. Pigs enter and eat the cadavers!"

Participants from Chambellan and Les Anglais, on the other hand, reported hurricanes and flooding as the greatest threats to their communities. It should be pointed out that Chambellan and Les Anglais are bordered by the Grande-Anse and Les Anglais rivers, respectively. During focus group discussions and interviews, the need to properly protect riverbanks was reported as a priority, as flooding posed a serious threat to local residents in both sites. Residents lamented how these rivers destroyed arable land and, in more severe cases, cost some their lives. Although the town of Les Anglais is also on the southern coast of Haiti, the threat posed by the river was imminent: "Over the past decade, the river has grown from 13 to over 300 meters, in some places. We need to deal with the river!" (Representative, Office of the Mayor).

Disaster remains an existential threat to Haiti due to its geographic location, high levels of poverty, institutional fragility, minimal resources, deforestation, poor urban planning, and limited infrastructure, which are exacerbated by climate change (Marcelin et al., 2016). Despite this fact, only 10% of community leaders surveyed reported any awareness of disaster preparedness initiatives being carried out in their local communities prior to Hurricane Matthew. Disaster preparedness in Haiti entailed warning citizens of impending hazardous events.

Côteaux cemetery, January 2017

DJ in Chambellan hired to alert residents, February 2017

Early Warning Systems:

Prior reporting of disaster preparation for Hurricane Matthew in Haiti (Charles, 2016) emphasized the existence of the Directorate of Civil Protection and its regional personnel and volunteers going door-to-door to inform citizens of the impending hurricane. Among survey participants, 46.6% reported that they were aware of the existence of a warning system at the time of the hurricane. For these survey participants, warning systems consisted mainly of radio broadcasting, which did not reach many areas where the disaster hit. Field ethnography revealed that warning residents in rural areas posed particular challenges given their remote location in the mountains, especially during the inclement weather that precedes hurricanes. In addition, participants reported that lack of access to energy, lack of resources to purchase battery-powered radios or batteries precluded them from benefitting from early warning systems. Alternative means of communication relied on hiring DJs from rural communities to warn rural residents through *teledyol* (word of mouth) using their microphones.

Though 46.6% of survey participants were aware of an alert system, its efficacy was called into question as several issues came into play. During focus group discussions and interviews, many complained that the warnings came too late:

> "We did not know about it until the day it happened. We heard that there would be a hurricane, but we were not prepared for that." (Female vendor).

The hurricane hit during a contentious election season, resulting in the politicization of warning messages:

> "There were announcements but the problem is that the people distrust the government, and now you had a transitional government so people were skeptical. It was also election season… The government does not have a record of doing anything for the people so why would they listen now?" (Male agronomist).

Destroyed chapel used as shelter, Chambellan, January 2017

According to study participants, some messengers wore political party t-shirts creating skepticism among opposition groups who believed the warnings to be a strategy to increase the party's visibility. Finally, the continued marginalization of the rural population and absence of any viable structural supports, such as temporary shelters, rendered such last-minute warnings ineffective:

> "Well, the education level here is much lower, and people were already vulnerable. Where were they supposed to go? What were they supposed to do? If those of us in town were alerted the day of the hurricane, do you think those in the rural areas received any warning?" (Female leader).

Shelters and Local Construction Practices:

Local officials in Haiti have reported that the country has a vast network of 1,300 shelters with a capacity to house approximately 340,000 people (Charles, 2016). More than half (54%) of the community leaders interviewed reported that there were no temporary shelters available in their communities. Focus groups, interviews, and observation data revealed that schools and chapels were the most commonly designated temporary shelters. Many of these structures were not structurally appropriate to be designated as shelters in the first place. Some designated shelters were already in disrepair prior to the event. When the hurricane hit, most shelters were severely damaged, often losing their rooftops, if not altogether destroyed. In Chambellan, the local chapel had already been decrepit prior to the hurricane, and its roof collapsed at the onset of the disaster, forcing residents who sought refuge there to escape to a privately owned cement-block home a few yards away. During a focus group discussion, the group complained of another designated shelter in town that was inaccessible during the disaster: "The school we call a shelter is located in a flood zone, so no one could get to it during Matthew!" Field observations revealed that most schools and chapels across towns in the Grande-Anse and Sud suffered serious damage while others were destroyed. What the data reveal is that the temporary shelter system in the Grande-Anse and Sud, in many instances, does not contribute to disaster preparedness and may, in fact, contribute to the population's vulnerability during a disaster.

Ethnographic data reveal that the precarious shelter system reflects a larger issue in the country, the failure to enforce, and in some cases establish, sound construction codes. As one community member revealed in Côteaux: "The mayors' office has a civil engineering committee that has established construction laws; however, they lack the resources to enforce those laws." Local construction practices were identified as a major impediment to disaster preparedness during focus groups and interviews. Moreover, in a post-disaster context where many people are rebuilding their homes with limited resources, the problem has only magnified as this community leader points out: "Now, everyone is a construction worker!" This is yet another case of history repeating itself as the high death toll of the 2010 earthquake in Port-au-Prince has been largely attributed to poor building practices, the use of inappropriate materials, and construction in high-risk areas. As one community leader explained, "The earthquake happened, Matthew happened, and we continue to follow the same patterns. Nothing has changed."

Field observations reveal that most institutions and homes have yet to rebuild. In many cases, metal sheets and tarpaulins, often distributed as part of the relief effort, have been used to render homes, schools, and chapels functional in the short-term. However, 93% of survey participants reported that their communities had no access to the resources necessary to rebuild these structures using sound construction techniques nor the proper materials. Many complained about

the short-sightedness of the relief effort: "There are houses that have been destroyed, and we had hoped that they would have helped us rebuild them instead of giving us a little food and some tarps." With the next hurricane season only a few months away, many are more vulnerable now than they were before Matthew.

Impact of Hurricane Matthew on Affected Communities

Hurricane Matthew devastated the Grand Sud with official government reports of a death toll at 546 and more than 175,000 displaced persons (Office for the Coordination of Humanitarian Affairs [OCHA], 2017). However, ethnographic data suggest that the death toll may be much greater, as many rural peasants explained that they had had no contact with government officials or aid workers in order to tell them how many family members they lost since the disaster (as of March 11, 2017, more than 5 months after the event). In the third communal section of Cosse, a group of residents shared that at the time of the event they were farming land *nan otè – dans les hauteurs* [in the hinterlands] along the Sud and Grande-Anse borders, and several Hurricane Matthew widows shared their stories of loss: "We went to farm our land. When we go, we stay for 3 to 4 days, and we sleep outside because it is far away. We lost our husbands, and now all we have is each other." One woman watched the hurricane winds carry her husband's body away. His body would later be found in the Voldrogue River in the Grande-Anse, several miles from the highland where they farmed. According to these widows, they did not know that a hurricane was about to hit the region and were caught by surprise. Based on many accounts by small-scale farmers in Cosse, dozens of family members and neighbors lost their lives and were not counted among the dead. Similar reports emerged in interviews in the following localities: Danglise and Chombert in the commune of Abricots; Lafitte and Morne Roc in the commune of Chambellan; and Morne Bellevue in the commune of Les Anglais.

The impact of the disaster continued to be felt throughout the southern region of Haiti 5 months after the event, deeply affecting people's lives and the local economy. According to the government of Haiti (2017), as of January 2017, more than 120,000 structures had been severely damaged or altogether destroyed by Hurricane Matthew. At the same time, over 93% of study participants reported that they no longer had a suitable place to live. Many expressed disappointment with relief efforts that provided no support to rebuild homes, schools, or other communal structures. Moreover, in the absence of such needed aid, many resigned themselves to continuing to live in this cycle of vulnerability: "I don't have the means to build a cement house; I can only build a shack. That's what we'll always do because we don't have the money and no one is thinking about us" (Female resident of Côteaux). With housing remaining a critical issue, the disaster's impact has increased the vulnerability of the overall population.

Water, Sanitation, and Hygiene (WASH):

Hurricane Matthew compounded water and sanitation issues that pre-dated the disaster. Access to potable water and services is limited throughout Haiti and even more so in the Grande-Anse (Ahmed, 2016b). Seventy-seven percent of all survey respondents reported that access to potable water for drinking and cooking was a serious problem in the post-disaster context. Several water initiatives were observed in both the Sud and Grande-Anse. However, ethnographic data have shown that water access remained an issue for those residing in remote areas, as water stations were often located in towns. Even in those locations, solar paneled water stations often failed to meet local demand, particularly in the late afternoons and during inclement weather. Sensitization efforts encouraging the use of clean water need strengthening, as local residents did

Children at natural water source, Grand Fonds, Moron, February 2017

Destroyed home in Digo, Côteaux, February 2017

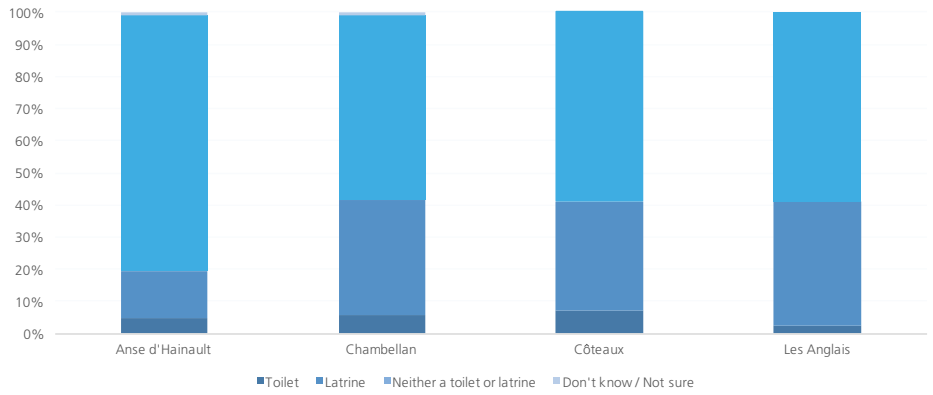
Outhouse in Chambellan, February 2017

not understand that more easily accessible, natural water sources (such as rivers, aquifers, or *sous dlo*) were contaminated. Participants often refused to use the Aquatabs they had received as part of the relief effort because, "It makes the water taste bitter." Another household study conducted in southwest Haiti in 2011-2012, also found resistance to the use of Aquatabs, as it was believed that they "contribute to cancer or reduce an individual's ability to fight disease" (Earth Institute, 2013: 93). Interviews and focus groups showed that Aquatabs were distributed to the population with no information on how to use them, why they were important to use after the disaster, or the health consequences of not using them.

Physical Health:

With limited sanitation services and poor infrastructure (World Bank, 2015), the preference for natural water sources renders much of the population vulnerable to maladies and disease. Further compounding their vulnerability is the population's limited access to toilets and latrines. Among survey participants, only 4% reported having access to a toilet, with a higher rate of participants, 20%, reporting access to a latrine. Most notably, more than three-quarters (76%) of survey participants reported that they did not have access to either a toilet or latrine. In a 2011-2012 study of 10 communes in southwest Haiti, more than half (56%) of all households reported that they did not have access to any sanitation facilities (Earth Institute, 2013). In the current study, Anse d'Hainault stands out among all the sites, with less than one-fifth of respondents having access to a toilet or latrine (see Graph 1). During a focus group discussion among community leaders in Anse d'Hainault, this issue was raised as a priority: "Just about every space in town has become a site for defecation. We need a place where waste can be discarded!"

GRAPH 1: ACCESS TO TOILET OR LATRINE



Source: Mapping Assets-Access for Equitable Recovery and Reconstruction Study, 2017.

Accordingly, study results revealed a correlation between access to a toilet or latrine and self-reported serious physical health problems. The rate of participants reporting serious health problems increased sharply when comparing individuals with access to a toilet (57.45%) to individuals with access to a latrine (80.47%). This trend continued to rise to 86.76% for those with neither a toilet nor latrine (see Table 4). While survey data suggest that even those with access to a toilet or latrine are vulnerable to health problems, ethnographic observations provided further insights into the matter. For example, many latrines were observed to be shared by multiple families. Latrines were often observed on or near school grounds to provide access to

students. However, as was observed in several sites, these latrines may also serve local residents (whose children often attended the school in question). This situation lends itself to issues of maintenance and hygiene that contribute to poor physical health even among those with access to a latrine.

TABLE 4: ACCESS TO TOILET OR LATRINE AND PHYSICAL HEALTH

Physical Health	Toilet		Latrine		I have neither a Toilet or Latrine	
	N	%	N	%	N	%
Missing Data			1	0.34	3	0.48
Serious Problem	27	57.45	239	80.47	544	86.76
Not a Serious Problem	19	40.43	57	19.19	79	12.6

Source: Mapping Assets-Access for Equitable Recovery and Reconstruction Study, 2017.

Physical health was a major concern across sites, with 82% of survey participants reporting serious health problems. With regard to health history, less than two-fifths (39%) of survey respondents had received a tetanus vaccination, with women reporting slightly higher rates (40%) than men (37%). Survey participants were asked to identify any illnesses they suffered after Hurricane Matthew. The most commonly reported illness suffered by survey participants following the disaster varied by locality. In Anse d'Hainault, the most commonly reported illness was in the category "Malaria/Chikungunya/Zika." In Côteaux, "body aches and pains" were the most commonly reported illnesses suffered by survey participants. In Chambellan and Les Anglais, the most commonly reported illness suffered was dysentery. Ethnographic data revealed that cholera was a major concern for study participants prior to the hurricane while common colds [*grip*] and dysentery [*kolorinn*] became a major preoccupation in all localities following the disaster. Throughout the study, participants complained about dysentery, its severe nature, and the similarity of symptoms with cholera: "There is this illness called *kolorinn* [dysentery] that's devastating the community. It can last 8 to 15 days…The person will go to the bathroom several times a day!" (Male, community leader, Chambellan). During focus group discussions in Anse d'Hainault, one health administrator expressed concern about the medical community's failure to intervene in this matter: "There is no standard intervention for dysentery. People are developing their own remedies for it because there has been no systematic intervention by health institutions." Much emphasis has been placed on preventing the spread of cholera, a campaign launched in the aftermath of the earthquake that continues through today. However, during several focus groups in February 2017, local health professionals criticized the central government for its lack of follow-through on a local cholera initiative: "The Ministry came and gave people the first [cholera] vaccination in November 2016. Patients were supposed to have the second shot within 15 days. Until today, we are still waiting for the second shot. We haven't heard from them at all." Thus, that particular intervention was, in their view, a waste of time and resources.

While physical illnesses in the aftermath of disasters are common, the level of devastation caused by Hurricane Matthew provides sufficient reason to explore its impact on the mental health of its survivors. The mental health needs of the people living in these devastated communities

Scabies infected mother and child, Chambellan, February 2017

Sick child in Chambellan, February 2017

Child with eczema, 2nd communal section Rigosse, Chambellan, February 2017

Infected child, 2nd communal section Rigosse, Chambellan, February 2017

have gone largely unmet as expressed by this local physician: "We need a mental health intervention, some people have lost everything!" Sixty-four percent of respondents expressed serious concern for the mental health of family members while more than three-quarters (78%) of participants reported suffering from distress. Yet, no mental health interventions were reported during the course of the study. Of greater concern is that more than two-thirds (67%) of study participants reported that they did not have access to adequate healthcare. Among the most common reasons given to explain this were the insufficient number of physicians or nurses at clinics/hospitals and the unavailability of prescribed medicines. One field team was approached by a healthcare professional from a local hospital who explained that while they prescribed certain medications to patients, they were aware that many were no longer available on the local market. She gave the team a list of medications to bring back to the facility to address that concern.

Emerging Health Epidemics:

In the aftermath of disasters, new epidemics often emerge in the most vulnerable communities. During the implementation of the study in January 2017, some participants mentioned the sudden emergence of skin irritation illnesses locally referred to as "gratel" [itching] or skin disease. By February 2017, ethnographic data revealed that *gratel* had become more common and had spread, at different rates, within various communities, particularly in the second communal section of Chambellan. During a week of ethnographic observation at a remote locality in Chambellan, more than 50 residents, ranging from 8-week old babies to senior citizens, lined up to have photographs taken of various emerging skin diseases in hopes that an intervention might be undertaken in the future. Upon returning from the field, INURED presented the data collected to the University of Miami's Miller School of Medicine for preliminary diagnoses of the skin diseases captured in the photos.

Among the illnesses identified were eczema, scabies, tinea capitis, lichen nitidus, and pruritus. The highly contagious nature of these diseases, which can be spread through direct contact and by sharing personal items, requires immediate intervention. Yet, no prior assessments appear to have captured the existence of these emerging diseases with most post-disaster health interventions focusing disproportionately on the spread of cholera. On April 9th and 10th, 2017, INURED and Project Medishare, upon the request of the mayors office in Chambellan, and in collaboration with the Chambellan local health clinic, returned to the site where the illnesses were most present to conduct an intervention. Over the course of those two days, more than 400 men, women and children were able to consult a team of Haitian and American dermatologists, wound care specialists, public health specialists and healthcare workers and were provided with medication for treatment. A more long-term strategy, however, will be needed to eradicate scabies and address other waterborne skin diseases that were treated. Epidemiology and ethnographic data collected by INURED suggest that these illnesses have begun to spread to the town of Chambellan and into the communal sections of bordering localities, including Anse d'Hainault, Dame Marie and Les Anglais. As growing internal migration was reported by study participants, principally to Port-au-Prince as employment opportunities in Jérémie and Les Cayes were limited, it is plausible that these diseases will spread to the capital if they remain untreated.

Agriculture and Food Security:

"The next few months will be critical. We are facing a serious problem of food security."
~ CASEC, Chambellan.

Haiti is a predominantly agrarian society in which rural areas, in particular, are disproportionately dependent upon agriculture. For this reason, significant efforts were made to examine the experiences of farmers and agronomists both before and after the disaster to better understand the hurricane's impact on the Grand Sud. During focus group discussions and interviews, farmers explained that they stored seeds in the *galata* [barns, garner] of their homes. Therefore, most farmers lost seeds that were vital to their agricultural activities: "We lost everything, our homes, our seeds. We have nothing!" Yet, as the farmers report, the devastating impact of Hurricane Matthew on the agricultural economies of the Grande-Anse and Sud only begins with the loss of seeds. They lamented the fact that many outsiders failed to understand the gravity of the situation, as this agronomist in Chambellan explained: "There needs to be an immediate recovery effort to help us remove trees from our land. Our crops are dying underneath them. We are in planting season, and farmers can't plant anything. If we don't remove these trees we will lose arable land and face serious hunger in the upcoming months!"

Observational data reveal that while efforts have been made to remove debris, particularly trees, from major roadways, 5 months after the disaster, many large, centennial trees have yet to be removed from communal spaces and private lands. As the typical Haitian farmer has access to the most rudimentary of tools (e.g., a machete), they do not have the appropriate equipment to clear the debris from their lands. In addition, the size and weight of some of these trees will require significant manpower for their removal. As an example, during an interview, the Mayor of Anse d'Hainault explained that he had to assemble a group of 16 men, daily over the course of 1 week, to remove one large tree blocking the single roadway that linked the towns of Anse d'Hainault and Les Irois to the rest of Haiti. Just as this roadway is a lifeline for these towns, land is a lifeline for small-scale farmers in southern Haiti. The loss of arable land not only compromises the ability of farmers and their family members to eat, it contributes to their overall economic insecurity.

While debris poses significant challenges to relaunching the agricultural sector of the Grand Sud, some of the trees that remain standing have recently been discovered to have died at the roots. These trees provided hope that, as one central government representative purported, "Nature will regenerate!" By February 2017, although these trees remained standing, many of them could not yield fruit because the hurricane had destroyed them. In the aftermath of Hurricane Matthew, Grande-Anse, in particular, was hit by ongoing rain showers for almost 1 month further devastating tubular crops, such as yams, sweet potatoes, and yucca. Local agronomists estimate that it will take years to produce many indigenous trees (see Table 5).

Debris on farmland in Grand Fonds, February 2017

Caterpillars threaten crops, February 2017

TABLE 5: ESTIMATED YEARS NECESSARY FOR REGENERATION OF INDIGENOUS TREES

Indigenous Trees	Years necessary for regeneration
Avocado	2 to 3 years
Breadfruit	4 years
Mango	3 to 5 years
Coconut	7 to 10 years

Source: Mapping Assets-Access for Equitable Recovery and Reconstruction Study, 2017.

Sweet potato crops destroyed by caterpillars, Grand Fonds, February 2017

Further, with no known census of indigenous trees and crops, unless efforts are made to retroactively identify and codify indigenous plants, whose seeds could be purchased from neighboring countries, many that are native to the region may never be seen again in Haiti.

The data begins to illustrate the impending threat of food insecurity for these areas. The data also shed light on survey results that indicated that 96% of households have serious problems accessing food in the aftermath of the disaster. During focus groups participants shared that the loss of crops and arable land left them without most of the fruits, vegetables, and tubular plants that they once enjoyed. Dietary habits, quite understandably, have begun to change as street vendors were observed serving rice and beans (staples of the relief aid effort) for breakfast, lunch and, in some instances, dinner. At the time of publication, none of the above-referenced produce could be found in the Grande-Anse unless brought in from other parts of the country. The population has now become dependent upon "imported" foods, from foreign countries and other regions of Haiti. What local farmers once cultivated for their own consumption, sale, and bartering, they now had to purchase at significantly higher prices. These producers were now consumers with very limited purchasing power.

Livelihood and Economic Security:

As study results suggest, the livelihood of the population is under serious threat, with 90% of participants indicating that economic security is a serious problem in the aftermath of the disaster. As data in the previous section illustrate, this phenomenon is particularly acute for those engaged in the agriculture sector. In the Grande-Anse and Sud, local cultivators and agronomists explained that the disaster exacerbated an already inefficient agricultural sector that lacked the modern tools to exploit natural resources, was threatened by deforestation, and was under attack by a series of pests. With national tree coverage rates very low—estimates range as low as less than 2% (United Nations Development Program [UNDP], 1996) to as high as 32.3% (Churches et al., 2014)—Haiti has been unable to produce enough food for its people leaving half of the population undernourished (WFP, 2017). Prior to October, food insecurity had already been identified as an impending threat for the nation (MSPP, 2013), and while Grande-Anse served

TABLE 6: PESTS THREATEN CROPS AND LIVESTOCK IN THE REGION

Pest	Department most affected	Characteristic
Caterpillars	Grande-Anse, Sud	Two types of caterpillars unknown to the farmers emerged after the disaster. These pests have crippled agriculture in the region studied: Chambellan, Anse d'Hainault, Dame Marie, Abricots, and surroundings.
MINUSTAH ants	Grande-Anse	Also called crazy ants. These ants have been destroying local maize, rice, and sweet potato crops for over 3 years.
Ti Mouton	Grande-Anse, Sud	A white-winged insect that has destroyed the production of local peanuts, once the primary crop in towns such as Tiburon, Les Anglais, Côteaux, and Chambellan.
Lougawou flies	Grande-Anse, Sud	Eats the skin and eyes of livestock, causing death.

Source: Mapping Assets-Access for Equitable Recovery and Reconstruction Study, 2017.

as its breadbasket (Marcelin et al., 2016) this region faced similar challenges of deforestation, though at a different scale. However, the disaster brought with it new threats, including two unknown types of *chenilles* [caterpillars], which have destroyed maize, yams, sweet potatoes, and other crops. As one cultivator explained, "These caterpillars won't let us live! We plant sweet potatoes, and they eat the leaves. We plant maize, and they destroy it!"

While the caterpillars were introduced after the disaster, other pests have been threatening their crops and/or livestock for some time with no known interventions on the part of the central government or international organizations (see Table 6).

As farmers struggle to recover from Hurricane Matthew, threats to their food security and livelihood remain constant. Historically, these largely agrarian communities have been critical to the nation's agricultural production, particularly the Grande-Anse, which suggests that the threat of food insecurity that they face today may become the food insecurity that the nation faces tomorrow.

Destroyed school in Durocher, Anse d'Hainault, February 2017

Food distribution in Anse d'Hainault, February 2017

Access to Education:

Many survey participants shared the impact that the hurricane has had on the education of their children. Ethnographic data collected from parents indicated that education had become a serious problem for them since the hurricane. Many drew our attention to the loss of materials such as textbooks, supplies, and even clothes and shoes that made returning to school difficult: "We lost everything in the hurricane—books, notebooks, even their shoes!" While it was expected that many children would be reported as out-of-school due to economic losses, what most educational administrators reported was that children were pulled out of school altogether to accompany or rejoin family members who had migrated to Port-au-Prince following the disaster. Ethnographic data also revealed that because of the food crisis, many parents in rural areas did not send their children to school. The following is a composite from a focus-group with parents in Digo (commune of Côteaux): "It takes 2 hours for the children to walk to school. They can be fed in the morning, but how are they going to find energy to come back home in the afternoon?"

Relief Aid:

Since late October 2016, relief efforts have been underway to address some of the immediate challenges posed by the hurricane. Focus group and interview data suggest that initial efforts provided access to potable water and/or Aquatabs, healthcare services, metal sheets, tarpaulins, and food. Aid was later expanded to include cash and seed distribution. Throughout the study, concerns were raised about the sufficiency of the aid provided, how it was distributed, and, more specifically, to whom as well as its appropriateness.

In the aftermath of the hurricane, food distribution became a priority in both departments as local agricultural production had come to a standstill, and damaged infrastructure impeded the import of agricultural products from other regions of the country. Based on ethnographic observations, food aid was, most often, distributed by international NGOs and included the following: a bag of rice, beans, and cooking oil, or some variation thereof. While recipient communities expressed gratitude, many complained that it was insufficient as it did not reach all families in need, particularly those in rural areas. Survey data suggest that most participants (79%) believed that there was a problem with the way in which aid was provided and identified aid insufficiency as the primary reason for the problem: "Until now, we still have problems. When they give out food, some receive and others don't." Insufficiency of aid led to a critique of who was selected to receive it over others. In all localities, the majority of participants reported that

Relief aid distribution, Côteaux, February 2017

access to aid was unfair, with response rates being slightly under 50% in Anse d'Hainault, almost three-quarters in Côteaux, over 80% in Les Anglais, and almost 90% in Chambellan. During one focus group discussion, the local government expressed how aid insufficiency placed the mayor's office in quite a conundrum with its constituency: "One ministry offered 100 bags of rice. I couldn't accept it because of the challenges it would present for us. What would we tell the thousands of families that didn't receive aid?"

As illustrated in the quote above, the inability to provide aid to many of those in need has contributed to allegations of local corruption. With aid distribution limited to a portion of the population, various schemes have been devised by local authorities and international organizations to determine who will receive which type of aid and when. Further, as the disaster occurred days before a highly contested election, aid has also been politicized. In fact, the first 3 months of the relief effort coincided with the final stages of the presidential and legislative elections. Thus, throughout the study many participants intimated that the local government used aid to strengthen their political base and secure votes by making aid a campaign tool: "You have to be connected to get aid! If you are not with the right political party you get nothing!"

Ethnographic accounts of corruption across sites consistently referenced the influence of local politics on aid. However, there was another serious dimension to allegations of corruption against those in control of aid distribution: "Only young girls are receiving aid. They are sleeping with them for a bag of rice. What they [aid distributors] are doing is shameful!" Field observations confirmed such predation, which extended beyond the aid scheme. Young, vulnerable women now became prey to older, economically secure men. One field team encountered a 35-year old man who showed them the seaside tent in which he sheltered his homeless 14-year old pregnant girlfriend and her toddler son (from a previous relationship). During an informal interview, the recently "divorced" father of three, showed the team the two meager red snapper fish he would offer his new "family" for dinner that night. He was proud of having come to the rescue of this poor young girl.

The level of devastation caused by Hurricane Matthew has led some to question why neither the transitional government, which was in office at the time of the disaster, nor the current president, inaugurated in February 2017, declared a state of emergency. With such great need and limited local and international resources committed to the relief effort, aid has been placed under significant scrutiny. Many have called into question the quality of the aid that has been provided, particularly as it relates to food: "We must ask ourselves, is the food they are giving us contributing to the health problems we are seeing?" This sentiment was echoed by many during the study who believed that certain countries had been sending Haiti genetically modified rice that made them ill. Some questioned the appropriateness of aid received, as evidenced from shared concerns about the failure to provide aid to rebuild homes and schools. Local authorities stressed how eager NGOs have been to secure their authorization to provide aid only never to see them again after receiving it. The lack of local involvement in determining what aid is needed, who it will be distributed to, and how it will be distributed led many to conclude that "some aid is not really aid. It's a business that destabilizes local initiatives and institutions," (Female community leader in Anse d'Hainault).

Community Assets, Resources, and Capacities

This study set out to map the resources and assets available to communities most affected by Hurricane Matthew so that recovery and reconstruction initiatives could build on them and promote sustainability. Quantitative and ethnographic data help us characterize these assets and resources as follows:

Physical/material assets:

As mentioned earlier, about 65% of study participants or their family members owned their land. Creative financial instruments (e.g., loans, credit, and insurance) would help them valorize and organize their assets in a productive way, particularly through agricultural production.

Social assets:

Many women's groups, some with the assistance of NGOs, have initiated credit cooperatives [mityèl]. This study identified over 175 women-initiated *mityèl* in all sites, some with more than 10 years of existence. These cooperatives include 32 in urban and rural Côteaux, 49 in urban and rural Les Anglais, 38 in urban and rural Chambellan, 30 in urban and rural Anse d'Hainault, and 28 in urban Dame Marie. More than 800 farmers' groups based on reciprocal labor were identified across sites and were the primary drivers of organized agricultural labor. These groups took many forms, including *sori, kove, eskwad,* and *atribisyon*. These groups varied in size and structure but all provided collective labor for weed, plant, and tree removal in exchange for meals, beverages, and/or nominal compensation. The study identified 220 youth groups organized around civic and/or cultural activities across sites. There were 154 associations or cooperatives of fishermen identified across sites. These networks, organized among small and large-scale vendors, farmers, youth, fishermen, and other groups should serve as the basis of any community-based efforts toward recovery and reconstruction.

Women's association beneficiary of livestock transfer program in Chambellan, February 2017

Human capacity:

Local capacity, which can be used to strengthen local skills and leadership, can be enhanced to build on the existing efforts of local leaders in politics and civil society as well as the professions (e.g., administrators, teachers, engineers, lawyers, and physicians) in agriculture, fisheries, and trade. Identifying local leadership will be critical in ensuring that initiatives have community buy-in and are sustainable over time.

Institutional relations and capital:

Mayoral offices, churches, health clinics, schools, local NGOs, and community-based organizations are among the institutional assets that are to be reinforced or leveraged in recovery and reconstruction efforts.

Instruments (organization):

Cooperative banking, community-based organizations, farmland, and fishing coastlines are material assets upon which communities can take ownership of initiatives in order to be directly implicated in rebuilding efforts. As has been shown elsewhere, the greater the level of community participation in the conception of a project, the higher their level of participation during its implementation and the greater its potential for sustainability (IFRC, 2011).

Time:

An Assets, Access, and Time-based approach requires that local communities be assisted in taking a series of steps on the path toward greater economic self-sufficiency. This requires collaboration with local government, community-based organizations, local NGOs, and international organizations and focus on how to scale interventions in consultation with local stakeholders so that interventions are tailored to their actual needs.

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“According to the government, Hurricane Matthew caused losses totaling USD 573.3 million to the agricultural sector, leaving more than 1.3 million people food insecure in the Grand Sud.”

Government of Haiti, 2017

Restitution meeting in Anse d'Hainault, March 2017

Restitution meeting in Les Anglais, March 2017

Since 2004, disasters have affected the lives of more than five million Haitians causing substantial infrastructural damage while affecting an already weak economy. The 2010 earthquake, one of the greatest disasters of the modern era, had a death toll of over 200,000 and impacted the lives of more than 2 million people. The earthquake's epicenter was located just south of the nation's capital, where most of Haiti's public services are offered, delivering a damaging blow that would affect the entire nation. When Hurricane Matthew struck, Haiti had yet to fully recover from the 2010 earthquake. Further, at the time Haiti was being run by a transitional government (Ahmed, 2016a). The interim government's mandate was to organize and oversee one of Haiti's most contentious elections for which they had limited to no resources. Hurricane Matthew would thus strike during one of Haiti's more vulnerable political and economic periods.

In preparation for Hurricane Matthew, which was expected to be a category 4 storm, much attention was paid to the steps taken to prepare for the disaster in Haiti and neighboring countries such as the Dominican Republic, Cuba, and Jamaica (Marcelin et al., 2016). According to government reports, 234 temporary shelters were made available to residents of three departments: Grande-Anse, Nippes, and Sud, while 10,000 people in the region were evacuated to safety both before and following the disaster (GoH, 2017).

Hurricane Matthew devastated the Grand Sud, with official reports of 546 deaths, 439 injured, 128 missing, and more than two million people affected (GoH, 2017). It must be noted that the number of casualties, as well as those missing, may be questioned as Haiti has struggled to maintain an accurate civil registry (Organization of American States [OAS], 2012). As an example, by 2007, only 37% of live births were attended by a skilled health professional (WHO, 2015) suggesting that most births occur outside of healthcare facilities. This problem is only magnified in the provinces where Hurricane Matthew struck. In Côteaux and Les Anglais, for example, live births attended by a skilled health professional were estimated at 12% and 5% in 2012, respectively (Earth Institute, 2013) suggesting that the death toll from the disaster may be higher. According to the government of Haiti, Hurricane Matthew destroyed 103,907 homes and damaged more than more than 110,000 in eight out of 10 departments (GoH, 2017). Haitian authorities estimate that the total damages from the hurricane were USD 2.78 billion (GoH, 2017).

The education of approximately 600,000 students was affected by the hurricane with more than half (317,000) experiencing disruption (OCHA, 2017). Schools in affected areas remained severely damaged, and many were operating under makeshift conditions. At home, parents of private school students struggled to pay tuition while both public and private school parents figured out how to replace lost or damaged textbooks, materials and supplies, book bags, clothes, and shoes with little to no income. What disaster interventions have failed to take into account is the impact of internal migration on school children whose families have left the hurricane zone in search of more opportunities in the capital.

Historically, Haiti's water and sanitation coverage has been among the lowest in the region and on par with countries in sub-Saharan Africa (Gelting et al., 2013). Recent disasters, such as the 2010 earthquake, the cholera outbreak, and Hurricane Matthew, have only exacerbated the situation in both urban and rural areas as, according to Haitian officials, 90% of the existing water system has been damaged or destroyed by the hurricane (Direction Nationale de l'Eau Potable et de l'Assainissement [DINEPA], 2017). The 2011-2012 Earth Institute Integrated Baseline Study (2013) reported that household access rates to improved water and sanitation facilities

among 10 communes on the southwest coast of Haiti were 45% and 22%, respectively. By 2013, national access rates to improved water sources and sanitation facilities were estimated at just over 60%, and slightly below 30%, respectively (WHO, 2015). However, Haiti's sharp urban/rural divide concentrates most public services around city centers and translates into significantly lower rates in rural areas (Gelting et al., 2013). Many of these rural areas were devastated by Hurricane Matthew where as of March 2017, approximately 750,000 people lacked access to potable water (OCHA, 2017). Yet, international focus on "improved water sources" often fails to take into account that these sources may become contaminated, thereby increasing community vulnerability to waterborne diseases (Earth Institute, 2013; Gelting et al., 2013).

As 76% of survey participants lacked access to either a toilet or latrine, one can surmise that open defecation is common practice that contaminates water sources. For communes such as Les Anglais, which is bordered to the east by the Les Anglais River and to the south by the sea, the risk of disease is significantly higher.

Health spending in Haiti is among the lowest in the region representing only 6% of government expenditure (USAID, 2017). With 40% of its population lacking access to healthcare or nutrition services, many Haitians are dependent upon foreign donors for health services (USAID, 2017). Understandably, Haiti's health indicators are quite poor, including life expectancy at birth estimated at 62 years in 2012, compared to 76 years in the region (WHO, 2015), and fewer than half (45%) of all children (ages 12-23 months) are fully vaccinated (USAID, 2017). In 2012, stroke, respiratory infections, HIV/AIDS, ischemic heart disease, diarrheal diseases, and diabetes were recorded as the top leading causes of death among Haitians (WHO, 2015).

Throughout the survey, much attention was drawn to particular illnesses that were spreading or had emerged after Hurricane Matthew. In terms of healthcare services, cholera received a significant amount of attention as recovery efforts to prevent the spread of the illness reportedly benefitted 769,990 (OCHA, 2017). However, ethnographic data suggest that such claims require further scrutiny, as some campaigns were launched but not successfully completed. According to OCHA, Grande-Anse and Sud saw a 40% increase in cholera cases due to damage caused by Hurricane Matthew to various treatment facilities (OCHA, 2017).

Food and Agriculture:

Food availability in Haiti is dependent upon two principal factors: agricultural production, which accounts for 48% of food availability, and imports, which account for 44% (Glaeser et al., 2011). Over the past decade, food availability has been compromised by a number of events, including the 2008 food crisis, during which time the price of imported rice rose by as much as 150%, and multiple tropical storms, hurricanes, and the 2010 earthquake, which have hampered local food production (Glaeser et al., 2011). Between 2009 and 2011, production rates decreased in beans/pulses (-20%), plantains (-14%), roots/tubers (-12%), and cereal (-9%) due to soil erosion, a decrease in total land cultivated, insufficient investments in infrastructure, and internal displacement/migration resulting from the earthquake (Glaeser et al., 2011). According to the government of Haiti, by 2012 slightly under two-thirds of Haitian households suffered from food deprivation (MSPP, 2013).

In Haiti, rural households depend on agriculture for their own livelihood, yet limited productivity renders food inaccessible for much of this population at various times throughout the year (Earth Institute, 2013; Pauzé et al., 2016). According to a 2012 food security study, only 23% of households reported high diversity diets, which included 11 or more food groups (Coordination Nationale de la Sécurité Alimentaire [CNSA], 2013). In a 2011-2012 study of 10 communes on

Farmland covered in debris in Anse d'Hainault, January 2017

Fallen trees in Côteaux, February 2017

Fallen tree on main road in Despas, Côteaux, February 2017

Haiti's southwest coast, including Les Anglais and Côteaux, 93% of households reported having an inadequate food supply at least one out of the previous 12 months, while 60% "consumed seeds intended for planting the following season" (Earth Institute, 2013: 49). Notably, this same study cited Les Anglais and Côteaux among the southwest communes with the highest levels of combined chronic and acute malnutrition among children under age 5 (Earth Institute, 2013). In the Grande-Anse department, over 80% of households reported suffering three major shocks, including tropical storms and drought, that destroyed crops while raising food prices, thereby increasing their vulnerability (CNSA, 2013). This resulted in the launch of a multisectoral public health agriculture intervention undertaken by the United Nations Food and Agriculture Organization (FAO), the German Red Cross, and Médecins du Monde in collaboration with the Ministry of Public Health and Population (Pauzé et al., 2016). These data suggest that prior to Hurricane Matthew, the Grande-Anse and Sud departments faced grave threats to food security. Thus, recent reports suggesting that by December 2016, and in the aftermath of a devastating hurricane, food insecurity was reduced from 78% to 54% and 79% to 41%, in the departments of Grande-Anse and Sud, respectively, (FAO, 2017) require further scrutiny. In the aftermath of the disaster, crop, arable land, and fruit tree losses were estimated at 54,000 metric tons (OCHA, 2017). According to the government, Hurricane Matthew caused losses totaling USD 573.3 million to the agricultural sector leaving more than 1.3 million people food insecure in the Grand Sud (GoH, 2017) and reducing the availability of arable land by 33% (CNSA, 2017).

Recovery and Economic Security:

During the first decade of the 21st century, extreme poverty in Haiti decreased by almost one-quarter, from 31 to 24% (World Bank, 2015). Despite these gains, in 2012, Haiti's poverty headcount was 59% with extreme poverty affecting 24% of the population. Economic development stagnated in rural areas of the country, including Grande-Anse and Sud where rates were 36 and 26%, respectively (World Bank, 2015). The World Bank's diagnosis of Haiti suggests that during this period income inequality widened in rural areas. They speculate that "the contraction in agricultural production caused by repeated weather-related shocks could explain the widening of inequality in rural areas, reducing earnings for agricultural labor and increasing the prices of food" (World Bank, 2015: 22). With 90% of the present study's participants expressing that their livelihood was threatened by the hurricane, one can surmise that Matthew reinforced this pattern of weather-related shocks widening income inequality while exacerbating poverty in rural parts of southern Haiti. Therefore, the challenge before us is not simply to intervene in response to the disaster but to respond to the preexisting conditions that rendered it a disaster of this magnitude in the Haitian context.

As the data show, immediate recovery has been a challenge for Hurricane Matthew victims, making reconstruction and disaster preparation and risk mitigation more difficult for many victims to envisage. More than 90% of affected populations continue to live in makeshift structures, with no immediate hope for rebuilding. Yet, the 2017 hurricane season has already begun. Food remains in short supply, as agricultural production has all but come to a standstill. Aid structures remain insufficient. Income generating activities have stagnated. More specifically, large trees continue to cover arable land, fishermen have yet to replace their equipment, and petty commerce suffers as resources remain scarce.

In the wake of the disaster, many have intervened to provide immediate relief. Following Hurricane Matthew, a flash appeal was issued requesting USD 139 million to respond to the

disaster in Haiti. However, 5 months after the hurricane, only 64% of that appeal goal had been reached (OCHA, 2017). As the data showed, failure to raise more than two-thirds of this appeal has translated into despair, as people struggle to find their next meal, rebuild their homes, tend to various health issues, and find (or resume) work. Yet, Haiti has never had the luxury of time to differentiate between periods of relief, recovery, reconstruction, or development. With each additional crisis, Haiti is faced with the integrated nature of the risks its faces—risks that render sector-based, compartmentalized approaches unsustainable in the long-term and occasionally damaging in the short-term.

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“The only viable options for Haiti to address these existential threats faced by its citizens are to systematically integrate community-based assets and capacities in its responses to and management of disasters.”

CONCLUSION

Jérémie, days after Hurricane Matthew hit Grande-Anse, October 2016

Haitians have lived in a constant state of political, economic, and social instability. Abject inequality, social indifference to inequities, and weak governance have resulted in poor urban planning, over-centralization of public services, massive deforestation, and disproportionate internal migration from rural communities to urban centers. These factors have exacerbated the threat of climate change while rendering the Haitian population more vulnerable to risks. More importantly, contextual factors make complex emergencies an existential threat for Haitian society and its core institutions. Hurricane Matthew now calls our attention to the need for a context-specific, locally developed, integrated risk governance and disaster preparedness mechanism that incorporates community participation at all levels. As is evidenced by the 2010 earthquake, international intervention in post-disaster Haiti has had limited long-term effects. The only viable options for Haiti to address these existential threats faced by its citizens are to systematically integrate community-based assets and capacities in its responses to and management of disasters. Further, it is critical for the government, Haitian institutions, and society to apply integrated risk reduction and management and disaster preparedness measures in all aspects of life, if the country is to survive the many disasters to come in a time of inevitable climate change (Marcelin et al., 2016). These measures should be embedded in recovery and reconstruction efforts following Hurricane Matthew while other communities facing high levels of risk establish their own risk mitigation and disaster preparedness schemes.

Hurricane Matthew has left its imprint on the Grand Sud. The level of devastation caused by the disaster was so severe it will have an impact on generations to come. It left many homeless or living in makeshift homes, decimated the local economy, severely damaged infrastructure, and changed daily food habits. When taking into account the damage caused to the natural environment, the majority of families, most of whom depend on agriculture and fishing to survive, will struggle to maintain their livelihoods for some time to come if immediate efforts are not made to re-launch the local economy. Yet, this deficit approach to disaster leaves everyone, victims and advocates alike, in an endless cycle of co-dependency in which Haitians are victims always in search of being saved. All communities have assets upon which they can build for the purposes of recovery, reconstruction, and development. Haiti is no exception. These assets are often eclipsed by the gravity of the challenges they immediately face, in this case the aftermath of Hurricane Matthew. While it is important to identify and understand the nature of these challenges, it is imperative that we also take stock of the resources at their disposal.

Across fieldwork sites we identified local authorities, community leaders, professionals, women's cooperatives, farmers associations, and youth groups seeking support that would help their communities recover, rebuild, and, more importantly, (re)establish a level of self-sufficiency. As this and numerous other reports have demonstrated, many of Haiti's challenges are the result of under-investment in its people (Groupe de Travail sur l'Éducation et la Formation [GTEF], 2010; INURED, 2010; World Bank, 2015). This is a pattern that the central government cannot afford to continue and international aid institutions run the risk of perpetuating if they continue to distribute goods and provide services without building the capacity of local authorities, leaders, professionals and civil society organizations to respond to the disasters which place their livelihoods and lives at risk.

“Data from this study can help leverage and align local communities’ resources from national and international organizations.”

ASSETS-ACCESS TIME-BASED RECOMMENDATIONS

Recommendations across Sites:

- The Government of Haiti (GoH), along with the Ministry of Agriculture and Ministry of Finance, should secure funding from the World Bank, Inter-American Development Bank (IDB), European Union, and USAID to support the establishment of an agricultural bank (*banque agricole*) that provides loans to local farmers associations, vendors, craftsmen associations, women's organizations, cooperatives, and individual farmers.
- The Ministry of Agriculture and Ministry of Planning should develop strategies with international organizations and non governmental organizations (NGOs) operating in the agriculture sector and engaged in food distribution, including the World Food Programme and Food for the Poor, to establish local seed banks to distribute and sell to farmers.
- The Ministry of Agriculture should provide sustained training for agricultural technicians and veterinarians to revitalize crop production and animal husbandry in the impacted communes.
- The GoH should earmark funding to hire and retain, for a period of at least 6 years, agricultural extension workers and veterinarians.
- The Ministry of Agriculture should collaborate with faculty of agronomy from public and private universities to conduct scientific investigations to identify solutions to pest threats to agriculture and livestock in the impacted areas.
- The Ministry of Agriculture should partner with public and private universities to survey and catalog rare, indigenous (and endangered) trees that have been destroyed in the region for replanting and reforestation.
- The GoH should secure funds for the Ministry of Education to provide free schooling and supplies (e.g., uniforms, backpacks, textbooks, notebooks), for the next 2 to 3 years, to victims of the disaster.
- The GoH, international organizations, and NGOs should maximize the use of local materials from the communes they serve in construction and other forms of intervention.
- The GoH, international organizations, and NGOs should commit to hiring local professionals from affected areas in the reconstruction of schools and public infrastructure.
- The Ministry of Education should provide canteens that serve nutritious meals to school children in the affected regions, using local products to stimulate agriculture and fisheries.
- The GoH should partner with NGOs to provide or subsidize the purchase of tools for debris removal (e.g., two-man saws to clear debris on arable lands).
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for DINEPA to establish water stations in rural areas to increase access to potable water in the communal sections that have limited or no access.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for the Ministry of Health to establish mini-health clinics (*avant postes de santé*) for health interventions in localities in the communal sections. The GoH should train rural community health volunteers who will staff them. This initiative should be done in coordination with international organizations and NGOs operating in the health sector, including the Centers for Disease Control and Prevention, in partnership with local mayors and local clinics and hospitals.

Recommendations by Locality

Anse d'Hainault

- The GoH, along with the Ministry of Agriculture and Ministry of Finance, should secure funding from the World Bank, Inter-American Development Bank (IDB), European Union, and USAID to support the establishment of an agricultural bank (*banque agricole*) that provides loans to local farmers associations, vendors, craftsmen associations, women's organizations, cooperatives, and individual farmers.
- The Ministry of Agriculture should develop and implement sustained training to agricultural technicians to assist in the revitalization of crop production in the commune.
- The Ministry of Agriculture should provide training and supplies to local veterinarians; in turn, the latter will provide technical support to local farmers in animal husbandry.
- The Ministry of Agriculture and Ministry of Planning should develop strategies with international organizations and NGOs operating in the agriculture sector and engaged in food distribution, including the World Food Programme and Food for the Poor, to establish a local seed bank to distribute and sell seeds to local farmers.
- The GoH should provide funding to the Ministry of Agriculture and Ministry of Environment to distribute new seeds and subspecies of cacao and coffee that are adaptable to the environment.
- The Ministry of Environment and Ministry of Agriculture should distribute young trees to local farmers and farmers associations; trees that are capable of providing shade to cacao and coffee crops.
- The Ministry of Agriculture should collaborate with faculty of agronomy from public and private universities to conduct scientific investigations to identify solutions to pest threats to local agriculture and livestock.
- The Ministry of Agriculture and Ministry of Environment should create pest control centers in the region that offer experimentation opportunities that focus on threats to crops.
- The Ministry of Agriculture and Ministry of Planning should develop strategies with NGOs operating in fisheries to support interventions in the sector:
    - provide boat engines to fishermen associations,
    - replace boats that have been destroyed,
    - replace fishing nets;
    - provide training in new fishing techniques (DCP) to fishermen; and
    - create financial instruments to support credit schemes to develop the potential for modernizing the fishing industry.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for the Ministry of Health to establish at least 3 mini-health clinics (*avant postes de santé*) for health interventions in 3 rural localities. The GoH should train rural community health volunteers who will staff them. This initiative should be done in coordination with international organizations and NGOs operating in the health sector, including the CDC, in partnership with local mayors and the local hospital.
- The Ministry of Health should work with the local hospital to establish a standard intervention for dysentery.
- The Ministry of Health and Ministry of Planning should encourage NGOs in the WASH sector to collaborate and coordinate with local mayors and the local hospital to establish latrine initiatives.

Fisherman in Ilet, Anse d'Hainault, January 2017

Destroyed home in Boucan, Chambellan, February 2017

- The GoH should earmark funds for the Ministry of Education to provide free schooling and supplies (e.g., uniforms, backpacks, textbooks, notebooks and writing utensils), for the next 2 to 3 years, to victims of the disaster.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for DINEPA to establish water stations in rural areas to increase access to potable water in the communal sections that currently have limited or no access. This initiative will be sustainable if it is done in coordination with local mayors and the hospital.
- The Ministry of Health and DINEPA should partner with the local hospital to provide/support community sensitization efforts to educate local residents about potable water, its uses, and health consequences.
- The local Mayors of Anse d'Hainault should secure funding to relocate the cemetery, which represents a health hazard for the community.

Chambellan

- The Ministry of Public Works and Ministry of Environment should partner with the World Bank, IDB, European Union, and USAID to provide financial and technical support to contain the Grande-Anse River:
  - provide engineering experts to survey the river and determine what protections are most appropriate;
  - profile the river bank;
  - use local workforce and volunteers to gabionade;
  - build a dam to protect the city of Chambellan; and reduce and control the erosion of arable land.
- The GoH, along with the Ministry of Agriculture and Ministry of Finance, should secure funding from the World Bank, IDB, European Union, and USAID to support the establishment of an agricultural bank (*banque agricole*) that provides loans to local farmers associations, vendors, craftsmen associations, women's organizations, cooperatives, and individual farmers.
- The Ministry of Agriculture should develop and implement sustained training for agricultural technicians to assist in the revitalization of crop production in the commune.
- The Ministry of Agriculture should provide training and supplies to local veterinarians; in turn, the latter will provide technical support to local farmers in animal husbandry.
- The Ministry of Agriculture and Ministry of Planning should develop strategies with international organizations and NGOs operating in the agriculture sector and engaged in food distribution, including the World Food Programme and Food for the Poor, to establish a local seed bank to distribute and sell seeds to local farmers.
- The GoH should provide funding to the Ministry of Agriculture and Ministry of Environment to distribute new seeds and subspecies of cacao and coffee that are adaptable to the environment.
- The Ministry of Environment and Ministry of Agriculture should distribute young trees to local farmers and farmers associations; trees that are capable of providing shade to cacao and coffee crops.
- The Ministry of Agriculture should collaborate with faculty of agronomy from public and private universities to conduct scientific investigations to identify solutions to pest threats to local agriculture and livestock.
- The Ministry of Agriculture and Ministry of Environment should create pest control centers in the region that offer experimentation opportunities that focus on threats to crops.

- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for the Ministry of Health to establish at least 3 mini-health clinics (*avant postes de santé*) for health interventions in 3 rural localities. The GoH should train rural community health volunteers who will staff them. This initiative should be done in coordination with international organizations and NGOs operating in the health sector, including the CDC, in partnership with local mayors and the local clinic.
- The Ministry of Health should work with the local clinic to establish a standard intervention for dysentery.
- The Ministry of Health and Ministry of Planning should encourage NGOs in the WASH sector to collaborate and coordinate with local mayors and the local health clinic to establish latrine initiatives.
- The GoH should earmark funds for the Ministry of Education to provide free schooling and supplies (e.g., uniforms, backpacks, textbooks, notebooks and writing utensils), for the next 2 to 3 years, to victims of the disaster.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for DINEPA to establish water stations in rural areas to increase access to potable water in the communal sections that currently have limited or no access. This initiative will be sustainable if it is done in coordination with local mayors and the health clinic.
- The Ministry of Health and DINEPA should partner with the local clinic to provide/support community sensitization efforts to educate local residents about potable water, its uses and health consequences.
- The Ministry of Health should collaborate with the local health clinic to provide medical intervention services in rural areas to control existing and emerging skin diseases in the region (e.g., eczema, scabies, tinea capitis/kerion, and avitaminosis).

Destroyed home in Côteaux, February 2017

Côteaux

- The Ministry of Agriculture and Ministry of Planning should develop strategies with NGOs operating in fisheries to support interventions in the sector:
  - provide boat engines to fishermen associations,
  - replace boats that have been destroyed,
  - replace fishing nets;
  - provide training in new fishing techniques (DCP) to fishermen; and
  - create financial instruments to support credit schemes to develop the potential for
  - modernizing the fishing industry.
- The GoH along with the Ministry of Agriculture and Ministry of Finance should secure funding from the World Bank, IDB, European Union, and USAID to support the establishment of an agricultural bank (*banque agricole*) that provides loans to local farmers associations, vendors, craftsmen associations, women's organizations, cooperatives, and individual farmers.
- The Ministry of Agriculture should develop and implement sustained training to agricultural technicians to assist in the revitalization of crop production in the commune.
- The Ministry of Agriculture should provide training and supplies to local veterinarians; in turn, the latter will provide technical support to local farmers in animal husbandry.
- The Ministry of Agriculture and Ministry of Planning must develop strategies with international organizations and NGOs operating in the agriculture sector and engaged in food distribution, including the World Food Programme and Food for the Poor, to establish a local seed bank to distribute and sell seeds to local farmers.

Bariadèle, Dame Marie, January 2017

- The Ministry of Agriculture should collaborate with faculty of agronomy from public and private universities to conduct scientific investigations to identify solutions to pest threats to local agriculture and livestock.
- The Ministry of Agriculture and Ministry of Environment should create pest control centers in the region that offer experimentation opportunities that focus on threats to crops.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for the Ministry of Health to establish at least 3 mini-health clinics *(avant postes de santé)* for health interventions in 3 rural localities. The GoH should train rural community health volunteers who will staff them. This initiative should be done in coordination with international organizations and NGOs operating in the health sector, including the CDC, in partnership with local mayors and the local clinic.
- The Ministry of Health should work with the local clinic to establish a standard intervention for dysentery.
- The Ministry of Health and Ministry of Planning should encourage NGOs in the WASH sector to collaborate and coordinate with local mayors and the local health clinic to establish latrine initiatives.
- The GoH should earmark funds for the Ministry of Education to provide free schooling and supplies (e.g., uniforms, backpacks, textbooks, notebooks and writing utensils), for the next 2 to 3 years, to victims of the disaster.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for DINEPA to establish water stations in rural areas to increase access to potable water in the communal sections that currently have limited or no access. This initiative will be sustainable if it is done in coordination with local mayors and the health clinic.
- The Ministry of Health and DINEPA should partner with the local clinic to provide/support community sensitization efforts to educate local residents about potable water, its uses and health consequences.

Dame Marie

- The GoH should provide funding to the Ministry of Agriculture and Ministry of Environment to secure and distribute new seeds and subspecies of cacao and coffee that are adaptable to the environment.
- The Ministry of Environment and Ministry of Agriculture should distribute young trees to local farmers and farmers associations; trees that are capable of providing shade to cacao and coffee crops.
- The Ministry of Public Works and Ministry of Environment should partner with the World Bank, IDB, European Union, and USAID to provide financial and technical support to contain the coastline of the city. This will require that they:
    - provide engineering experts to evaluate the impact of the advance of the sea toward the city;
    - use the local workforce and local volunteers in infrastructural projects;
    - reduce and control coastline erosion.
- The GoH, along with the Ministry of Agriculture and Ministry of Finance, should secure funding from the World Bank, IDB, European Union, and USAID to support the establishment of an agricultural bank (*banque agricole*) that provides loans to local farmers associations, vendors, craftsmen associations, women's organizations, cooperatives, and individual farmers.

- The Ministry of Agriculture should develop and implement sustained training to agricultural technicians to assist in the revitalization of crop production in the commune.
- The Ministry of Agriculture should provide training and supplies to local veterinarians; in turn, the latter will provide technical support to local farmers in animal husbandry.
- The Ministry of Agriculture and Ministry of Planning should develop strategies with international organizations and NGOs operating in the agriculture sector and engaged in food distribution, including the World Food Programme and Food for the Poor, to establish a local seed bank to distribute and sell seeds to local farmers.
- The GoH should provide funding to the Ministry of Agriculture and Ministry of Environment to distribute new seeds and subspecies of cacao and coffee that are adaptable to the environment.
- The Ministry of Environment and Ministry of Agriculture should distribute young trees to local farmers and farmers associations; trees that are capable of providing shade to cacao and coffee crops.
- The Ministry of Agriculture should collaborate with faculty of agronomy from public and private universities to conduct scientific investigations to identify solutions to pest threats to local agriculture and livestock.
- The Ministry of Agriculture and Ministry of Environment should create pest control centers in the region that offer experimentation opportunities that focus on threats to crops.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for the Ministry of Health to establish at least 3 mini-health clinics *(avant postes de santé)* for health interventions in 3 rural localities. The GoH should train rural community health volunteers who will staff them. This initiative should be done in coordination with international organizations and NGOs operating in the health sector, including the CDC, in partnership with local mayors and the local clinic.
- The Ministry of Health should work with the local clinic to establish a standard intervention for dysentery.
- The Ministry of Health and Ministry of Planning should encourage NGOs in the WASH sector to collaborate and coordinate with local mayors and the local health clinic to establish latrine initiatives.
- The GoH should earmark funds for the Ministry of Education to provide free schooling and supplies (e.g., uniforms, backpacks, textbooks, notebooks and writing utensils), for the next 2 to 3 years, to victims of the disaster.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for DINEPA to establish water stations in rural areas to increase access to potable water in the communal sections that currently have limited or no access. This initiative will be sustainable if it is done in coordination with local mayors and the health clinic.
- The Ministry of Health and DINEPA should partner with the local clinic to provide/support community sensitization efforts to educate local residents about potable water, its uses and health consequences.
- The Ministry of Health should collaborate with the local health clinic to provide medical intervention services in rural areas to control existing and emerging skin diseases in the region (e.g., eczema, scabies, tinea capitis/kerion, and avitaminosis).

Field team in Les Anglais, January 2017

Les Anglais

- The GoH, along with the Ministry of Public Works and Ministry of Environment, should secure funding to assist with the protection of the Les Anglais River:
  - provide engineering experts to survey the river and determine what protections are most appropriate;
  - profile the river bank;
  - use local workforce and volunteers to gabionade;
  - build a dam to protect the city and reduce and control the erosion of arable land.
- The Ministry of Agriculture and Ministry of Planning should develop strategies with NGOs operating in fisheries to support interventions in the sector:
  - provide boat engines to fishermen associations,
  - replace boats that have been destroyed,
  - replace fishing nets;
  - provide training in new fishing techniques (DCP) to fishermen; and
  - create financial instruments to support credit schemes to develop the potential for modernizing the fishing industry.
- The GoH, along with the Ministry of Agriculture and Ministry of Finance, should secure funding from the IDB, European Union, and USAID to support the establishment of an agricultural bank *(banque agricole)* that provides loans to local farmers associations, vendors, craftsmen associations, women's organizations, cooperatives, and individual farmers.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for DINEPA to update the city's two obsolete water supply systems.
- The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for DINEPA to establish water stations in rural areas to increase access to potable water in the communal sections that currently have limited or no access. This initiative will be sustainable if it is done in coordination with local mayors and the health clinic.
- The Ministry of Health and DINEPA should partner with local clinics to provide/support community sensitization efforts to educate local residents about potable water, its uses and health consequences.
- The Ministry of Agriculture should provide sustained training for agricultural technicians to assist in the revitalization of crop production in the commune.
- The Ministry of Agriculture should provide training and supplies to local veterinarians; in turn, the latter will provide technical support to local farmers in animal husbandry.
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- The Ministry of Agriculture should collaborate with faculty of agronomy from public and private universities to conduct scientific investigations to identify solutions to pest threats to local agriculture and livestock.
- The Ministry of Agriculture and Ministry of Environment should create pest control centers in the region that offer experimentation opportunities that focus on threats to crops.

» The GoH should secure funding from WHO, USAID, UKAID, European Union, and IDB for the Ministry of Health to establish at least 3 mini-health clinics (*avant postes de santé*) for health interventions in 3 rural localities. The GoH should train rural community health volunteers who will staff them. This initiative should be done in coordination with international organizations and NGOs operating in the health sector, including the CDC, in partnership with local mayors and the local clinic.

» The Ministry of Health should work with the local clinic to establish a standard intervention for dysentery.

» The Ministry of Health and Ministry of Planning should encourage NGOs in the WASH sector to collaborate and coordinate with local mayors and local health clinics to establish latrine initiatives.

» The GoH should earmark funds for the Ministry of Education to provide free schooling and supplies (e.g., uniforms, backpacks, textbooks, notebooks and writing utensils), for the next 2 to 3 years, to victims of the disaster.

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