



## **CASE STUDY OF BOG HOLE, JAMAICA: BUILDING CAPITALS IN DISASTER THROUGH LOCAL KNOWLEDGE**

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### **Abstract:**

This paper details the qualitative analysis of data collected about a 2017 flood in the community of Bog Hole, Clarendon in Jamaica during February-May, 2018. The data aimed to answer the how did the local knowledge on disaster risk reduction strategies enhance the capital base of this area, as well as how did it contribute to poverty eradication within the context of disaster management. The data was analysed through the lens of a framework that amalgamated the principles of the Sustainable Livelihoods Framework and the Disaster Management Cycle. Both frameworks enabled the author to present a context that addresses the external and uncontrollable factors or attributes that influence and affect people's assets and livelihoods and how they utilized their local experiences and history to overcome these situations to build the assets (capital) that are crucial for the pursuit of positive livelihood, while utilizing the main tenets of the disaster management cycle, namely: Preparedness, Mitigation, Response and Recovery. The study found the main natural capital of the area is also a source of hazard to the area. However, it is their local knowledge that has afforded them the technical knowhow of how to seize the opportunities from the pond as a capital in periods of disaster and normalcy. The residents of the community have accepted the inevitability of the floods, because of their geographic location, the knowledge systems that they have developed over the years to cope with floods and the way in which they control the market post disaster. Thus, the study shows that in the face of the recurrent disaster, residents have found a way to stimulate rural trade and finance, develop a tourism product and by so doing, have increased their income generation. The study highlights that a disaster has different meanings for different farmers in the same space. This working paper is therefore making a recommendation for further studies on the transient nature of vulnerability to natural disasters in rural spaces in Jamaica.

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## 1. Introduction

The Global Facility for Risk Reduction ranks Jamaica as the third most vulnerable country in the world to multiple hazards, as it reports 96% of its population and GDP as being susceptible to two or more disasters. In fact, various models have predicted that Jamaica is likely to be impacted by more ruinous events in the future. This is of great importance, as typically, natural disasters hitting land in Jamaica means delayed essential services, damaged infrastructure and a loss of livelihood. Overall, according to the Jamaican Agricultural Ministry Operation Plan for 2013-2014, mentions vulnerability to extreme weather conditions as one of the challenges facing the Jamaican agricultural sector. Similarly, the feature by Lee (2015) shows, Jamaican farmers continue to be at the mercy of weather extremities and unpredictability. In essence, Jamaica, like other Small Island Developing States, is very vulnerable to natural hazards, and this vulnerability is felt specifically by those individuals who depend on the country's natural capital for their livelihoods, such as farmers. Therefore, the victory of these people in the face of constant weather adversity represents a struggle, a struggle of cultural retention in the face of *'development'* and ought to be captured to add to what is known about Jamaica's disaster anthropology.

## 2. Methodology

This paper is a working paper, as it is just one section of a final thesis by the author and details the qualitative analysis of data collected from the residents of Bog Hole, Clarendon in Jamaica in February-May, 2018 to answer the research questions of how did the local knowledge on disaster risk reduction strategies enhance the capital base of this area and how does local knowledge contribute to poverty eradication in the studied area. The methods used were household surveys, literature reviews, focus group discussions and in depth interviews.

The data was analysed through the lens of a framework that amalgamated the principles of the Sustainable Livelihoods Framework and the Disaster Management Cycle. Both frameworks enabled the author to present a context that addresses the external and uncontrollable factors / attributes that influence / affect people's assets and livelihoods and how they utilized their local experiences and history to overcome these situations to build the five types of assets (capital) that are crucial for the pursuit of positive livelihood, while utilizing the disaster management cycle: Preparedness, Mitigation, Response and Recovery. Please see the framework drafted for this thesis:

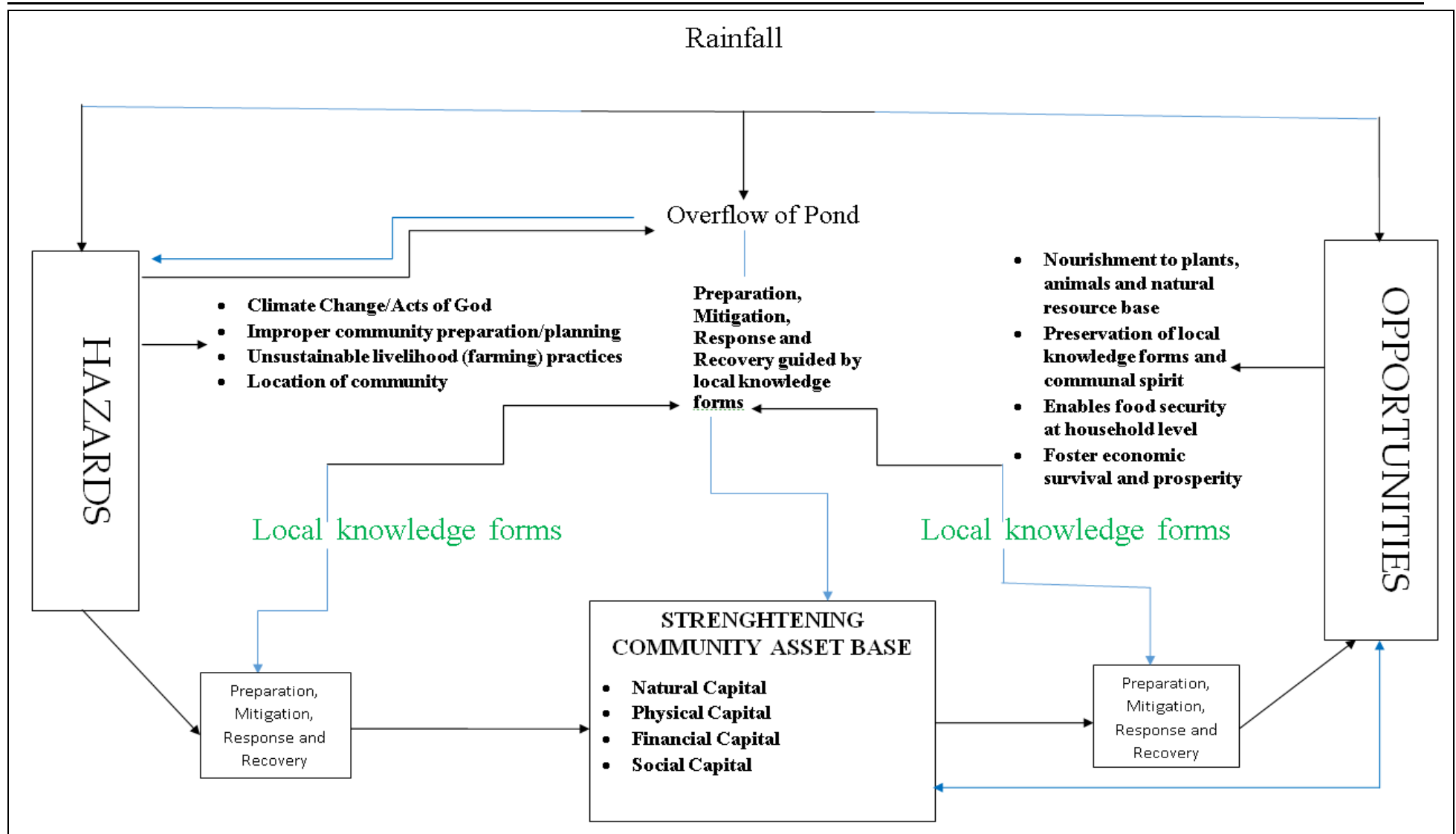


Figure 1: Framework for Data Analysis

### 3. Analysis of Data

#### 3.1 Natural Capital

Natural Capital in the Sustainable Livelihoods Framework context refers to the quality and quantity of natural resources (DFID, 2000; cited in Majale, 2002). In other words, Natural Capital are resource stocks that people can draw on for their livelihoods, such as land, forests, water, air, and others in this regard. Natural Capital is a crucial element of the framework as it can be manipulated (used) to acquire and enhance the other types of capital. For instance, a Natural Capital such as a pond can be used to acquire and enhance Financial Capital by providing fish that can be sold to get money which can, in turn, be used to enhance Human Capital by paying for their education and/or that of their children. The aforementioned argument can be exemplified by the participants from the rural area used in the qualitative data collection. These participants are residents in the Bog Hole community whose lives are centered around nature (that is, the pond).

The pond is the main source of irrigation for the residents' vegetable farms and is also used for fishing which provides a source of income (Financial Capital) and enables them to enhance the Human Capital of their households. However, based on the data collection it was revealed that the pond as a Natural Capital is also a hazard as following the passage of heavy rains, it causes flooding in the community. This flooding results in a decrease of other assets such as Physical Capital (Homes and other structures), Financial Capital (loss of income and loss of property) and Human Capital (reduces the capacity of residents). Conversely, a most interesting finding from the interviews with the residents revealed that the flooding also results in the increase of Physical Capital, Financial Capital and Human Capital. In Table 1, the effects of the disaster of flooding on the community of the residents are outlined in the residents own words in addition to the related decrease in various assets. Notwithstanding, through the use of the local knowledge across the various stages of the disaster management cycle, the residents are able to bridge the gap between the pond as a Natural Capital or Opportunity and the pond as a hazard and source of disaster.

In Table 1, the effects of the disaster of flooding on the community of the residents are outlined in the residents' own words in addition to the related decrease in various assets.

**Table 1: Impacts of Flood and the Related Decrease on the Types of Capital in the Studied Community**

Types of Capital Decreased	Effects of Flooding
Physical Capital	Water destroys houses, farms, roves
	Damage road network
	Overflow of sewage
	Loss of electricity
Financial Capital	Aggressive worms in crops
	Loss of livelihood
	Replant crops destroyed
	Sell products cheaply
	Outside communities benefitted from fishing
Human Capital	In need of more manual labour
	Lots of Insects
	Mosquito-borne diseases
	Sewer overflowing post disaster
Natural Capital	Aggressive worms in soil

In Table 2, the effects of the disaster of flooding on the community of the residents are outlined in the residents' own words in addition to the related increase in various assets.

**Table 2: Impacts of Flood and the Related Increase on the Types of Capital in the Studied Community**

Types of Capital Increased	Effects of Flooding
Physical Capital	Promoted the building of rafts for transportation
Financial Capital	Area became a tourist attraction-build rafts and gave tours
	Earned income from transporting goods across water
	Earned income from watching personal assets of visitors
	Sell products cheaply
	Farmers who stored produce control market price
Social Capital	Communal living, enhanced trust
Natural Capital	Soil became more fertile
	Water killed weeds

### 3.2 Natural Capital and the Disaster Management Cycle

The intersection of Natural Capital and the Disaster Management Cycle is often complex, as in many instances the Natural Capital has a huge vulnerability index and is highly susceptible to disasters especially in conjunction with climate extremities. However, overtime experience with and observance of the Natural Capital and its interaction with various climatic circumstances can result in a repository of local knowledge which often proves instrumental in the various stages of the disaster management cycle (Pareek & Trivedi, 2011). This viewpoint is illustrated in Table 3.

**Table 2:** Local Knowledge being used in the Various Stages of the Disaster Management Cycle to Build Capitals/Assets

Stages of the Disaster Management Cycle	Local Knowledge of the Residents	Outcome	Effect on Capital
Preparation	When the pond is dry or almost dry it is a signal that rainfall is imminent	<ul style="list-style-type: none"> <li>• Reap Crops quickly if they are able to be reaped and so preserve the crops so as to increase financial capital</li> <li>• Moving further away from the pond to higher ground</li> <li>• Control market price for vegetables</li> </ul>	<ul style="list-style-type: none"> <li>• Preserves and Increases Financial Capital</li> <li>• Preserves Human Capital</li> </ul>
	Knowledge of the Natural Sinkholes	<ul style="list-style-type: none"> <li>• Know which areas of crops and homes are going to be most impacted by floods so reap crops and move house.</li> <li>• Plant crops in areas that are less likely to be impacted by flood.</li> </ul>	<ul style="list-style-type: none"> <li>• Preserves Financial Capital, Physical Capital and Human Capital</li> <li>• Preserves Financial Capital</li> </ul>
Mitigation	When the pond is dry or almost dry it is a signal that major rainfall is imminent	<ul style="list-style-type: none"> <li>• Postpone planting and or reap crops as soon as they are ready</li> </ul>	<ul style="list-style-type: none"> <li>• Preserves and Enhances Financial Capital</li> </ul>
	Knowledge of the Natural Sinkhole	<ul style="list-style-type: none"> <li>• Plant crops in areas less likely to be impacted by floods</li> </ul>	<ul style="list-style-type: none"> <li>• Preserves and Enhances Financial Capital</li> </ul>
Response	Dug Drains to correspond to Natural Sinkholes	<ul style="list-style-type: none"> <li>• Water runs off instead of causing flooding</li> </ul>	<ul style="list-style-type: none"> <li>• Preserves Natural Capital and Financial Capital</li> </ul>
	Adjusting their farming practices when they realize that the pond is dry or almost dry	<ul style="list-style-type: none"> <li>• Reduce damage and loss of crops</li> <li>• Use destroyed crops for composting when planting other crops post flood</li> </ul>	<ul style="list-style-type: none"> <li>• Preserves Financial Capital</li> </ul>
Recovery	After the flood the soil is very fertile	<ul style="list-style-type: none"> <li>• Planting in fertile soil results in higher yields</li> </ul>	<ul style="list-style-type: none"> <li>• Preserves and Enhances Financial Capital</li> </ul>
	After the flood the soil very close to the pond is extremely fertile	<ul style="list-style-type: none"> <li>• Planting very close to the pond after a flood results in very high yields</li> </ul>	<ul style="list-style-type: none"> <li>• Preserves and Enhances Financial Capital</li> </ul>

This has highlighted that while the members of this community are functioning outside of the scientific realm of responses to the anticipation of disasters, their practises fit into the disaster management cycle (correctly or incorrectly), and are reaping the rewards and challenges of utilizing their historical knowledge systems.

### 3.2 Financial Capital

*“some man, wen di res’ a we a bawl bout flood, dem a sell dem produce at a higher rate. As a matter of fact, di best time fi sell is after di flood if yu know wah yu a do.”* (Farmer from Bog Hole during the focus group discussions on April 12, 2018)

In the Sustainable Livelihoods Framework, Financial Capital refers to savings and consistent inflows of money (DFID, 2000; cited in Majale, 2002). Furthermore, the Financial Capital is a key facet of the Sustainable Livelihoods Framework as it often inextricably linked to Natural Capital particularly in the case of poor residents in the rural areas. In addition, Financial Capital is significant as it provides a good platform for denoting the complexities of livelihoods and the perils of constraints and the possibilities of opportunities. The Financial Capital also creates a link between Livelihood assets and the vulnerability of assets, because the ability to garner Financial Capital from Livelihood Assets is often executed in a Vulnerability Context for many persons but especially for low-income persons in the rural areas. The Vulnerability Context in the Sustainable Livelihoods Framework denotes the external milieu in which people exist.

To elaborate, the Vulnerability Context encompasses various trends, shocks, and the seasonality factor. The trends include those that are international and national, changes in available technology and political systems (DFID, 2000; cited in Majale, 2002). Shocks include natural and man-made disasters, illness, death, conflict, violence and civil unrest. Seasonality refers to a fluctuation of prices, production and cycles. The Vulnerability Context is of tremendous importance because its three main factors directly influence the possibilities that persons have to earn a living in the present and the future. In more specific terms local and international conditions can create more or even fewer opportunities and changes in technology can make current technology irrelevant. Similarly, an illness or death in the family can take away income from the family and cause them to quickly deplete assets that they have accumulated over time. While natural disasters such as hurricanes and man-made disasters such a fire can damage both livelihood mechanisms and Physical capital resulting in a depletion of Financial Capital. Seasonality speaks to shifts in the areas of price, production, and opportunities for employment and/or income generation.

Applied to the qualitative interviews, problem tree, transect walk and focus group discussions with the farmers of Bog Hole, it can be ascertained that their Financial Capital and opportunities for acquiring Financial Capital are inextricably linked to the Natural Capital of the land and the pond, and though impacted, capitals are still forthcoming during the disaster. This is a complex case of dependency, as their source of financial capital is also the source of their main hazard in the community, as the pond is extremely prone to overflow. It is important to note that the positions concerning this vary. For instance,

*"Miss, no rain nuh haffi fall inna Bog Hole fi we get flood. Di rain only need fi fall a Mandeville"* (Excerpt from Focus group discussion with farmers of Bog Hole, Jamaica)

Others posit that the vulnerability context of the residents is high due to the geographical realities of Bog Hole as a rural community that has a heavy reliance on agriculture. Based on the views shared by the residents when the pond overflows, it causes flooding and subsequently *"destroys houses and farms"*, *"repetition in planting efforts"* and persons *"can't find labour"*. Notwithstanding, even though the vulnerability context is high, the residents are deftly able to reduce their vulnerability through the use of local knowledge across the Disaster Management Cycle resulting in protection, maintenance, and increase of their Financial Capital. Therefore, this highlights the pivotal role of local/indigenous knowledge as a strategy for determining positive and consistent livelihood outcomes in the absence of a truly decentralized disaster management system in place. Essentially, through the application of local knowledge across the Disaster Management Cycle, the residents were able to protect their livelihood, maintain and increase their well-being and Financial Capital and ultimately reduce their vulnerability (See Table 3). As seen, some farmers paused agriculture during this period and went into a new skill, raft making and tour guiding. While some stated that this never interrupted their farm lives, as they cleaned when they could, what was seen is that these men made enviable returns during this period. When added to their usual income, it made a difference which saw some persons investing in more in poultry production. For instance, present at the focus group discussions was a female farmer with a white bucket that is air tight locked with peas. According to her, if there should be a flood tomorrow, she pulls her bucket and starts to replant as soon as possible, though conventional wisdom warns farmers not to plant immediately after a flood. However, according to her, she reaps as soon as possible, and this will mean that she has an advantage over other farmers to generate financial income by scaling up the price if she has willing buyers. This also highlights another side to farmers in this rural space, is that they are very risk averse and these are farmers who are enjoying bigger returns from their livelihoods.

### **3.3 Physical Capital**

Physical Capital in the Sustainable Livelihoods Framework denotes the infrastructure that persons need and/or use to make a living. Therefore the Physical Capital encompasses tools and equipment, transportation systems, communications systems, shelter, buildings, water and sanitation systems, energy, mechanized technology, traditional technology (local knowledge), seeds, fertilizers and pesticides (DFID, 2000; cited in Majale, 2002). Essentially, Physical Capital is used to increase productivity and as a means for gaining Financial Capital especially when strategically and consistently applied in conjunction with the other forms of capital. Based on the interviews with the residents of the Bog Hole community, the Physical Capital highlighted are the drip irrigation system, overhead sprinklers, drains and rafts. The drip irrigation system and



the overhead sprinklers are crucial means by which the farmers of the Bog Hole community are able to convert the Natural Capital of the land and the pond to Financial Capital seeing that the aforementioned are water systems and water is a mandatory facet of the agricultural process.

The drain is a major modality that enables the Natural Capital of the land and the pond to be efficiently transmuted into Financial Capital. In addition, the drain is a significant part of the preparation, mitigation, response and recovery from the disaster of flood in the community. Basically, the cleaning and proper maintenance of the drains is pivotal to the preparation and mitigation of floods the community. In the words of residents, "blocked sinkhole" is caused by the community – Styrofoam, diapers, pads, plastic bottles". Therefore, if the drains are not littered, cleaned regularly and properly maintained, there will be little or no flooding in the community due to the overflow of the pond. Similarly, the cleaning, proper maintenance and fixing of the drains are instrumental in the community's response to and recovery from the flooding. Interestingly, the raft is a Physical Capital that was created primarily as a response to and is crucial in the recovery from the flood. Furthermore, this response and recovery effort even result in the acquisition of Financial Capital. As not only are the rafts used to transport people and goods from the community but is also used as a tourist attraction. Area became a tourist attraction briefly; farmers became rafters and took people on tours on rafts throughout the community. Accordingly, Physical Capital is a crucial modality for enabling the Natural Capital to be converted to Financial Capital. Moreover, it must be appropriately managed across the various stages across the Disaster Management Cycle in order to protect, repair and diversify the use of Natural Capital for Financial Capital.

The study ascertained however, that local knowledge as is, is not sufficient to build the physical capital of the space. As seen, science had to be introduced to scientific methods to enhance their lives post disaster. For instance, they made mention of Honduran farmers who introduced them to the drip irrigation that increased their yields. Likewise, despite practising in a state of indigeneity for several years, they were still unable to fix the blocked sinkholes. This supports what is already known in the scholarship, that is, local knowledge as is, is more effective when combined with a scientific approach.

### **3.4 Human Capital**

In the Sustainable Livelihoods Framework, Human Capital refers to the amount and the quality of knowledge and labour, and whether or not it is available in a household (DFID, 2000; cited in Majale, 2002). Taken in a more specific way, it denotes the skills, knowledge, the ability to work and good health (DFID, 2000; cited in Majale, 2002). In this regard, good health is not purely a means for the achievement of a sustainable livelihood but is the ultimate goal. Of all the various capital elements, limited or even a lack of Human Capital can significantly impair one's ability to benefit from the other types of capital. Or even more importantly, convert one form of capital to the other for example using Physical Capital to convert Natural Capital into Financial Capital. Based

on the responses given by the residents, the occurrence of the flood in the community resulted in “mosquito-borne diseases” thereby impairing or reducing the human capital of residents. Furthermore, the availability of their human capital is thwarted by the disaster as the other mechanisms and/or the capital that would facilitate the use of the residents’ skills, knowledge and labour was severely impacted by the flood. Notwithstanding the most significant incidence of human capital is the clever use of local herbs to prevent any form of pain and suffering to the human body. Some residents reported an increase in drinking “bissy” tea during this period, as they were conscious of the overflowed sewer. In response to the mosquito-borne diseases post disaster, residents had a concoction of lemon grass and the chipping s from wood to start a fire in their homes and farms. It is important to note that the local nutraceutical industry in Jamaica has taken note of the use of lemon grass as a natural repellent.

The human capital of the residents’ in the form of local knowledge has been instrumental in the residents’ ability to effectively transmute the Natural Capital of land and water with the use of the Physical Capital of seeds into Financial Capital through the sale of crops. Most importantly, the deft use of local knowledge plays a central role in the preparation, mitigation, response and recovery to the flood (See Table 3). Furthermore, special mention must be made of the importation of human capital in the form of Honduran Engineers as a crucial modality towards the community’s’ preparation, mitigation, response and recovery towards the occurrence and reoccurrence of floods. Human capital is also critical to the residents’ financial capital, as was discovered in the focus group discussions. For instance, the inability of some farmers to swim, meant that when the fishes came downstream during the flood, some farmers made double return, while some made none and outside persons came into the community to reap these rewards. Consequently, the study shows the need for constant development of human capital, as the people’s local knowledge was sufficient in one sense, but lacking in another sense.

### **3.5 Social Capital**

Social Capital in the framework in the broad sense delineates social resources such as networks for cooperation, mutual trust and support (DFID, 2000; cited in Majale, 2002). In essence, it is the social resources that people use to make a living. Specific examples of the aforementioned encompass relationships with more powerful people (vertical connections), associations with people like themselves (horizontal connections), and membership in groups or organizations. With the attendant fact that these relationships are chiefly about trust, reciprocity, and a resource that persons that reach for in times of need. These relationships are also formed to lower the costs of productive work through collaboration. Social capital is not only perceived as a means but also as an end. The interview with the residents of the Bog Hole community involved various scenarios that could be referred to as Social Capital. As a response to and a modality for recovery from the flood in the community, the residents “live more communally”. That is they co-exist in groups and share facilities in order to offset the effect of the flood. In addition, the responses by the residents indicated that there is no formal mechanism for

addressing the Bog Hole community's susceptibility to the disasters in the form of preparation and mitigation, and response and recovery post-disaster. Social capital is key and if acquired and used effectively, can make a noticeable positive or negative difference in the realization of the optimal returns from the other forms of capital. For instance, during the focus group discussions there were varying views on how persons received help post flood, if any at all. In some cases, what has been unearthed is that politics plays a critical role in how resources are distributed despite the angle of severity being experienced by members of community. As such, some persons spoke of the local political representative visiting and giving residents "a ting", though not substantial.

Though unrelated, critical to the livelihoods of these farmers is how they locate markets for their produce, and the discussions highlighted their inability to connecting with the local hotel industry that is located very close to them. They make mention of the neighbouring community that benefits from the said industry, however, further probing pointed to this community benefiting from the social capital it has been exposed to. Additionally, of the farmers who joined the focus group discussions, only a few were registered farmers. This has implications on how they access resources from the State. Residents also praised the church and the work they continue to do, in terms of how they link charity in reconstruction period to the message of salvation. As such, the church has become more than just a space for belief system. The church is also a place for refuge for families who have been displaced by the floods. As such, the leaders of the church in this community are highly respected. Additionally, local nonprofit organizations continue to do projects in the community since the floods and so, they continue to be exposed to climate smart agriculture trainings that are done at a national and local level. These NGOs have also brought international and local experts in this space to continue build their human capital. Unquestionably, as seen in this space, the use of social capital can enable productive and sustainable conversion of Natural Capital through the use of Physical Capital and Human Capital into significant Financial Capital.

#### **4. Conclusion**

The framework that was used to analyse the data was pivotal in not only showcasing the vulnerability of the Bog Hole community but the ways in which the use of local knowledge at various stages of the Disaster Management Cycle enabled the residents to transcend this vulnerability. The geographical profile of the Bog Hole community clearly indicates that a natural vulnerability exists. The salient concern then becomes the actions (or non-action) of the residents reducing or heightening vulnerability. For the most part, the residents must be commended for whilst the flood disaster cannot be prevented, through their local knowledge they were able to correctly predict its occurrence and take steps to prepare for and mitigate against the impacts.

Most importantly, the residents must be commended for their innovative tendencies as during the flood they developed rafts as not only a means of basic

transportation but also as a means for making money. Therefore, it can be ascertained that while the residents' livelihood may be vulnerable based on their geographic reality and there are losses to the disaster, their local knowledge balances out the loss by way of how they apply it to preparation, mitigation, response and recovery to the flood disaster significantly heightened the sustainability of their livelihood/s. The data presented also shows an interesting finding too, that a disaster has different meaning for farmers in the same space, even though they are all farmers. For instance, some see it as the perfect time to incur more profit, but some see it as a time to pause farming and assume another trade such as: raft construction, tour guiding, etc.

### **About the Author**

Tamika Peart is a feminist and final year PhD student of Rural Development at China Agricultural University. She is Jamaican and is a scholarship recipient from the Chinese Scholarship Council.

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