A Model Towards Hurricane Preparedness Communication in the State of Florida, USA

Sanjay Jayaswal

School of Science, Engineering and Environment

University of Salford, Salford, UK

Submitted in Partial Fulfilment of the

Requirements of the Degree of Doctor of Philosophy, 2020

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ACKNOWLEDGMENT

This thesis effort benefitted immensely from the guidance of Dr. Bingunath Ingirige. He provided valuable insight into how this research study should be framed within the world of Disaster Management. His constructive feedback and critical thought partnership were essential. I must also thank my initial supervisor, Dr. Chaminda Pathirage. His belief in my research abilities and vision were instrumental in launching me on this thesis path. My journey was also well supported by my local advisor, Dr. Ajit Pyati. His consistent review of my research study was reflective of the deep passion he has regarding the access to information and knowledge for vulnerable groups. I would also like to give thanks to all the examiners who helped me refine this research study and strengthen it. Their thoughtful input along this journey was very helpful and well appreciated. The PGR Support team and other staff at the University of Salford also deserve my gratitude. They are the unsung heroes who help so many students. Without them, none of us would ever be able to progress.

The research study itself was reflective of the stellar cooperation of its participants: high-risk building occupants, FEMA, the Florida Division of Emergency Management, and the Emergency Managers of two Florida counties. Their gracious participation in the study and their candour in the interviews were the foundation this thesis was based on. I must also give thanks to the Disaster Management professionals and high-risk building occupants who counselled me in the early stages of this study. Their sage guidance helped me to realise the potential this study offered and the path toward achieving it. Finally, there were many people who helped facilitate a number of steps and stages in this research study. Their efforts were invaluable.

DEDICATION

My first and foremost thanks is to God. You guided me throughout this thesis that is dedicated to those without a voice: the brave, yet vulnerable people that prepare for natural hazards far too often with very little support. I can only hope that this research provides a path so that someday their voices will be heard. They will always find me by their side advocating for their right to flourish upon this Earth.

My family has been a solid foundation, particularly the loving support of my wife Susan. You are the sunshine that lights up my world. God Bless you always! To my father, the late Shri Vijay Kumar Jayaswal: after you passed away, I made a promise to you to finish a PhD. I hope my efforts have been worthy of you. To my mother, Shrimati Vasanti Gopinath Jayaswal: you have not only been my teacher throughout, but my inspiration as a seeker of knowledge. To my brother, Kishore: I hope my path gets you thinking about returning to the academic world, as you are a true scholar. To my sister-in-law Amy, and my nieces Asha and Priya: I hope that my journey gives you a reason to search for greater truth and knowledge. To my in-laws, Bill and Mickey: I feel so blessed for your sage guidance and encouraging words throughout this journey. To my brother-in-law, Greg: I am grateful for your insightful words along this path. I must also thank my ancestors for their blessings: my path is only one component of our collective mission that spans generations.

There are many other people that deserve immense thanks: Larry Weinstock, Lawrence Dotson, Lee Smith, Finn McKenna, Azmath Wazeer, Susan Trueblood, and Michael Preiss just to name a few. All of you supported me, believed in me, challenged me, and picked me up when I was down. This journey of mine is your journey too.

LIST OF ACRONYMS AND INITIALISMS

ASCE	American Society of Civil Engineers
CBO	Congressional Budget Office
CDC	Centers for Disease Control
CWF	Central and West Florida
DC	Disaster Communication
DHS	Department of Homeland Security
DM	Disaster Management
DMP	Disaster Management Professionals
EAS	Emergency Alert System
EM	Emergency Management
EMAC	Emergency Management Assistance Compact
EOC	State of Florida Emergency Operations Center
ESF	State of Florida Emergency Support Functions
FCC	Federal Communications Commission
FDEM	Florida Division of Emergency Management
FEMA	Federal Emergency Management Agency
HP	Hurricane Preparedness
HRBO	High-risk Building Occupants
HUD	Department of Housing and Urban Development
ICC	International Code Council
ICRT	International Community Radio Taipei
IPAWS	Integrated Public Alert Warning System
LOC	Locus of Control
M2M	Machine-to-Machine
MSC	Most Significant Change
NASA	National Aeronautics and Space Administration
NAWAS	National Alert Warning System
NEMA	National Emergency Management Association
NFIP	National Flood Insurance Program

NHC	National Hurricane Center
NOAA	National Oceanic and Atmospheric Administration
NPS	National Preparedness System
NWR	NOAA Weather Radio
NWS	National Weather Service
OPC	Open Platform Communications
PEN	Personal Experience Narrative
RHPL	Repository for Hurricane Preparedness Language
SEOCA	State of Florida Emergency Operations Activation
SFG	State of Florida Government
SMCR	Source-Message-Channel-Receiver
TCP	Tropical Cyclone Preparedness

ABSTRACT

Hurricanes are hazards that become disasters when they interact with the human environment. It is critical to elucidate how the minimally investigated hurricane preparedness communication paradigm impacts vulnerable populations. This study was conducted in a hurricane-prone U.S. region: Central and West Florida. The aim was to develop a model for hurricane-focused Disaster Management professionals that informs social-centric hurricane preparedness communication that is tailored to high-risk building occupants in Florida, and verify its accuracy. The research design was derived from the literature review and document review covering Disaster Management, hurricanes, hurricane preparedness plans, high-risk buildings, and communication. Interviews were conducted with six Disaster Management professionals and 12 high-risk building occupants. Five linguistic analysis techniques guided the data collection and analysis: Personal Experience Narrative, frame analysis, paradigmatic analysis, discourse analysis, and template analysis. Research results, including 10 exemplars and 27 themes, were synthesised to develop a model that incorporates hurricane preparedness language input from these stakeholders: Disaster Management professionals, high-risk building occupants, and academic institutions. Three Disaster Management professionals and four high-risk building occupants reviewed the model and found that it accurately represented their interview responses; the model was refined further based on these responses. This collaborative model offers a framework to generate holistic hurricane preparedness language by combining prescriptive language used by Disaster Management professionals and academic institutions with descriptive language used by high-risk building occupants. The hurricane preparedness language from this model can be utilised by Disaster Management professionals to optimise hurricane preparedness communication for high-risk building occupants in Florida.

Chapter 1 – Introduction

1.1 Overview

The following chapter examines the background of this research study: an enquiry into the area of hurricane preparedness (HP) communication amidst a yearly occurrence of these devastating storms that plague the U.S., with a particular region of the country as a study focus: the state of Florida. As a prologue, the justification and research problem for this study is considered: the U.S. National Oceanic and Atmospheric Administration [NOAA] (2014) highlighted that the U.S. is the one of the most hurricane-prone countries in the world with the state of Florida bearing the brunt of these meteorological phenomena. These stark Disaster Management (DM) realities magnify the assertion that HP communication is a critical issue to investigate further. The word *hurricane* is used by NOAA to designate such storms striking Florida and the entire North Atlantic region. Therefore, the word *hurricane* is primarily used in this research study rather than the global scientific term *tropical cyclone* that subsumes it, as a hurricane is indeed a strong tropical cyclone. Accordingly, HP is primarily used in this research study instead of tropical cyclone preparedness (TCP).

This research study is an exploration into the broader topic of HP communication, with a focus on a particular area of Florida and HP communication relevant to this area. Furthermore, HP in this study generally refers to preparedness for hurricanes in the U.S. and the specific area of Central and West Florida (CWF). In addition, the term *language* is used extensively in this study and this generally refers to words and phrases that are used within any communication or messaging relevant to HP. This study focuses on language used in HP communication and examines the problems associated with it and the justification for this study.

Importantly, this research study maintains a clear stance in being climate change agnostic in its enquiry to remain as mutually exclusive as possible from debates over climate-induced causality of hurricanes globally. The intention is to avoid any potential discourse that would detract from exploring HP communication on a broader level. This reflects an overt effort to ensure not to bias the research study toward a climate change-centric investigation.

The fundamental endeavour of this research study conducted in the U.S. is elucidated in its aim: to develop a model for hurricane-focused Disaster Management professionals (DMP) that informs social-centric HP communication that is tailored to high-risk building occupants (HRBO), and verify its accuracy. The objectives of this study pertain to how language constructs might be leveraged in synthesising this aforementioned sociolinguistic-based HP communication model. Finally, the scope of this research study is discussed extensively. The global phenomena of hurricanes comprise the only natural hazards and causes for the disasters of research focus for this study. The geographic area of particular interest for this research study is limited to the hurricane-prone region of CWF in the U.S. The study participants focused on are HRBO in this vulnerable area, and hurricane-focused DMP. Additionally, CWF is roughly within 500 kilometres of Tallahassee, the capital of Florida and location of the main hub for DMP, which is comprised of FEMA, the State of Florida government (SFG) – Division of Emergency Management (FDEM), and local agencies when they are coordinating DM efforts for hurricanes. The HRBO have hurricane experiences ranging from limited to significant. The research study only explores English language usage generally pertaining to the pre-disaster stage and preparedness phase. This study represents a confluence of the distinct fields of built environment research and linguistics research. The focus on linguistics predicates that the textual representation of this study is extensive in each chapter.

1.2 Background

In this study, the terms *natural hazard* and *natural disaster* were used extensively. A natural hazard may be defined as an environmental phenomenon that has a risk of threatening or affecting vulnerable social and economic infrastructures; it then becomes a natural disaster upon striking these infrastructures (Collins, Manyena, Jayawickrama, & Jones, 2014, pp. 5-6). Of particular focus in this study was whether HRBO were resistant to government communication regarding disaster preparation and awareness pertaining to hurricanes. Morss, Cuite, Demuth, Hallman, and Shwom (2018) showed in their study that when fear-based language is removed from weather risk messaging, and the actual impacts become the focus of the message, that protective behaviour can be motivated rather than the negative reactions catalysed by fear-based language (p. 55). This example reflects how

changes to the actual words used in weather messaging can have an impact on the behaviour of the public.

When examining the broader concept of what a hurricane actually is, it is necessary to provide a number of explanations. A hurricane is defined as a strong, rotating weather system that almost always originates in tropical oceanic water bodies, with a low pressure core at the centre that has clusters of thunderstorms rotating around it, but no associated weather fronts (NOAA, 2013). The U.S. National Weather Service [NWS] (2019b) elucidated that before a hurricane reaches its threshold, it starts out as an elongated area of low pressure in the tropics (tropical wave), then transitions to a more organised system that maintains its structure for more than 24 hours (tropical disturbance), then becomes a system with organised circular winds that remain below 63 kilometres per hour (km/h) (tropical depression), then when it intensifies beyond the 63 km/h it is classified as a tropical storm until it reaches the hurricane threshold of 119 km/h. It is also critical to distinguish hurricanes from other cyclonic weather phenomena prevalent in the U.S.: *tornadoes*. The U.S. National Aeronautics and Space Administration [NASA] (2019) described that the major differences are that tornadoes almost always form over land, they can form at many different latitudes (usually outside of the tropics), are much smaller in scale in both size and intensity, travel short distances (dozens of kilometres), and have very short lifespans (minutes). Hurricanes usually form in the tropics over the ocean, can be massive, can travel thousands of thousands of kilometres, and last for days sometimes even weeks.

This research study also used the word *nomenclature* extensively in reference to the global phenomena of hurricanes. In this study, *nomenclature* referred to the system used that governs the set of names that describe such storms. An initial basic delineation as to whether these storms are referred to as the synonyms of *hurricane*, *cyclone*, or *typhoon*, which are all common in meteorological parlance, is geographically determined and elucidated in Table 1.1 below.

Table 1.1: Basic Storm Synonyms Based on Geographic Location (Adapted from original source: NOAA, 2019c)	
Storm name	Geographic nomenclature jurisdiction
Hurricane	North Atlantic
	Central, Northeast Pacific
Cyclone	Indian Ocean
	South Pacific
Typhoon	Northwest Pacific

The term *tropical cyclone* is generically utilised in the field of meteorology to scientifically describe these types of storms around the world. Within this research study, references were made regarding specifically named *hurricanes* (generally originating in the North Atlantic Ocean or the Central or Northeast Pacific Ocean, e.g. Hurricane Katrina that affected the Bahamas and the U.S. in 2005), with occasional references to specifically named *cyclones* (generally originating in the Indian Ocean or South Pacific, e.g. Cyclone Nargis that affected South and Southeast Asia in 2008), or specifically named *typhoons* (generally originating in the Northwest Pacific Ocean, e.g. Typhoon Haiyan that affected Southeast Asia in 2013). The nomenclature depends on the geographic context of the storm origination and the according countries with geographic meteorological jurisdiction and nomenclature responsibilities (NOAA, 2019c).

It is readily acknowledged that storm nomenclature within this research study was challenging. Fitzpatrick (2006) reinforced the notion that the vast difference in nomenclature for tropical-origin cyclonic storms geographically across the world is unequivocally confusing (p. 95). In the U.S., the National Hurricane Center [NHC] is the foremost authority on hurricanes. The interviews for this research study were all conducted in the U.S. where the word *hurricane* is used to describe the strongest type of tropical-origin cyclonic storms. Thus, all the research study participants used the word *hurricane*. At the same time, the literature and document reviews for this research study were conducted within the broader global context of research with its variety of nomenclature systems for tropical-origin cyclonic storms. The words *cyclone*, *hurricane*, or *typhoon* were used in the literature and documents depending on this same aforementioned geographic context. For

ease of readability in this research study, the word *hurricane* was substituted in the literature and documents utilised because the study focus was the U.S.

While the bulk of Atlantic Ocean-borne hurricane strikes is often associated with the U.S. and the Caribbean, Haarsma et al. (2013) argued that there will be an increasing amount of hurricanes also striking Western Europe in the future (p. 1787). While data and analysis is being increasingly conducted on these storms referred to as *medicanes*, a categorisation and nomenclature system is unofficial and is being handled by various entities, including the Mediterranean Cyclone Centre (Cavicchia, L., Storch, H., & Gualdi, S., 2014; González-Alemán et al., 2019; Mediterranean Cyclone Centre, 2020). Twice the current amount of violent medicanes may affect the Mediterranean areas of Europe and the Middle East, and the Black Sea region in the future (Romero & Emanuel, 2016, pp. 295-297). Due to the unofficial status of medicanes, these specific storms were not researched extensively for this study and an unofficial categorisation and nomenclature system is detailed in Appendix N.

The meteorological storm names used globally are actually more complicated than what was listed in Table 1.1 because of the geographic meteorological jurisdiction. Table 1.1 was a basic overview and a more detailed perspective on meteorological storm names and how to equate the categories and nomenclature systems across the world is as follows in Table 1.2.

Table 1.2: Comprehensive Storm Names and Wind Speeds Based on Geographic Location (Adapted from original sources: Australian Government, Bureau of Meteorology, 2019c; NHC, 2018; National Institute of Informatics, 2017; Mediterranean Cyclone Centre, 2020)

U.S. Name	U.S. Category	Australian Name	Australian Category	NW Pacific Name	Arabian Sea/ Bay of Bengal Name	SW Indian Ocean Name	South Pacific (East of 160E) Name	Mediterranean Hurricane (Medicane) Name	Approximate wind speed
Tropical Storm				Typhoon	Cyclonic Storm	Moderate Tropical Storm	Tropical Cyclone (Gale)	Severe MediStorm	63 – 88 km/h

		Tropical Cyclone	1		Severe Cyclonic Storm	Severe Tropical Storm	Tropical Cyclone (Storm)	Medicane	89 – 118 km/h
Hurricane	1		2	Strong Typhoon	Very Severe Cyclonic Storm	Tropical Cyclone	Tropical Cyclone (Hurricane)	Major Medicane	119-153 km/h
	2	Severe Tropical Cyclone	3	Very Strong Typhoon		Intense Tropical Cyclone		Violent Medicane	154-177 km/h
Major Hurricane	3			Violent Typhoon					178-208 km/h
	4		4		Super Cyclonic Storm	Very Intense Tropical Cyclone			209-251 km/h
	5		5						252+ km/h

Table 1.2 helped to disambiguate the high level of geographic and nomenclature detail that is based on jurisdiction because of the numerous cyclonic storms of record across the world, which were referenced and discussed in this research study. However, it should be noted that Table 1.2 was created through an amalgamation of a number of tropical-origin cyclonic storm nomenclature references from around the world. This underscored the severity of the lack of global nomenclature uniformity.

In the North Atlantic, Central Pacific, and Northeast Pacific, hurricanes are distinguished from their precursor stage of tropical storms once the sustained wind speed is 119 km/h [74 miles per hour (mph)] or higher; hurricanes range from Category 1 to Category 5 based on sustained wind speed thresholds (see Appendix H). The U.S. National Weather Service [NWS] described how once a storm achieves the tropical storm threshold of 63 km/h (39 mph) is when it gets officially named (i.e. Tropical Storm Irma in 2017, which later became Hurricane Irma), and it remains referred to as a tropical storm as it strengthens all the way to its limit of 119 km/h (74 mph) when it is then referred to as a hurricane (NWS, 2019b). The details of wind speed thresholds corresponding to various storm categories across global geographical locations are different (see Appendices H – N). The focus in this research study from the standpoint of the participants who are HRBO in CWF was solely dedicated to their personal experiences with and perceptions of the stronger storms that are found in the

North Atlantic and referred to as hurricanes in the U.S.

Further light was shed on the semantic aspect in the U.S. of these cyclonic storms as Terry (2007) argued that there may have been more confusion historically as to the word *hurricane* regarding storms that originate in the North Atlantic due to the fact that not all storms actually reach hurricane force wind speeds and may remain classified as tropical storms (p. 57). This is where the naming of the storms may have helped to orient the public around a personification of the storms. Storms in the North Atlantic are given male and female names alternatively once they reach tropical storm strength to render these storms memorable and anchor the public in the characteristics of the storm, particularly the intensity and threats. The distinctive names used to differentiate large-scale storms in the North Atlantic has helped the public to distinguish between hurricanes and tropical storms and better understand that hurricanes are the more destructive of these two phenomena (Neely, 2013, pp. 8-9, 69-70). Within this research study, participants were asked specifically about their hurricane experiences and not about their tropical storm experiences. A study premise was that the word *hurricane* in the U.S. was generally understood to be a definitive large-scale, strong cyclonic storm of potentially dangerous magnitude.

There has been a marked increase in disaster frequency globally. The United Nations (2009) reinforced the assertion that natural disasters, the number of people affected, and the associated economic losses are all increasing. While the focus of this research study is the U.S., the global impact of hurricanes is felt by vulnerable populations in many countries. China ranks second in the world as far as strikes by hurricanes (referred to as *typhoons* in this region) (NOAA, 2014). Accordingly, China is statistically regarded as one of the most frequently affected countries, as the nation sees seven to eight hurricanes strike their southeastern coast every year (Zhang et al., 2017, p. 492). The large population centres in China present a robust challenge to DMP. From 1900 – 2004, six hurricanes struck China that caused more than 1,000 deaths each, totalling 159,238 deaths during this time period (Schultz, Russell, & Espinel, 2005, p. 28).

The Philippines is another country that receives a lot of hurricanes (also referred to as *typhoons* in this region). In 2013, Super Typhoon Yolanda affected 11 million people in the

Philippines; the country had the highest disaster mortality in the world that year (Program on Resilient Communities, 2018, p. 3). China and the Philippines certainly have their share of large impoverished communities that may be more vulnerable. At the same time, affluence is not a guarantee that any country will escape the wrath of hurricanes. Since 1945, Japan has experienced strikes by numerous hurricanes (also referred to as *typhoons* there), resulting in the loss of tens of thousands of lives (Cabinet Office Japan, 2015). The loss of life does not completely account for the damage to the physical and social environments. Typhoon 23 in 2004 flooded 14,323 homes in Japan (Cabinet Office Japan, 2015). The loss of a living environment is an example of physical and social destruction wrought by these storms.

In meteorological circles, the country of Bangladesh may be better known for the tragic loss of life due to the effects of hurricanes (referred to as *cyclones* in this region) rather than the sheer frequency of hurricane strikes. Cyclone Bhola struck Bangladesh in 1970 and claimed over 300,000 lives and another hurricane, which struck in 1991, killed over 138,000 people (Habib, Shahidullah, & Ahmed, 2012). Bangladesh is well-known in the DM industry as being one of the most disaster-prone countries in the world, with a number of historical events as detailed in Table 1.3 below.

Table 1.3: Bangladesh – Historical Disasters (Adapted from original source: Habib et al., 2012)

Year	Disaster
1876	Great Backerganj Cyclone
1954	Flood
1969	Demra Tornado
1970	Cyclone Bhola
1974	Manikganj Tornado
1977	Madaripur Tornado
1985	Cyclone Urichar
1987	Flood
1988	Flood
1989	Saturia Tornado

1991	Super Cyclone BOB 01
1995	Louhajong Tornado
1996	Tangail Tornado
1998	Flood

Bangladesh has certainly suffered a considerable amount from natural disasters, but there is no country which can claim sole ownership to the suffering wrought by hurricanes. The damage can be extensive, the loss of life is tragic, and the social and financial costs from hurricanes can be catastrophic.

As another example, the Cuban government and the Cuban people themselves operate in a well-coordinated manner to develop and curate risk reduction, thus preventing the recurring hazard of hurricanes from turning into disasters because of the loss of life, as compared to the death toll from similar strength hurricane strikes in the U.S. (Oxfam, 2004, p. 8). This is a hallmark of the stellar reputation that Cuba has received in the global DM community regarding their HP efforts and capabilities. Many of the same hurricanes which strike Cuba end up striking the U.S. subsequently. The disparity in hurricane impacts to the public between the U.S. as one of the richest countries in the Western Hemisphere and Cuba as one of the poorest in the same region offers another reason the HP landscape in the U.S. is of research interest. Overall, the widespread global prevalence of hurricanes and their effect on human existence were major motivations for the endeavours of this research study in the U.S.

The U.S. is one of the most hurricane-prone countries in the world (NOAA, 2014). The stark post-hurricane media imagery of people clinging to rooftops in evacuation areas in the U.S., as illustrated in Figure 1.1 below, offers the glimpse of a potential need to explore how HP messaging from government agencies directed toward the public may be optimised.

Figure 1.1: Louisiana – Hurricane Katrina Survivors on Rooftop, New Orleans (Source: NBC News, 2005)

This photograph depicted residents stranded on a rooftop and awaiting rescue after Hurricane Katrina struck in 2005; helicopter evacuation efforts across the entire area had been halted during the specific time period captured in this photograph because there had been an earlier incident where another survivor had shot at a U.S. military rescue helicopter (NBC News, 2005). The tragic reality of this photograph reflects how in the aftermath of Hurricane Katrina, the frustration of the public at the perceived lack of assistance in either HP or response on the part of DMP was profound.

The geographic focal point for the storms pertinent to this research study is the U.S., which is squarely in the path of seasonal North Atlantic hurricanes. An alarming potential in the U.S. was highlighted by Pielke et al. (2008) as they emphasised that the increase in costs due to hurricanes is growing markedly (p. 20). Damage in the U.S. due to hurricanes in 2015 was $28 billion and accounted for 0.16% of GDP; by 2075 the damage is expected to increase to $39 billion, and account for 0.22% of GDP (Dinan, 2017, p. 195). A plethora of government agencies in the U.S. are involved in DM including the Federal Emergency Management

Agency [FEMA], as well as state and local Emergency Management (EM) agencies. Communication is a critical aspect of these activities.

Hurricane frequency has increased significantly in the Atlantic Ocean since the late 1980s (NOAA, 2011). The impact of hurricanes in the U.S. is significant. NOAA (2020) estimated that there is an 'average cost of almost $22 billion' for each hurricane event. The frequency of natural hazards that have incurred losses worldwide has nearly tripled since the 1980s and storms have contributed 71% of all losses in the insurance industry during that same time period (Hoeppe, 2015, p. 4). The costs to the government and insurance companies from hurricanes are significant. The U.S. Congressional Budget Office [CBO] related that 45% of the increase for annual federal spending for damage from 2016 to 2075 would be due to climate change (CBO, 2016, p. 1). At the same time, economic costs inflicted by hurricanes affect countries around the world. In the 1990s, insurance companies paid out $91.8 billion globally due to losses from meteorological-related natural disasters (Raksakulthai, 2003).

However, the financial analyses of infrastructural damage post-hurricane may be far easier to measure than the social impacts. NOAA (2019a) encourages the members of the public to communicate with their insurance agents to obtain an insurance check-up to ensure that they have enough coverage for their homes and vehicles, and to determine whether they need flood insurance. However, insurance impacts may not fully reflect the impacts to the social realm. Communities in the U.S. struggle in natural disaster environments, feeling helpless and isolated and the residents, property owners, and businesses in the area are under enormous pressure to figure out how to rebuild the community to the way it was before, which is sometimes impossible (University of Colorado, Boulder, 2001, p. 8-1). Critical infrastructure systems in cities are interdependent; there are numerous systems at multiple levels none of which act alone but all of which are intimately integrated within the social structure (Thayaparan, Ingirige, Pathirage, Kulatunga, and Fernando, 2016, p. 1). Regardless of the challenges with HP communication, communities have consistently proved their collective strength and have contributed local insights and highly innovative ideas, which if leveraged effectively could result in helping to mitigate the destruction wrought by natural disasters (Tran, Shaw, Chantry, & Norton, 2008, p. 152). Thus, perhaps there is optimism that enhanced HP messaging by government entities may find willing partners

with the public. The ideal unofficial colleagues to DMP in the U.S. may be HRBO due to the inherent risks these members of the public face. Thus, this research study has a social aspiration in its intention: enhancing HP communication to the public in the U.S. to better convey the extent of the dangers of hurricanes could potentially save lives.

1.3 Justification/Research Problem

The problems found within HP communication often parallel those found in the field of Disaster Communication (DC) that subsumes it. Fraustino, Liu, and Jin (2012) defined DC as 'information disseminated to the public by governments, emergency management organizations, and disaster responders as well as disaster information created and shared by journalists and the public' (p. 4). Vultee and Wilkins (2012) expressed that research consistently has shown that the uniqueness of disasters predicates 'that communication with the public, specifically and precisely, is essential during the warning and impact phases of a disaster' (p. 15). Research on HP communication is justified in part by this fundamental premise pertaining to DC overall. A critical guide for this research study on HP communication with a specific focus on HP in the U.S. was outlined by Kim and Kang (2010) as they asserted that 'there are only a few empirical studies on the effect of communication variables (media use and interpersonal communication) on preparedness' (p. 475). This critical knowledge gap was the space this research study explored. In analysing problems with HP communication in the U.S. specifically, Haddow, Bullock, and Coppola (2020) cited an address to the nation by former President Barack Obama prior to the 2016 hurricane season in which he exhorted the public to seek out HP information from FEMA because of the meagre HP efforts the public has exhibited (pp. 180-181). However, HP communication in the U.S. on the part of DMP may not be optimal. Rabinowitz (2018) argued that in the U.S., members of the public can combine previous hurricane experiences and cognitive biases along with the perception that hurricane messaging wording is ambiguous, resulting in detrimental behaviour such as a failure to prepare or even to evacuate. Public misunderstanding of HP communication messages can have devastating consequences. The spectre of public distrust in HP communication is yet another factor. Sellnow-Richmond and Sellnow (2020) opined that 'desensitization to the threat of natural disasters is a persistent communication challenge to spokespersons encouraging hurricane preparation' (p. 444).

There is also a dearth of research studies examining HP communication gaps on a language-based level. Ryan (2018) asserted that the knowledge gaps caused by the lack of research studies focused on what information people seek during disaster situations predicate that DMP are unable to develop communication that corresponds to public needs (p. 73). The broad range of linguistic differences in the U.S. makes these endeavours even more difficult. Wolkin, Schnall, Nakata, and Ellis (2019) reflected that the diversity of audiences in the U.S. and the potential for linguistic barriers predicate that DMP need to understand their communication preferences (p. 90). As an example of HP communication issues, Anthony, Cowden-Hodgson, O'Hair, Heath, & Eosco (2014) described how NHC/NWS, and emergency managers struggle with the media over the accuracy and timeliness of disseminating hurricane information to the public (p. 478). The primary hurricane information emanates from NHC/NWS and goes directly to emergency managers, but the media feel they are getting bypassed at times and do not have a chance to help in the sharing of critical information that could be vital to HP activities for the public (Anthony et al., 2014, p. 479). This potential disconnect between HP communication entities does not bode well for the public as they are at the greatest risk from hurricane hazards.

As an example of such communication dysfunction, Wukich and Mergel (2015) described how despite the fact that state and local governments utilised social media to communicate warnings to the public prior to the onset of Hurricane Sandy in 2017, that the public largely refused to acknowledge or heed these warnings and sought information from Google, the Red Cross, and utility companies instead (p. 718). This choice of non-governmental information sources is in sharp contrast to the fact that these same sources have no jurisdiction or legal standing regarding HP, as opposed to government entities focused on DM and HP.

There are also communication breakdowns in the U.S. between federal, state, and local government entities regarding HP. A review by FEMA of the entire 2017 hurricane season focused partially on Hurricane Maria, which devastated the U.S. territories of Puerto Rico and the U.S. Virgin Islands; the report revealed that FEMA did not have an effective communication plan with territorial EM partners to be able to handle the plethora of issues which arose there before, during, and after the storm (FEMA, 2018a). This transparent

reflection by FEMA on its perceived shortcomings with the brutal 2017 hurricane season that saw three destructive storms strike the U.S. (Hurricane Harvey, Hurricane Irma, and Hurricane Maria) provided fertile ground to conjecture that there may be widespread HP communication issues that remain hidden in the U.S. when there are no major storms to test proactive communication integrity.

In December 2016, just a few months prior to the first activities of this research study (which commenced in April 2017), the Office of Inspector General of FDEM released a scathing audit which highlighted a number of HP communication shortcomings in Florida. Interviews conducted with FEMA, FDEM, and local EM leaders revealed that they were not able to even articulate their expectations of FDEM to provide supplies and equipment to shelters (Florida Division of Emergency Management, 2016). The ambiguity surrounding supplies and equipment which are absolutely critical to the HP effort was a sign that there may be deep communication problems in Florida. One component of this communication disconnect that was discovered during the audit was that the main information source for what supplies and equipment are needed for HP efforts was located in 'a spreadsheet created in the 1980s' (Florida Division of Emergency Management, 2016). How such critical information is shared, and which individuals have access to the document was not discussed in the audit. However, the assumption was made for this research study that depending on a shared spreadsheet as a critical communication element is a hallmark of inefficient and potentially problematic HP communication for DMP. These highlighted issues with DMP offered strong justification to examine HP communication in Florida.

Research on HP communication in Florida is also justified by the fact that the state receives the highest annual hurricane strikes: historically 40% of all hurricanes that struck the U.S. hit Florida, and 88% of major hurricanes strikes in the country have struck Florida or Texas (NOAA, 2018a). Major hurricanes are defined by the U.S. as having sustained winds above 209 km/h (111 mph) (NHC, 2018). The premise was taken that the sheer frequency of hurricanes in Florida is ample justification to explore HP communication there. Florida is also a state with lots of outdoor, leisure activities due to the balmy climate it experiences for a large portion of the year. Therefore, there are many people who are relative newcomers to the state, thus putting them at even greater risk for their lack of hurricane

experience. Lazrus, Morrow, Morss, and Lazo (2012) highlighted how in Florida, 'newer residents may be unfamiliar with the channels and messages used in communicating hurricane information' (p. 106). Part of the issue for DMP focused on hurricanes in Florida in creating HP communication is that there is no easy way to determine which residents need more HP messaging focus than others. Furthermore, Florida also has very large immigrant communities, mostly from Spanish-speaking countries. Limited English proficiency, cultural barriers, lack of access to resources due to location, and financial distress are just a few factors that pose a challenge for DMP in creating HP messaging that effectively reaches these communities, let alone be understood (Ogie, Rho, Clarke, & Moore, 2018, pp. 1-2).

This research study was partially based on interviews with participants who are HRBO. Various communities in the U.S. have HRBO that may find themselves in a pre-hurricane context with a sociocultural predisposition regarding preparedness and awareness that could be in sharp contrast to what government agencies might actually desire from the public. Communication issues regarding high-risk buildings in Florida compound the overall HP communication landscape there. High-risk buildings are by definition inherently vulnerable. The SFG created its current wind speed threshold building codes map to account for Risk Category II buildings, which are dwellings and townhouses that are less than three storeys or less in height and are designed for either one- or two-family occupancy (Florida Building Commission, 2012a). These buildings are most likely to be of older construction and thus face a higher risk of not being up-to-code and therefore at high risk for hurricane damage. Previous research on communication regarding Risk Category II buildings in Florida revealed stark inconsistencies in how well the public understands building codes, including at times a complete lack of knowledge about these building codes, particularly for newcomers to the state (Peacock, Brody, & Hightower, 2005, p. 132). The Florida HP communication environment is under-researched, thus the reasons for these communication shortcomings were components of the exploration for this research study. To further highlight the knowledge gap, Prasad and Stoler (2016) emphasised that there is very little research regarding risk perception and information dissemination knowledge of Risk Category II building occupants in Florida (p. 437). These HP communication issues underscore some of the impetus for this research study to examine Risk Category II buildings.

Shifting building code statutes in places like Florida are yet another example of HP communication shortcomings which cause confusion for both building contractors and potential claimants (Lesser, 2004). A study of the 2004 storm Hurricane Charley examined the relationships between building codes and damage and found that structures with newer building codes had lower claim severity, reduced interior damage, and ultimately resulted in a lower claim rate per policy (Institute for Business and Home Safety, 2004, p. 2). For homes that faced Hurricane Charley that were built after modern building codes were in place, the claims were 42% less severe when there was a loss and the overall claim frequency was reduced by 60% (Institute for Business and Home Safety, 2004, p. 5). Lee, Wu, and Aouad (2007) opined that building design 'is part art and part alchemy' to a certain degree because of the diversity of building stakeholders, which 'include not only the organisations and individuals who occupy the building, but also those who have provided it, those who manage it and those who live with it – the community in general' (p. 3). One focus of this study was to attempt to understand what HRBO actually perceive when they consider building codes in the context of HP communication. Imagery broadly displayed in the media after every U.S. hurricane depicts victims tragically relating the loss of their residences. The surreal photograph of Hurricane Katrina survivors clinging to a partially destroyed rooftop in Figure 1.1 underscores a potentially broad underestimation of high- risk buildings by both government agencies and the public.

After Hurricane Katrina, FEMA (2006b) recommended that the guidance and procedures for mapping hazards in areas protected by levees had to be re-evaluated so that the risk to buildings in these areas was clearly communicated to the public (p. 4-4). This FEMA perspective guided the following research study assumption: that to better understand perceptions of HP and awareness of study participants, it was critical to obtain further details on how HRBO related building codes to the high-risk buildings they live in. The reality of post-hurricane disaster consequences seems to be a pattern in the U.S. When Hurricane Katrina struck in 2005, many communities in the path of the storm that were severely impacted had buildings that were not constructed with current building codes that incorporated wind and flood protection; some buildings were not constructed to any building code whatsoever (FEMA, 2006b, p. iii). Furthermore, hurricane strike location predictability is not always an exact science and therefore communication of such data is

inherently wrought with uncertainty. Hurricane Charley in 2004 caught the public off guard, partially due to the relatively low frequency of hurricanes in CWF. Most people in the larger area of CWF followed communication regarding the path of Hurricane Charley in the days prior to the storm actually making landfall, yet they did not assume that there was any real threat to themselves and their property because the media had largely focused the landfall centring specifically on a limited strike zone of the Tampa area (International Hurricane Research Center, 2004, p. 2). The destruction wrought by Hurricane Charley on what appears likely to be high-risk buildings is exemplified in Figure 1.2 below.

Figure 1.2: Florida – Hurricane Charley Damage, Punta Gorda (Source: FEMA, 2004)

Photographs such as this one from Hurricane Charley offer real-life examples of hurricane destruction that influence public perceptions. However, pre-hurricane public perceptions have been constructed through a complex medley of information gathering and fact-finding that is inherently multifaceted in HP communication. In the era of an information society, what is construed as knowledge is invariably interpreted in different ways by government agencies and the public. This underscores the argument that 'the concept of an information

society is a contested terrain, understood at various social, political, economic, and theoretical levels' (Pyati, 2006, p. 86). The differing perspectives of the knowledge corpus pertaining to HP communication may be reflected in the measure of how HRBO feel about the basic construction integrity of their residences prior to a hurricane striking the area.

Thus, since disasters are often measured in more conceptual terms pertaining to social structures rather than strictly physical infrastructure terms, the importance of language used to describe disasters in DC is critical. In the case of hurricanes, it is the language used in HP communication that is of importance. The consequences of HP communication, or lack thereof, are often only revealed in the midst of a disaster. In addition, DMP are inherently deployed in the midst of a disaster to address immediate impacts to the social and physical infrastructures, putting them in danger potentially as a result of issues compounded by HP communication shortcomings. A significant social issue that is reflected in HP is that residents of high-risk buildings may simply refuse to leave zones of potential danger. People in the U.S. will risk their lives and remain in unsafe buildings during disasters to protect their property from looters or to protect their animals, and emergency responders often have to expend tremendous effort to rescue these animals despite the fact that there may be meagre time and resources to conduct such activities (Bekoff, 2009, p. 164). Part of the HP approach for such residents may simply be for them to fortify themselves and their pets not only against an impending hurricane but the potential onslaught of looters.

Huang, Lindell, and Prater (2016) argued that people in the U.S. who live in mobile homes (a type of Risk Category II building in Florida) are quite aware of the well-known vulnerability of their dwellings and are therefore more likely to evacuate prior to a hurricane strike because they have acute risk perception regarding the structures that they live in (pp. 1014-1015). However, it remains to be seen as to how HP communication factors into the vulnerability awareness of HRBO. While there are objective factors that render physical infrastructures to be protected to a certain limit, i.e. immovability, social infrastructures can be retained to a significant extent if loss of life can be minimized or even prevented. The heart of HP communication is indeed in the social realm and the issues that affect messaging pertaining to hurricanes have very real consequences to the integrity of human experience and well-being of HRBO. The true goal for HP communication should ideally be

to save lives and this is where this research study finds its ultimate justification.

1.4 Aim

The aim of this research was to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

1.5 Objectives

1. Examine the pre-hurricane perceptions of HRBO
2. Evaluate the pre-hurricane strategies of HRBO
3. Explore and identify specific words, concepts, communication channels used by HRBO and hurricane-focused DMP regarding pre-hurricane realities such as preparedness and awareness
4. Develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy
5. Extract contextualised findings which expand existing knowledge
6. Formulate conclusions and recommendations of HP communication measures for policy-makers

1.6 Scope

This research was solely focused on understanding HP communication in the state of Florida through efforts combining a literature review, document review, and qualitative research activities to help distil the English language HP communication constructs of 12 HRBO in CWF, as well as six U.S.-based DMP. Non-English language HP communication was not in scope for this research study, nor was conducting a quantitative study. Support for this scope is also elucidated by the Justification/Research Problem, Aim, and Objectives previously detailed (see Sections 1.3, 1.4, and 1.5). The region of CWF has a relatively high frequency of hurricanes within Florida and was the sole location for the research study participants who are HRBO. These HRBO in this research study were occupants of Risk Category II buildings and not any other type of residential structure. The DMP were all primarily hurricane-focused as part of their employment. This study was crafted to understand language-based hurricane experiences of these HRBO and DMP, not to uncover their experiences with tropical storms or other types of weather phenomena (see Section

1.2).

Words and phrases were a critical focus of the objectives of this study (see Section 1.5). In the context of hurricanes in the U.S., the words used to build HP communication messaging become critical due to the excessive amount of damage wrought by these storms (see Appendix H). Words comprise a major portion of the building blocks of language constructs and people process the same words differently in isolation than if these words are used in the context of a sentence, let alone a broader context which holistically describes a situation (Dunabeitia & Molinaro, 2014, p. 85). Thus, words are by definition part of the foundation of HP communication. Misconstruing words used for HP messaging can have devastating consequences for HRBO given the inherent challenges of HP. Governments may use different language than the public might for HP. As an example, Lake County in CWF clearly stated on its website that 'Emergency Managers seem to have their own language when talking about hurricanes' (Lake County, 2007). In addition, the words used in DM in the U.S. are very specific to the industry itself and most people remain unaware or unfamiliar with either the words or the actual meaning of the words (Blackstone & Beukelman, 2015, p. 104). This study analysed English language literature on a broad range of subjects related to linguistics and HP communication. In addition, HP documentation issued by FEMA, SFG, and HP documentation from other places and countries that utilise English extensively in government documentation was analysed. The focus on the aforementioned English HP resources paralleled the language background of the study participants as they were all English first-language speakers. This aided in the analysis of HP communication issues that was central to this study. A study premise was that the word *hurricane* in the U.S. was generally understood to be a definitive strong storm of potentially dangerous magnitude that participants would have less ambiguity about.

In the U.S., NOAA (2016b) has detailed how to use words in the field of DC to discuss hazards:

- Be specific.
- Be consistent.
- Be clear and accurate.

- Use plain language.
- Meet the needs of the media and other emergency partners.
- Describe protective actions to take and how those actions will benefit the audience.
- Describe the hazard, including location and timing.
- Disclose the source of the information.
- Provide options for more information.

However, it remains to be seen whether this ideal of DC has truly been optimised in the U.S. in reference to HP communication. Smith (2003) argued that 'communication consists of the simultaneous transfer of signals and meanings,' yet the meanings in communication are not simply based on the words within communication, but are inferred from the context of communication and associated words (pp. 175-176). This study examined where the individual and collective hurricane experiences of DMP and HRBO contribute both words and meaning, and shape HP communication and interpretation, and not in how language was used for other DC contexts.

The HRBO residing in the hurricane-prone region of CWF were a cornerstone of this research study designed to explore their sociolinguistic predisposition regarding HP and awareness. One particular focus of this study was the focus on understanding whether building codes specific solely to Risk Category II buildings were well-known to HRBO that live in CWF. This research study was an examination of how any such knowledge may have played a part in the decision-making process of HRBO prior to a hurricane, particularly from a HP and awareness standpoint. The gathering of such insights was focused on discovering whether there is a disconnect between government entities and the public regarding HP communication, and not focused on any other potential disconnect between the government and the public.

This research study was an exploration within the pre-disaster stage and preparedness phase of hurricane hazard events in Florida. The study did not cover other disaster stages or phases, other regions, other types of natural hazards, or occupants of non-high-risk buildings. A targeted examination of lower income HRBO or individuals with other

demographic, socioeconomic, or physical characteristics was also not in scope. Additionally, the research did not directly examine other phases of the DM cycle. Exacting generalised understanding of how insights might be applied across other areas of the DM industry was also not in scope for this research study.

Another reason that this research was relegated to the pre-disaster stage reflected the aforementioned difficulty in clearly defining what actually constitutes a disaster itself. Oliver-Smith (1999) maintained that disaster is reflected ‘as a behavioural phenomenon, and the focus of the definitional problem is primarily the behaviour of human beings and groups in a specific context of disruption and/or damage as expressed in individual, group, or institutional terms' (p. 24). This research design for this study had to account for the inherent biases of participants whose views might have been coloured by their varying degrees of previous exposure to hurricanes. It was accepted that within this research study that during the pre-disaster stage, the integrity of the definition provided by participants of whether a disaster would occur was affected by the impact of any previously transpired hurricane event(s) these participants might have experienced. This a priori knowledge was taken into account anecdotally to accurately reflect the language-based perspectives of participants defining concepts such as HP in a high-risk building context.

The spectre of climate change is another aspect that was not covered in this research beyond anecdotal responses from study participants. Booth, Hammond, Lamond, and Proverbs (2012) provided that while 'there are areas of substantial uncertainty about climate change,' the scientific consensus on the realities of climate change have ensured that it is 'now very high on the worldwide political agenda' (pp. 1-2). The premise is acknowledged that the relationship between climate change and severe meteorological events underscores one critical argument for the necessity of hurricane research. Often, the victims of hurricanes are located adjacent to the coast and the potential for rising seas due to climate change inherently increases hurricane-generated flood risk. Additionally, scientists believe that climate change will increase certain factors such as sea surface temperatures and that this will increase the probability of hurricane formation (CBO, 2016, p. 4). Thus, the language constructs of HRBO might reflect the use of coping mechanisms that are a direct response to climate issues and the involvement of stakeholders in a

number of these mechanisms (Raksakulthai, 2003). This research study was designed to focus on more fundamental aspects of HP language constructs rather than to be aligned with any potential debate over the validity and scope of climate change. Thus, whether or not there is a climate change induced component to hurricane frequency, this research study maintained a clear premise: HP communication remains a factor with inherent value from a societal standpoint in the U.S. due to the deleterious nature of hurricanes themselves.

Communication is an integral aspect of the social fabric and HP communication is one of the many threads, albeit an inherently critical one in a hurricane context. There are serious consequences for sub-optimal HP communication (see Section 1.3). This research study explored the social construction of HP language utilised by HRBO and DMP. This was a subjective approach whereby the data collection was conducted as an immersion in the actual research effort itself and not by separate outside observation. Language is not exact in that the meaning of words and their implications are themselves subjective. Therefore, gaining a lexicon of language usage did not necessarily paint an exact picture of the rationale of research study participants that comprises the foundation of their HP behavioural landscape. There is limited literature available which addresses the linguistic realities of HP. Furthermore, studies using data collection techniques that are linguistic-centric have not been used extensively in the DM research domain. Given the inceptive nature of study in this research area, deep, exploratory discovery needed to be conducted. This predicated that the research study had to focus on the examination of the HP perspectives of a small number of participants in a specific region of the U.S. to begin the task of understanding the broader sociolinguistic HP communication landscape. The endeavours of hypothesis testing and theory building were not the path this study followed. The research study data collection occurred during an extremely narrow window of time, the months of January and February of 2019, which is within the short window from 1 December to 31 May where HRBO and DMP were less likely to either be cleaning up from the previous hurricane season or preparing for the next hurricane season.

Participants did not have the same amount of hurricane experience or knowledge. This necessarily resulted in a wide range of perspectives on HP language constructs. Research in

the field for an extended period of time such as months or years was not conducted for this particular research study: the study was devoid of observation in real-time as to what HP actually entailed from a functional and behavioural standpoint. Thus, this research study did not include real-time, in situ observations on how HP efforts were tested by a hurricane to measure the effectiveness of this preparation. The DMP were drawn from FEMA, FDEM, and two distinct EM departments from separate counties in CWF. The perspectives of these research study participants differed considerably at times from each other for a wide variety of reasons. Research observer bias was also accounted for by the assumption that there were inherently different perspectives between the research being conducted and the research study participants themselves regarding language use and HP. Finally, this research study had the distinct limitation of putting ethical considerations at the forefront before any study objectives were met. This entailed that ethical standards were adhered to no matter what the consequences were to the research study itself, with an ultimate focus on protecting the security, well-being, and integrity of the research study participants.

This research study was an exploration into the identification of distinct language domains of HRBO regarding pre-HP and awareness and was an attempt to qualify these domains through the use of the Research Strategy of linguistic analysis and according qualitative data collection techniques used to analyse interview data. A consequence of this approach to the research study was that perceptions can be arranged intentionally or by default to results in views which are incorrect, despite the fact that they might be confirmed by the evidence or the efforts to correct these views (Goffman, 1974, p. 480). It is for this reason that understanding HP language constructs is helpful in the examination of the broader linguistic paradigm of DMP and HRBO. As an example, FEMA (2006a) has mandated that 'it is required that plain language be used for multi-agency, multi-jurisdiction and multi-discipline events, such as major disasters and exercises.' Thus, the importance of the interview-based data collection technique was supported by the premise that information itself is inherently vulnerable on a fundamental level: it is only as good as the words used to describe this information. One focus of this qualitative study was on achieving thematic saturation from this data-rich, linguistic-orientated interview technique on a group of participants specifically screened to be able to extensively articulate their hurricane experiences as HRBO in CWF or hurricane-focused DMP. Utilising participants that met probability-based

criteria for being representative samples was not in scope.

1.7 Summary

This chapter covered the introduction portion of the research study. The background of hurricanes, HP, and communication within a DM framework were initially touched upon. This provided the backdrop wherein the justification for this research study and the research problem were broached. Topics included the consequences of hurricanes, the hurricane frequency in the U.S., the vulnerability of high-risk buildings, and importance of HP communication.

Further clarity was provided by presenting the aim of this research study: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy. The six objectives of this research study were also detailed. The scope of this study was described as being relegated to the U.S. state of Florida, hurricanes, HP communication, and the participants being limited to HRBO located in CWF, as well as DMP focused on hurricanes.

Chapter 2 – Literature Review

2.1 Overview

In the following chapter, literature based on research studies such as peer reviewed journal articles, books, webpages, and other research-informed and subject matter expert resources is leveraged for this research study. Literature review can generally be reflected in three phases, which are detailed in Table 2.1 below.

Table 2.1: Literature Review – Three Phases (Adapted from original source: Onwuegbuzie & Frels, 2016)

Exploration	Beliefs and topics
	Search initiation
	Information storage and organisation
	Information selection and deselection
	Search expansion
Interpretation	Information analysis and synthesis
Communication	Literature review reporting

In the exploration phase, a broad number of areas of enquiry are examined for this research study to provide a holistic perspective of HP communication. Defining disaster and elucidating the relationship between HP communication and hazard is a prerequisite to help establish a basic level of familiarity with the broad subject matter being researched. Literature from the field of DM is also investigated to establish that this research study occurred within the pre-disaster stage and preparedness phase. This establishes that the consequences of the study objectives are reflected in the post-disaster stage and recovery phase. The frequency and cost of disasters worldwide are reviewed and narrowed down to the case of the U.S. where hurricanes are perhaps some of the most prevalent in the world. The state of Florida is described in the literature to be the region that receives the most frequent hurricane strikes annually in the U.S.

The interpretation phase of the literature review is conducted partially in this chapter and as part of the data collection analysis phase of the research study. Additionally, the

communication phase of the literature review is reflected in how the exploration phase comprises the contents of this literature review chapter. Additionally, the interpretation phase is reflected later in the data collection analysis phase of the research study. Elements from the literature review inform the conclusions of the research study.

Document review is a technique used in this research study, which may be denoted as an umbrella term under the aegis of the search and critical reading of any and all types of relevant material in either digital or hardcopy form that are not research-based from an academic standpoint. These documents are usually associated with governments, institutions, and companies. Document review is actually placed in this literature review chapter for the sake of topical clarity and context, as well as the continuity across these topics, despite the fact that document review is different from literature review. The rationale behind this is that the subject material of documents reviewed including building codes, wind speed thresholds, and global HP plans is very well-placed contextually, subsequent to the literature pertaining to hurricane frequency variation across countries. Literature review and document review in this study are both focused only on English language material due to the scope of this study being solely on English language HP communication (see Section 1.6). The structure of the document review is roughly parallel to that of the literature review. An initial exploration phase is conducted to gain a baseline understanding of topics related to building codes and global HP communication. The interpretation phase of the document review is similarly conducted partially in this chapter and as part of the data collection analysis phase of the research study. Finally, the communication phase of the document review is combined with the insights gained from the literature review exploration phase and interpretation phase. This is further expressed in how the exploration phase comprises the contents of this literature review chapter and is reflected later in the data collection analysis phase of the research study. Similarly, elements from the document review inform the conclusions of the research study.

Eleven sources comprise the document review in the research study: FEMA disaster preparedness task categories for the public; three HP plans, with one each for the U.S., Taiwan, and Australia; FEMA National Preparedness System; three building codes documents, one each for the U.S., Bangladesh, and Australia; and three maps of wind and

risk regions, one for Florida and two for Australia. These sources are reviewed to examine some similarities and differences, to derive language elements for analysis, and also to catalyse the process of better understanding global HP language usage and themes to develop interview questions for the research study. High-risk buildings in Florida, their wind speed-based definitions, and how their inherent vulnerabilities might reflect on HRBO are also examined in the document review and are discovered to be a conceptually fertile domain to then target HRBO therein. Definitions and details regarding high-risk buildings across other places including Bangladesh, Bahamas, and Bermuda are utilised to provide context for the high-risk building definitions in Florida. In addition, an explication of hurricane frequency variation across a broad number of countries is augmented by an exploration of HP across three specific countries: the U.S., Taiwan, and Australia. The HP plans for these countries are compared and contrasted.

The broad field of communication is reviewed, with foci on communication issues, language and linguistics, and communication models. Of particular note is the discovery that highly specific HP language which is optimised to the language usage of the public is not prevalent in mainstream DC models. This supports the creation in this research study of two initial HP language models for the U.S. that are introductory attempts to explore how such communications might be optimised with language synthesis powered by the collaboration between DMP and the public.

2.2 Defining Disaster

The word *disaster* is derived from Latin and etymologically breaks down into the prefix *dis*, which expresses negation, and the stem *aster*, which refers to the word *star* in English. The semantic analysis of the word *disaster* implies a situation in which the positive *alignment with the stars*, as the infamous astrological idiom goes, is disrupted. The traditional implication of a disaster in medieval time was that when something occurs under a *bad star*, this corresponded to a case of clear misfortune (Lonergan, 2011, p. 131). Perhaps what is currently implied by the word *disaster* is slightly simpler: it is when society and its ecosystem have issues coping with new stresses due to the undermining effects of environmental, social, economic, and political factors (Ball, 1979, p.3). This multifactorial characterization underscores some of the reasons that the very definition of disaster

continues to be hotly debated. The uses of the term *disaster* in both literary and popular vernacular challenge scientific enquiry due to the association disaster has with the broad attempts of allusions, concepts, phenomena, metaphors to achieve simplicity, precision, and clarity (Oliver-Smith, 1999, p. 19). The disaster wrought by Hurricane Katrina in 2005 in the U.S. had a direct impact on the corpus of literature as illustrated in Figure 2.1 below.

Figure 2.1: Louisiana – Hurricane Katrina Damage, Tulane University, New Orleans (Source: Dankowski, 2015)

When defining disaster, it is critical to distinguish between *natural* disasters and *anthropogenic* (human-made) disasters. From the early stages of planet Earth, natural phenomena of intense magnitude have shaped the physical environment. These events may have reduced in intensity over the billions of years Earth has been around, but these types of events still persist. Natural disasters can be caused by geophysical principal agents that are climatic and meteorological (e.g., floods, hurricanes, and droughts) or where the principal causal agent is geological and geomorphological (e.g. landslides, tsunamis, and earthquakes) (Bokwa, 2013, p. 711). It is also critical to clarify other types of disasters that may be considered as natural disasters where the causal context is reflected in flora and fauna including such examples as viral diseases, fungal diseases, infestations, poisonous

plants, or locusts (Bokwa, 2013, p. 711). Yet, prior to human beings being around, there was no human context to be affected by these *natural disasters*; thus, there were only *natural hazards* at that time by this definition. Natural disasters still occur in regions that are unpopulated, but these are less popularized in media as being bona fide and are thus regarded in this research study as natural hazards. In essence, a natural hazard does not get classified as a natural disaster unless the area it affects has some degree of social vulnerability (Mitra, 2013, p. 107).

Natural hazards like tsunamis and hurricanes always form over open oceans, yet they usually become newsworthy to the non-scientific public when a threat to infrastructure or life is imminent. The types of natural hazards that do not threaten the social infrastructure are largely only focused on by the scientists that conduct research on the natural environment. Sun and Faas (2018) argued that most studies do not focus on the social construction of disasters despite the fact that disasters are defined by the intersection of hazards and vulnerable populations (pp. 624-625). The implication here is that these types of natural hazards, which are non-threatening to the human-centric material world, are somehow regarded as less destructive due to the lack of impact on human beings. This leads to a critical argument of this research: that the very concept of disaster is ultimately measured in a human context. Due to the preponderance of the language usage of the term *disaster* in common parlance, in this research study the term *disaster* was used interchangeably with the term *hazard* depending on the social impact context.

Another perspective on disasters is characterizing their causality as either being anthropogenic or natural. Anthropogenic causality for disasters by definition reflects the human context in that these disasters would have never occurred without the elements created by humans that are either catalysts or contributing factors to these disasters. Examples of such disasters include incidents that have causes including nuclear material, coal mines, oil drilling operations, and acts of war. Due to the fact that there are extremely complex human elements involved in such disasters, these events seem to garner their own separate set of perceptions and related responses from preparedness and awareness perspectives. Yet, with the steadily increasing levels of human alteration to the natural environment through actions such as the release of greenhouse gases, the levelling of

forests and greenspaces for development, and the demands on freshwater, it may be difficult to disambiguate anthropogenic disasters from some natural disasters. The spectre of climate change is perhaps the most vivid example of a discussion topic which is en vogue regarding the dysfunctional relationship between humans and the natural environment.

Catastrophic events that are caused by nature or humans may be exacerbated by human activity (Lonergan, 2011, p. 134). As a simple assumption, the greater the amount of human presence and their infrastructure in a given area, the greater the probability exists for the potential for disaster to occur. The importance of preparedness can be highlighted by the assertion of Thayaparan et al. (2016) that the impact of hazards on the social infrastructure in highly developed, urban areas can be disproportionate to the level of the hazard and its impact on the physical infrastructure in the area (pp. 1, 3). Thus, another way to distinguish disasters is by describing them according to various factors as detailed in Table 2.2 below.

Table 2.2: Disaster Factors (Adapted from original source: Rutherford & de Boer, 1983)

Disaster factor	Definition
Effect	What the effect from the disaster is on the community
Cause	Whether the cause of the disaster was natural or anthropogenic
Time	How long the cause of the disaster takes to develop
Extent	What the size and magnitude of the disaster area is
Casualties	What the number of casualties is
Injuries	What the causes of injuries and their after-effects are
Rescue	How long it will take to conduct rescues

Given the number and diversity of disaster factors listed in Table 2.2, preparedness would need to account for each one of them to be comprehensive. Thus, regardless of the method used to characterize disasters, Table 2.2 provided clarity for this research study. To get a

better grasp on the factors pertaining to disaster in this research study in CWF, an understanding was needed regarding how preparedness evolves from communication between the main stakeholders of this study, DMP and HRBO, that are affected by even just the threat of hurricane strike.

2.3 Preparedness and Mitigation within the Disaster Stages

To properly clarify the concept of disaster, it is critical to understand that disaster events are characterized by three stages: pre-disaster, during-disaster, and post-disaster. To further detail the stages of disaster, as co-opted from the field of EM, there are four phases of DM: mitigation, preparedness, response, and recovery (FEMA, 2012, p. 2). It is important to note that DM is an open-ended process in which there is considerable overlap between these phases. Therefore, attempting to examine all of these phases as being independent would render perspectives devoid of the holistic and comprehensive reality that a disaster environment entails. Shaluf (2008) argued that mitigation forms both the beginning and end of the DM cycle and is found throughout this cycle as depicted below in Figure 2.2.

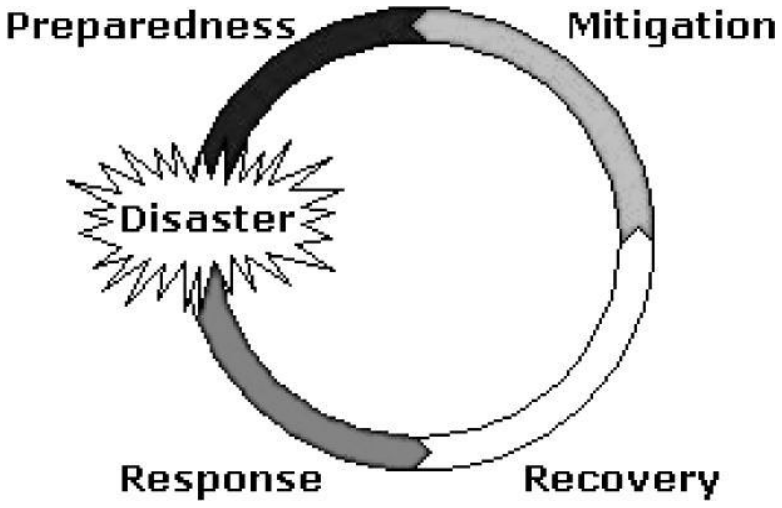

Figure 2.2: DM Cycle (Source: Shaluf, 2008)

However, if mitigation is the beginning of the DM cycle and the next stage is preparedness and onward, then mitigation may have dependencies on recovery and preparedness may have dependencies on mitigation. Thus, detailing activities in each of these phases is critical. Furthermore, FEMA (2012) emphasised that activities that are conducted during mitigation

involve risk and hazard identification to significantly reduce or perhaps even eliminate the impact of incidents through the use of structural measures (p. 3). This perspective reflects the premise that the very notion of disaster is regarded by the U.S. government from a decidedly physical structure-centric standpoint rather than a social structure-centric perspective. The logic behind this is certainly apparent in that structural impact and loss is undeniably costly. Some examples of mitigation given by FEMA (2012) 'include:

- building codes that address risks such as fires, high winds, or earthquakes;
- zoning rules that restrict construction in floodplains;
- rebuilding damaged structures with more resilient materials;
- flood mapping to identify low lying areas and relocating homes and structures located in floodplains and flood prone areas; and
- dams and levees that help prevent flooding' (p. 3)

To delineate, FEMA (2012) clarified that 'preparedness is distinct from mitigation because rather than focusing on eliminating or reducing risks, the general focus of preparedness is to enhance the capacity to respond to an incident by taking steps to ensure personnel and entities are capable of responding to a wide range of potential incidents' (p. 3). Examples of preparedness 'include:

- training;
- planning;
- procuring resources, such as food, water, and medication stockpiles; intelligence and surveillance activities to identify potential threats; and
- exercising to assure the adequacy of planning efforts and the use of after-action reports to improve emergency response plans' (FEMA, 2012, p. 3)

In building upon the logic exemplified in Figure 2.2 regarding how phases work together with contingencies and dependencies, another example of this perspective is reflected by a different DM cycle model as depicted in Figure 2.3 below.

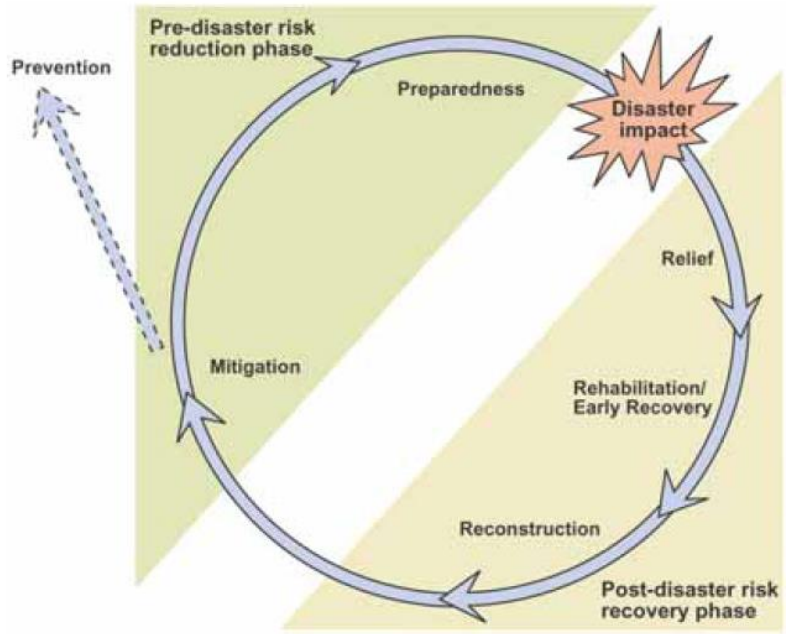

Figure 2.3: Preparedness Initiative Approach (Source: Max Lock Centre, 2001, as cited in RICS, 2006)

Of noted interest in deciphering Figure 2.3 is the premise that enhanced mitigation may lead to enhanced disaster prevention. However, the lessons learned from the path through the DM cycle can be put to use if the entire process of risk reduction is philosophically embedded throughout each phase, particularly in the mitigation phase as evidenced above. Thus, enhanced mitigation could then lead to a risk reduction phase in the pre-disaster stage environment. Such insight into disaster reduction would be characterised as an ideal state of proactive engagement to achieve the ultimate objective of complete disaster prevention.

The pre-disaster stage certainly has a strong presence of mitigation and preparedness. Mitigation is a generally focused on the physical infrastructure. This research study supported the argument that the impact to the social structure is what should be the primary focus of the DM cycle. The impact to the physical structure is one major component that contributes to the impact to the social structure. When disaster is defined in terms of a social-centric crisis that is characterised by significance and interpretation instead of an infrastructure-centric threat, the definition of disaster then becomes quite broad (Oliver-

Smith, 1999, p. 22). Within the context of the pre-disaster stage, it is perhaps critical from a mitigation standpoint to understand how the public regards social risks and hazards as a complement to the identification of risks and hazards from a physical structure-centric perspective. In some areas that are prone to natural hazards, individuals may view natural hazards as simply being a normal characteristic of these areas (Maskrey, 2010, p. 35). This perspective reflects a level of local disaster awareness. As an example, the vulnerability of individuals living in lower income housing is highlighted by the fact that the physical structure and form of buildings are regarded as secondary factors definitively (Maskrey, 2010, p. 17).

This research study also focused on gauging disaster awareness through the examination of public understanding of building codes, specifically the perspectives of HRBO in CWF. Such enquiry helped to shed light on opportunities to enhance preparedness. This research study emphasised that the pre-disaster stage could ideally be more social-centric than currently emphasised in DM practise. The opportunity for collaboration between DMP and HRBO is usually at minimum outside of the during- and post-disaster stages where collaboration is forced and imperative.

2.4 Disaster Response

In the post-disaster stage, the tasks of relief, rehabilitation, early recovery, and then reconstruction are in motion as depicted in Figure 2.3. This timeframe also corresponds to the disaster response phase as shown in Figure 2.2. Additionally, FEMA (2012) clarified that the response phase is based on the focus of immediate action to save lives, meet basic human needs, protect property, and protect the environment through the execution of emergency plans that include the following tasks:

- evacuating victims;
- deploying response teams, medical supplies, and other assets; and
- establishing incident command operations (p. 3)

To conduct response phase operations, DM personnel may require some degree of cooperation from members of the public. However, it is in the evacuation of victims that perhaps the social context is most evident. Evacuation ideally occurs prior to the actual

onset of a hazard. This proactive evacuation is reflective of how the response phase is actually triggered by the declaration of a potential hurricane strike that exceeds the risk threshold for a given area. The response phase often continues right into the post-disaster stage.

The post-disaster stage itself is a time in which the recovery phase is prevalent. While the post-disaster stage does initiate at the juncture regarded as an aftermath of the disaster event, it is still debatable as to when a disaster event truly begins or when it is actually over. Case-in-point: hurricanes can and often do cause flooding. So even when the hurricane has physically left the affected area, sometimes the flooding continues. Thus, disasters can extend chronologically. This in turn is reflected in how recovery can be described as short-, medium-, and long-term. To clarify, FEMA (2012) asserted that recovery is comprised of activities that are intended to restore essential services and repair damage caused by the event and include:

- restoring essential government services and operations such as emergency services, public safety mechanisms, and educational institutions;
- reconstituting services and housing for victims who are displaced and engaging in the restitution of essential supplies (p. 3)

What renders the response phase efforts so critical to disambiguate is the fact that by definition, the response phase is necessarily contingent upon both mitigation and preparedness efforts. Perhaps one infrastructural connection between the mitigation phase and the response phase is evidenced by building codes. As a component of the mitigation phase, building codes were one of the top foci of this research study as they pertain to both the high wind and storm surge risks associated with flooding from hurricanes in Florida. In reflecting upon this relationship between hurricanes and building codes, Marshall (2009) argued that building code upgrades in Florida after Hurricane Andrew were effective in improving building performance in subsequent hurricanes.

Without building code adherence, the efforts for the response phase may be more involved. The mitigation phase also reflects on mapping flood prone areas and setting construction rules in these areas. Should this aspect of the mitigation phase be deficient, it is clear to

assume that the risk for damage to structures could increase, and accordingly the response phase may have to account for this by expanded efforts.

The preparedness phase also contributes to the realities of the subsequent response phase. With effective preparedness communication, training, planning, and stocking up on essentials in advance of a hurricane, it is quite likely that the impacts from the storm will result in less devastating effects. Hurricane preparedness communication between individuals and their family, friends, and neighbours can also reduce uncertainty about safety (Kim & Kang, 2010, p. 485). With enhanced preparedness, the response phase may be able to focus better on the areas and individuals that were not able to prepare effectively, or were displaced as a result of the unpredictable consequences of a hurricane. Due to their inherent increased exposure to storm-based risk, HRBO are heavily dependent on the mitigation and preparedness phases to better ensure that the efforts in the response phase are best tailored to serve their needs in the post-disaster stage.

2.5 Disaster Frequency and Costs

The aforementioned perspective on the sheer vulnerability of HRBO underscored the global diversity of the human context to disasters. Yet, one of the critical motivations to engage in disaster research is that the frequency of disasters is in fact increasing globally as elucidated in Figure 2.4 below.

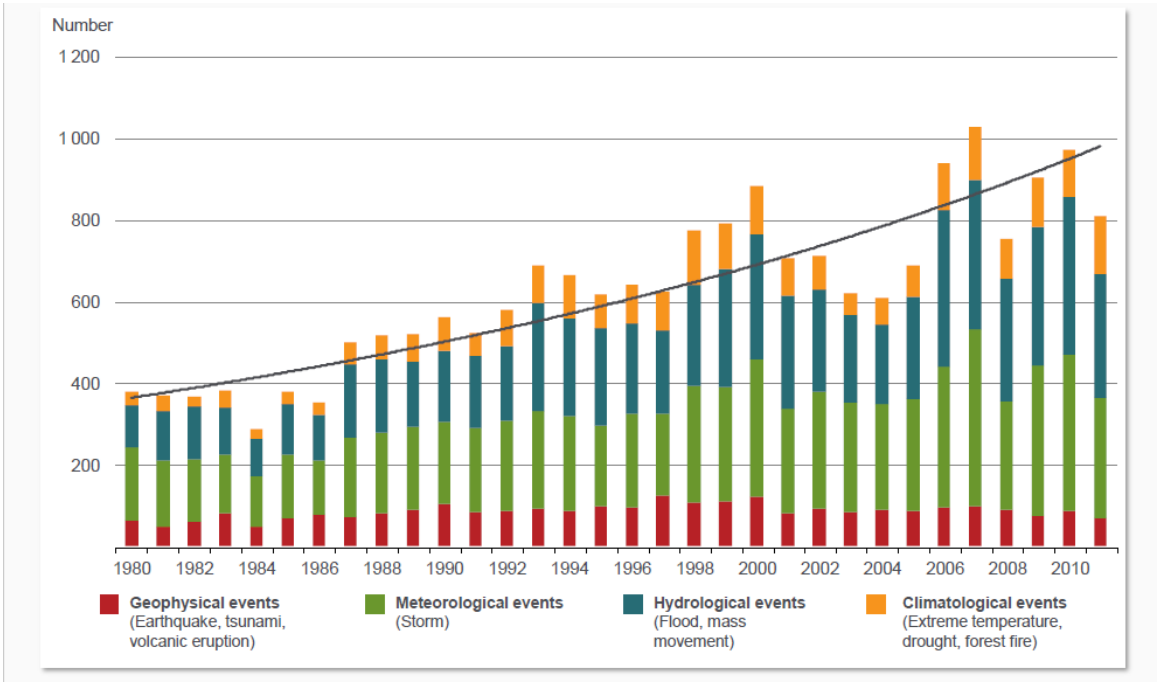

Figure 2.4: Worldwide – Natural Disasters by Type 1980 – 2011 (Source: Munich RE, 2012)

The consistent upward trend of disaster frequency shown in Figure 2.4 reveal a number of notable aspects. Geophysical events appear to remain fairly consistent. However, meteorological, hydrological, and climatological events are all increasing in frequency. What makes this more troubling is that often in specific events, many of these factors coincide. While the spectre of climate change may often be regarded as a major cause of both meteorological and hydrological events, the need for preparedness is still present beyond the climate change debate. The storms that comprise meteorological events as defined in Figure 2.4 are often the cause of the floods, which are part of the definition provided for hydrological events. Storm surge inundation and coastal flooding is the leading cause of death in the U.S. out of the aforementioned hazards, which all have ruinous effects (Morss et al., 2018, p. 46). The increasing frequency of natural disasters is thus not merely characterised by effects on the physical environment, but the social environment as well.

The increasing frequency of natural disasters and the effect on the physical and social environment is by no means the only characteristic of this perilous reality. There is an increase in costs associated with disasters as well as elucidated in Figure 2.5 below.

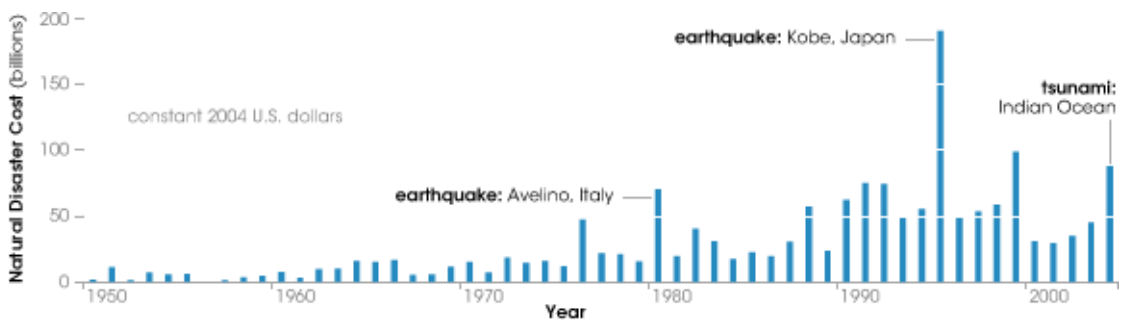

Figure 2.5: Worldwide – Cost of Natural Disasters 1950 – 2010 (Source: NASA, 2005)

What is quite telling from Figure 2.5 is how rapidly the costs have been rising over in the last 40 to 50 years of the depicted time period. While Figure 2.5 only highlighted the Avelino, Italy earthquake, the Kobe, Japan earthquake, and the Indian Ocean tsunami, numerous meteorological, hydrological, and climatological events have certainly contributed to these increasing costs and each one corresponds to different types of natural disasters.

The situation in the U.S. reflects the global trend when it comes to the rising frequency of natural disasters as detailed in Figure 2.6 below.

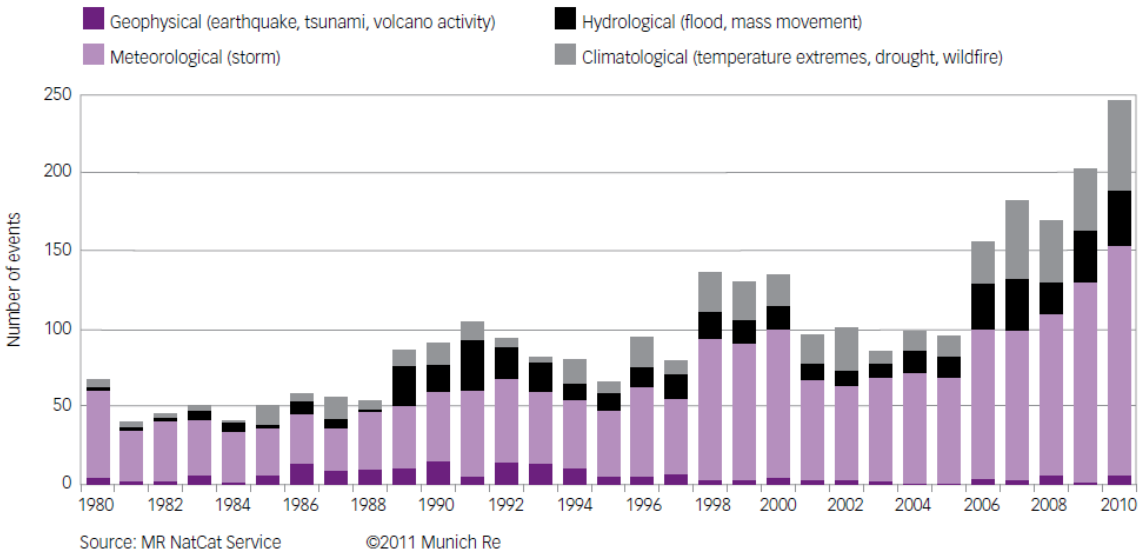

Figure 2.6: U.S. – Natural Disasters by Type 1980 – 2010 (Source: Lloyd's, 2011)

The same pattern is evident: geophysical events remain fairly constant throughout this timeframe, whereas meteorological, hydrological, and climatological events have been

steadily increasing during this 30 year timeframe. There is also a rapid increase in the number of disaster events from 2006 onward. This trend is clearly evidenced by an enormous amount of events occurring beyond what would be construed as average. This would point to the need perhaps to reconsider what an average year is in the U.S. in terms of natural disasters.

The trend on the costs of natural disasters in the U.S. follows suit with a steady increase and noticeable spike in costs that corresponds to the same timeframe as aforementioned, 2006 – 2010. The cost increase of natural disasters in the U.S. is depicted in Figure 2.7 below.

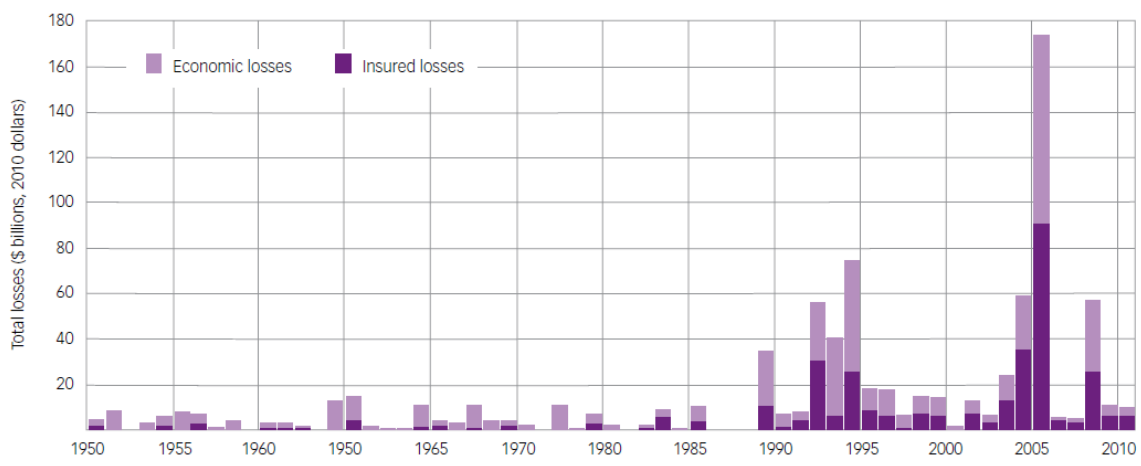

Figure 2.7: U.S. – Cost of Natural Disasters 1950 – 2010 (Source: Lloyd's, 2011)

The rapid increase of costs from natural disasters in the U.S. from 1990 – 2010 is telling. The intense spike in cost in 2005 was not only due to Hurricane Katrina. The 2005 hurricane season in the U.S. was the busiest in history and quite protracted: even toward the end of the season in late November, Tropical Storm Gamma, the 24th named storm, was threatening South Florida (Daniels & Loggins, 2007, p. 48). Such events are not characterised simply by their occurrence frequency or their cost in dollars. The inherent social costs appear to play a large part in these natural disasters, thus giving rise to the aim of this research study: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

2.6 Hurricanes

For the purpose of the data collection in the U.S., the natural disaster phenomena of hurricanes were focused on in this research study. It was not within the scope of this research to contribute an exhaustive anthropogenic climate change argument that accounts for the occurrence or the intensity of hurricanes globally. At the same time, the face of climate change was impossible to fully eliminate from the context of the research, but this was detailed from a sociocultural implication perspective rather than a causality perspective. It was acknowledged in the U.S. by the CBO (2016) that both coastal development and climate change will have an impact on the level of hurricane damage moving forward (p. 8). This premise was utilised to clarify that for the purpose of this research study, it was recognised that both anthropogenic and natural factors contribute to hurricane occurrence and intensity globally.

2.6.1 Hurricane Strike Variation across Countries

Hurricane experience exists for these hazards across the world. Since the advent of disaster event recordkeeping in the late 1800s, hurricanes have impacted a number of countries with varying degrees of frequency as illustrated in Table 2.3 below.

Table 2.3: Worldwide – Total Number of Hurricane Strikes by Country (Adapted from original source: NOAA, 2014)

Rank	Nation	Strikes
1	U.S.	268
2	China	230
3	Philippines	176
4	Mexico	134
5	Japan	133
6	Cuba	79
7	Australia	66
8	Bahamas	61
9	Vietnam	45
10	Madagascar	30

While the focus of this research study is the U.S., it is helpful to provide a global context to the phenomena of hurricanes. The country in Table 2.3 that ranks second on the list to the U.S. is China. There were almost 300 hurricanes (referred to as typhoons in this region, see Table 1.2) that struck China between 1980 and 2012, affecting 61% of the landmass of the country (Zhang et al., 2017, p. 492). Hurricanes in China have caused enormous property and human losses that affect both the physical and social infrastructure, but the serious public health threat beyond injuries and death is a devastating consequence of these storms (Zhang et al., 2017, pp. 491-492). China is the most populous country in the world and has numerous large urban areas. This predicates that when disasters like hurricanes strike, the toll on the DM personnel and resources may be significant depending on the intensity, magnitude, and area affected. As an example, Super Typhoon Chan-hom struck Zhejiang Province in July 2015 in the middle of its coastline, resulting in nearly $90 million in losses, and this affected 1.9 million people, forcing the evacuation of 1.06 million people (Zhang et al., 2017, p. 493). The yearly seasonal effect of hurricanes is so significant in China that millions of people have to contend with the threats.

The Philippines is the country that ranks third on the Table 2.3 list to the U.S. and China respectively. The geographic area that the Philippines is responsible for is affected by an average of 20 hurricanes (also referred to as typhoons in this region, see Table 1.2) per year, with an average of eight or nine that actually strike land (Program on Resilient Communities, 2018, p. 2). The effect of hurricanes on the Philippines can devastate the social environment. Due to Typhoon Haiyan, the Philippines was ranked the highest worldwide for mortality due to disasters in 2013 (Program on Resilient Communities, 2018, p. 2). As a nation that is comprised of many islands, the Philippines is naturally vulnerable to storm surge and flooding. The extreme poverty in parts of the Philippines also contributes to the tragedy. The Philippines is characterised by 25% of its population living below the national poverty level; there are huge numbers of informal settlements in coastal and flood prone areas, the population is still largely young with one-third being below the age of 14 years, and over 1 million people are displaced each year due to rapid-onset disasters (Program on Resilient Communities, 2018). This recurring theme of the most vulnerable members of the population facing the worst aspects of disasters is a reality in the field of DM.

Japan is another country that faces the wrath of hurricanes (referred to as typhoons in this region, see Table 1.2) and is ranked fifth in the world in hurricane strikes (see Table 2.3). Despite its wealth and prosperity, the country faces serious challenges from these storms. Hurricane season in Japan is from June to October and averages about 11 hurricanes yearly (Heimburger, 2018, p. 23). The collective toll disasters have taken on human life in Japan is evidenced in Figure 2.8 below.

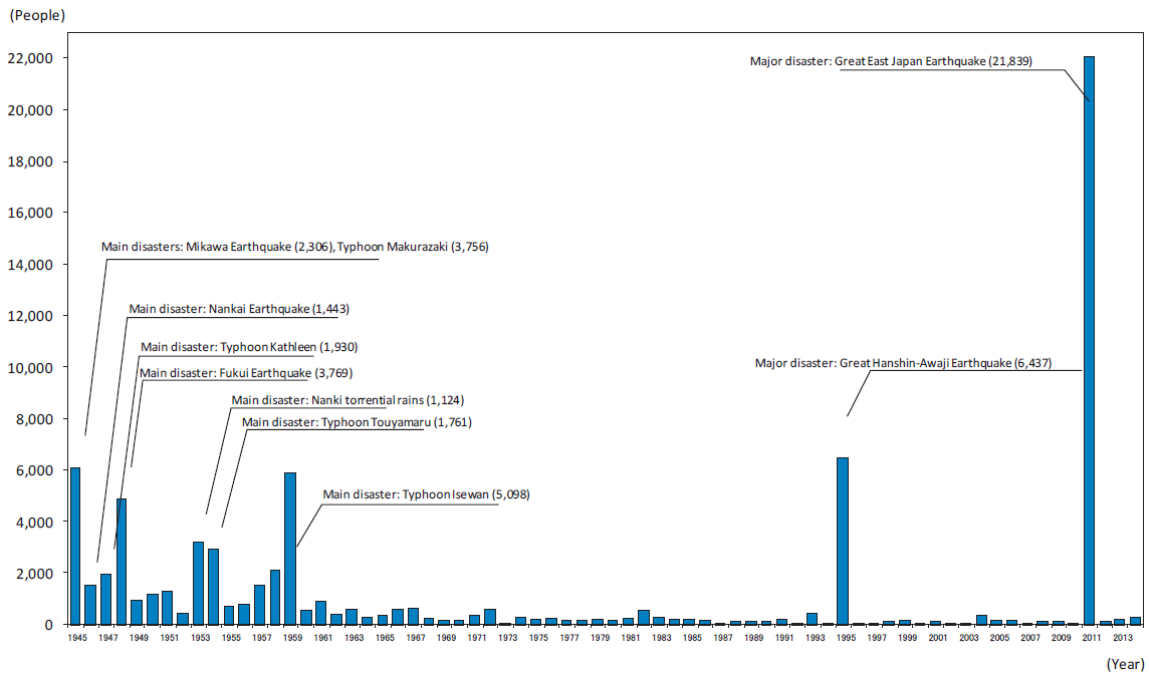

Figure 2.8: Japan – Number of Fatalities and Missing Persons from Disasters (Source: Cabinet Office Japan, 2015)

While earthquakes certainly stand out as major causes of casualties in Japan, there are a few noteworthy hurricanes mixed in with the data depicted in Figure 2.8. Furthermore, what is assumed is that a number of these relatively smaller data points actually do include hurricanes, given that an average of 11 of them strike Japan every year.

Bangladesh, not listed in Table 2.3, is another country which contends with hurricanes (referred to as cyclones or cyclonic storms in this region, see Table 1.2) every year. Between 1877 and 1995, Bangladesh was struck by 154 these storms, including 43 severe cyclonic storms, 43 cyclonic storms, and 68 tropical depressions (Dasgupta et al., 2011, p. 1). In

keeping with the ominous trend of all the other countries listed thus far, the frequency of hurricanes striking Bangladesh has increased in the last 35 years (Dasgupta et al., 2011). Bangladesh is one of the poorest countries in the world. For Bangladesh to cope with these disasters every year is debilitating to the country on a socioeconomic level. The consequences of HP have far-reaching impacts for developing countries around the world.

Cuba is one of the most impoverished countries in the Western Hemisphere and is adjacent to the U.S. It is squarely in the path of many of the same North Atlantic hurricanes that cause damage in the U.S. (see Table 1.2). The country ranks sixth on the list of countries in Table 2.3 most frequently struck by hurricanes. However, the toll on human life in Cuba is markedly different than for surrounding countries as elucidated by the hurricane history depicted in Table 2.4 below.

Table 2.4: Cuba – Mortality Rate vs. Other Countries for Specific Hurricanes (Adapted from original source: Oxfam, 2004)

Hurricane, year	Category when it struck Cuba	Fatalities in Cuba	Category when it struck elsewhere	Fatalities elsewhere	Total fatalities
Lili, 2002	2	1	Tropical Storm; 1-2	Jamaica: 4 Haiti: 4 St. Vincent: 4	13
Isidore, 2002	2	0	Tropical Storm; 3	U.S.: 4 Mexico: 2	6
Michelle, 2001	4	5	Tropical Depression	Honduras: 6 Nicaragua: 4 Jamaica: 2	17
Irene, 1999	1	4	1	U.S.: 8	12
Georges, 1998	3-4	6	3-4	Antigua: 2 St. Kitts & Nevis: 4	

				Dominican Republic: 380 Haiti: 209 Bahamas: 1 U.S. 1	603
Lili, 1996	3	0	Tropical Storm (Extratropical)	Honduras: 5 Costa Rica: 3 Great Britain: 6	14
Total fatalities		16		649	665

Cuba has a well-organised approach to HP including well-equipped rescue teams, a well-organised civil defence, an early warning system, emergency supplies, and a bevy of other resources (Oxfam, 2004, p. 7). The Cuban approach to HP reflects a clear focus on protecting lives, mobilising the community, educating the population to become aware of disasters and the actions needed to be taken, and a general sense of solidarity between the government and the public (Oxfam, 2004, pp. 7-8).

Table 2.4 reveals part of the story of how Cuba appears to fare better from the onslaught and devastation from hurricanes than its wealthier neighbour, the U.S. As an example from Table 2.4, Hurricane Irma from September 2017 showed how one storm can strike Cuba and then the U.S. with markedly different impacts. Hurricane Irma caused nine direct deaths in Cuba and seven in the U.S., but there were 85 indirect deaths in the U.S. as well (NOAA, 2018b). Destruction in the U.S. from Hurricane Irma is depicted in Figure 2.9 below.

Figure 2.9: Florida – Hurricane Irma Damage, Monroe County (Source: WFSU, 2018)

There is a consistent theme of Cuba responding with seemingly more effective approaches to the exact same hurricanes that end up striking the U.S. despite the vast economic differences between the two countries. Such inequities point to a need to further examine how the U.S. approaches HP.

Another part of the motivation for this research study in focusing on the impact of hurricanes in the U.S. comes from the fact that the frequency of hurricanes striking the U.S. has increased in the 30 year period from 1980 – 2010 as depicted in Figure 2.10 below.

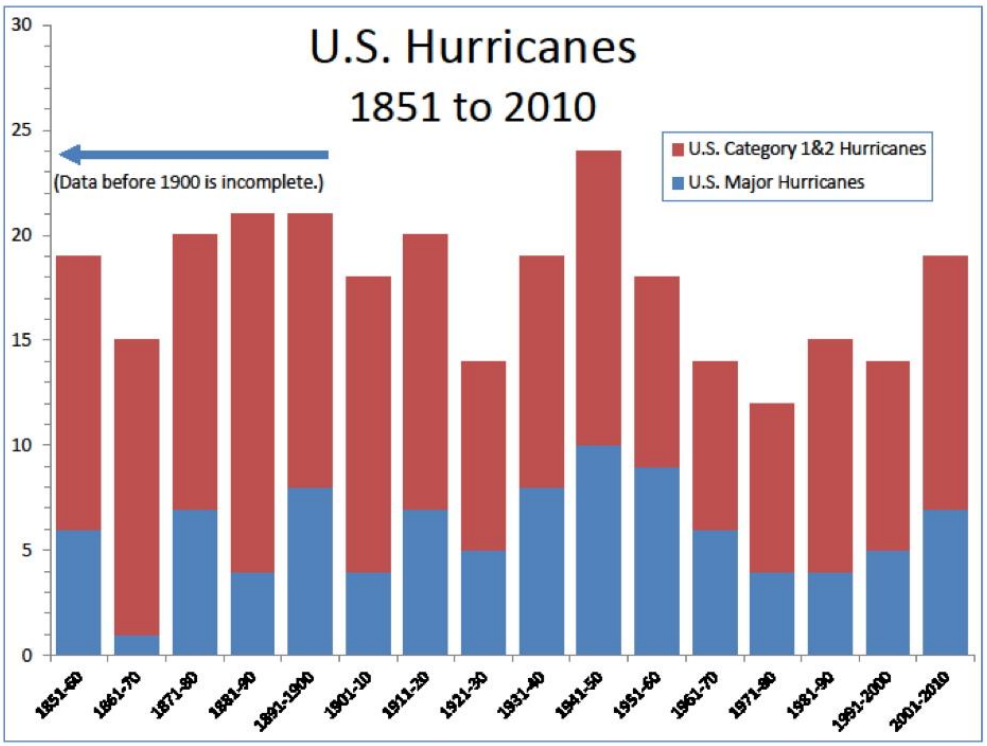

Figure 2.10: U.S. – Hurricanes 1851 – 2010 (Source: NOAA, 2011)

One of the inherently problematic aspects of examining data is that looking at it in a vacuum can lead to flimsy assumptions. Case in point: while Figure 2.10 may depict at first glance that the increase in hurricanes in the U.S. over the last 30 plus years may not be markedly out of line with the cyclical patterns shown over the past 150 plus years, the increase in costs due to hurricanes is growing markedly, as evidenced in Figure 2.11 below.

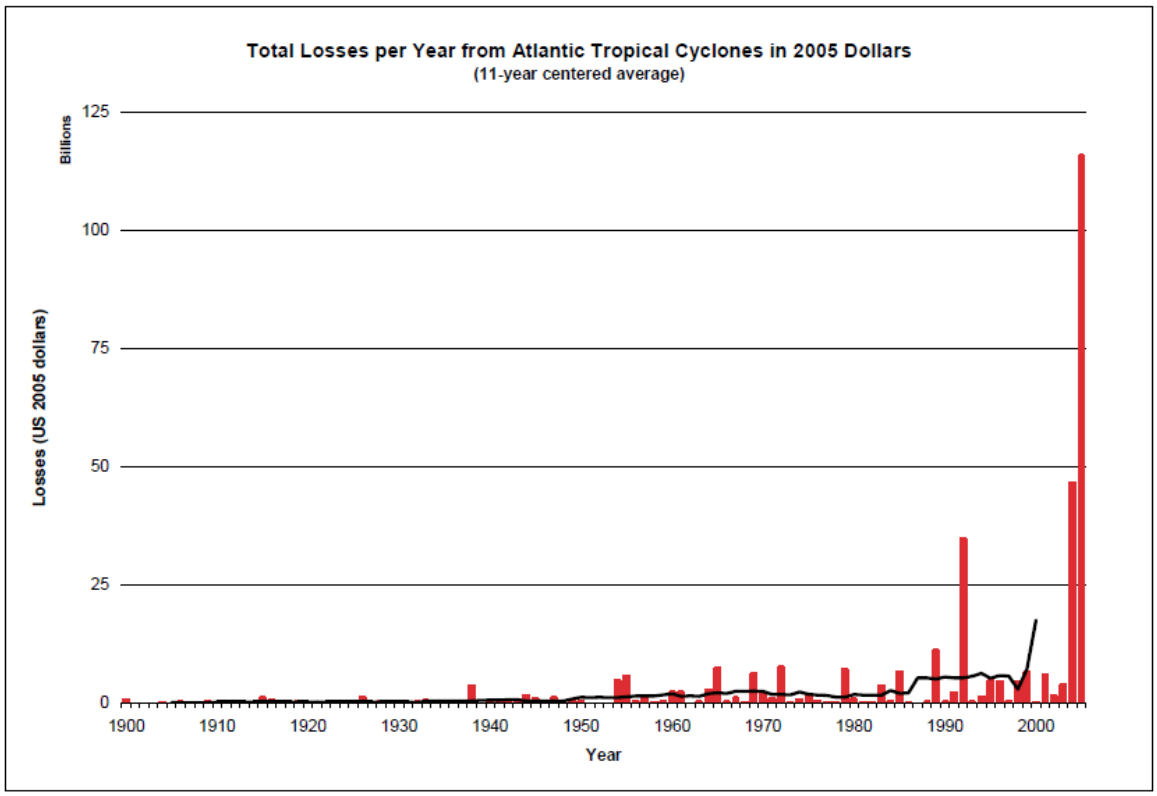

Figure 2.11: U.S. – Cost of Hurricanes 1900 – 2010 (Source: Pielke et al., 2008)

Figure 2.11 tells a revealing story: the U.S. costs of hurricanes has risen consistently since the 1950s and have grown exponentially since the 1990s. Again, this trend portends ill even if the cost amounts remain similar to their current levels, let alone continue to increase. The aspect of the financial losses from hurricanes in the U.S. is an example of the protracted nature of suffering that this type of natural disaster causes. It is critical to note that such financial impacts necessarily have a social component which this research aimed to better understand in terms of the HP language constructs of HRBO and DMP.

2.6.2 Hurricane Preparedness across Countries

Given the global nature of hurricanes, a number of countries have enacted HP plans that they encourage the public to follow to build individual- and community-level HP competency. These plans have many similarities, but they also have a number of differences, which include geographic and cultural variances. Linguistic components within miscommunication particularly reflect the cultural differences between how people conceptualise their experiences (Sharifian, 2017, p. 49). One specific similarity all of these

HP plans have is that they are all written in the English language. Qualitative research design can be weakened by the assumption of conceptual equivalence across languages: the presupposition that meaning in one language can *certainly* be found in other languages (Larkin, Dierckx de Casterlé, and Schotsmans, 2007, p. 469). For consistency, stronger comparative value, and the search for conceptual equivalence, this research study was focused on a monolingual, English language data collection and analysis. English language documentation focused on hurricanes, including those on building risk, were part of this endeavour (see Section 1.6). Most of the countries that are higher ranked on the list of those affected by hurricanes such as Cuba, China, Japan, or Mexico have HP documentation in non-English languages that are native to these countries (see Table 2.3). As an example, while Japan is beset by hurricanes annually, the Japan Meteorological Agency releases HP messaging regularly on their Twitter account, but only in Japanese: (https://twitter.com/JMA_bousai). The examples of HP plans from the U.S., Taiwan, and Australia were written in English and examined through document review. These HP plans will be detailed forthwith to provide a broader spectrum to compare and contrast various approaches.

2.6.2.1 U.S.

The primary U.S. agency dealing with disasters is FEMA. They have emphasised to the public the need to concentrate on specific task categories for preparedness for a number of disasters, including hurricanes. The approach FEMA uses is based on the fundamentals that are illustrated below in Table 2.5.

Table 2.5: FEMA – Disaster Preparedness Task Categories for the Public (Adapted from original source: FEMA, 2014)
Be Informed
Know local/community risks and community systems and plans, participate in preparedness training, and practice response skills by participating in drills.
Make a Plan
Develop a household emergency plan and discuss it with household members.
Build a Kit
Set aside and maintain supplies one may need in disasters.

Get Involved
Find local opportunities to volunteer for community safety and disaster response and be a part of the community planning process.

While these four task categories are useful in preparing for a variety of disasters, in a hurricane-prone state such as Florida, these structured preparations could be paramount for HRBO. Of particular note, are the two middle components: Planning and Building a Disaster Kit. These two foci are the ones that emphasise self-reliance. They do not require any interaction with outside entities and can be customised as per the needs of the HRBO. Surveys conducted by FEMA (2014) regarding preparedness found that 68% of the study participants believed that preparing for natural disasters would be helpful for them both during and after the event and that they were more confident in their own abilities to react to natural disasters than they were in reacting to situations resulting from disease outbreaks, terrorism, or accidents pertaining to hazardous materials (p. 15). This finding by FEMA pointed toward an opportunity that may exist to understand language constructs of HRBO regarding HP and perhaps eventually capitalise on this level of public confidence.

However, Fairchild, Colgrove, and Jones (2006) described the lack of legal uniformity in the U.S. regarding evacuation authority (p. 959). Communication from DMP regarding evacuations may not be definitive enough for the public. Park (2010) examined disasters and society and opined that the danger of ambiguity is that in a society which is predicated on law-and-order, there may be limited tolerance for ambiguity, and individuals will resort to any means necessary to reduce their uncertainty (p. 468). It is possible that HRBO may have clear notions regarding their own specific vulnerabilities, including structural risk and coastal proximity risk, that they use when deciding on whether or not to evacuate (Huang et al., 2016, p. 1023).

There may be another aspect to the rationale for residents deciding whether or not to evacuate: a perceived lack of security. CNN journalist Jeremy Harlan reflected on how in the immediate aftermath of Hurricane Katrina, there were riots, people shooting, and that despite being part of a crew of journalists, they were still at high risk of being robbed (Greeley, 2012, p. 83). Huang et al. (2016) argued that if authorities communicate that they

will ensure security in evacuation zones, that this will help ensure residents that comply with evacuation orders (p. 1022). The literature review almost exclusively revealed that researchers found that exaggerated assumptions regarding the spectre of looting could drain valuable DM resources away from those who really need the assistance (Tierney, Bevc, & Kuligowski, 2006, p. 60). However, the potential for looting certainly exists to a degree. Bin, Haiyan, and Peng (2009) argued that the aftermath Hurricane Katrina in 2005 was characterised by a large amount of criminal cases including robbery that severely damaged the security reputation of the city of New Orleans (p. 59). There is also the prospect of HRBO facing a looted home upon returning from evacuation that may play a part in evacuation decisions. While there is a plethora of anecdotal evidence that violence occurs in disaster environments, the dearth of empirically-based studies on this subject predicates that there is minimal theoretical understanding pertaining to this violence (Frailing & Harper, 2017, p. 102).

Additional FEMA (2014) survey findings from members of the public specifically detailed how preparedness is part of life: 14% believed that it was a basic consequence of being alive, 21% were currently engaged in preparation tasks, 18% felt that preparation was a top-of-mind subject, and 46% of participants conveyed that preparation was not something they were concerned with for the following behaviours:

- Risk perception of natural disasters
- Confidence in the ability to respond to a natural disaster
- Belief that it is helpful to prepare for a natural disaster
- Belief that they have adequate access to preparation information, the requisite knowledge, and the time to prepare
- Have already discussed preparation
- Have been prompted either by school or employers to create a family disaster plan
- Have already had disaster experience
- Have already volunteered in either a disaster response, safety, or preparedness capacity (p. 15)

The finding that 14% of the population believes that preparedness is part of life is a

significant enough number to indicate that preparedness awareness is at least measurable. However, the fact that nearly half of the population found these behaviours to not even be a focus was conversely a negative finding. In the case of HRBO in CWF, perhaps the prevalence of hurricane strikes might play into enhanced preparedness awareness there and the language investigation framework of the study strived to distil these data. Social networks in communities, workplaces, educational institutions, and the engaging in volunteer work with organisations focused on safety, disaster, and preparedness were believed to affect the levels of preparedness behaviour and may thus reflect the opportunity for emergency managers in the local areas to work with members of the community in terms of outreach and training for disaster preparedness (FEMA,2014). The point of connection between DMP and the HRBO in these aforementioned groups may also be opportunities where the language of HP gets shared and understood to varying degrees.

Guidance for the public was provided by FEMA (2018b) in terms of HP that can be conducted at any time of year:

- Know your area's risk of hurricanes.
- Sign up for your community's warning system. The Emergency Alert System (EAS) and NOAA Weather Radio also provide emergency alerts.
- If you are at risk for flash flooding, watch for warning signs such as heavy rain.
- Practice going to a safe shelter for high winds, such as a FEMA safe room or International Code Council (ICC) 500 storm shelter. The next best protection is a small, interior, windowless room in a sturdy building on the lowest level that is not subject to flooding.
- Based on your location and community plans, make your own plans for evacuation or sheltering in place.
- Become familiar with your evacuation zone, the evacuation route, and shelter locations.
- Gather needed supplies for at least three days. Keep in mind each person's specific needs, including medication. Don't forget the needs of pets.
- Keep important documents in a safe place or create password-protected digital copies.

- Protect your property. Declutter drains and gutters. Install check valves in plumbing to prevent backups. Consider hurricane shutters. Review insurance policies.

While this aforementioned HP guidance for the public was quite detailed, these components also revealed areas of enquiry that were explored through this research study specifically in the language realm. As an example, this research study utilised interviews to explore language constructs and concepts that were similar to some of those expressed in the aforementioned FEMA guidelines. As a point of clarification, the U.S. Federal Communications Commission [FCC] is in charge of the EAS, which is in turn activated by the messaging sent out over the NOAA Weather Radio (NWR) (NOAA, 2016a). Subsequently, the EAS messaging is delivered to state and local EM entities, as well as wireless, cable, satellite, and broadcast providers (NOAA, 2019c). This system factors heavily into the HP communication in the U.S. Additionally, this basic communication structure revealed areas for language analysis in the HP messaging itself and communication channel choices, which provided question areas that factored into the interview question construction for this research study. Another area of focus for the research study was in trying to understand how much HRBO considered the storm-related geographic specifics of the areas that they live in. These participants were also gauged as to where they obtained their information from in case of an imminent or impending hurricane strike. Furthermore, participants were asked regarding which steps they outlined once they obtained information regarding an imminent or impending hurricane strike. These questions framed some of the same areas of foci that FEMA emphasised that the public should pay attention to.

The reality is that members of the public are sometimes scrambling to prepare for an incoming hurricane. Sometimes these efforts are conducted just hours before hurricane arrival. FEMA (2018b) offered the following highly detailed, time-based guidelines for HP, which is listed below in Table 2.6.

Table 2.6: FEMA – HP Guidelines for the Public (Adapted from original source: FEMA, 2018b)
When a Hurricane is 36 Hours from Arriving
Turn on your TV or radio in order to get the latest weather updates and emergency instructions.
Restock your emergency preparedness kit. Include food and water sufficient for at least three days, medications, a flashlight, batteries, cash, and first aid supplies.
Plan how to communicate with family members if you lose power. For example, you can call, text, email or use social media. Remember that during disasters, sending text messages is usually reliable and faster than making phone calls because phone lines are often overloaded.
Review your evacuation zone, evacuation route and shelter locations. Plan with your family. You may have to leave quickly so plan ahead.
Keep your car in good working condition, and keep the gas tank full; stock your vehicle with emergency supplies and a change of clothes.
If you have National Flood Insurance Program (NFIP) flood insurance, your policy may cover up to $1,000 in loss avoidance measures, like sandbags and water pumps, to protect your insured property. You should keep copies of all receipts and a record of the time spent performing the work. They should be submitted to your insurance adjuster when you file a claim to be reimbursed. Visit www.fema.gov/media-library/assets/documents/137860 to learn more.
When a Hurricane is 18-36 Hours from Arriving
Bookmark your city or county website for quick access to storm updates and emergency instructions.
Bring loose, lightweight objects inside that could become projectiles in high winds (e.g., patio furniture, garbage cans); anchor objects that would be unsafe to bring inside (e.g., propane tanks); and trim or remove trees close enough to fall on the building.
Cover all of your home's windows. Permanent storm shutters offer the best protection for windows. A second option is to board up windows with 5/8" (1.59 cm.) exterior grade or marine plywood, cut to fit and ready to install.
When a Hurricane is 6-18 Hours from Arriving

Turn on your TV/radio, or check your city/county website every 30 minutes in order to get the latest weather updates and emergency instructions.
Charge your cell phone now so you will have a full battery in case you lose power.
When a Hurricane is 6 Hours from Arriving
If you're not in an area that is recommended for evacuation, plan to stay at home or where you are and let friends and family know where you are.
Close storm shutters, and stay away from windows. Flying glass from broken windows could injure you.
Turn your refrigerator or freezer to the coldest setting and open only when necessary. If you lose power, food will last longer. Keep a thermometer in the refrigerator to be able to check the food temperature when the power is restored.
Turn on your TV/radio, or check your city/county website every 30 minutes in order to get the latest weather updates and emergency instructions.

These meticulous guidelines offered by FEMA elicited numerous areas of enquiry that were well served by this research study. This study sought insights on who HRBO would communicate with once imminent HP activities were underway. The questions asked of HRBO in the study were geared toward getting these participants to elucidate their language constructs that comprised these types of communications. Given the FEMA guidelines listed above, what is clear is that the level of urgency climbs as the time grows nearer to a hurricane strike. Furthermore, the amount of activities that HRBO can conduct reduces as the strike time nears. Given the vulnerability of HRBO, the stakes are high and the breadth and depth of preparation may make the difference between life or death.

As part of this research study, DMP in the U.S. were also interviewed to try and distil the language constructs they used to convey HP. As with the HRBO, the interview questions were structured along the same lines as much of the content found on the FEMA website regarding HP. The language constructs utilised by DMP that were explored during this research study were to help understand how these guidelines are conveyed and how they might be conveyed if these professionals felt such messaging could be optimised.

It is critical to note that FEMA is a federal agency of the U.S. government, but more specifically, it is an agency of the Department of Homeland Security [DHS]. Since DHS has a large umbrella over many activities in the U.S. and abroad, they also have a focus on preparedness that is naturally quite broad. This is elucidated by the Presidential Policy Directive, which is aimed at strengthening the security and resilience of the U.S. through systematic preparation for the threats that pose the greatest risk to the security of the nation, including acts of terrorism, cyber-attacks, pandemics, and catastrophic natural disasters (DHS, 2018). FEMA has been able to manifest a comprehensive, coordinated effort with DHS elucidated in the National Preparedness System (NPS), which has six parts as detailed in Table 2.7 below.

Table 2.7: FEMA – NPS (Adapted from original source: FEMA, 2018c)
Identifying and Assessing Risk
This part involves collecting historical and recent data on existing, potential and perceived threats and hazards. The results of these risk assessments form the basis for the remaining steps.
Estimating Capability Requirements
Next, you can determine the specific capabilities and activities to best address those risks. Some capabilities may already exist, and some may need to be built or improved. FEMA provides a list of core capabilities related to protection, prevention, mitigation, response and recovery, the five mission areas of preparedness. To see a full list of the core capabilities, including details about each one, visit our Core Capabilities page on this site.
Building and Sustaining Capabilities
This involves figuring out the best way to use limited resources to build capabilities. You can use the risk assessment to prioritize resources to address the highest probability or highest consequence threats.
Planning to Deliver Capabilities
Because preparedness efforts involve and affect the whole community, it's important that you coordinate your plans with other organizations. This includes all parts of the whole community: individuals, businesses, non-profits, community and faith-based groups, and all levels of government.

Validating Capabilities
Now it's time to see if your activities are working as intended. Participating in exercises, simulations or other activities helps you identify gaps in your plans and capabilities. It also helps you see progress toward meeting preparedness goals. Please visit the National Exercise Division for more information.
Reviewing and Updating
It is important to regularly review and update all capabilities, resources and plans. Risks and resources evolve — and so should your preparedness efforts.

The language used in describing the components of the NPS reflects a holistic, collaborative aspect of the HP spectrum, whereas FEMA – HP Guidelines for the Public (see Table 2.6) emphasises individual efforts. The intersection of risk and capabilities elucidated in the NPS is one area of HP that might benefit depending on how much involvement HRBO have with DMP. At the same time, language alignment for HP may be explored in parallel through examples of HP offered by countries that are located in other hurricane-prone regions of the world.

2.6.2.2 Taiwan

In the Northwest Pacific region, the nation of Taiwan engages efforts to help the public prepare for hurricanes (referred to as typhoons in this region, see Table 1.2). The critical time period for HP in Taiwan is prior to the yearly April – October season for these storms striking this nation, with July – October being the peak season with pre-hurricane information coverage conveyed during this time of year by International Community Radio Taipei (ICRT) (Community Services Center, 2006). A HP plan that is propounded in Taiwan is detailed in Table 2.8 below.

Table 2.8: Taiwan – Example of a Hurricane Preparedness Plan (Adapted from original source: Community Services Center, 2006)
Proactively Prepare Your Home
• Be sure to have on hand a disaster kit. • Check roof for leaks. • Clear drain holes in balconies and window boxes.

• Obtain plastic sheeting for furniture protection, tape for windows and extra radio batteries. • Organize valuable papers into a waterproof packet. • Make sure your PC or other sensitive electronic equipment is not situated in a place where water can damage it.
48 Hours Prior to a Hurricane
• Fill your gas tank; power loss may disable pumps during storms. • Make extra ice for short-term cold storage if power fails. • Check potable water supply. • Listen to ICRT, FM 100.7 for regular hurricane updates. Within 36 hours from landfall, ICRT includes hourly hurricane updates as part of their regular newscasts.
24 Hours Prior to a Hurricane
• Move furniture away from windows. Roll up rugs and place on furniture. Place furniture legs in tin cans or on bricks in case of flooding. • Remove debris and loose equipment from your yard or balcony. Tie down or trim trees and brushes. • Secure potted plants. • Turn refrigerator and freezer to coldest setting. • Charge mobile phones. • Fill bathtub and sinks with water for cooking and flushing. Use plastic wrap around stoppers to seal drains.
12 Hours Before Expected Hurricane Strike
• The hurricane becomes ICRT's top news story. Hourly newscasts begin with a hurricane update. ICRT will announce school and government office closures. When government offices close, so will most private sector companies. Do not be tempted to stay at work, as you may become stranded. • Traffic is restricted to emergency vehicles only. • Power loss sometimes occurs. Power outages are monitored by the electric company and repairs will be made as soon as possible. Do not tie up the telephone system with unnecessary reports. Telephone lines may also go down.

- If the power goes out, open the refrigerator and freezer as little as possible. A refrigerator will maintain its temperature for 24 hours or more unless opened. Put the ice you've made and the food you will need into a cooler to avoid opening the refrigerator.
- Pull down hurricane shutters, if available.
- Park your car on high ground in an area free from danger of falling trees or flying debris.
- If leaks develop in the ceiling, you may have to make a small drain hole to localize the leakage and prevent the whole ceiling from becoming saturated.
- Tape windows in crisscross fashion (use strong tape you would use for parcels, most hardware stores stock it). Note: tape will not prevent windows from breaking, but will minimize the danger of them shattering.

The Taiwan HP plan largely corresponds to many of the same elements seen in the FEMA HP plan, albeit not nearly as detailed or expansive. The Taiwan HP plan describes the ICRT radio being the single source for information. In the U.S., NWR and the EAS account for a nearly comprehensive level of coverage regarding impending hurricanes. However, given the immense amount of various communication sources in the U.S. that fall under the aegis of EAS, essentially every media channel imaginable in an area that may be imminently affected by a hurricane will be broadcasting updates. This predicates that the public in the U.S. may actually be getting the information they need to make HP decisions from any number of sources. It remains to be seen despite the best intentions of EAS, as to whether these variable sources for HP communication are in fact consistent with each other in their messaging content and detail.

Another aspect of the Taiwan HP plan that is markedly different than the FEMA HP plan is the clear communication that in Taiwan, the roadways six hours prior to a hurricane strike are only meant to be for emergency vehicle use. The U.S. has had a vigorous debate ongoing for many decades regarding mandatory evacuations. Numerous hurricane events in the U.S. have been marked by individuals not heeding the warnings during voluntary or mandatory evacuations communications and then later trying to escape at the last minute when

conditions were extremely dangerous, thus initiating the blame game that DMP in the U.S. have become well accustomed to dealing with (Fairchild et al., 2006, p. 961). In Taiwan, the message is clear that the roadways are not meant for anything other than emergency vehicles when a hurricane strike is imminent.

2.6.2.3 Australia

Australia is surrounded by the Indian Ocean and South Pacific Ocean, which are both prone to hurricanes (referred to as tropical cyclones in this region, see Table 1.2). Thus, the nation regularly faces hurricanes. In particular, the northern part of country may face hurricanes during its typical season from November to April yearly (Australian Government Bureau of Meteorology, 2019a). The following information is presented as the HP plan offered by the government of Australia as detailed in Table 2.9 below.

Table 2.9: Australia – Example of a HP Plan (Adapted from original source: Australian Government, Bureau of Meteorology, 2019b)

Before the Hurricane Season

• Check with your local council or your building control authority to see if your home has been built to hurricane standards.
• Check that the walls, roof and eaves of your home are secure.
• Trim treetops and branches well clear of your home (get council permission).
• Preferably fit shutters, or at least metal screens, to all glass areas.
• Clear your property of loose material that could blow about and possibly cause injury or damage during extreme winds.
• In case of a storm surge/tide warning, or other flooding, know your nearest safe high ground and the safest access route to it.
• Prepare an emergency kit containing:
  ○ a portable battery radio, torch and spare batteries;
  ○ water containers, dried or canned food and a can opener;
  ○ matches, fuel lamp, portable stove, cooking gear, eating utensils; and
  ○ a first aid kit and manual, masking tape for windows and waterproof bags.
• Keep a list of emergency phone numbers on display.
• Check neighbours, especially if recent arrivals, to make sure they are prepared.

When a Hurricane Watch is Issued
• Re-check your property for any loose material and tie down (or fill with water) all large, relatively light items such as boats and rubbish bins. • Fill vehicles' fuel tanks. Check your emergency kit and fill water containers. • Ensure household members know which is the strongest part of the house and what to do in the event of a hurricane warning or an evacuation. • Tune to your local radio/TV for further information and warnings. • Check that neighbours are aware of the situation and are preparing.
When a Hurricane Warning is Issued
Depending on official advice provided by your local authorities as the event evolves; the following actions may be warranted. • If requested by local authorities, collect children from school or childcare centre and go home. • Park vehicles under solid shelter (hand brake on and in gear). • Put wooden or plastic outdoor furniture in your pool or inside with other loose items. • Close shutters or board-up or heavily tape all windows. Draw curtains and lock doors. • Pack an evacuation kit of warm clothes, essential medications, baby formula, nappies, valuables, important papers, photos and mementos in waterproof bags to be taken with your emergency kit. Large/heavy valuables could be protected in a strong cupboard. • Remain indoors (with your pets). Stay tuned to your local radio/TV for further information.
On Warning of Local Evacuation
Based on predicted wind speeds and storm surge heights, evacuation may be necessary. Official advice will be given on local radio/TV regarding safe routes and when to move. • Wear strong shoes (not thongs) and tough clothing for protection. • Lock doors; turn off power, gas, and water; take your evacuation and emergency kits.

- If evacuating inland (out of town), take pets and leave early to avoid heavy traffic, flooding and wind hazards.
- If evacuating to a public shelter or higher location, follow police and State/Territory Emergency Services directions.
- If going to a public shelter, take bedding needs and books or games for children.
- Leave pets protected and with food and water.

The Australia HP plan follows much of the same type of logic and structure as parts of the FEMA HP plan. Similar to the Taiwan HP plan, the Australia HP plan is quite scaled down compared to the FEMA HP plan with the notable exception of it being task-based and not overtly time-based in terms of days or hours. Another major difference with the Australia HP plan is that specific hurricane communication triggers such as watches and warnings are needed for the public to engage in certain tasks that are outlined. Both the FEMA HP plan and Taiwan HP plan set out time-based tasks, which then require a bit of chronological mathematics to be conducted by members of the public to calculate the numbers of hours prior to an expected strike. With the typical shifting strike dates and times that occurs with these highly unpredictable storms, the preparation calculations and subsequent triggers could become a bit confusing for the public. The issuance of a watch and warning however is definitive, thus evidencing a strong advantage of the approach of the Australia HP plan. Perhaps one of the most profound aspects of the Australia HP plan is that it encourages members of the public to enquire with the building control authority or local council to determine whether their homes are built to modern standards. In essence, this is referring to building codes. Any reference to building codes is absent from the FEMA HP plan and the Taiwan HP plan.

One focus of this research study was whether HRBO in CWF had knowledge of building codes. Building codes in the U.S. are not set by the Department of Housing and Urban Development [HUD], and vary widely across states and all the way down to the local, city, and community level; adoption of these codes at this level is also subject to varying legal processes; there is no uniform building code that is absolutely consistent across the entire U.S. and there is no mechanism to force jurisdictions to adopt any building codes at all

(HUD, 2018; FEMA, 2013a). Perhaps this is one reason that FEMA does not include any mention of building codes within their HP plan.

The Australia HP plan also offers a highly social-centric guideline, including checking on neighbours as a critical component. This aspect belies a true local and community approach. Furthermore, the humanity of the Australia HP plan is well reflected in the details provided regarding preparing for pet and animal needs. Despite the Australia HP plan having far less content than the FEMA HP plan, pet and animal needs have a focus in the Australia HP plan. This is one area in which the FEMA HP plan barely covers. This gap in the FEMA HP plan is perplexing, considering that there are thousands of well-documented cases in the U.S. in which hurricane victims refused to evacuate because there were no well-laid plans to account for their animal evacuation and other animal-specific needs (Bekoff, 2009, p. 171).

It is abundantly clear that the FEMA HP plan is extremely detailed and content rich in comparison to both the Taiwan HP plan and Australia HP plan. One difference with FEMA is that they propound the first stage of HP planning as that of gathering information regarding local and community risks, resources, and plans, prior to creating an actual plan. Furthermore, FEMA encourages individuals to collaborate with their families as well as entities in their local area to build customised HP plans for themselves. This includes developing knowledge and familiarity with the insurance policies that cover any physical property that may be of risk during a hurricane event. In addition, FEMA describes how individuals can create communication plans to let families and friends know plans, whereabouts, and other particulars prior to a hurricane strike. There is also the overt suggestion that practising the execution of HP plans is essential. Another unique aspect of the FEMA position is the encouragement for the public to volunteer and get involved in the community level HP process. In addition, FEMA encourages vigilance regarding weather conditions individually in order to augment weather updates through personal observation. The U.S. also has two government level systems that deliver warning messages: NWR and EAS. However, the EAS system delivers messaging content to a wide variety of communication partners for dissemination, creating the potentially positive aspect of redundant information critical to HP, but also diffusing this information across manifold communication channels thus obviating the streamlined logic of a single source of

communication. This leads to HP messaging with multiple senders, who in turn utilise a range of linguistic components thus potentially leading at times to mixed results of interpretation by the public. This communication redundancy in the U.S., regardless of any potential divergent messaging, does assist in providing backup in case of various channel outages, and also helps to offer inherently better probability of reaching diverse audiences.

Additionally, while FEMA certainly offers numerous suggestions on coordinating locally and with communities, there is a notable absence of suggesting to the public the benefits of coordinating HP efforts with neighbours. Furthermore, the importance of animals to the U.S. public is certainly well documented: Bekoff (2009) described how the bond between humans and animals is also a mechanism for support for disaster victims that can help these victims with the psychological strains of such events (p. 166). Considering the social, psychological, and economic importance of animals in the lives of the U.S. public, this is an area of the FEMA HP plan that could be well served for further attention. In addition, as aforementioned pertaining to the Australia HP plan, a more concerted effort on the part of FEMA to strongly emphasise to the public the importance of building code knowledge could potentially raise building structure awareness, which in turn could contribute to a more comprehensive approach for HRBO particularly to be more self-reliant in their HP measures.

2.7 High-Risk Buildings

Buildings that are considered at high-risk from hurricane hazards may have numerous definitions across the globe. The definitions of high-risk buildings provided by SFG were utilised in the question construction for the interviews for this research study. Knowledge of what constitutes high-risk buildings was also examined in this research study through a document review of SFG Risk Category definitions and wind speed threshold documentation. High-risk building definitions from other places, namely Bangladesh, Bahamas, Australia, and Bermuda were utilised to provide context and a comparative set of standards to those of SFG. All of these places have high-risk building documentation in the English language, which was requisite for this linguistic analysis-driven research study.

2.7.1 Risk Category Definitions

The definitions of high-risk buildings beyond the aforementioned official SFG definition of being one- or two-family residential buildings less than three stories in height are differentiated by the following Risk Category designations detailed in Table 2.10 below.

Table 2.10: Florida – Risk Category of Buildings and Other Structures (Adapted from original source: Florida Building Commission, 2012b)

Risk Category	Nature of Occupancy
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing elementary school, secondary school or day-care facilities with an occupant load greater than 250. • Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500. • Group occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities. • Any other occupancy with an occupant load greater than 5,000. • Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:

	Exceed maximum allowable quantities per control area or per outdoor control area in accordance with the International Fire Code; and are sufficient to pose a threat to the public if released.
IV	Buildings and other structures designated as essential facilities, including but not limited to: • Group occupancies having surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centres and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area or per outdoor control area in accordance with the International Fire Code; and are sufficient to pose a threat to the public if released. • Aviation control towers, air traffic control centres and emergency aircraft hangars. • Buildings and other structures having critical national defence functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

The building risk categories used by SFG and detailed in Table 2.10, are actually derived from the International Building Code and the American Society of Civil Engineers (ASCE), and have been adopted by 38 countries around the world (International Code Council, 2018a; ASCE, 2003). Risk Category II buildings were the type of high-risk buildings specifically focused on in this study. These buildings are primarily residential and are inherently high-risk during the yearly hurricane season. Risk Category I, Risk Category III, and Risk Category IV buildings were not focused on because they are not residential properties. Therefore the occupants of these other risk category buildings may have a different level of potential HP

behaviours than those associated with more permanent residents regarding their actual homes, as in the case of Risk Category II HRBO (see Section 1.3 and Table 2.10). Thus, HRBO from CWF who live in Risk Category II buildings comprised the group from the public that were part of the research study, along with the DMP that are tasked with guiding the public regarding HP. Of particular note in this research study was the focus on the examination of the extent that language regarding building codes entered into the lexicon of HRBO. In conjunction, the perspectives of DMP regarding these high-risk buildings and the implications on HP language were also explored.

Building risk category definitions were examined from four other places that face hurricanes: Bangladesh, Bahamas, Bermuda, and Australia. The reason these places were chosen is because their building risk category definitions are written in the English language. This research study was focused on English language data collection and analysis. English language documentation focused on hurricanes, including those on building risk, were part of this focus (see Section 1.6). Most of the countries that rank high on the list of those affected by hurricanes such as China, Japan, Cuba, or Mexico have building risk documentation in non-English native languages (see Table 2.3). In particular, 'Building Control in Japan' documentation is available in English, but the building codes in Japan are more relegated to earthquake hazards than wind hazards such as those emanating from hurricanes (Institute of International Harmonization for Building and Housing, 2020). This research study was focused on English language data collection and analysis and English language documentation focused on hurricanes, including those on building risk, were part of this focus (see Sections 1.6 and 2.6.2).

The credibility of the SFG system to designate high-risk buildings may be evidenced by the hurricane-prone country of Bangladesh, which has adopted this building risk category designation system in an almost verbatim manner for their Occupancy Category of Buildings and other Structures for Flood, Surge, Wind and Earthquake Loads (The Housing and Building Research Institute, 2015, pp. 431-432). The main change Bangladesh made to the system used in Florida was to substitute the word *cyclone* for *hurricane*, as per geographic nomenclature (see Table 1.2). Similarly, the country in Table 2.3 that ranks eighth on the list of hurricane strikes, Bahamas, uses the same high-risk building category system as SFG,

which is adopted from ASCE and the International Building Code (Government of The Bahamas, Ministry of Works & Utilities, 2003; ASCE, 2003). For this specific research study, the designations by SFG on Risk Category II buildings in Florida are what constituted the definition for high-risk buildings.

As a comparison, Australia has a high-risk building code system which is based on a different approach. As a first step toward understanding this system, it is critical to note that Australia designates hurricane risks across the country according to regions that have varying degrees of wind risk as depicted below in Figure 2.12.

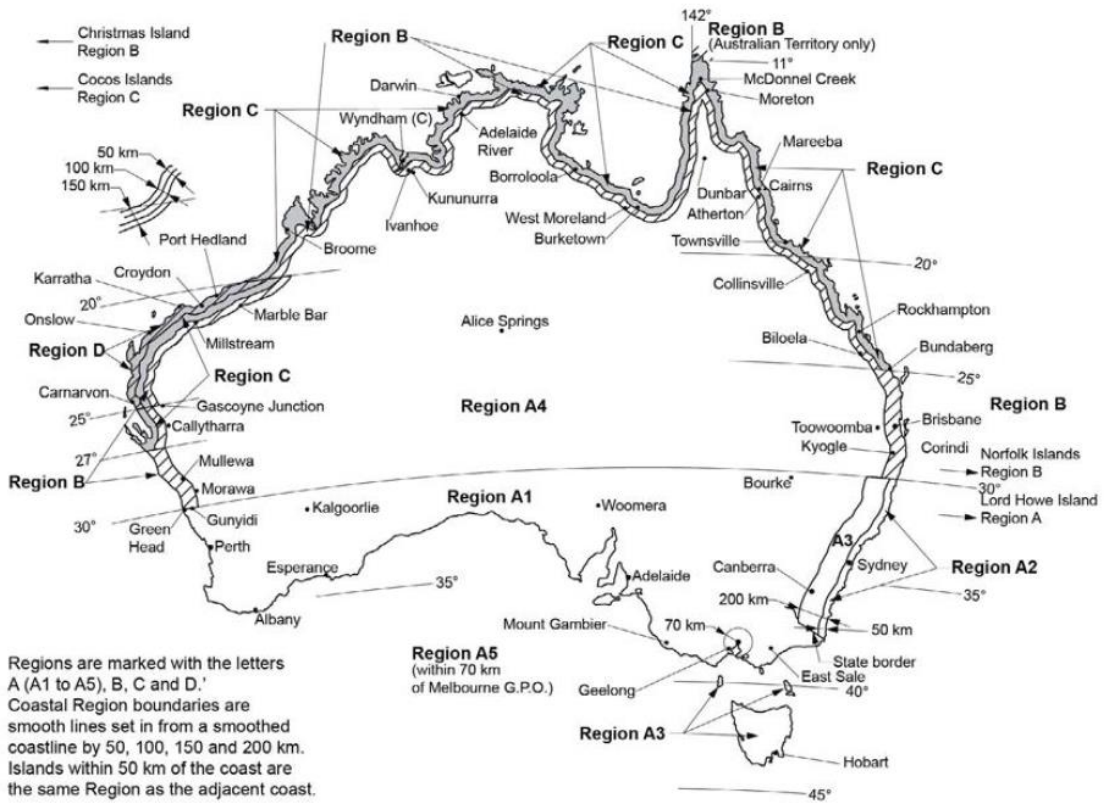

Figure 2.12: Australia Wind Regions (Source: Australian Building Codes Board, 2019)

This highly detailed wind region map can be simplified through an examination of the severity of the hurricanes that affect these areas as depicted below in Figure 2.13.

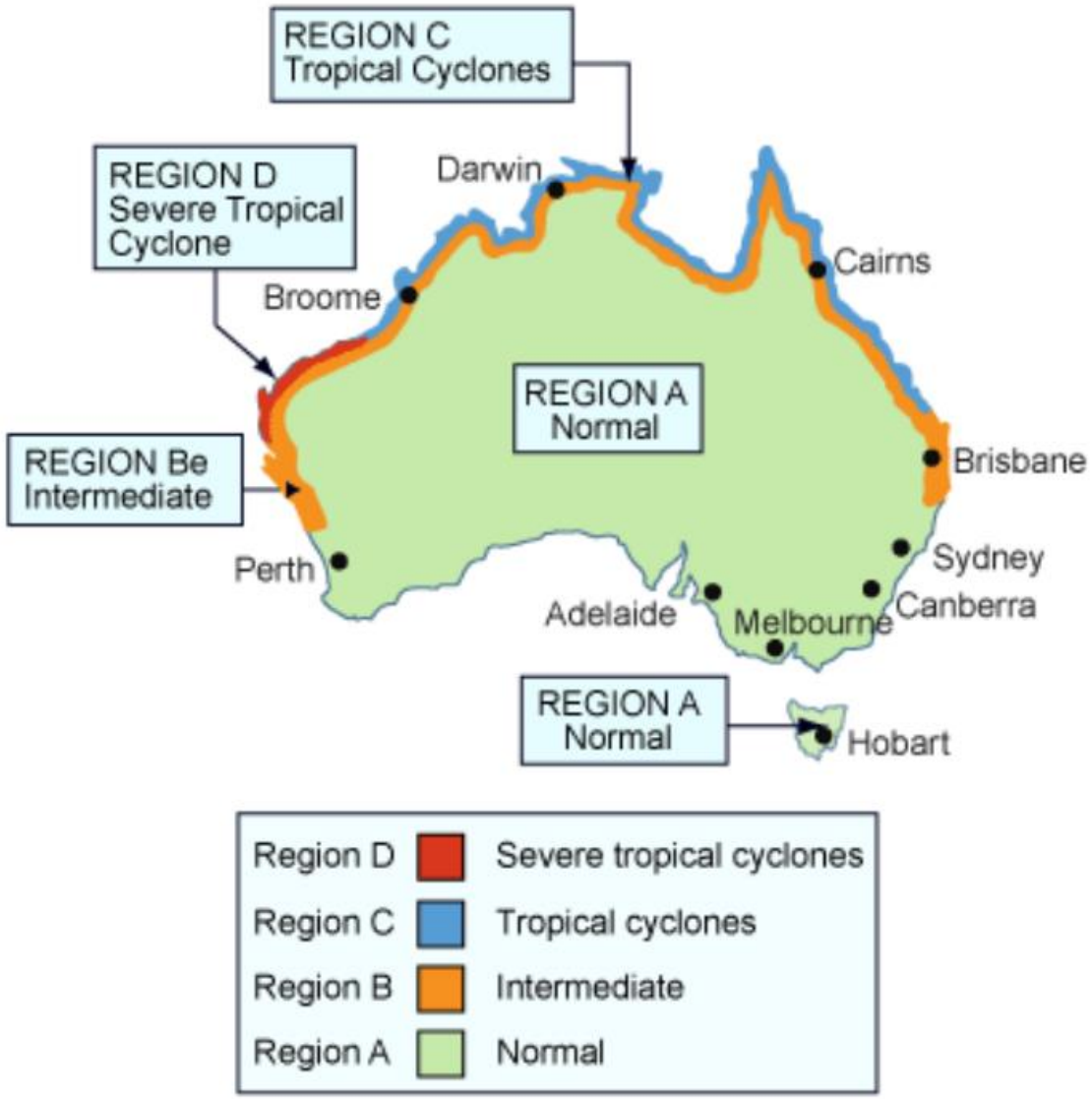

Figure 2.13: Australia Hurricane Risk Map (Source: Royal Melbourne Institute of Technology, 2009)

These two maps clearly show that Western, Northwestern, and Northern Australia are the regions that are at the highest risk for hurricane activity. With this regional specificity in mind, the system for determining building risk in Australia is elucidated in Table 2.11 below.

Table 2.11: Australia – Building Risk Factors and Scores (Adapted from original source: Australian Building Codes Board, 2019)

Risk Factor	Category	Risk Severity	Score
Wind Region	Region A	Low to medium	0
	Region B		
	Region C	High	1
	Region D	Very High	2
Number of storeys	One storey	Low	0
	Two storeys in part	Medium	1
	Two storeys	High	2
	More than two storeys	Very High	4
Roof/wall junctions	Roof-to-wall junctions fully protected	Low	0
	Roof-to-wall junctions partially exposed	Medium	1
	Roof-to-wall junctions fully exposed	High	3
	Roof elements finishing within external wall boundaries	Very High	5
Eaves Width	Greater than 600 mm for single storey	Low	0
	451-600 mm for single storey; or greater than 600 mm for two storeys	Medium	1
	101-450 mm for single storey; or 451-600 mm for two storeys; or greater than 600 mm for above two storeys	High	2
	0-100 mm for single storey; or 0-450 mm for two storeys; or less than 600 mm for above two storeys	Very High	5
Envelope complexity	Simple shape with single cladding type	Low	0
	Complex shape with no more than two cladding types	Medium	1
	Complex shape with more than two cladding types	High	3
	As for high risk but with fully exposed roof-to-wall junctions	Very High	6

Decks, porches and balconies	None; or timber slat deck or porch at ground level	Low	0
	Fully covered in plain view by roof; or timber slate deck attached at first or second floor level	Medium	2
	Balcony exposed in plain view at first floor level; or balcony cantilevered at first floor level	High	4
	Balcony exposed in plain view at second floor level or above; or balcony cantilevered at second floor level or above	Very High	6

In examining Table 2.11, the high-risk building type with the highest risk score of Very High across all risk factors would be characterised by the following:

- Wind Region: D
- Number of storeys: More than two storeys
- Roof/wall junctions: Roof elements finishing within external wall boundaries
- Eaves width: 0-100 mm for single storey; or 0-450 mm for two storeys; or less than 600 mm for above two storeys
- Envelope complexity: Complex shape with more than two cladding types, but with fully exposed roof-to-wall junctions
- Decks, porches and balconies: Balcony exposed in plain view at second floor level or above; or balcony cantilevered at second floor level or above
- Risk score: 28

At the same, this system of scoring high-risk buildings is clearly not weighted heavily toward wind risk as the difference in scoring risk factors between Region A at the lowest risk and Region D at the highest risk is merely 2 points. Other risk factors have scoring differences between 4 – 6 when going from Low to Very High risk scores thus evidencing the high-risk building focus from a building code standpoint in in Australia is not wind-centric but rather it is structure-centric from a risk standpoint.

2.7.2 Wind Speed Thresholds for Building Codes in Florida and Other Places

The relationship between building codes and HP is evidenced partially by code enforcement.

Craven (2018) posited that 'local culture decides code enforcement' (p. 18). The lack of building code enforcement uniformity across the U.S. and Florida in particular, and the absence of building code language in FEMA HP documentation, predicates that how building codes affect HP efforts remains mysterious (see Section 2.6.2.3). Part of the hurricane risk determination process for HRBO should be ideally be contingent upon an assessment of how up-to-code their residential buildings are. A study conducted in Sarasota County in CWF found that 'fewer than 30% of the households reported having roof anchors, whistles and/or distress flags, or electric generators, items which are much more likely to represent hurricane-specific preparedness' (Hung, 2017, p. 1065). This aforementioned study evidenced that perhaps knowledge regarding building safety and according codes could be deficient among residential occupants in CWF. A study in the adjacent region of South Florida on Risk Category II buildings found that residents were resistant to even engage in any structural enhancements despite hurricane vulnerability (Prasad & Stoler, 2016, p. 438). This study provided further evidence that there is a potential disconnect between building code knowledge and HP efforts. The findings from both of these aforementioned studies in Florida offered support for the critical focus of this thesis study in investigating the relationship between HP communication and building codes.

Wind speed thresholds are critically considered by SFG. They take a decidedly more wind-risk based approach to determining building codes for their definitions of high-risk buildings, which specifically focuses not only on wind regions but on wind speed criteria. Due to the prevalence of hurricanes striking Florida at a greater frequency than any state in the U.S., the zones themselves show an orientation according to the typical direction that hurricanes strike the state. Furthermore, the zones in Florida have a distinct graduated wind speed threshold for building codes, referred to as the ultimate design wind speed or V_{ult}, which generally decreases from south to north in this state. This V_{ult} corresponds to a 3-second gust of wind at 33 feet (10 meters) height above ground level in open terrain; for buildings not in open terrain and at heights other than 33 feet, the V_{ult} would need to be recalculated based on localised wind speed data (Florida Building Commission, 2018, p. 11). The following map reflects Risk Category II wind speed threshold building codes for varying zones of vulnerability in Florida as depicted in Figure 2.14 below.

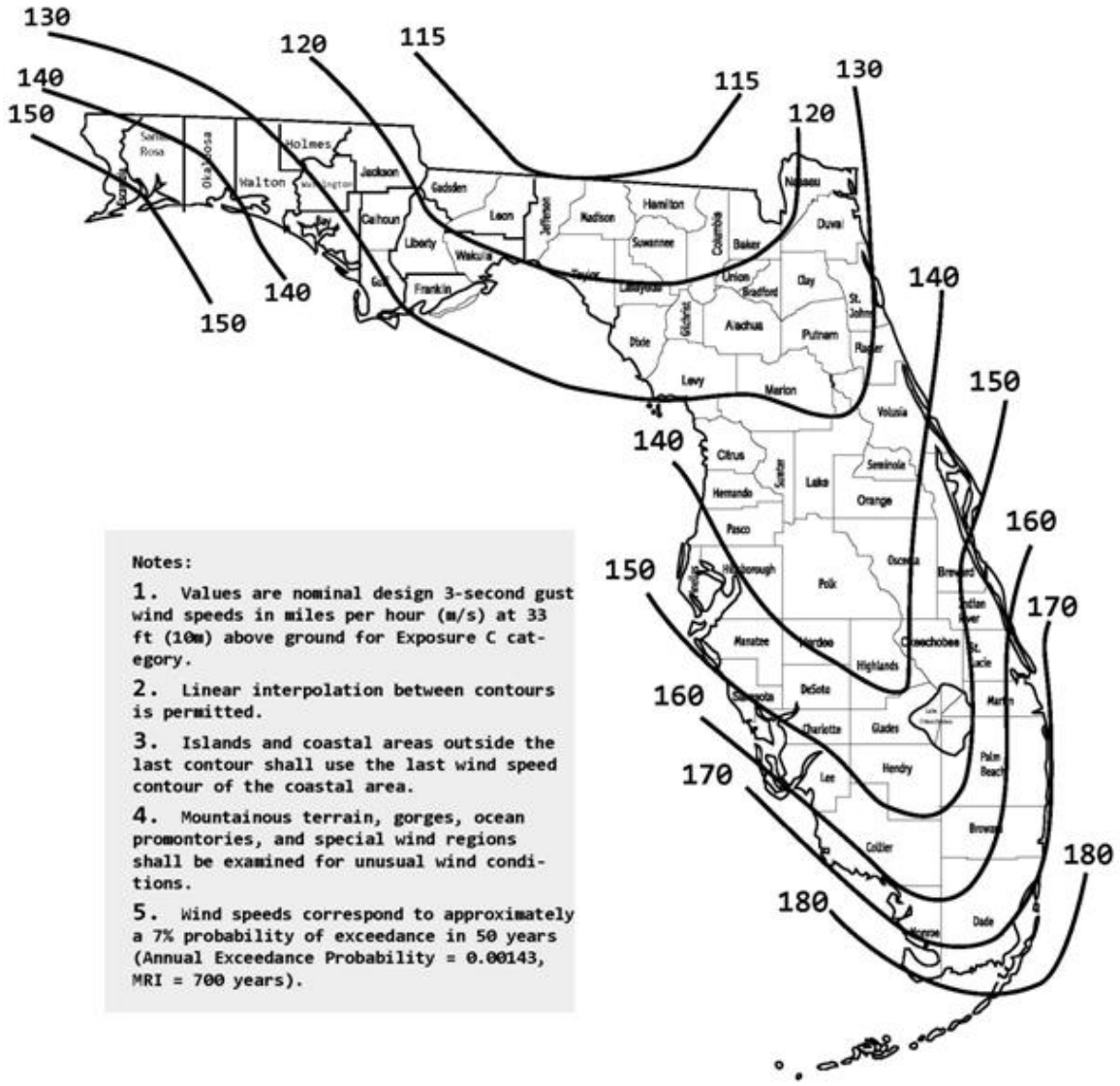

Figure 2.14: Florida – Ultimate Design Wind Speed Map for Risk Category II Buildings (Source: Florida Building Commission, 2012a)

The wind speeds described in Figure 2.14 are detailed in mph and the conversion to the metric system for this map is detailed in Table 2.12 below.

Table 2.12: Ultimate Design Wind Speed Conversion - Imperial to Metric Units	
V_{ult} in miles per hour	V_{ult} in kilometres per hour
180 mph	290 km/h
170 mph	274 km/h

160 mph	257 km/h
150 mph	241 km/h
140 mph	225 km/h
130 mph	209 km/h
120 mph	193 km/h
115 mph	185 km/h

These wind speed threshold building design criteria detailed in Figure 2.14 are mandated by SFG to be adopted by builders and construction companies. Furthermore, when prospective homebuyers in Florida are looking for a new home, the sellers have to disclose the building codes status of the home and whether there are any code violations, inspections, or remaining issues that still need to be closed by a formal governmental inspection (Florida Realtors, 2017). The aforementioned Risk Category II wind speed threshold building code map is the essential legal framework in Florida that builders are supposed to abide by. However, it is ultimately the legal responsibility of the owners of high-risk buildings, whether they are occupants or not, to bear the brunt of the expenses to bring buildings up to code to withstand hurricanes. The options for HRBO who wish to change their living circumstances can be limited though. If HRBO choose or are required to move to safer areas, they have to bear the financial expenses of moving and the social and psychological consequences of then living in a new community (Kunreuther, 2006, p. 218). Such decisions necessarily depend on their levels of risk perception.

The wind speed threshold building code system used in the U.S. state of North Carolina, which is described by the International Code Council (2018b), is quite similar to the system used in Florida, but with V_{ult} going from higher to lower wind speeds from east to west in North Carolina. This is as opposed to the south to north decreasing V_{ult} orientation in Florida (see Figure 2.14). The differences of V_{ult} orientation between these two states is indicative of hurricane strike frequency being the highest in South Florida and Eastern North Carolina respectively for each state. The British Overseas Territory of Bermuda in the North Atlantic Ocean has specifically adopted the wind speed threshold building code V_{ult} of 150 mph (241 km/h) of Eastern North Carolina, which is approximately roughly 1,000 kilometres west of

Bermuda (Government of Bermuda, Department of Planning, 2014; International Code Council, 2018b). North Carolina faces many of the same hurricanes that batter Florida, due to the close proximity of both states. In contrast, the small, isolated, island territory of Bermuda sometimes escapes the wrath of nearby hurricanes during the annual North Atlantic hurricane season, but Bermuda still averages one hurricane strike every six to seven years (Bermuda Weather Service, 2020). Despite this hurricane strike frequency, the HP documentation created for the public in Bermuda has not been updated since 2016 and does not contain any language regarding building risk categories or building codes (Government of Bermuda, Ministry of National Security, 2016).

Bahamas is a chain of hundreds of islands in the North Atlantic Ocean, starting less than 100 kilometres east of South Florida. The country does not have a wind speed threshold building code map of its own, despite its location in the middle of an extremely high hurricane-frequency area. For building risk categories, Bahamas relies on the documentation from ASCE, and particularly the documentation from SFG because of the close proximity of Bahamas to Florida (Government of the Bahamas, 2020). A number of the same hurricanes which strike Florida also strike Bahamas. The only guidance Bahamas uses for wind speed-based building design is a general V_{ult} of 75 mph (121 km/h) (Government of the Bahamas, 2020). This is quite minimal considering the hurricane frequency the country faces (see Table 2.3). Vickery (2013) used a hurricane simulation model similar to one employed by ASCE to develop their wind speed threshold maps, and this model showed that the Bahamas wind speed threshold should be a V_{ult} between 170-180 mph (274-290 km/h). This extreme V_{ult} parallels wind speed thresholds of adjacent South Florida (see Figure 2.14). If Bahamas would adopt the South Florida guidance for building code wind speed threshold, this would be similar to the aforementioned strategy of Bermuda regarding their adoption of the wind speed threshold of Eastern North Carolina. A further challenge for Bahamas is reflected in the fact that despite being adjacent to the most hurricane-prone region of Florida, and facing many of the same major hurricanes, the HP documentation Bahamas has created for the public does not include any language regarding building risk categories or building codes (Government of the Bahamas, 2020). The lack of building risk category or building code language in the HP documentation is reflected across all of these places explored in this

research study. This consistent language disconnect reinforced the justification and research problem for the research study and its manageable research focus on CWF (see Section 1.3).

The physical vulnerability of high-risk buildings from hurricanes underscores the importance of building codes; the impact of HP efforts, or lack thereof, is reflected in lives disrupted by hurricanes. Using Hurricane Irma, a storm that battered Florida in 2017, as a point of analysis, residents reflected a plethora of perspectives on what they perceived would happen to their places of residence, themselves, or others as a result of the storm as illustrated in Figure 2.15 below.

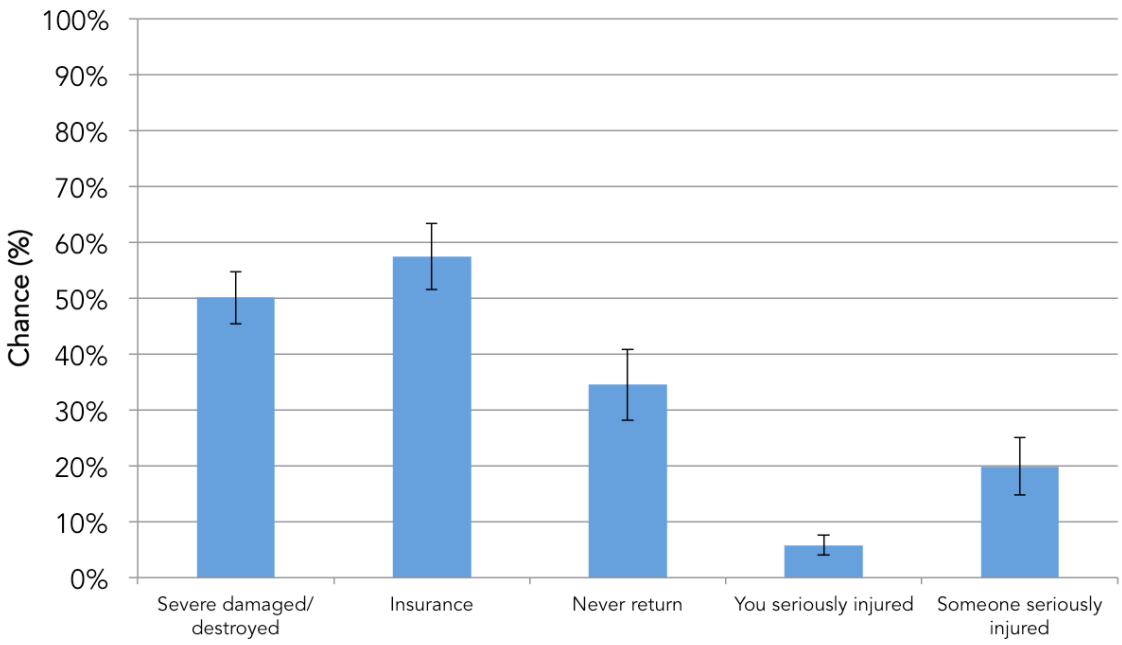

Figure 2.15: Florida – Hurricane Irma Risk Perception (Source: Florida Building Commission, 2018)

Figure 2.15 reflects how strongly residents felt that Hurricane Irma was going to damage their places of residence. The assumption is made that the HP decision-making process which transpired for these residents must have had some degree of dependence on the hurricane communication they have received, of which building code language seems to be deficient. Conversely, Grafakos et al. (2018) found in their survey of residents that experienced Hurricane Sandy in 2012, hurricane communication was largely ignored to the extent that even on the day of landfall, only 50% of participants surveyed had realised there

was a hurricane warning for an imminent strike (p. 131). This is another example of how hurricane communication shortcomings can put populations at great risk.

Liu, Lai, and Xu (2018) discovered in their research of Hurricane Harvey that 'crafting the appropriate crisis response messages to match public expectations is at the core of effective crisis management' (p. 808). Conversely, in a study on the aftermath of Hurricane Charley conducted by the International Hurricane Research Center (2004), researchers remarked that more than one-third of the hurricane victims interviewed in assistance centres and shelters were renters largely from either public or subsidised housing and these were some of the most tragic stories reflected (p. 21). Public housing would seem to be prime locations for direct communication from government authorities to HRBO regarding HP. Some of the most impoverished members of society live in public housing, which is characterised almost exclusively by high-risk buildings. Thus, this research study made the case that communication regarding building codes should be a paramount component of HP communication to safeguard not only the well-being of the physical structures, but of the social structures threatened as well.

2.8 Communication, Language, and Linguistics

The necessity of common understanding between the government and public in communication pertaining to HP is difficult to underestimate. The stakes are as high as can be with the ultimate failure of communication being measured in the loss of lives. Kim and Kang (2010) argued that the most important first step is to help residents prepare for natural disasters is to create a system whereby neighbours, community organisations, and the local media are connected to each other so that they can share stories and share information regarding preparedness (p. 484). Yet the media coverage in the U.S. post-hurricane chaos often reveals victims in the throes of confusion about what they thought was communicated to them regarding hurricane strength, evacuation warnings, and a plethora of other related topics. In Hurricane Katrina in 2005, victims became swept up in what Lindstrom and Losavio (2005) described as environment of anarchy in which DMP had to operate in (p. 38). A tragic image of the aftermath of Hurricane Katrina is depicted in Figure 2.16 below.

Figure 2.16: Louisiana – Hurricane Katrina Survivor on Hotel Luggage Cart, New Orleans (Source: Lindstrom & Losavio, 2005)

The image above depicts a hurricane victim being loaded onto a hotel luggage cart for lack of a more appropriate conveyance. Such scenes underscore the chaos that HP communication disconnects can elicit in the U.S., with the most harrowing of consequences at times. As an example of the U.S. government trying to help the public better understand what impacts there are pertaining to different categories of hurricanes, the NHC removed central pressure statements and now only include peak winds in its Saffir-Simpson scale, which covers the five strength categories of hurricanes (NHC, 2019 and Appendix H). The nebulous factor of central pressure was not as easy for the public to digest. How the public interprets government and media communication regarding wind speeds and then connects this communication to their own knowledge of building codes and according building integrity was a topic explored by this research study. The effect of wind speeds on building integrity is illustrated in the hurricane damage evidenced in the photograph in Figure 2.17 below.

Figure 2.17: Florida – Hurricane Charley Damage, Punta Gorda (Source: FEMA, 2004)

These types of photographs underscore real life stories for HRBO that have tragic endings, with property destruction and lives changed or even lost. A major focus of this research study was the attempt to get HRBO and DMP to reflect on the connection of their knowledge and usage of HP language to the real life experiences they have had with hurricanes and high-risk buildings with a critical focus on HP communication.

2.8.1 Communication Issues

The importance of DC is difficult to underestimate. 'Community disaster decision-making and the possession of information have been consistently connected' (Ryan, 2018, p. 73). In an era of rapidly increasing technology, social forces affect what is considered to be information and knowledge. However, it remains to be seen how much social forces actually shape technology in ways that translate into knowledge that is well understood by the public about high-risk buildings. As data-centric knowledge bases are increasingly relied upon by the public, it is critical to understand the means by which the public gains knowledge. The institution of libraries offers the traditional model of structured information

delivery to a user base. ‘Libraries are precisely the points where techno-capitalist ideologies of the information society are gaining more of a foothold’ (Pyati, 2006, p. 87). Yet, despite the prevalence of hurricanes in certain parts of the U.S. and the rich body of literature available that examines these phenomena from numerous meteorological perspectives, it remains to be seen as to what information source may offer an effective model for communicating critical, potentially life-saving HP information to the public in a manner the public clearly understands, or whether other social forces are at play that render HP communication building simply a process the public expects the government to conduct in an unspecified manner.

Creating and disseminating the most appropriate messaging to match public expectations is critical within DM (Liu et al., 2018, p. 808). Demuth, Morss, Morrow, and Lazo (2012) identified that in the U.S. there are three major groups that largely influence the creation of hurricane risk messages and how they are conveyed: NWS/NHC and local weather forecast offices; local emergency managers; and local media, which is generally television and radio (p. 1134). These three information sources all have various methods they use to convey information to each other and to the public. NWS/NHC is the government authority in the U.S. that has an enormous retinue of resources that study hurricanes globally and prognosticate in great detail about them. The remaining information sources aforementioned largely glean their information regarding hurricanes from NWS/NHC and then determine how to distil this information within their organisations and to the public. It is within this extremely broad information environment that the language that comprises the building blocks of HP information is developed and disseminated in the U.S.

2.8.1.1 Communication Channels

The communications channels chosen by DMP are a major aspect of ensuring that messaging is effective. In the U.S., websites maintained by FEMA, NOAA, and the American Red Cross remain some of the main communication channels used to provide detailed HP information (Kim & Kang, 2010, p. 472). However, social media is becoming increasingly used by DMP to provide real-time information as this information can be *pushed* directly to social media users, rather than the users needing to access a website and search for updates. Social media is inherently connective, which is advantageous in the pre-disaster

stage where the communication 'goal deals primarily with delivering disaster preparedness and warning information,' as well as to deliver information on' impending situations (Liu et al., 2018, p. 808). Text messaging or SMS is another communication channel whereby impending disaster information can be pushed. However, there are many private companies which provide SMS warnings on impending weather and this introduces the potential for imprecise or even false information to be disseminated (Höppner, Buchecker, & Bründl, 2010, p. 121). Therefore, the frequency of this communication channel may be characterised by inherently dubious potential outcomes if incorrect information is acted upon in a preparedness behaviour context.

In the U.S., television and radio remain the most widely used communication channels to deliver impending hurricane information, which is often information which is originally shared by NWS/NHC and then repurposed for broadcast by media company meteorologists (Demuth et al., 2012, pp. 1134, 1136-1137). The danger of the media as interlocuters in this hurricane messaging is that 'in pursuit of these goals, media producers and managers can influence aspects of hurricane coverage' (Demuth et al., 2012, p. 1137). This is the HP communication space within which HRBO must navigate the linguistic landscape to try and understand the information and then make decisions based on this. However, most of these communication channels do not create content targeted toward demographic characteristics of their audiences. Höppner et al. (2010) argued that 'ethnicity associated with characteristics such as income, education, housing quality and access to community resources and assistance has been shown to impact on the effectiveness of communication' (p. 24). The bulk of HP planning documentation is in the English language. Therefore, in a state like Florida, where a large sector of the population are Spanish speakers, it remains to be seen how well HP messaging reaches such audiences. Perhaps an even more vulnerable population, the disabled, face serious consequences from inadequate HP communication. In Florida, 18% of the population living in poverty is disabled, and over 75% of these individuals are not in the labour force (Florida Senate Committee on Children, Families, and Elder Affairs, 2016, p. 19). These individuals are far more likely to be dependent on others when it pertains to HP activities, thus highlighting the importance of HP communication.

2.8.1.2 Locus of Control

A critical concept pertaining to dependence and independence that affects communication is the locus of control (LOC), which is derived from the field of Psychology. Individuals are classified in two ways pertaining to LOC: individuals with an internal LOC communicate with a sense of independence and are confident operating unilaterally, while individuals with an external LOC communicate with a sense of dependence on others and seek to collaborate (Rubin, 1993, p. 168). Individuals with internal LOC are more likely to be motivated to take control and initiate communication, while individuals with external LOC are more like to be anxious about initiating communication and may be generally mistrusting of society (Rubin, 1993, pp. 162-163). The relevance of LOC to this research study on HP communication was framed by Ryan (2018), who found that individuals with an internal LOC were more willing to extract useful information from communication and then prepare for a potential disaster (p. 80). This perspective could then point to the potential for individuals with an external LOC to be less likely to easily distil information actively from DC and then act upon it. Furthermore, internals have 'a strong degree of perceived personal control over risks' as compared to externals, 'who see risks as less under their control and more a consequence of outside forces' (Trumbo et al., 2016, p. 2236).

2.8.1.3 Culture

Culture also plays a role in communication. Wood, Stoltz, Van Ness, and Taylor (2018) described one aspect of culture as *personal culture*, which includes aspects of personal memory that learned and shared, including recollected events (p. 244). Wood et al. (2018) also described another aspect of culture as *public culture*, which is focused on more interactive aspects such as physical objects and settings, people, sounds, texts, and conversations (pp. 244-245). Personal culture is more aligned with an internal LOC and public culture is more aligned with an external LOC. Within these matrices of culture and LOC, and DM, DC is highly variable depending on the cultural frameworks of the individuals and the societies they live in.

Japan is well renowned as a world leader in DM for its ability to prepare for and respond to disasters, evidencing a public culture-centric focus. Part of the reason for this: Japanese people respond to disaster based on a sense of collective well-being which is deeply

embedded in the national culture (*nihonjinron*) and the motivation to collaborate to help others (Starrs, 2014, p. 9). Linguistic elements frame the relationship between culture, language, and DM in Japan: there is even a word in Japanese for disaster preparedness: *bousai* (Tokyo Metropolitan Government, 2020). As another example of how integrated the concept of disaster preparedness is in Japan, the government even has a specific Bousai department and an annual Disaster Prevention Day on 1 September (http://www.bousai.go.jp/). The profound cultural importance placed on disaster preparedness in Japan is reflected in the following four words describing 'forms of aid: *kojo* (public aid), *jijo* (self-help), *gojo* (mutual aid in the neighbourhood), *kyojo* [mutual aid between strangers)' (Kitagawa, 2016, p. 630). This linguistic reality underscores the strength of the social propensity in Japan tending toward communalism rather than individualism (Chulho, 2018, pp. 1-2). In particular, the concept of gojo reflects the aspect of checking on neighbours evidenced in the Australia HP plan (see Section 2.6.2.3). The concept of kyojo goes beyond any behaviour described in DM planning documentation reviewed in this research study and is a hallmark of communalism in Japanese culture in the DM context.

The HP plans detailed from Australia, Taiwan, and particularly the U.S. are in stark contrast to Japanese culture and reflect a social propensity that is based on individualism. The U.S. appears to take quite a different perspective on disasters in general than Japan. Rozario (2019) argued that 'disaster movies became a mass phenomenon at the very same time that a national security state became the preferred means of achieving protection against natural and man-made catastrophes' (p. 142). In support of this assertion, FEMA is actually part of DHS. This structural arrangement with DM administration being under the guidance of a security apparatus is unique among the countries examined in this research study, and perhaps emblematic of how the U.S. approaches disasters with a bellicose mindset. Additionally, perhaps the highly individualistic culture in the U.S. is reflective of a personal culture-centric ethos, certainly as compared to the public culture-centric collaborative nature of a country like Japan. In its document *Preparedness in America*, FEMA states 'that widespread cultural change is a long-term process' (FEMA, 2014). On a fundamental level, this research study on HP communication attempted to explore the linguistic building blocks of communication that are an integral component of culture.

The government of Japan is extremely active in communicating with relevant organisations and citizens and facilitating interaction by providing risk education materials, promoting citizens empowerment programmes, providing training and exercise programmes, through the proactive sharing of early warning and subsequent disaster information (Cabinet Office Japan, 2020). This evidences culturally-orientated communication which strikes a collectivist balance between internal LOC individuals and external LOC individuals. The bulk of the DM communication in Japan is however more focused on the frequent hazards Japan faces such as earthquakes and floods, and the more catastrophic hazard of tsunamis rather than hurricanes. This relatively diminished focus on HP documentation in Japan is also characterised by this documentation mostly being written in the Japanese language instead of English. These were the main reason that countries with more detailed HP documentation including Australia, Bangladesh, and Taiwan were focused on in this study in comparison with HP documentation from the U.S. However, the relationships between culture, communication, language, and DM in Japan frames the importance of this research study in the U.S., which examined HP communication with a particular focus on linguistics.

2.8.1.4 Memory

How knowledge is retained through memory is another area which affects communication. Memories regarding disasters contribute to both the knowledge and communication of disasters. 'Research into disaster memory disrupts the definition of past disasters as temporally discrete events with finite impact and recovery periods, instead highlighting the enduring political, social, and cultural impacts of these events and the cyclic nature of the hazards by which they are often triggered' (McKinnon, 2019, p. 204). Within the field of DM, flood research has surfaced a great deal of understanding about how people perceive and communicate about hazards. Of particular note for this research study on HP communication is learning gathered from flood memory research. Flood memory 'incorporates emotion and affect, having implications for developing lay knowledge, behavioural responses and decision-making (whether preparedness or lack of action), and endeavours to comanage these in and with communities' (McEwen, Garde-Hansen, Holmes, Jones, & Krause, 2017, p. 25). Floods can develop into memorable events when they are repeated or common events in an area and then they become 'part of individual and collective narratives of self and place' (McEwen et al., 2017, p. 15). Research into other

hazards has revealed similar findings with hazard memory influencing preparedness communication. Earthquake memories in Israel of historic and more recent temblors have combined with media coverage and public agency efforts to manifest enhanced earthquake preparedness communication (Kirschenbaum, Rapaport, & Canetti, 2017, p. 102). Such narrative-based memories parallel the social effect of hurricanes on preparedness communication, which was a focus of enquiry for this research study.

Part of how individual or shared flood memories affect behaviour is through the concept of active remembering, in which these memories factor in behaviour or decision-making (McEwen et al., 2017, pp. 15, 18). In contrast, Hardt, Nader, and Nadel (2013) defined active forgetting as memories being actively removed due to factors such as recency or relevance instead of simply being passively forgotten (p. 111). Communication is at the heart of active remembering and active forgetting. How disaster factors are communicated plays a major role in the manufacture of memories (see Table 2.2). Hurricane events in Florida may be annual, but the devastation from them is significant enough for each storm to become variably memorable depending on such factors (see Section 1.3). The language bases for how hurricane experience and memories affect HP communication and according HP behaviour was not evidenced in the literature review. This knowledge gap framed part of the rationale for this research study attempting to draw out HP communication insights from the participants. However, to gain a deeper immersion into the building blocks of HP communication, it was critical to employ deep frameworks from the field of linguistics.

2.8.2 Language and Linguistics

The examination of language constructs of HRBO in CWF for this research study was predicated on elucidating a linguistic understanding of HP. The aim of this research study was to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy. A minimal amount of literature exists globally regarding any potential communication divide between government agencies and the public in terms of HP language constructs. Kim and Kang (2010) provided critical insights reflecting this communication divide as they argued that using specific messaging to convince the public in the U.S. to prepare for hurricanes is an onerous task despite a plethora of efforts that different government agencies have taken at

various levels (p. 471).

This communication disconnect between the government in the U.S. and the public in terms of HP provided the research space in which this study was conducted. Powell and O'Hair (2008) highlighted their study findings, which found that on a fundamental level that the public often failed to understand weather forecast terminology, thus resulting in message misinterpretation. As part of the initial impetus for this research study, a premise was reflected upon that convincing the public as to the critical need and functions of HP might be better achieved through communication which the public may find easier to understand. Wind speed is an example of information which is critical to HP in Florida and globally as well. The essential labelling component of hurricane strength, as described by North Atlantic hurricane categories 1 – 5 (see Appendix H), may be a concept that is unclear to the public. Data analysis of Twitter users communicating about Hurricane Sandy in 2017 revealed that typical governmental and scientific measurements of hurricane strength which is wind-based, the Saffir-Simpson scale for hurricanes (see Appendix H), were not deemed an accurate reflection of the perceived strength of the storm in terms of societal impacts, and non-wind threats including storm surge, rainfall, and power outages (Knox, Mazanec, Sullivan, Hall, & Rackley, 2016, p. 31). These examples of language-based issues underscored the need to review deeper techniques from the field of linguistics that are better suited to explore the elemental constructs of HP language.

2.8.2.1 Personal Experience Narrative Technique

This research study focused on the experience-based HP narratives of study participants. The Personal Experience Narrative (PEN) technique was used in this study to aid in deconstructing narratives into clauses to help to better elucidate meaning. ‘A narrative clause is one that cannot be moved without changing the order in which events must be taken to have occurred’ (Johnstone, 2008, p. 637). Additionally, Johnstone (2008) argued that a fully developed narrative may include clauses or sets of clauses the have the following functions in the order which is detailed in Table 2.13 below.

Table 2.13: Personal Experience Narrative Defined (Adapted from original source: Johnstone, 2008)	
Abstract	This includes one or two clauses at the beginning of a narrative that will summarise the forthcoming story.
Orientation	This includes clauses that introduce the situation, the characters, and the physical or chronological setting.
Complication action	This includes narrative clauses that summarise a sequence of events that lead up to the climax or the moment of maximum suspense. Such clauses also refer to the events transpiring in the environment of the story, how they are told, and this creates the tension that keeps an audience listening.
Evaluation	This includes clauses that either state or underscore what might be unusual or interesting about the story and offer the reasons for the audience to continue listening. This also allows the storyteller to continue speaking. At the same time, evaluation of the story by the audience can occur in the form of free clauses.
Result or resolution	This includes clauses which release tension and finally explain what happened in a story.
Coda	This includes clauses that provide the announcement that a story is finished. Sometimes this will bridge the environment of the story to current times and can also include a short summary of the story.

Many of the aforementioned functions of a fully developed narrative lent themselves well to a deconstruction of HP experience. In particular, the *complicating action* function served to be a rich area of enquiry in field research.

2.8.2.2 Frame Analysis

The sub-field of linguistic analysis known as frame analysis holds that language can be deconstructed to examine what is important or relevant going on in a specific situation. Frame itself can be defined as a product of social interaction that has become a situational definition (Wood et al., 2018, p. 249). Hurricanes are events which represent contested spaces as far as what is going on, with numerous voices each describing separate narratives for the same hurricane. 'Material evidence can always be manufactured and given an appropriate biography to provide a false grounding for events' (Goffman, 1974, p. 445). The frame of a hurricane event is inherently vulnerable and prone to miscommunication and misinterpretation. This in turn may affect situations in which there are preparedness efforts.

Frame Analysis is based on the premise that language can be deconstructed to examine what is important or relevant going on in a specific situation, such as through a singular language element: *exemplar*. An exemplar is a type of rhetorical device within frame analysis that portrays a particular situation (Walsh, 2013, pp. 9, 19). Various aspects of preparedness communication could be construed as exemplars within a hurricane frame. Exemplars 'accentuate a given frame, making it noteworthy, vivid, memorable, and easily communicated, triggering mental associations and rendering a situation quickly interpretable' (Creed, Langstrat, & Scully, 2002, p. 40). Frame Analysis has not been used extensively globally in DM or HP research. Thorson (2012) speculated that the frame analysis technique could be an excellent tool for disaster coverage in the media for the following three reasons:

- Human interest stories, impacts, and consequences, conflicts, and timelines are traditional headlines that represent the criteria found in many natural disasters.
- There are numerous angles pertaining to natural disasters that can be covered due to their inherent dramatic qualities.
- Despite the reality that many viewers or readers of news may not have had personal experience with natural disasters, such events have issues quite familiar to people

> because of the overall compelling nature and widespread coverage in the news (p. 70).

These same three reasons could hold true for using exemplars to study HP globally and in the U.S. The assumption is made that timelines, impact or consequences, human interest, and conflict are all quite likely to be components of studying HP. As far as the nature of studying hurricanes and HP, a common theme seen in the U.S. on television stations such as The Weather Channel or CNN have dramatically depicted studying hurricane impacts by showing fierce winds blowing reporters over (Daniels & Loggins, 2007, p. 62). Finally, public familiarity with the phenomena of hurricanes in a prone-region like CWF is a research study premise that held that HRBO living in these areas would likely be compelled to necessarily to discuss their familiarity with HP. The inherently narrative character of hurricane experience appears to be a fertile domain to be explored through the use of exemplars.

2.8.2.3 Paradigmatic Analysis

Paradigmatic analysis is another sub-field of linguistic analysis which examines meaning in text which is relative to structure. The word *paradigm* is both a homonym and a homograph since it has one sound and spelling, and multiple meanings. One commonly understood meaning of the word paradigm indicates a broad understanding of the world that is based on a collection of ideas, methods, and theories that has shaped and determined this understanding (Blackshaw & Crawford, 2009, p. 157). Patel (2014) furthered this traditional definition of paradigm: 'a set of beliefs, assumptions, values and shared knowledge' (p. 264). Another meaning of the word paradigm is found in the field of linguistics: a concept whereby words can be interchanged without disrupting the syntax of a sentence, while sharing the same grammatical function (Baldick, 2015, p. 182). To illustrate these two definitions, while the paradigm of normal existence is all too often shattered for unprepared HRBO who experience a hurricane, the words and phrases these people use to describe the hurricane paradigm may also reflect their understanding of this disaster reality. Both of these concepts of paradigm were focused on together in this research study within the broader context of HP communication.

Fatemi (2014) made the case that paradigmatic analysis utilises an iterative approach to

elucidating the understanding of thought, knowledge, and actions (p. 116). In the scope of meteorological global phenomena such as hurricanes, the language utilised to convey conditions and forecasts is perhaps the most critical aspect of the communication structure of DM, as this can provide a frame for all of hurricane communication and thus preparedness. Patt and Schrag (2003) posited that members of the public facing climate-based threats maintained specific language expectations regarding the magnitude and probability or risks, and that they believed DMP and the media should meet these expectations (p. 29). Further arguments were made by Patt and Schrag (2003) as they asserted that probability descriptors were also used and interpreted as containing information about event magnitude and that people expected that language used to describe probability for events that had more serious consequences should convey certainty, such as using the word *likely* as opposed to the word *unlikely* (p. 26). This underscores how semantic opposites such as *likely* and *unlikely* structurally comprise how hurricanes may be communicated and how the usage of something as simple perhaps as semantic polar opposites can result in interpretation that is imbalanced. The frame of hurricane threat conveyed in terms using *likely* may result in a very different interpretation of the same threat conveyed in terms using *unlikely*. Such word substitution is a hallmark of the numerous different analyses that comprise the broader scope of paradigmatic analysis. This research study leveraged one of them, the paradigmatic transformation referred to as *substitution* (Chandler, 2007, p. 90). Examining language differences that occur from the substitution of words and how that changes meaning can help to deeply explore the perspectives that language reveals.

2.8.2.4 Discourse Analysis

Discourse analysis investigates an elementary understanding of what language is actually used for (Brown & Yule, 2004, p. 1). On a deeper level, discourse analysis generally describes a data analysis technique that examines phenomena beyond individuals, specifically linguistic material such as written or spoken texts, or combinations of the two (Taylor, 2013, p. 2). The DM realm has been examined using discourse analysis before. Cox, Long, Jones, and Handler (2008) argued that research studies regarding the relationship between disasters, development programs, aid donors, and government policies were analysed using discourse analysis, highlighting the discourse of vulnerability and risk, and characterised

how the overall impact of disaster was minimised by these entities and resulted in power dynamics that benefitted business and government interests (p. 470).

Hurricanes can be destructive storms in many parts of the world with a penchant for havoc wrought on the physical and social environments, which in turn can be captured within the personal stories of preparedness. Stories include a range of many elements including words, sentences, and phrases that can be individually and collectively analysed. A broad perspective of discourse analysis is that it examines how words, phrases, and sentences can manifest a range of meaning that may be highly variable depending on the context of use (Gee & Handford, 2012, p. 1). Themes are one essential and fairly straightforward area of focus in discourse analysis, and are defined as the main starting point and character of narrative (Brown & Yule, 2004, p. 137).

Another area of focus in discourse analysis is *schemata*, which refers to knowledge structures (Brown & Yule, 2004, p. 140). Schemata due to their very definition serve the purpose of reflecting a priori and a posteriori knowledge that may be shaped by communication related to HP. Brown and Yule (2004) argued further that schemata can be regarded as the organisation of background knowledge that is able to help prediction and expectation in discourse interpretation in a deterministic context (p. 248). When an individual receives new knowledge with particular key words and key phrases that pertain to a specific context or discourse, this connects existing schemata on this context or discourse that the individual has and connects it to this new knowledge (Ahmed, 2006). Key words and key phrases are found within specific frames, which in turn activate domain-specific schemata, and this causes individuals to respond behaviourally (Wood et al., 2018, p. 252).

2.8.2.5 Template Analysis

The sub-field of linguistic known as template analysis is defined as utilising a template that is comprised of a coding structure that is subsequently applied to the data collected and then revised as needed until a more complete perspective or understanding of documents being analysed is achieved (King & Horrocks, 2010, p. 166). Coding is a system of identifying the specific linguistic information that is sought within a larger chunk of collected data, creating

and applying a set of codes to these data, and then matching the codes to the specific data (Lampert and Ervin-Tripp, 1993, p. 169). There are four steps in the coding process as detailed in Table 2.14 below.

Table 2.14: Template Analysis – Four Steps in the Coding Process (Adapted from original source: Lampert & Ervin-Tripp, 1993)	
Construction	The first step involves designing the system of coding.
Implementation	The second step involves actually doing the coding.
Evaluation	The third step involves ensuring the adequacy of the coding.
Application	The fourth step involves organising the data to conduct subsequent analysis.

Coding is particularly useful with qualitative interview data to distil the various aspects of other analysis techniques. As an example, the themes that can be elicited using discourse analysis can be more easily teased out of interview data by the use of codes. Then depending on code frequency, theme saturation can be determined (Hennink, Kaiser, & Marconi, 2007, p. 593). Thus, coding has the critical function of helping to describe data in more distinct ways.

2.8.3 Communication Models

To examine how a social-centric HP communication model for hurricane-focused DMP that is tailored to HRBO might be constructed, a number of communication models that are relevant to DM were examined for this research study.

2.8.3.1 Berlo's Source-Message-Channel-Receiver Model

The Source-Message-Channel-Receiver (SMCR) model examined for this research study focused on linear communication shaped by a number of factors as depicted in Figure 2.18 below.

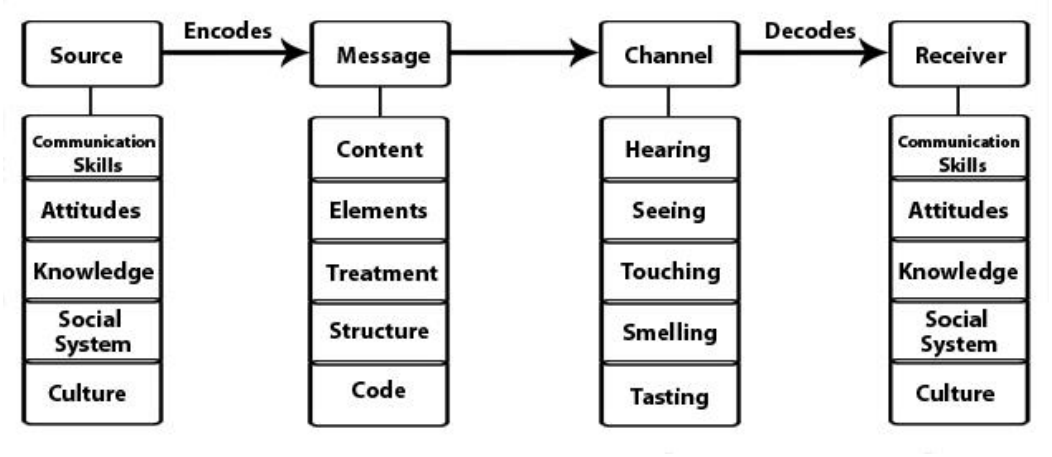

Figure 2.18: Communication Model – Berlo's SMCR Model (Source: Berlo, 1960)

In this model, the source and receiver have the same communication factors, which are experiential, sociographic, and psychographic in nature. Once a message is encoded, the message itself has a number of factors, as does the channel. The receiver then must decode this message that includes all of the factors from the source, message, and channel. This model was effective in detailing that multiple sender-receiver, messaging, and channel factors are involved in coding in decoding, thus emphasizing the necessity for messaging diversity, which is a hallmark of HP communication. Berlo (1960) emphasised that it is critical that sources encode messages with elements that would make these messages easier for receivers to decode and understand (p. 62). However, this model does not feature any mechanism by which receivers can communicate with senders to provide feedback. This model is inherently sender-centric, which favours individuals with an internal LOC (see Section 2.8.1.2). Individuals with an external LOC may feel the messages are not tailored to them and therefore their decoding may not be as effective (see Section 2.8.1.2). From a communication perspective, this model appears to include factors such as culture and social propensity for senders and receivers. The message factors seem well disposed to both knowledge and information, and would likely reflect more modern communication channels used (electronic). From a linguistics perspective, the messages themselves have factors that could be construed as exemplars, themes, and schemata. Another aspect of this model was that the channels are sensory in nature. Perhaps to extend this model into the modern age of electronic communication as aforementioned, the sensory channels could be substituted for electronic channels such as e-mail, web, chat, text, application, social media that are of

vital importance for both senders and receivers. Further models which offered insight on receiver responses were thus sought after.

2.8.3.2 Extended Parallel Process Model

One communication model examined for this research study focused on how individuals might respond to messaging pertaining to threatening circumstances and was elucidated in Figure 2.19 below.

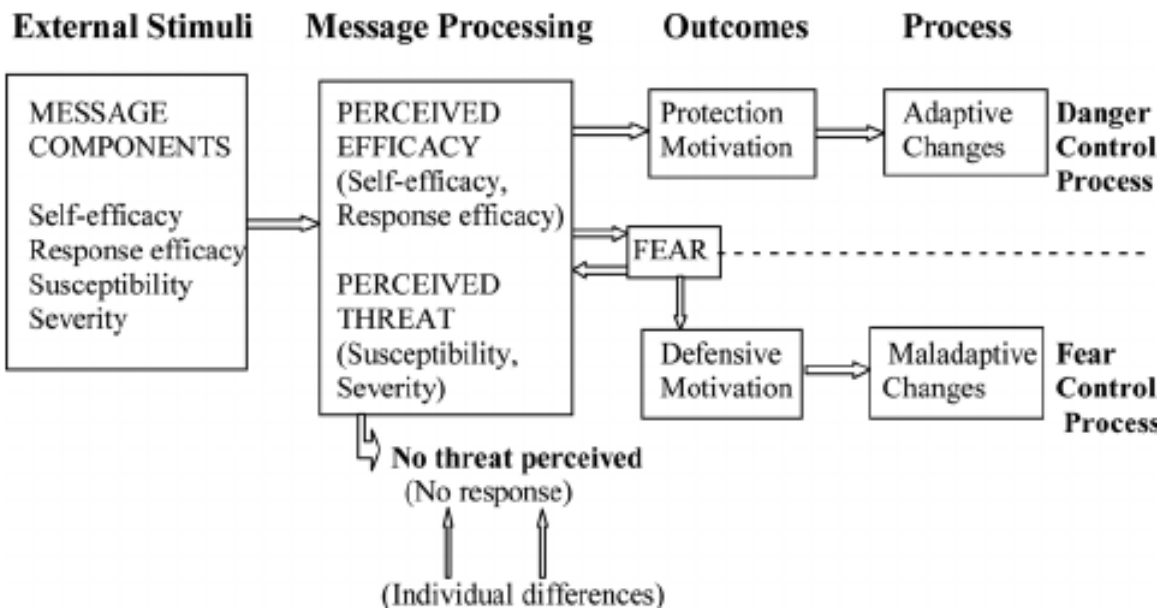

Figure 2.19: Communication Model – Extended Parallel Process Model (Source: Witte, Meyer, and Martell, 2001)

Witte et al. (2001) described the premises this model is based upon:

- Specifying what leads to danger control versus fear control.
- Identifying the underlying mechanisms occurring in each process.
- Explaining when one process would be expected to dominate over the other.
- Detailing what outcomes to expect with each process (pp. 25-28).

This model provided a clear perspective of a basic format for message reception and response, which then bifurcated into a protection motivated, adaptive process to control damage and a defensive motivated, maladaptive process to control fear. This model also does not feature any mechanism by which receivers can communicate with senders to

provide feedback. With its emotional and behavioural-laden messaging, this model is a bit more recipient-centric than Berlo's SMCR Model, and thus better suitable for individuals with an external LOC (see Section 2.8.1.2). However, the semantics of the details of the messages being received were not elucidated in this model; interpretative differences among message recipients could cause widely varying decoding issues. This aspect of the model might be well served by expanding it to include the sources for these messages. The two aforementioned factors of message source and recipient interpretation were both focused on in this research study. Adaptive behaviour outcomes were certainly deemed favourable in considering how to develop and a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO. From a communication perspective, this model with its focus on emotional- and behavioural-laden messaging was based on information and knowledge. From a linguistics perspective, this model had a foundation in exemplars, themes, and schemata due to its focus on message processing and emotional/behavioural outcomes and processes (see Section 2.8.2). At the same time, the need to review communication models which focused more on message sources and semantics was paramount.

2.8.3.3 Hazard and Risk Warning Model

Another communication model that was reviewed provided areas that were favourable for extrapolation. The following model examines communicating hazard risk and warning with an emphasis on sources and recipients as reflected in Figure 2.20 below.

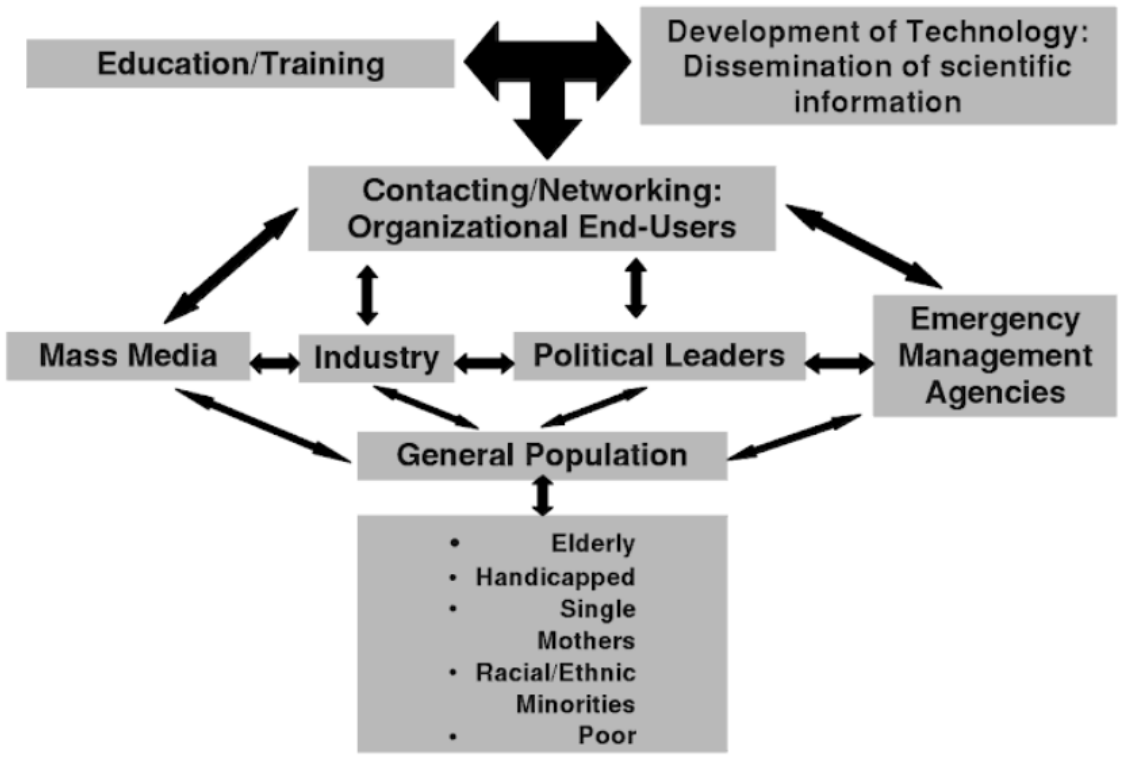

Figure 2.20: Communication Model – Hazard Risk and Warning Model (Source: Rodriguez, Quarantelli, & Dynes, 2007)

Rodriguez et al. (2007) further contended that for this information to be useful and to have a significant impact on individual and community responses, it had to reflect the following criteria:

- It must reach the intended end-users or the population at risk in a comprehensible and useful form.
- It must be perceived by them as relevant to their situation (i.e., individuals need to be made aware and recognize the hazard risk and potential outcomes such as the loss of life and damage to property).
- The end-users must have the capacity and the necessary resources to use this information in ways that will allow them to better prepare, respond to, and recover from a hazard or disaster situation (p. 480).

This model provided a lucid structure which flowed well from source to recipient, from the education and scientific communities which are progenitors of disaster data, through the

major communication entities of governmental, media, and industry, through to the end recipient of the public. This model reflected a better potential to address components such as culture and social propensity (see Section 2.8.1.3). The clarity of the model was also indicative of how the messages themselves would need to have the qualities of being easily understood by the recipients, be relevant, and have information, which was geared toward preparation and outcome, although this was never explicitly clarified in the model itself. At the same time, it remained to be seen as to how such information could be optimised with those aforementioned qualities without a feedback mechanism from the public to ensure these qualities were achieved to some degree. This model could still be considered recipient-centric due to importance placed on decoding, which favours individuals with an external LOC (see Section 2.8.1.2). From a communication perspective, this model did an excellent job of representing senders and receivers due its diversity of stakeholders. These areas include culture, social propensity, demographics, and socioeconomics. The lack of other messaging details rendered the linguistics perspective of this model absent from an analysis standpoint. The research study sought to develop a model that would elicit social-centric messaging which was developed from dialogue between DMP and HRBO such that the shared language would have a higher degree of mutual intelligibility.

2.8.3.4 Hurricane Preparedness Discourse Synthesis Language Model

The two aforementioned communication models could potentially benefit from the input of the preferred language constructs from a target audience. This approach might be considered social-centric since this research study was specifically designed to provide the input language that HRBO use or would prefer used pertaining to HP. Thus, an initial HP discourse synthesis language model was developed for this research study as depicted in Figure 2.21 below.

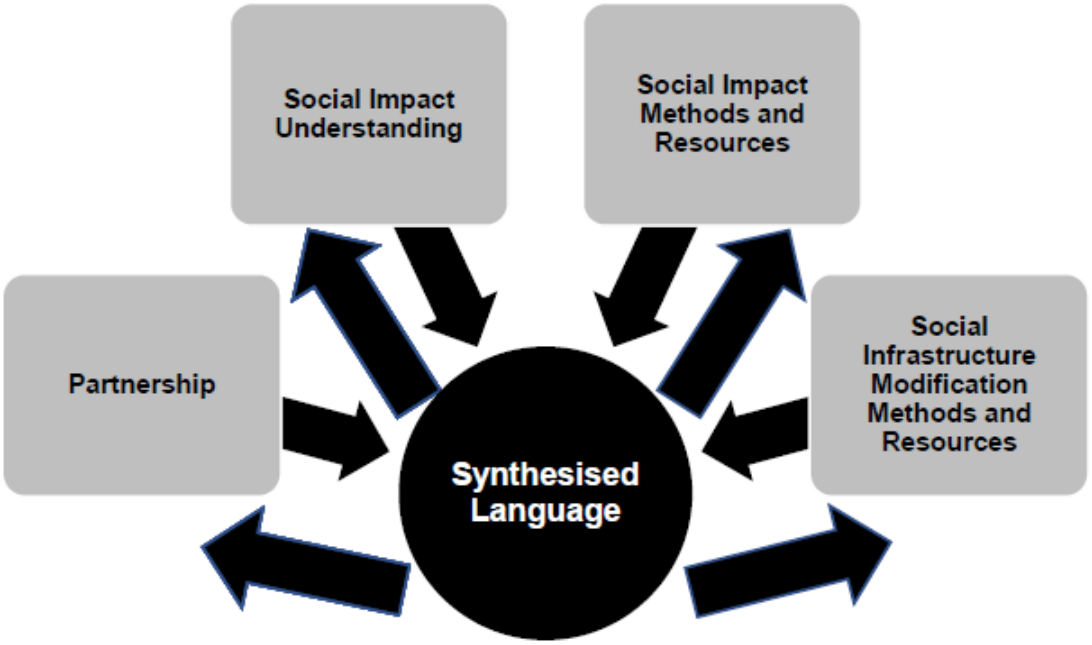

Figure 2.21: Communication Model – Hurricane Preparedness Discourse Synthesis Language Model

This model depicts how HP language can be collectively synthesised by HRBO and DMP by virtue of related discourse areas:

1. Partnership: where HRBO and DMP communicate on how to partner together on a broad-based level regarding HP
2. Social impact understanding: where HRBO and DMP communicate regarding the social impact of hurricanes and how that reflects the need for HP
3. Social impact methods and resources: where DMP communicate with HRBO as to the self-help HP methods and resources available to them to address the social impact of hurricanes
4. Social infrastructure modification methods and resources: where HRBO and DMP communicate regarding how the social infrastructure itself may be modified collectively through the partnership between these entities

From a linguistics perspective, the messaging in this model did not have enough detail regarding stakeholder-centric input to render it rich in exemplars, themes, and schemata. The synthesised language created by such discourse areas could be leveraged further as language input in a HP communication model and serve a greater range of functions if this

stakeholder detail was available. This model was very basic, yet it did represent from a communication standpoint an initial attempt to address culture, social propensity, information, knowledge, demographics, and socioeconomics (see Section 2.8.1.3). This model attempted to have clear decoding for individuals with an external LOC (see Section 2.8.1.2). However, for truly synthesised language to be operationalised, the creation of a communication model that was somewhat inclusive of message source, recipient, interpretation, and consequential behaviour was the subsequent effort undertaken.

2.8.3.5 Alpha Hurricane Preparedness Communication Model

Given the range and content of the literature reviewed for this study, the following HP communication needs were considered:

1. Identifying specific members of the public that are in greatest need of HP communication
2. Communicating HP in terms that have situational relevance to specific members of the public
3. Ensuring the that public has the capacity and resources to use this communication to better prepare for hurricanes
4. Focusing on actionable HP language rather than fear-based language
5. Ensuring the public understands the HP communication mechanisms and their outcomes

With these needs in mind, the Hurricane Preparedness Discourse Synthesis Language Model (Figure 2.21) was coupled with the Hazard and Risk Warning Model (Figure 2.20) to derive the following initial Alpha Hurricane Preparedness Communication Model that DMP focused on hurricanes can use to convey hurricane risks effectively with HRBO, which is illustrated in Figure 2.22 below.

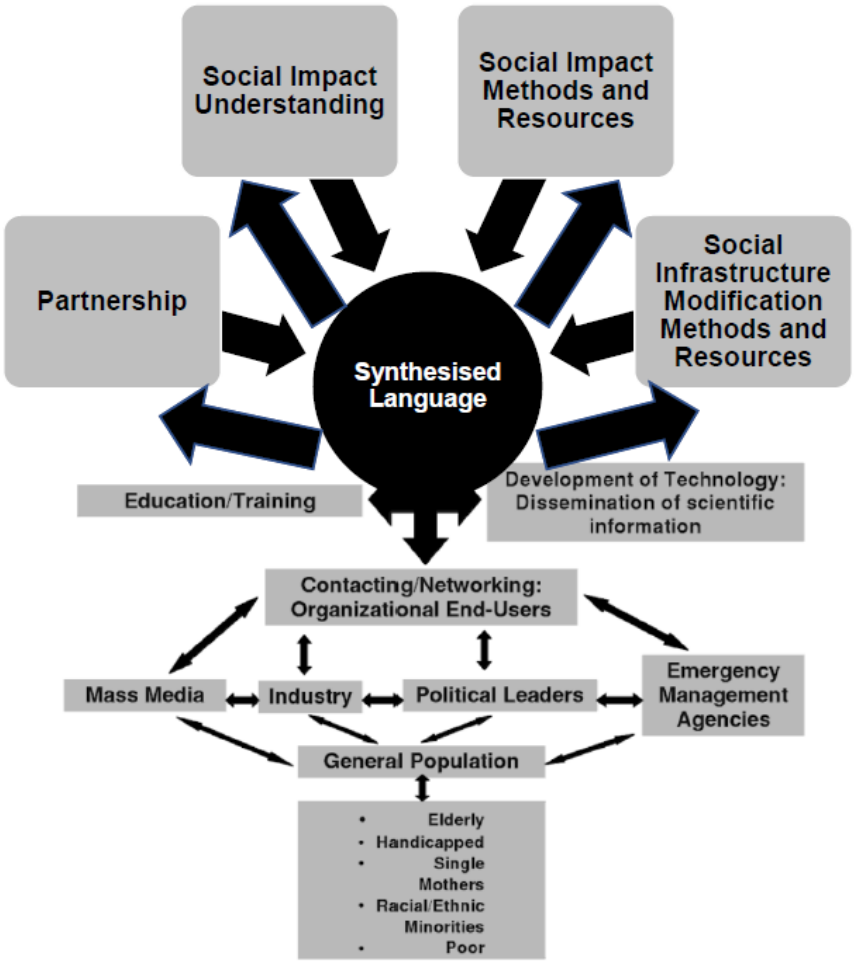

Figure 2.22: Communication Model – Alpha Hurricane Preparedness Communication Model (Adapted from original source: Rodriguez et al., 2007)

The purposes of this model are as follows:

1. Communicating to the public in terms they understand clearly as to what the impacts will be to the social infrastructure due to impending hurricane hazards;
2. Communicating to the public how to become active partners in reducing the magnitude and impact of hurricane hazards to the social infrastructure;
3. Communicating to the public methods and resources to assist them in recovering from the social effects of hurricane hazards;
4. Communicating to the public methods and resources to assist them to adapt to hurricane hazards through modification of the social infrastructure system

This model remained inadequate though as there were many other factors to consider in

terms of better identifying characteristics of the various non-governmental social actors that may influence HRBO, the impact of a broad set of such actors on language input, and a wider range of consequential HP actions resulting from language input. Components such as culture and social propensity were not optimised because of this lack of detail in stakeholder characteristics. From a linguistics perspective, the messaging in this model was still not detailed enough to optimise or analyse further than the previous two models it was built upon. Thus, there was a need to review further communication models.

2.8.3.6 Iterative Warning Response Model

The following model utilised by FEMA that examines how social factors, social actors, and specific communication affect behavioural response to warnings is illustrated in Figure 2.23 below.

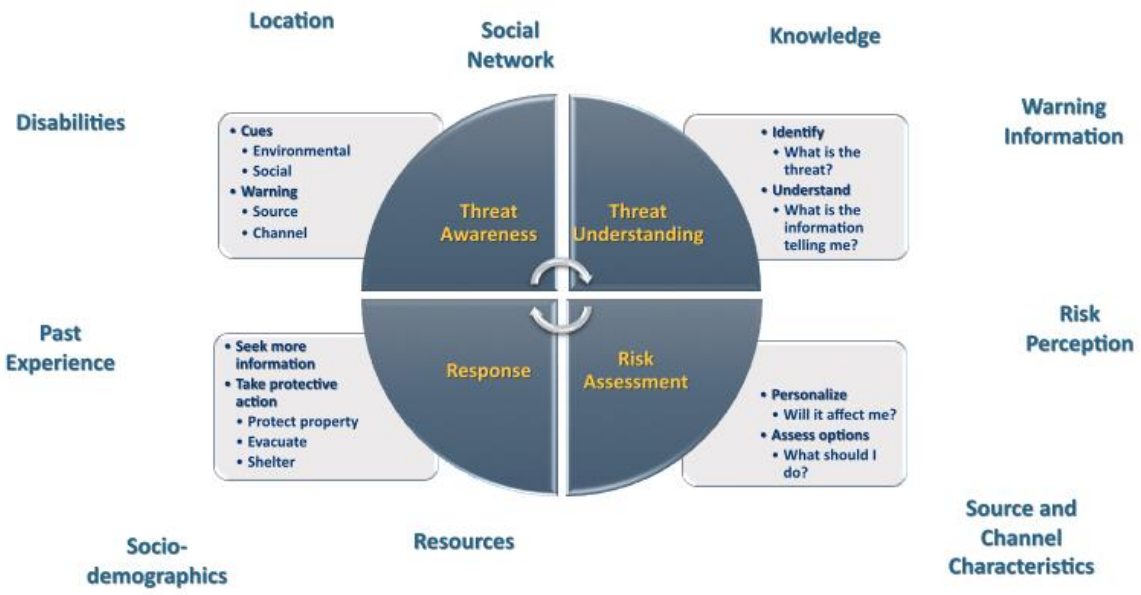

Figure 2.23: Communication Model – Iterative Warning Response Model (Source: NOAA, 2016b)

This model examined a number of expanded factors that may affect the communication and subsequent response process. Specific factors from this model such as social network, knowledge, warning information analysis, risk perception, warning source and channel characteristics, resources, location, and past experience were all indicative of most of the communication factors detailed earlier in this chapter (see Section 2.8.1). This model had

the most detailed approach to including factors related to culture, social propensity, ethnicity, and challenges such as disability (see Section 2.8.1.3). The model also included factors which could be evaluated from a language basis such as environmental and social cues, and how these also manifested in response options, reflecting the linguistic concepts of themes, exemplars, and schemata (see Section 2.8.2). While this model certainly offered a vastly improved collaborative approach and a number of inputs absent in the previous models reviewed in the literature, a feedback mechanism between DMP and the public remained to be developed to truly maximise communication for individuals with an external LOC (see Section 2.8.1.2). Finding a model which addressed this gap was the next step taken in collecting referential communications models.

2.8.3.7 Floodplain Occupant Perspective on Warning Model

The following model illustrated in Figure 2.24 below offered further insight on how detailed flood warning input from the public shared with DMP, as elucidated by content, channel, and entity, could influence the subsequent behaviour of floodplain occupants.

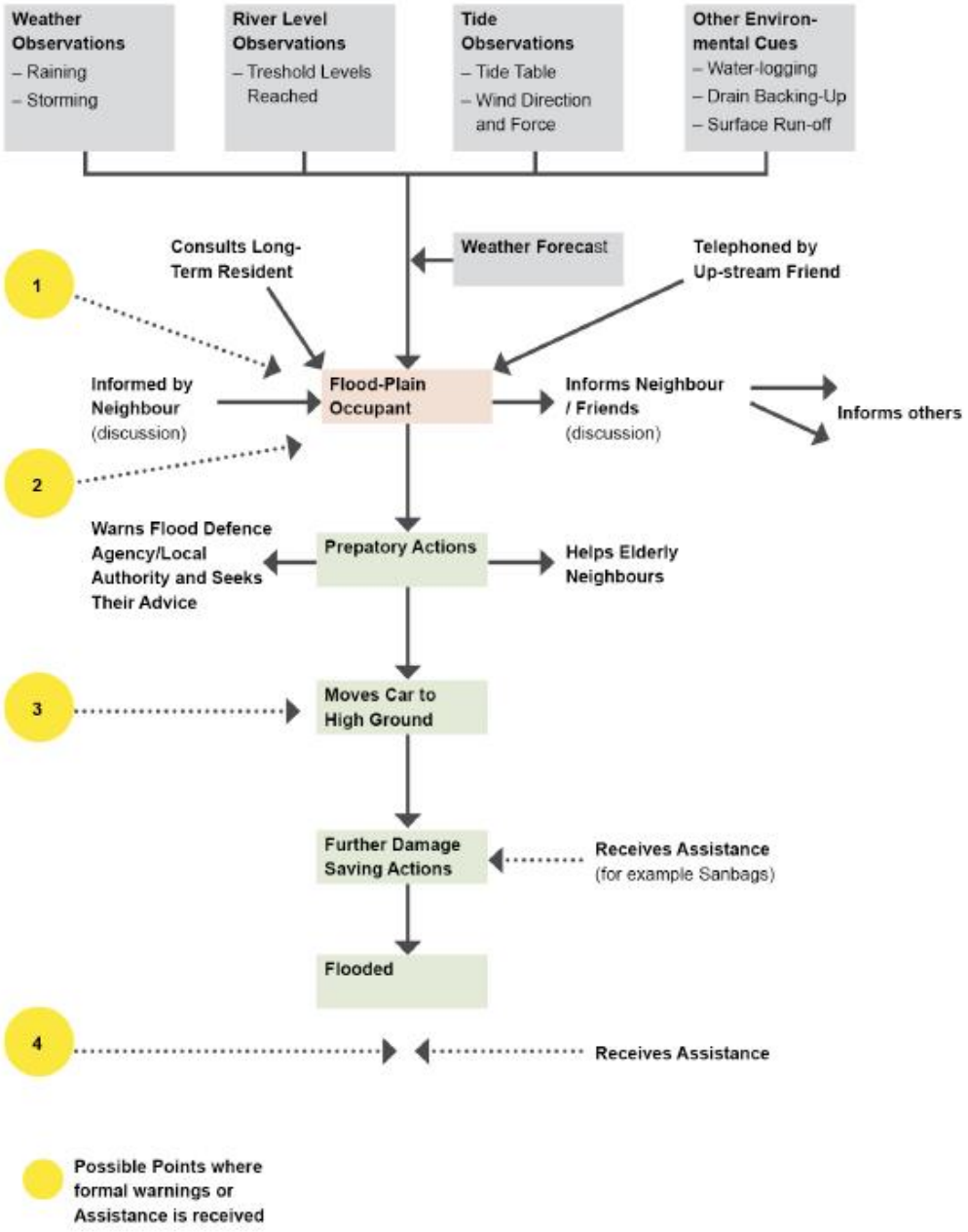

Figure 2.24: Communication Model – Floodplain Occupant Perspective on Warning Model (Source: Höppner et al., 2010)

Where this model differs from the other models previously depicted is that there are more community-based actions such as communicating with neighbours and mutual assistance. Furthermore, there is the aspect of this model that involves the floodplain occupants making observations and reporting these observations back to the appropriate DMP in order to receive actionable advice. A precedent for this collaborative weather data gathering has already been in place in the U.S. since the 1970s: the NWS SKYWARN severe

weather storm spotter programme that includes nearly 400,000 members of the public that volunteer their time during severe weather events by reporting back to the NWS conditions they observe (NWS, 2019a). This floodplain-centric communication model in Figure 2.24 underscored some of the same types of intentions of the Alpha Hurricane Preparedness Communication Model depicted in Figure 2.22. The community-based actions and partnership between floodplain occupants and DMP also reflected a clear attempt to maximise communication for individuals with an external LOC (see Section 2.8.1.2). This model had the most detailed approach to including messaging factors which could aid in mutual decoding between senders and receivers (see Section 2.8.1.2). From a communication perspective, this model with its focus on messaging, was overwhelmingly based on information and knowledge (see Section 2.8.1). From a linguistics perspective, this model had a foundation in schemata due to its focus on empirical, reactive, weather observation message content (see Section 2.8.2.4). While this model certainly offered a vastly improved collaborative approach and a number of communication mechanisms absent in the previous models reviewed in the literature, a proactive feedback mechanism between DMP and the public was a desired component of models yet to be reviewed.

2.8.3.8 Integrated Public Alert Warning System Model

The following model illustrated in Figure 2.25 below details the main communication framework that the U.S. federal government, particularly FEMA, uses to send out warning alerts to DMP and the public through a centralised system. This communication model was the final one reviewed as it offered the most realistic example of an existing model that could potentially be augmented by the model that was the aim of this research study.

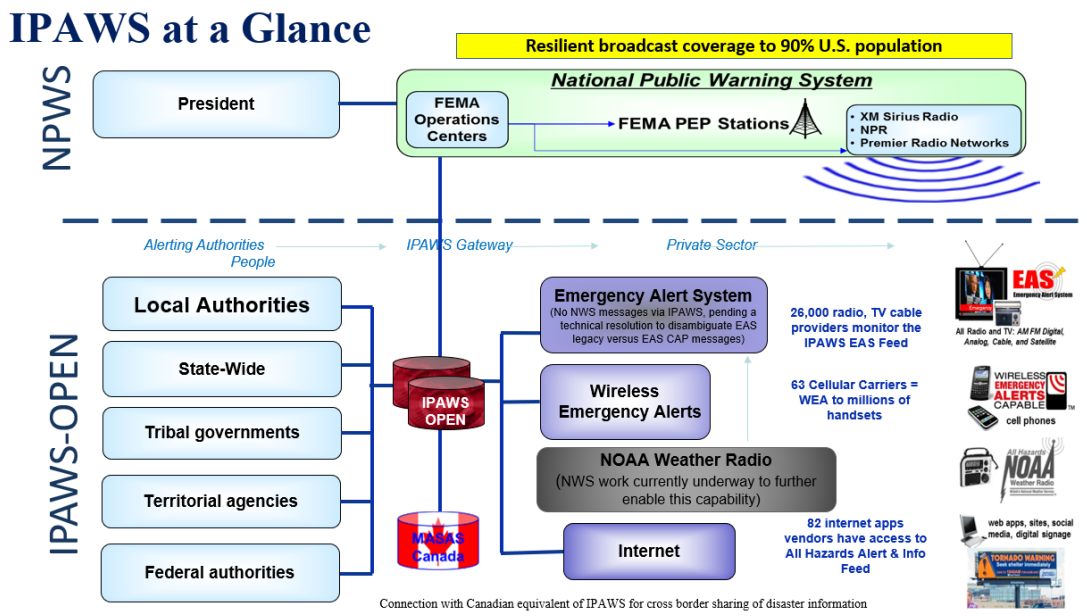

Figure 2.25: Integrated Public Alert Warning System Model (Source: FEMA, 2019)

The Integrated Public Alert and Warning System (IPAWS) is a centralised communication output system that provides storm, preparedness, evacuation, shelter, resources, logistical, and much more information through the integration of mobile telephone networks, electronic billboards, the internet, cable and satellite television and other communication systems including:

- EAS
- National Warning System (NAWAS)
- NWR
- Wireless Emergency Alerts (WEA) (FEMA, 2019)

This model features many of the stakeholders in the role of receivers that are critical to comprehensive HP communication, including the full gamut of the requisite DMP. However, members of the public are noticeably absent from this model as defined stakeholders. Furthermore, there is no mechanism by which the public and DMP can feed their own recipient-centric HP language back into this system to help shape truly holistic HP messaging. From a communication standpoint, information and knowledge were evident but from a unidirectional sender-to-receiver perspective. Also, this model was omnichannel,

reflecting a modern telecommunications approach to communication channels as compared to the sensory context for channels in Berlo's SMCR Model (see Section 2.8.3.1). From a linguistics perspective, this empirical, weather data messaging model was relegated to schemata (see Section 2.8.2.4). This model was also inherently sender-centric and thus favours individuals with an internal LOC (see Section 2.8.1.2). Individuals with an external LOC may feel the weather messages are not tailored to them and therefore their decoding may not be as effective (see Section 2.8.1.2). The consequences of this could be catastrophic. Thus, synthesis of the useful components of these models was needed and the intended outcome of this research study was to address some of the gaps in these models through research and analysis and to develop a HP communication model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO.

2.8.3.9 Collective Interpretation of Communication Models

This collection of eight communication models is interpreted and summarised in Table 2.15 as follows.

Table 2.15: Collective Interpretation of Communication Models

Model	Existent Relevant Component	Non-existent Relevant Component
Berlo's SMCR Model	Experiential, sociographic, and psychographic factors highlighting semantic diversity of senders and receivers; message and channel characteristics highlighted	Recipient-centric, external LOC feedback framework to ensure recipient-centric preparedness messaging language
Extended Parallel Process Model	Recipient-centric, external LOC messaging framework that highlights participant emotional and behavioural responses	Specificity regarding senders; messages lack deeper semantic characteristics
Hazard and Risk Warning Model	Specificity regarding senders and recipients	Recipient-centric, external LOC feedback framework to ensure

		recipient-centric preparedness messaging language
Hurricane Preparedness Discourse Synthesis Language Model	Recipient-centric, external LOC feedback framework; sender-recipient partnership framework	Specificity regarding senders, recipients; sender-recipient partnership framework
Alpha Hurricane Preparedness Communication Model	Collaborative, recipient-centric, external LOC synthesised language delivered to the public	Specificity regarding senders, recipients; sender-recipient partnership framework
Iterative Warning Response Model	Experiential, sociographic, and psychographic factors highlighting semantic diversity of recipient-centric language reflective of external LOC	Recipient-centric, external LOC feedback framework to ensure recipient-centric preparedness messaging language; sender-recipient partnership framework
Floodplain Occupant Perspective on Warning Model	Recipient-centric, external LOC messaging framework for public to give messaging feedback to governmental authorities	Proactive messaging feedback relevant to preparedness
Integrated Public Alert Warning System Model	Comprehensive DMP recipients; aggregation framework that provides a centralised output location for warning messages	Direct public access to message aggregator; recipient-centric, external LOC feedback framework to ensure recipient-centric preparedness messaging language

Berlo's SMCR Model depicted in Figure 2.18 offered a structure that detailed critical sender, message, channel, and receiver factors. However, the sender-centric, internal LOC messaging flow could result in decoding issues (see Section 2.8.1.2). The Extended Parallel

Process Model depicted in Figure 2.19 provided a basic framework for how messaging can evoke participant emotional and behavioural responses, but the lack of message sender identification and deeper semantic characteristics of the messages themselves highlighted important areas of need for a more robust model, which was the aim of this research study. The Hazard and Risk Warning Model depicted in Figure 2.20 was extremely useful for this research study as it identified specific message senders and specific message recipients, members of the public. However, a feedback mechanism from the message recipients that could ensure message recipient-centric language was lacking. The HP Discourse Synthesis communication model depicted in Figure 2.21 was built as a recipient-centric, external LOC feedback mechanism to provide a partnership-based, social-centric add-on that could be combined with a more robust HP communication model (see Section 2.8.1.2).

An initial attempt at creating such a model was made by combining the Hazard and Risk Warning Model with this Hurricane Preparedness Discourse Synthesis model, which resulted in the Alpha Hurricane Preparedness Communication Model depicted in Figure 2.22. However, further specificity was needed regarding the interaction of social actors with a communication model and the range of possibilities that an even more robust model might have on HP. The FEMA Iterative Warning Response Model depicted in Figure 2.23 offered numerous experiential, sociographic, and psychographic factors that were taken into account. However, the feedback mechanism of the message recipients, the public, remained to be reflected in another referenced communication model. The Floodplain Occupant Perspective on Warning Model depicted in Figure 2.24 represented a decidedly recipient-centric messaging framework in which the public could offer messaging feedback to governmental authorities. Yet, this model was reactive with the messaging feedback prompted by weather conditions, thus rendering any preparedness activities to necessarily be relegated to language pertaining to imminent weather threats and not language that was more aligned with threats to the social environment. Finally, while IPAWS did have comprehensive DMP message receivers and an aggregation mechanism in IPAWS-OPEN whereby messaging could be centralised for output, there was still no feedback mechanism from DMP and public message recipients to ensure recipient-centric, external LOC preparedness messaging language (see Section 2.8.1.2).

A proactive and collaborative social-centric HP communication model would need to be developed based on the language constructs of HRBO to achieve the aim of this research study: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy. Part of the impetus for conducting interviews with HRBO and DMP was to derive further insights that could help to identify specific DMP and any other partners that could collaborate with HRBO to create recipient-centric, external LOC HP language (see Section 2.8.1.2). Additional insight was needed regarding a collaborative communication partnership itself beyond the interpretation of these eight models described in Table 2.15 that would be elicited through the analysis of interviews with research study participants.

2.9 Summary

This chapter covered the literature review portion of the research study. Definitions of disaster were provided to set a platform for the broad outlines of the topic of disaster itself. The disaster stages were detailed with particular focus on preparedness and mitigation. In addition, the disaster phases were detailed with a focus on disaster response.

To provide further context for the state of disasters globally, disaster frequency and costs were elucidated. The variation of hurricane strikes across the world were also presented. Hurricane preparedness was then detailed across three countries: U.S., Taiwan, and Australia. Another critical aspect of this research study was covered in this chapter: high-risk buildings. Definitions and details regarding risk categories and according wind speed thresholds for building codes were explored across the following places: Florida, Bangladesh, Bahamas, Australia, and Bermuda.

The broad topic of communication was also covered in this chapter. Critical components, aspects, and influences pertaining to communication were reviewed such as communication channels, LOC, culture, and memory. The importance of delving deeply into language-based elements of the multiple data collection techniques employed predicated the need to review multiple techniques from the field of linguistics well-suited to explore HP language. These techniques included the PEN technique, frame analysis, paradigmatic analysis, discourse analysis, and template analysis. A number of communication models were

reviewed in this chapter included Berlo's SMCR Model, the Extended Parallel Process Model, the Hazard and Risk Warning Model, the study-derived Hurricane Preparedness Discourse Synthesis Language Model, the study-derived Alpha Hurricane Preparedness Communication Model, the Iterative Warning Response Model, the Floodplain Occupant Perspective on Warning Model, and the IPAWS Model. These models were interpreted for the existent components they have that are relevant to this study and some components these models lack were detailed as well. To determine how HRBO were able to access, receive, and interpret hurricane risk messaging and what their resultant HP behaviour was, it was necessary to deploy a rigorous research methodology in this research study, as elucidated in the subsequent chapter.

Chapter 3 – Research Methodology

3.1 Overview

This chapter provides a broad overview of the subject of research and details how various aspects of research were applied in the course of this research study. A detailed, multi-layered model for research methodology is utilised as a guide for the study. This model offers a structured, sequential perspective on the examination and decision-making rationale for research philosophy, research approach, research strategy, research choice, time horizon, data collection techniques, data analysis techniques, data reliability, data replication, data validity, and research ethics and data protection. The mechanisms for these areas of the research methodology depend upon and complement each other.

The choice for research philosophy is interpretivism, which entails a respect for how people are different from the empirical perspectives of the objectives of science. Interpretivism requires a subjective perspective as it pertains to social realities and the differences between people rather than the traditional targets of the natural sciences. The premises of interpretivism are that social construction, subjective meaning, and details of situations are the reality behind action. With interpretivism, the researcher is part of the research study inseparably and this perspective entails that such studies are often qualitative in nature and characterised by small samples examined through depth investigation.

The research approach adopted for this research study is abduction, which is not depicted in the research methodology model used to guide this study. Abduction is focused on generating plausible ideas, not in proving them. This research approach is focused on making an intelligent guess based upon research instead of either proving or creating a theory. The rationale behind this decision is that in the U.S., the domain of HP language research in the context of HRBO is nascent and research in this area is thus exploratory and discovery-based in nature. This predicates a search for ideas and intelligent guesses that goes far beyond just the data rather than more empirical understanding.

In a similar manner, the direction utilised for research strategy was linguistic analysis, another departure from the research methodology model used to guide this study.

Linguistic analysis allows for the intense focus on understanding the language elements used by HRBO and DMP pertaining to HP. In many research studies, the language of enquiry helps the researcher to obtain answers on perception or behaviour. In the case of this research study, the language of enquiry and its according language-based interview responses from study participants are the perceptual and behavioural answers that are explored. This communication-intensive focus underscores the rationale behind linguistic analysis being the selection for research strategy. On a fundamental level, this research study represents a confluence of the distinct fields of built environment research and linguistics research.

Multi method qualitative is the type of research choice selected. The exploratory nature of this research study predicates that qualitative, small sample data collection techniques are more appropriate than quantitative data collection techniques or a mix of qualitative and quantitative data collection techniques. Multi method qualitative specifically meets the definition of utilising multiple qualitative data techniques. This corresponds well with the data analysis techniques also found under the aegis of the research strategy of linguistic analysis.

The selection for time horizon is cross-sectional. Again, the germinal quality of the language domain of HRBO and DMP in the U.S. as it pertains to HP communication research predicates the need to collect data during one slice of time, rather than to be spread out across a longitudinal timeframe. The concise chronological component to the research study also matches well with the short timeframe for data collection that occurs after the hurricane season of the previous year and before the oncoming hurricane season of the current year.

The research data collection techniques are all qualitative in nature as aforementioned. The initial data collection technique utilised is triangulation, which cross-cuts secondary and primary data collection techniques. Triangulation is the way in which various data collection techniques can be used together so that they support each other and ensure that the data have richer, supplementary detail that qualify it from multiple perspectives. The subsequent technique utilised is literature review, whereby a plethora of digital and hardcopy reference

materials are examined and analysed for relevant content and direction to help guide in the research design for the study. The primary data collection is guided first by document review, which is a technique that consists of examining policy documents, protocols, recommendations, and guidelines. In this research study, this entails examining hurricane and disaster preparedness plans and related documentation from FEMA, building code documentation from SFG, Bangladesh, and Australia, as well as global HP plans from Taiwan and Australia. The next primary data collection technique utilised in this research study is sampling, which is non-probability and purpose-driven as the participants are purposefully chosen according to specific criteria.

The sample size for public participants is 12 and the sample size for government participants is six. These sample sizes are determined by an examination of multiple references on the subject of sample size and optimised for a relatively homogeneous participant pool and highly focused research topics. The technique employed first is respondent-driven sampling. This entails initial research study participants being groomed to conduct recruiting for further participants to participate in the research study. The main rationale for this is to obtain research study participants in the same communities as other participants without the pitfalls of unqualified referrals that may have a reduced level of consent, thus creating potential ethical issues and endangering the study. Respondent-driven sampling and in situ method is used to obtain 12 members of the public who are HRBO in CWF and six DMP (two from FEMA, two from FDEM, and two from Florida county governments). The HRBO have an even gender mix and a range of hurricane experience. Participants from the governmental sphere (hurricane-focused DMP) are in the roles of oversight, messaging, or HP. The structure for the interview guides is comprised of three categories of questions:

1. Pre-hurricane experience
2. Pre-hurricane strategies
3. Words, concepts, phrases, communication channels

Some of the DMP are sought after and agree to participate in the study through the effort of going through government and private channels to locate and confirm study participation of these individuals, thus obviating the need for respondent-driven sampling in a few cases. Once each individual in the research study has completed the consent form and returned it,

another primary data technique is employed: screeners. These are questionnaires, often used as surveys for quantitative research studies. In the case of this research study, demographic and experiential data are gathered using screeners to gain a broader perspective of the background of each participant. These data are used in data analysis to help characterise the profiles of each research study participant with more contextual information that serves to better qualify the individual responses to questions asked of them and in probing these responses deeper during the interviews.

The last primary data collection technique and the main one utilised in this study is interviews. The interview approach is based on the linguistic analysis framework known as the Personal Experience Narrative technique. This technique emphasises the question and response construction be in a story format, which is then further divided up into clauses which comprise these narratives. Because the interviews are designed with a narrative style, participants are more likely to couch their insights within story-based contexts that reveal their experiences. Also, the narrative-intensive interviews are designed to elicit language-rich responses that offer the study a stronger chance for thematic saturation. Another aspect of the rationale for multi method qualitative, the application of multiple qualitative data collection techniques, is the use of triangulation in this research study. This way of conducting research helps to ensure that different streams of research data are levelled against each other to provide a more holistic perspective of the research data environment, thus helping to validate all of the data. In addition, a pilot study is conducted with two DMP and two HRBO through the use of a questionnaire to get feedback to improve the screeners, refine the interview questions, to confirm the recruiting targets were correct, and to ensure the technique used to evaluate the HP communication model, the aim of this study, is adequate. The questionnaire in the screener also helps to triangulate the other methods utilised.

Florida is chosen as the state to conduct the research because it receives 40% of the hurricanes that strike the U.S. each year on average (see Section 1.3). In addition, the location of CWF is chosen because of its median hurricane frequency within the state as well as the relative proximity to the DM operational hub of Tallahassee. This research study operates with the premise that the median strike frequency and relatively close proximity of

HRBO to DMP during hurricane season ensures that HP communication experience will be evidenced during the participant interviews.

The choice for research data analysis techniques includes data analysis triangulation, document review analysis, literature review analysis, frame analysis, paradigmatic analysis, discourse analysis, and template analysis. The data analysis triangulation in this research study involves using multiple data analysis techniques for the data collected to help reflect a more holistic understanding of the data and their implications. The data and literature review analyses are based on the content covered in Chapter 2. This is also guided by the interpretation phase of the document and literature review, which involves combining the analysis of the documents and literature into a synthesised narrative relevant to research study. Template analysis entails utilising a system of codes to examine interview data and render them to a state where they can be analysed discriminately. Discourse analysis represents a comprehensive examination of the way language is used in holistic communication. This type of analysis is very effective at helping to decipher all of the language-based insights that are available within an interview response. Frame analysis refers to a linguistic examination of everything important or relevant that is going on in a situation. This is a language-based way of looking at what represents reality for research study participants in their own words. Paradigmatic analysis is a way of specifically examining changes to meaning in language if words or phrases are substituted within sentences. This type of data analysis technique is used to deconstruct HP messaging and examine linguistic differences between HRBO and DMP.

To ensure that the research study has credibility, the study has to conform to acceptable standards for reliability, replication, and validity. The research study is designed and detailed in a manner such that other researchers can repeat the same study in the same environment. This research study expresses its validity by virtue of strong internal validity and ecological validity, whereby rich, deep data are gathered carefully through a social-centric, linguistic-laden question set, in a narrowly chosen timeframe and location thus giving the study credibility. Because this is a qualitative study, measurement validity is not utilised. Alternatively, the Most Significant Change technique is used to verify the accuracy of the model, which was part of the aim of the study.

Research ethics and data protection are ensured in this research study by strict adherence to university, UK government, and EU guidelines. Additionally, the ethical objectives are always kept as the primary factor for this entire research study to ensure that the study always puts the physical and social well-being of HRBO, DMP, and general society within the research study environment as the top priority.

One of the first steps taken is to ensure that a conceptually clear definition of research itself is articulated within this research study. Research can be defined as the process of using a scientific system to search for information that is deemed to be unique or important on a specific subject of enquiry (Kothari, 2004, p. 1). At the same time, it is critical to distinguish research methodology from research methods or research techniques. Sahu (2013) described research methodology as being the logic governing the use of specific methods, techniques, and activities that surround collecting and analysing information, with the intention of analysing the results to support a specific objective (p. 3). These two definitions are quite detailed. On a simplified level, Saunders, Lewis, and Thornhill (2009) defined research methodology as being a theory of how research is supposed to be conducted overall (p. 3).

There are various perspectives on research methodology that are considered when formulating this study, with the critical need being the determination of a definition or model for research methodology that resonates well in a research study with such a nascent focus. The initial structure for a research methodology model is shown below in Figure 3.1.

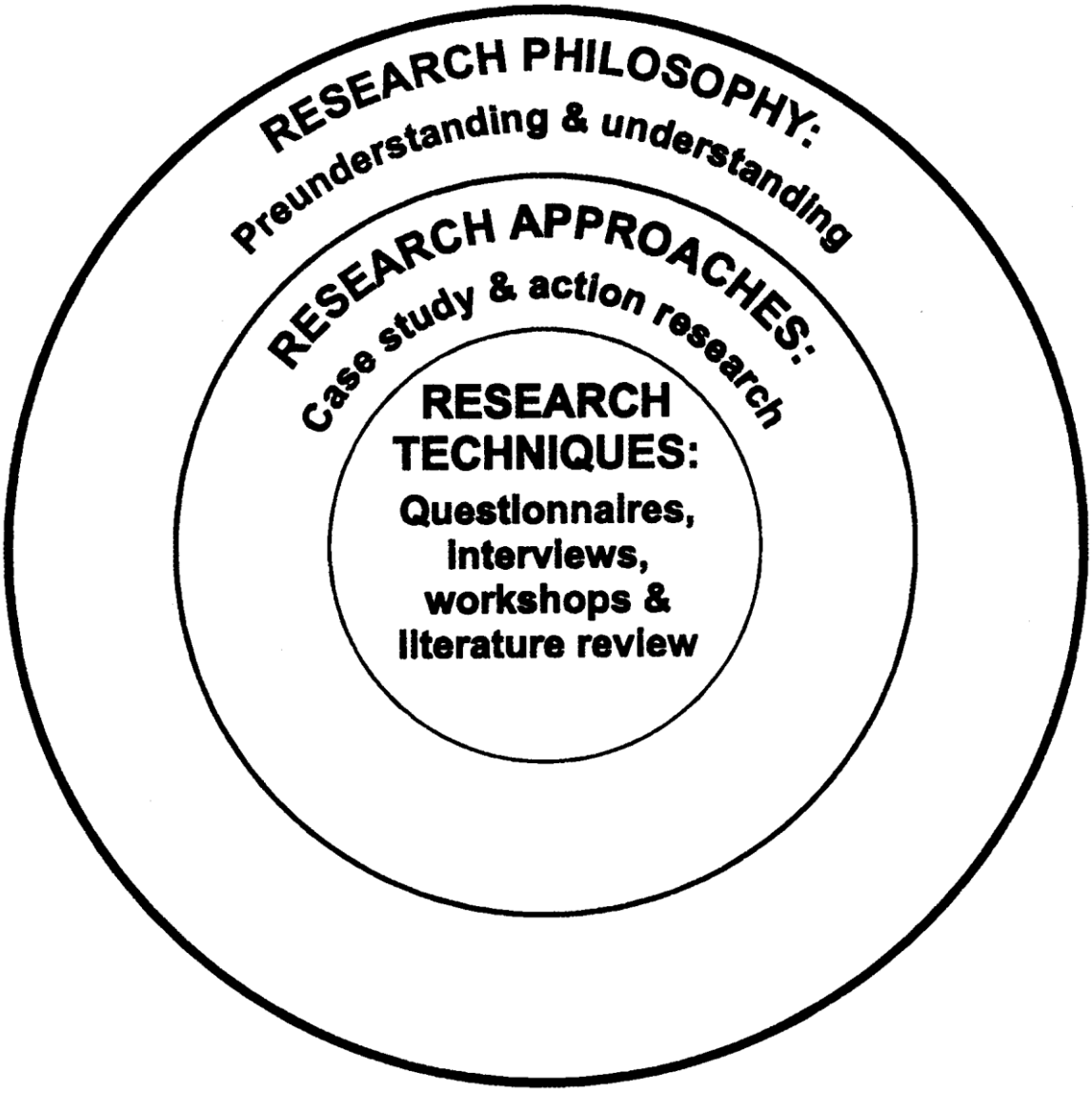

Figure 3.1: Nested Model (Source: Kagioglou, Cooper, Aouad, and Sexton, 2000)

The first stage depicted in Figure 3.1 is research philosophy followed by research approaches, and lastly research techniques. Kagioglou et al. (2000) found this research methodology model to be clear and consistent enough for their study (p. 143). However, other research methodology models are sought that provided greater detail. Thus, in considering research itself from a holistic yet detailed perspective, this research study relies heavily on the more comprehensive research model depicted below in Figure 3.2.

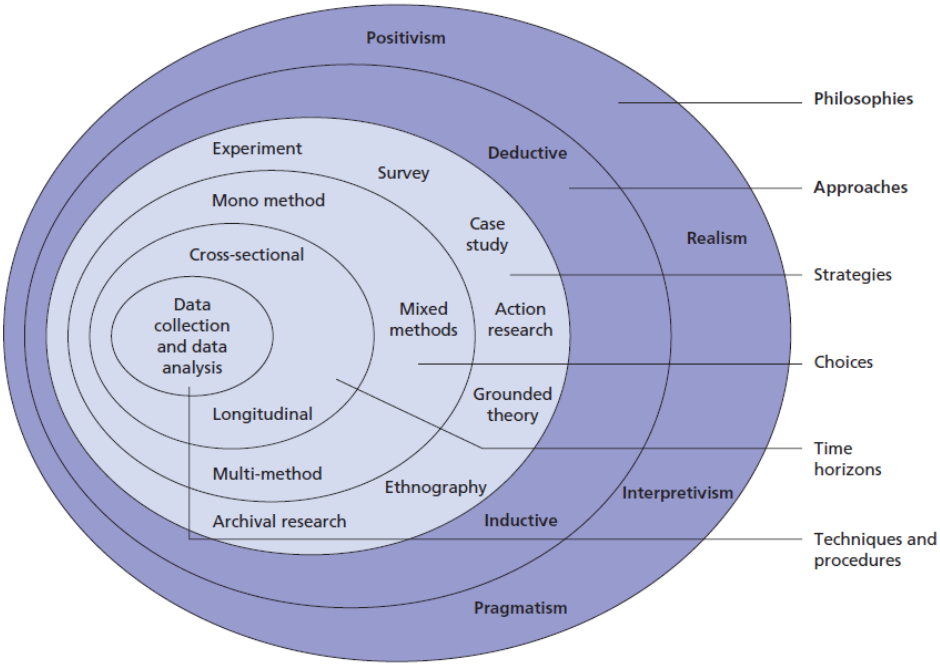

Figure 3.2: Research Onion (Source: Saunders et al., 2009)

The metaphor of the Research Onion belies a rigorous approach in which the outer layers are considered first, and each subsequent inner layer is then addressed and then *peeled* like an onion figuratively. The Research Onion requires researchers to carefully consider each layer sequentially thus influencing research plans holistically and comprehensively.

Using the guidance of the Research Onion, this research study is conducted in the following six stages listed below in Figure 3.3.

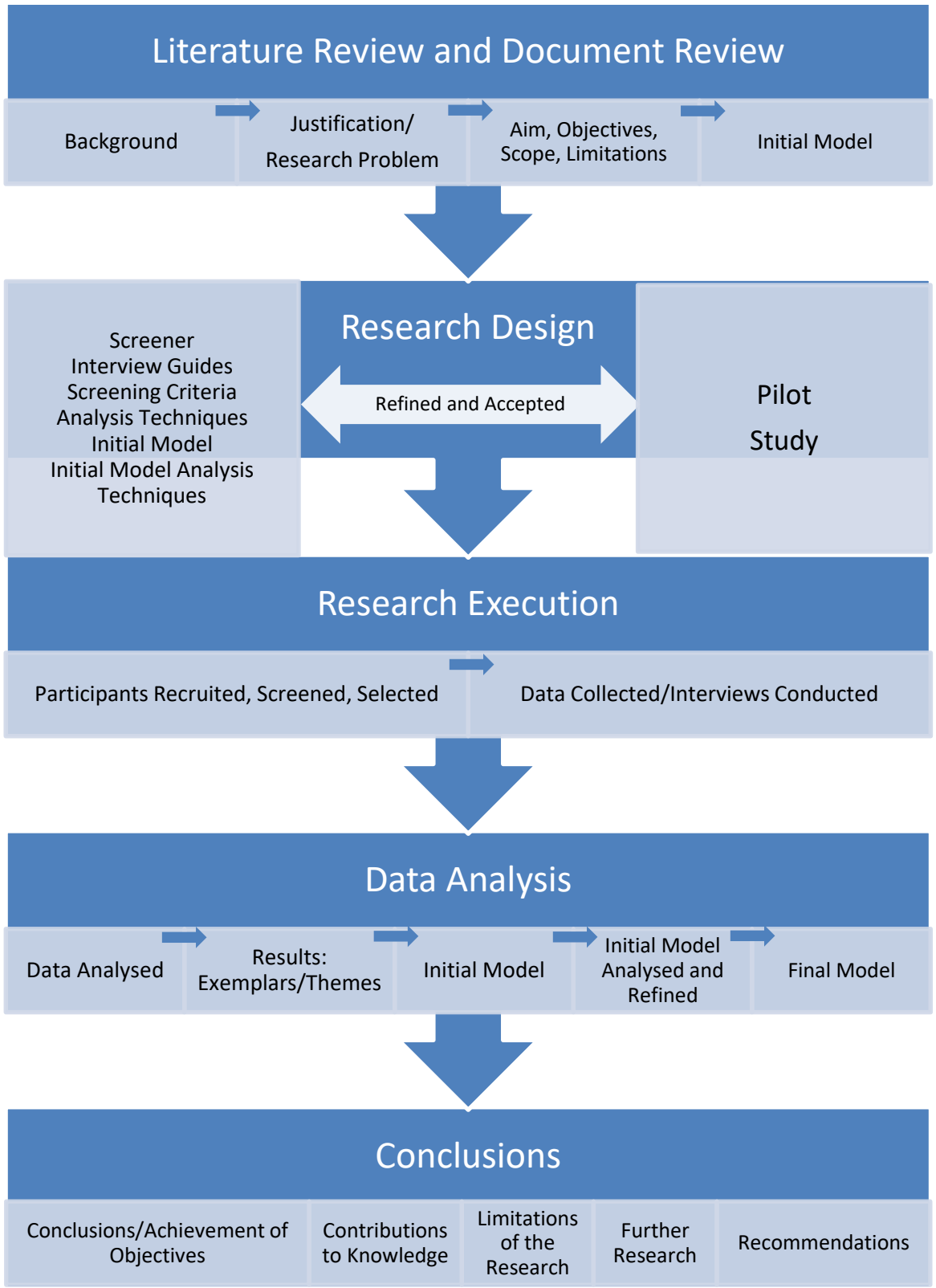

Figure 3.3: Research Flowchart (Adapted from original sources: Yin, 1994; Alsaidi and Mo, 2014)

3.2 Research Philosophy

Research philosophy is a broad concept that examines how knowledge is developed in a manner that is focused specifically on synthesising new understanding within a targeted area of focus (Saunders et al., 2009, p. 107). The research philosophy guiding this research study was interpretivism. Bryman (2012) emphasised that interpretivism focuses on individual differences in people and how this reflects in the subjectivity of their social behaviour (p. 30). One basis for the selection of interpretivism in this research study was founded in one of the pillars of interpretivism: symbolic interactionism. The realm of symbolic interactionism is hallmarked by an examination of the social behaviour of individuals interacting with each other and how this interaction itself causes individuals to subjectively alter their behaviour and their perception of meaning (Saunders et al., 2009, p. 116). This research study focused on the symbolic interactionism between the public and hurricane-focused DMP in the U.S., and explored similarities and differences in language constructs of these two groups pertaining to HP. Symbolic interactionism was used to examine the symbolic meaning of the social environment: a HP reality, and how this might have changed the behaviour of individuals based upon this meaning (Bryman, 2012, p. 31). This research study specifically explored how HP language is interpreted by individuals and how this meaning then led to action or inaction.

The other pillar of interpretivism is phenomenology, which is defined as being the philosophy that examines how individuals interpret their environment and how to clearly delineate where biases and preconceptions may colour this interpretation (Bryman, 2012, p. 30). Biases and preconceptions in HP in CWF were other areas which this study explored from a language-based perspective. Chandler (2007) highlighted how Linguist Ferdinand de Saussure ‘emphasised that meaning arises from the differences between signifiers (individuals conveying concepts and meanings); these differences are of two kinds: syntagmatic (concerning positioning) and paradigmatic (concerning substitution)’ (p. 83). In this research study, the premise was that language itself is fluid social phenomena that is vulnerable to applying preconceived meaning to. The research study was designed such that participants described meaning in their own terms as it pertains to HP. This study focused on how members of the public described engineering and scientific concepts pertaining to

building codes and HP in terms they understand, and how meaning and interpretation of these topics varied.

3.2.1 Rationale for Research Philosophy

The rationale behind interpretivism being the research philosophy best suited for this research study was initially elucidated through a comparison across research philosophies as detailed in Table 3.1 below.

Table 3.1: Research Philosophy Matrix (Adapted from original source: Saunders et al., 2009)

Philosophy	Interpretivism	Positivism	Realism	Pragmatism
Ontology Research perspective on the nature of reality or being	Subjective; socially dependent; dynamic; multiple perspectives	Objective; socially independent; external perspectives	Objective; completely independent of beliefs or philosophies; or, based on social conditioning (critical realist)	Subjective; aligns well to research questions; utilises multiple, external perspectives
Epistemology Research perspective on what knowledge is conceptually	Subjective; perspective of situations with an emphasis on the details of social aspects; examining meaning and corresponding action	Objective; observation-based generalisation through focus on causality and data; reductionist approach distilling simplicity from phenomena	Objective; observation-based with context providing data; incomplete data results in incomplete sensory perception (direct realism); observation may result in misinterpreted sensory perception (critical realism)	Subjective or Objective; both yield research question- focused understanding; utilises multiple perspectives to understand data within practical applied research
Axiology The researcher's view of the role of values in research	Subjective; value-bound research; researcher is an inseparable part of the research	Objective; value-free research; researcher is separate from the research	Subjective; value-laden research; researcher brings cultural and experiential bias which affects the research	Subjective and objective; values affect research and interpretation of data

Data collection techniques	Qualitative; in-depth investigation; small sample size	Mostly quantitative, but qualitative is possible; very structured; large sample size due to measurement requirement	Quantitative or qualitative; methods should be well aligned to research foci	Quantitative or qualitative; mixed or multiple method

Positivism was not chosen as the research philosophy for this study. Bischof (2017) reiterated *The Oxford English Dictionary* definition of positivism:

> 'A system of philosophy elaborated by Auguste Comte from 1830 onwards, which recognizes only positive facts and observable phenomena, with the objective relations of these and the laws that determine them, abandoning all inquiry into causes or ultimate origins, as belonging to the theological and metaphysical stages of thought, held now superseded' (p. xiv).

Interpretivism is reflected in subjective phenomena, such as the highly variable perceptions that HRBO might have in CWF regarding an impending hurricane. The research study had to parallel this subjective research paradigm. Saunders et al. (2009) maintained that in positivism, credible understanding can only be distilled from phenomena which can be observed and that the research philosophy that guides the data collection would need to be in turn framed by pre-existing theory to build hypotheses (p. 113). Due to the nature of HP communication being created by and disseminated through DMP and the media in the U.S., HRBO have to rely on data from third parties. The fluid social construction of the language that reflects this HP-centric data from these third parties is better aligned with the social context framework posited by interpretivism. Bryman (2012) argued that positivism focuses on the examination of social reality through the use of natural science-based methods (p. 715). Conversely, this research study leaned heavily upon linguistic theory, thus utilising social science-based methods to examine the social reality of HP in CWF. The concept of preparedness itself is an arguable reflection to an extent of the preconception aspect of phenomenology which edifies interpretivism.

Realism was also not chosen as the research philosophy for this study. Saunders et al. (2009) emphasised that realism is reflected by a sensory perception of reality as truth, and that

truth and objects are both independent of the mind (p. 114). The premise was taken that HP in the U.S. is unlikely to be based on markedly independent thinking. It might be extremely difficult for HRBO to truly prepare for the potential impact of an extreme meteorological event like an impending hurricane strike without necessarily depending on knowledge derived from sources such as third party data and communication. This aligns more with interpretivism and its hallmarks of subjectivism and dependence.

Bryman (2012) reinforced that realism highlights how researchers create categories that are based on real objects derived from both the social and natural world and that reality is thus independent of the sensory paradigm that researchers derive their theories and tools from (p. 715). This research study explored the qualitative, social-centric aspects that research study participants used to categorise their understanding and then reflect this categorisation as elucidated in interpretivism. Llewellyn (2011) described realism as a 'fidelity to nature, accurate recording of things as they are, as contrasted with things as they are imagined to be, or wished to be' (p. 44). Realism holds that researcher bias can be affected by experience and culture and this perspective was considered in this study. However, since interpretivism maintains that the researcher is part of the research itself, this premise was decided to be a more effective way of countering research bias than remaining on the outside of the research.

Lastly, pragmatism was also not chosen as the research philosophy for this study. Parker (2013) argued that in pragmatism, knowledge is not built on conceptual meaning or truth that can be analysed, or on the presumptions of intuition, indisputable facts, or beliefs (p. 22). For this research study, there was the reflexive acceptance that personal beliefs could bias the study, and these had to be accounted for. In pragmatism, the environment is not separate and distinct from individuals in a manner so that it can be stored or consumed according to preference (Parker, 2013, p. 28). The stance was maintained in this study that the environment may be regarded in a dualistic sense of being separate or inseparable, but that perceptions of this depend more so on the research study participants than on anyone else. It was thus paramount to accurately reflect the perspectives of the study participants on the duality of environment and sense of self.

3.2.1.1 Ontology Rationale for Interpretivism

Ontology is 'a branch of philosophy that is focused on the organisation of being and its nature' (Maedche, 2012, p. 11). Saunders et al. (2009) held that ontology is concerned with the nature of reality along with an objectivist perspective of social actors focused on existence, with social entities in an external reality to this, and that these social actors focused on existence then manifested social phenomena with their perceptions and according actions (p. 110). This research study explored how the social construction of HP in CWF is primarily focused on the language of disasters associated with the meteorological phenomena of hurricanes. There may be sociocultural factors such as interactions, political views, institutional discourses, and broader perspectives on the world in general that influence the perceptions that individuals have about disasters, thus affecting disaster-specific behaviour which may be quite commonplace (Sun & Faas, 2018, p. 627). The social construction premise in research philosophy concurs with the intersection between ontology and interpretivism as elucidated above in Table 3.1. Furthermore, Givigliano (2013) described social reality in terms of ontology as being based on a social framework of relations, subjects, and structures, which are in turn assembled by social reality (p. 9). It is within this organic structure that the research study explored how HP, HRBO, DMP, and the social realities of hurricanes in CWF are related on a linguistic level.

From an ontology perspective, Saunders et al. (2009) held that positivism is objective, free from the social paradigm, and external (p. 119). In contrast, this research study maintained the reality of being is rather highly subjective within the social paradigm, and prone to change. Saunders et al. (2009) emphasised that from an ontology perspective that realism is objective and remains independent of beliefs and human thoughts and is removed from the knowledge of their existence, and that critical realism offers interpretation through social conditioning instead (p. 119). Subjectivity is conversely what is asserted to be integral to the experience of researching HRBO in CWF. This research study explored the agency of human thought and meaning-building as it pertained to HP. Saunders et al. (2009) argued that from an ontology perspective that pragmatism holds multiple views of external-based reality of being that could be decided upon as how to best manifest the answering of the research question (p. 119). Conversely, this research study was conducted with research activities that were framed by a subjective view of the nature of the reality of being. Due to its social

construction, this perspective on the reality of being can change. Furthermore, this research study elicited insights from study participants to get their perspectives as internal-based reality that helped to elucidate how HRBO in CWF perceive HP.

3.2.1.2 Epistemology Rationale for Interpretivism

Kew and Foreman (2014) elucidated that epistemology is the branch of philosophy that examines the origin and character of knowledge and builds knowledge theory through the use of these types of questions:

- What is the reliability of perceptions?
- How is it possible to have certainty?
- What does truth really mean and how is it possible to discover it?
- What does the knowledge of something specific really mean?
- How did the knowledge of specific things come about?
- How can epistemological virtues be described and are they of use?
- How can epistemic justification be described and is this of use? (p. 10).

Saunders et al. (2009) expressed that epistemology is focused on what an acceptable level of knowledge might be within a specific field of enquiry and that researchers comport themselves more like natural scientists when it comes to gauging resources required to collect and analyse facts such that reality is comprised of objects that are also deemed to be real (p. 112). The perceptions that HRBO in CWF have of risk within the context of their high-risk buildings residences was examined in this research study. Accordingly, the connection between perspectives on the state of risk and knowledge that HRBO may have gleaned from their immersion with building codes was also an area of enquiry for this study. Rosa and Clarke (2012) emphasised that ontology and epistemology rarely harmonise when it comes to risk due to interfering aspects of society such as perceptions, values, culture, institutions, and interpretation of the realist world (p. 44). The differences between what HRBO believed they knew about risk and the actual risk that exists provided fertile ground to explore in this study. The research study also examined how high-risk buildings themselves were social phenomena with subjective meaning that acted as mechanisms to motivate behaviour pertaining to HP, due to HRBO finding meaning in aspects such as building codes or

perceptions of risk (Saunders et al., 2009, p. 119). These aforementioned components of research philosophy correspond to the intersection between epistemology and interpretivism as elucidated above in Table 3.1.

From an epistemology perspective, Saunders et al. (2009) described positivism as maintaining that only generalisation and reduction of observable phenomena to base elements can yield facts or data that have credibility (p. 119). This study maintained that subjectivity and the social phenomena associated with high-risk buildings, HP, and meaning driving action or inaction thereof may be difficult to surmise by mere observation in research. Saunders et al. (2009) argued that when it pertains to realism, that epistemology focuses on a contextual explanation of the credibility of data in observed phenomena and that any lack of data leads to flawed assessments of sensations (direct realism), or that phenomena itself can create sensations that are misinterpreted (critical realism) (p. 119). This research study was focused on how social phenomena which may not be observable could factor into the subjectivity of meaning and according HP perspectives. Saunders et al. (2009) also maintained that from an epistemology perspective that pragmatism can rely upon observable phenomena and/or subjective meanings and can focus on applied research studies that are practical, with a variety of perspectives to interpret the data (p. 119). In contrast, this study was a definitive attempt to conduct exploratory rather than applied research.

3.2.1.3 Axiology Rationale for Interpretivism

Axiology is 'the evaluative and normative assessment of things that exist' (Rescher, 2013, p. 100). In conducting this research study, there was an open admission that personal bias was brought to the study as it pertained to assessment and value. Saunders et al. (2009) provided direction by stating that all stages of a research study are affected by the values of researchers, and that understanding is critical to elicit credible research results (p. 116). This study was based on a subscription to an *emic* and *reflexive* perspective as the research was conducted. Emic approaches are highlighted by researchers examining constructs of individuals by being immersed within their cultural system as opposed to studying constructs of individuals from outside of their cultural system (Benet-Martinez, 2009, p. 173). Bryman (2012) defined reflexivity as being based on how social researchers *reflect*

about the implications of the understanding of the social world they explore in research studies through their physical presence in the research study environments, their decisions, their methods, their biases, and their values (p. 715). Clarifying this further, Davies (2012) argued the integral framework of reflexivity: that there are questions as to how much of the results of research are actually due to the influence and presence of the researchers on the research process due to the fact that researchers by nature are part of the objective of the research itself (p. 3). Thus, the research conducted for this study was value bound with the researcher being part of what was being researched, inseparable from this study, and thus implying subjectivity (Saunders et al., 2009). This aforementioned aspect reflects that the research philosophy corresponds to the intersection between axiology and interpretivism as elucidated above in Table 3.1.

From an axiology perspective, Saunders et al. (2009) maintained that within positivism the researcher remains objective, independent from the data, and conducts research in a value-free manner (p. 119). This research study was conducted in a value-based manner, while the researcher was within the realm of the data and maintaining a subjective stance. From an axiology perspective of realism, the researcher is biased by cultural and life experiences growing up, global perspectives, and these factors have an impact on the researcher thus rendering it value-laden (Saunders et al., 2009, p. 119). This research was based on the acceptance that there is an immense truth in this perspective. However, the approach was maintained that research from a value perspective for this research study was beyond being value-laden, and was value-bound, and the research was not merely impacted by the bias of the researcher, but rather fundamentally shaped by this bias as the researcher was fully embedded in the subjective corpus of the research study itself. Finally, from an axiology perspective, Saunders et al. (2009) held that values affect the interpretation of research study results in pragmatism because researchers have perspectives that are both objective and subjective (p. 119). As aforementioned, this research study was approached with a decidedly subjective point of view.

3.3 Research Approach

Research approach is a term often derived from the field of philosophy which describes forms of reasoning. These forms of reasoning are used in order to give a theoretical path to

handling concepts to be examined in research that must be deciphered into sections which are themselves researchable (Bryman & Bell, 2015, p. 23). In a departure from the Research Onion as it was depicted in Figure 3.2, the research approach utilised for this study was abductive. Schvaneveldt and Cohen (2010) described how abduction is focused on easing the typical rules that govern constraints in order to develop conceivable ideas (p. 11). This research study was conducted in a domain where there is a dearth of literature globally regarding the linguistic frameworks that underscore the relationship between HRBO and HP. Thus, an abductive research approach for the generation of plausible ideas was found to be more realistic, rather than attempting to prove something founded on a forced search for rule-based evidence in such an exploratory phase. Walton (2014) posited that abduction yields an intelligent guess but nothing more because it is based on a body of evidence that it is incomplete (p. 3). However, abduction is helpful in providing models with the essential building blocks that are needed to eventually synthesise new theories and laws that will only later be able to be tested in a rigorous empirical manner (Magnani, 2017, p. 15). The abductive research approach suited this nebulous space, which in turn aligned well with the research-based aim to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy. Abduction helps to provide a participant-centric worldview comprised of their perspectives, meaning, and language, which in turn allows researchers to distil a social scientific view of their environment (Bryman, 2012, p. 401).

Bryman (2012) further asserted how abduction was well-suited to qualitative research because of its foundation of explaining and understanding the worldviews of participants (p. 401). Given the exploratory nature of the research study in such an amorphous area of HP communication research in CWF, an abductive research approach pointed toward the use of qualitative data collection techniques. There is much to be discovered on a fundamental level regarding the communication differences between HRBO and DMP focused on HP. The gaps in the DM research field of enquiry of language and HP in the U.S. underscored the rationale behind the use of an abductive research approach; abduction is a reaction to a problem which is characterised by ignorance, a cognitive objective that is currently unattainable based on existing knowledge (Magnani, 2017, p. 2). The research study utilised the abductive research approach because it assisted in providing direction in such a

relatively novel research domain. Tavory and Timmermans (2014) argued that an abductive research approach 'outlines the construction of causal accounts and their limitations; the relation among forms of variation, observation, and theorisation; the uneasy relationship between explanations and categories used within the field as compared to the categories used by social scientists' (p. 7). The abductive research approach sheds light on explanations for research data within the embryonic expanse of communication pertaining to HRBO in CWF and their perceptions on HP.

3.3.1 Rationale for Research Approach

Deductive and inductive research approaches were not chosen for this study. In using an abductive approach, the first step is actually inductive as it begins with an area that requires investigation for further information perhaps regarding behaviour, and then proceeds to a deductive step to examine implications (DePoy & Gitlin, 2013, p. 273). Because the abductive research approach is somewhat of a blend of a deductive and inductive research approach, distinguishing them from each other was needed. These three research approaches are disambiguated in Table 3.2 below.

Table 3.2: Comparing Deductive, Inductive, and Abductive Research Approaches (Adapted from original sources: Walton, 2014; Tavory & Timmermans, 2014)

Research approach	Characterization
Abductive	Extrapolates well beyond the data and past what is observed in research
	Utilises speculation for what observed data could represent that is beyond existing theory
Deductive	Independent from the data and represented in a simplified manner
	Using theory-based observation to build a hypothesis
Inductive	Extrapolates beyond the data
	Reflects on existing theory by collecting new data

3.3.1.1 Rationale for Not Using Deductive Research Approach

Bryman (2012) described how a deductive research approach deduces hypotheses that are based on existing knowledge and theory about a specific domain and then tests these hypotheses in an empirical manner (p. 24). Research studies on the domain of HP communication globally are largely bereft of the application of linguistic theory to derive further insights. Thus, deducing a hypothesis would be premature, let alone placing a hypothesis to the scrutiny of empirical testing. As supported in the explanation of abduction being able to account for data that exceed existing theory as elucidated in Table 3.2 above, the observation of HP communication differences in CWF between HRBO and DMP did not fit well into existing theories and gave rise to speculation as to what the data from the research study could be indicating. The insights from this research study were gleaned from the data gathered in the research study, and from a broad extrapolation that stretched beyond the confines of the data itself. Furthermore, Saunders et al. (2009) asserted that a deductive research approach, by its inherent characteristic of testing a hypothesis, quite often points toward the need for quantitative data collection techniques or methods (p. 125). Again, given the early stage of research in the realm of HRBO and their communication perspectives on HP in CWF, quantitative data collection techniques or methods would have been premature due to the sparsity of qualitative research data regarding HP communication globally to provide a target for synthesising effective quantitative data collection techniques or methods.

3.3.1.2 Rationale for Not Using Inductive Research Approach

An inductive research approach resembles some of the same rationale utilised to choose the abductive research approach. One similarity found between an inductive research approach and the abductive research approach being used for this research study is framed by Saunders et al. (2009) in that studying a small sample of participants is more appropriate than a large sample when examining a context-rich environment in which events take place (p. 126). This perspective reflected the geography of this research study with the focus on the CWF region, along with a participant pool of 18 individuals in total comprised of HRBO and DMP. However, one of the main issues with trying to use an inductive research approach for this research study was that it was not designed to stretch the boundaries of speculation far enough to account for the dawning of understanding that the research study

distilled from HRBO and their perspectives on HP. A more in-depth comparison to distinguish the abductive research approach from the inductive research approach is detailed in Table 3.3 below.

Table 3.3: Comparing Inductive and Abductive Research Approaches (Adapted from original sources: Console & Saitta, 2013; DePoy & Gitlin, 2013)

Research Approach	Characterisation
Abductive	Argues that an observed phenomenon is characterised by the specific conditions that have given rise to this phenomenon, including causes for the phenomenon or special cases of the phenomenon
	Argues that unobserved properties can be extended to individuals being observed
	Data that is collected is analysed to derive their own concepts or patterns, which may or may not fit into existing theory or well understood and defined concepts which have been previously identified
Inductive	Argues that an observed phenomenon has been observed before under similar circumstances and provides and explanation based on this context
	Argues that the validity of properties regarding individuals that are being observed can be extended to individuals that are not being observed
	Data that is collected is fit into existing theory or well understood and defined concepts which have been previously identified

The literature review reflected that there are scant references in the corpus of global research featuring the use of linguistic theory to elucidate HP communication, let alone an anthology on the subject, which would be ideal from an inductive research approach perspective. Thus, an abductive research approach was realistic: the social environmental conditions of HRBO in CWF were chosen as the public participants and the hurricane-prone sites respectively that could perhaps serve as a general region to explore communication particulars that *could* be potentially reflective of a subset of global HP. Under an inductive research approach, this incipient research topic would be hard pressed to be able to yield insights that could extend to other individuals that do not correspond to the criteria of HRBO in CWF. In this research study, an abductive research approach was applied that allowed for some degree of a priori understanding of HRBO, but extending this understanding beyond the cursory would have been an exercise wrought with inherent caveats. Finally, an inductive research approach lends itself better to fit the data into appropriate sections of existing theory. With this research study, an abductive research approach was used to examine the data from the study in a manner such that they would not be irrevocably adhered to theory. Thus, there was freedom to potentially envisage a glimpse of potential patterns and concepts that emerged from this research study.

3.4 Research Strategy

Research strategy describes an overall plan of how research questions will be answered (Saunders et al., 2009, p. 600). As to which research strategy was employed in this research study, the selection for research approach narrowed this down, as research strategies generally correspond to either one research approach or another. The research strategy employed in this research study was linguistic analysis, another departure from what is depicted in the Research Onion. There are many forms of linguistic analysis and as a comparison two major forms are depicted in Table 3.4 below.

Table 3.4: Linguistic Analysis – Two Forms (Adapted from original sources: Fromkin et al., 2013; van Kemenad & Los, 2014)

Focus	Characteristics
Language use, processing, and performance	Language as a social status marker
	Register variation

	Interactive modes
	Language as a spoken form
Language competence and acquisition	Language knowledge as internalised grammar
	Formalised perspective
	How knowledge is acquired

In this research study, language use within the context of high-risk buildings and HP in CWF was focused on rather than examining the formality or grammatical prowess of HRBO or DMP. Linguistic analysis corresponds to a number of techniques of which a few were chosen for this research. To further elucidate the logic behind the form of linguistic analysis and the according techniques that were used in this qualitative research study, as opposed to analysis techniques that would better suited for quantitative research, a comparison is reflected in Table 3.5 below.

Table 3.5: Comparative Intervention Strategies (Adapted from original sources: Yeager & Sommer, 2007; Sober, 2015)

Quantitative inferential frames	Qualitative linguistic frames
Behaviour generalises across various contexts	Behaviour generalises within one context
Correlational frame	Cause-effect mechanism-of-action frame
Academic informational frame	Political hierarchical positioning frame
Normative measurement frame	Ipsative measurement frame
Solving for statistical robustness	Solving for simplicity, also referred to as Occam's Razor
Solving for inter-rater reliability	Solving for a workable contextual solution
Solving within a statistical vacuum	Solving according to a participant-centric frame of reference
Solving for statistical inferences	Solving for mechanism of action
Solving for the rules of statistical methods	Solving the behavioural problem

Likert scales provide separation of insights for questions and answers, stimuli and responses	Observations maintain causal connections between questions and answers, stimuli and responses
Deletes context and circumvents motives	Observations maintain context and motives
Statistical interpretation findings	Language behaviour findings
Methodological choice constrains the insights of the problem	Methodological success illuminates the problem
Behaviour remains unchanged	Behaviour changes routinely and predictably

One premise was that the linguistic analysis route taken for this research study pointed toward according qualitative research techniques for data collection. Given the exploratory nature of this research study, the spotlight was cast on a small set of participants and a narrowly defined geographic region of focus: CWF. The language behaviour explored was generalised within the specific context of high-risk buildings and HP communication in the CWF region. The complexity of a HP communication strategy could entail creating multiple HP communication models for various desired outcomes such as evacuation or property-based measures. Simplicity was the most expeditious path in the search for a basic HP communication aim: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

The research study was participant-centric as the direct interview responses comprised the data that were analysed with linguistic theory. Data collection techniques using a question-and-answer approach were utilised to understand behavioural issues pertaining to HP. Context and motives were of critical importance to enquire about during the research study through the examination of language behaviour. None of the quantitative inferential frames shown in the aforementioned Table 3.5 applied to this research study. This supported the premise taken that quantitative linguistic analysis was inappropriate for this research study, for many of the aforementioned reasons in the rationale section for not using a deductive research approach, including the premature nature of using quantitative data collection techniques in the research domain being explored. The qualitative linguistic analysis

research strategy corresponded eloquently to an abductive research approach for many of the same reasons as aforementioned in the research approach rationale section (see Section 3.3.1), including the premise of needing to examine the research domain for this study without the direct attachment to a theory-proving endeavour, as well as the need to potentially extrapolate far beyond the observations to make inferences.

3.4.1 Rationale for Research Strategy

None of the research strategies depicted in the Research Onion in Figure 3.2 were utilised. The rationale for this decision was based on a combination of the strong fit for linguistic analysis as a research strategy for this research study as well as some of the other research strategies not being well suited to achieve the research objectives as will be elucidated subsequently. In another departure from the Research Onion, archival research was not considered as a research strategy in this study, and was regarded instead as the primary data collection and corresponding analysis technique of document review.

3.4.1.1 Rationale for Not Using Experiment

Saunders et al. (2009) described experiment as being focused on a basic level as to whether two variables might be connected, while on a more complex level being focused as to the relative importance of two or more independent variables, as well as how much change there is between these variables (p. 142). The endeavour of looking for variables was compelling, but was considered to be premature in the elementary area of research on HP communication. Within linguistic analysis, in particular paradigmatic analysis, it is word substitution rather than variables which is important, and this suited the research study better. Experiment itself contains four areas as listed in Table 3.6 below.

Table 3.6: Experiment Defined as a Research Strategy (Adapted from original source: Gravetter & Forzano, 2011)

Manipulation	One variable is manipulated by changing its value to create a set of two or more treatment conditions.

Measurement	A second variable is measured for a group of participants to obtain a set of scores in each treatment condition.
Comparison	The scores in one treatment condition are compared with the scores in another treatment condition. Consistent differences between treatments are evidence that the manipulation has caused change in the scores.
Control	All other variables are controlled to be sure that they do not influence the two variables being examined.

Given the broad range of language forms in this research study that had to be distilled from HRBO residing in CWF and DMP focused on HP, the research strategy of experiment was deemed to be too premature to use in such a deep, exploratory study. Engaging in variable discovery and scoring is far beyond the focus of this research study in simply understanding elemental language building blocks via a qualitative linguistic analysis research strategy.

3.4.1.2 Rationale for Not Using Survey

Survey is a research strategy often part of a deductive research approach and it is used to collect quantitative data usually through a questionnaire, and then leveraged to find potential reasons for specific relationships between variables and to then assist in the production of models based on these relationships (Saunders et al., 2009, p. 144). When the target population of research participants is too large to comprehensively study, the research strategy of survey is helpful in focusing on collecting data from a large sample of this population (Monette, Sullivan, & DeJong, 2010, p. 164). On a fundamental level, quantitative-centric research strategies were too premature for this research study. This study was focused on asking basic language questions of participants and this required data collection techniques that emanate from different research strategies such as the qualitative-centric linguistic analysis.

3.4.1.3 Rationale for Not Using Case Study

Case study refers to the study of a social phenomenon and may be delineated into four categories detailed in Table 3.7 below.

Table 3.7: Case Studies Defined as a Research Strategy (Adapted from original source: Swanborn, 2010)

Single or multi-case	Research is conducted within one case (one social system) or within multiple cases (a few social systems). These cases may include individuals, groups, organisations, cities, states, regions, or countries in which there is a context of a phenomenon that characterises the case.
In-duration or subsequent	Research is conducted during a certain time period or immediately thereafter, whereby data regarding a phenomenon is collected. Foci include individual perceptions, opinions, values, controversies, expectations, behaviour, decisions, resources, mutual relations. Additionally, process-tracing may be conducted to describe or explain social processes that occur between individuals or between social institutions.
Delayed	Research is conducted only after a specified period of time so that a broad initial research question created earlier can be refined into more precise research questions. This affords the time to allow for unexpected aspects of the process to appear that might otherwise have been obscured by time-constrained procedures and operations. Multiple data sources may be used such as available documentation, interviews with critical participants, and participant observation.
Culminating	Research is conducted in the final stage of an applied research study project. Participants and stakeholders are invited to discuss and debate their subjective perspectives. These individuals may then be presented with preliminary research conclusions to suggest corrections, clarify misunderstandings,

	promote internal social relations, find consensus, and ultimately help to guide the creation of a better research report through their feedback.

The most basic example of case study as a research strategy can be the study of a single company, group, city, or specific location (Bryman, 2012, pp. 66-67). Observation over extended time utilising ethnographic data collection methods or engaging in a protracted process of research question refinement would require in situ data collection commitments that would have been operationally ineffective at the nascent stage of this research domain. Again, the germinal and specific nature of examining the communication of HRBO in CWF pertaining to HP predicated broadening the research location beyond one area, but not to encompass too large of a range which could render the research study untenable from an execution standpoint. Furthermore, comparing two or more locations against each other in this research study would have potentially resulted in insubstantial data. The assumption was that HP experience and perception of HRBO may vary widely even just within areas of CWF due to a plethora of factors that may be a result of widely ranging geographic or demographic variations. This was the reason for the data from these areas being included together in this research study: to deliver a broad data universe in this early stage of research regarding HRBO in CWF and their perceptions of HP.

3.4.1.4 Rationale for Not Using Grounded Theory

With grounded theory as a research strategy, there is no creation or use of a theoretical framework to start off with; by using a number of observations, theory is developed through the data collected, which then leads to a number of predictions in which further observations can be used to test the confirmation or denial of these predictions (Saunders et al., 2009, p. 149). Bryman (2012) further asserted that the interplay between data collection and emergent theory testing is a typical aspect of grounded theory (p. 387). The details of Grounded theory are described in Table 3.8 below.

Table 3.8: Grounded Theory – Components and Steps (Amended from original source: Urqhart, 2012)	
Aim	The aim is to manifest or distil a theory from research.
Initial theoretical framework	Existing theoretical frameworks are excluded to allow research-based theory to emerge.
	The new theoretical framework must focus on the interaction of research study participants with the phenomena of focus.
	The relationship between emergent concepts or set of concepts frames the new theoretical framework.
First data collection and theory refinement	The research study begins the execution stage with data collected from documents, interviews, focus groups, fieldwork, etc.
	The theoretical framework is refined by leveraging the collected data.
First data analysis and continued theory refinement	Systematic data analysis is conducted with the collected data.
	Initial categories are identified, and data analysis continues to connect these categories.
Second data collection and continued theory refinement	Emergent concepts guide further sampling and data collection.
	Emergent concepts are continually refined by comparing them to further data collected.
	Once concepts begin to saturate (repeat), data collection can be terminated.
Second data analysis and continued theory refinement and build	Categories and related dimensions and properties are built through open coding.
	Clustered categories are built through selective coding.
	Categories are finalised through theoretical coding and the theory is built.
Theory reporting	The resultant theory may be shared via a collection of propositions, or through a framework of narratives.

Theory development is not a requirement of an abductive research approach. This research

study was more focused on collecting data and establishing some rudimentary language patterns of words and phrases, which in turn supplied the language input for a social-centric HP communication model for hurricane-focused DMP that is tailored to HRBO. It was this model which was the focus of the research study, thus theory-building was bypassed in lieu of a qualitative linguistic analysis research strategy that helped to distil the language building blocks for this model. Additionally, putting all a priori theory aside runs counter to the emic and reflexive perspectives taken with this research study. Grounded theory certainly could have lent itself well to the research domain explored with this research study, but the juncture for adopting this research strategy may be in a future follow-up study, which could be conducted by a larger research team across expanded criteria once some degree of basic sociolinguistic landscape assessment is conducted.

3.4.1.5 Rationale for Not Using Ethnography

An ethnography research strategy is characterised by a main feature of the examination of a sociocultural setting generally through first-hand experience of participant observation (Atkinson, Delamont, Coffey, Lofland, & Lofland, 2007, pp. 4-5). Saunders et al. (2009) reinforced that ethnography is quite time intensive as it occurs over an extended period of time in which research is conducted in an immersion format in a sociocultural setting as comprehensively as possible by examining how participants behave in their own environment and how they themselves explain and describe this reality (p. 149). Ethnography is a longitudinal research strategy and that would have been operationally ineffective as part of this research study. Any research study conducted in CWF outside of the window from 1 December through 31 May would land within the calendar range of the North Atlantic hurricane season, which runs from 1 June to 30 November each year (NOAA, 2013). While examining HP during the latter stage of the off-season (beginning 1 December) for hurricanes could certainly yield insights, the premise was that both the HRBO and DMP in CWF would become critically occupied in either the actions of winding down activities for the previous hurricane season or toward 1 June, ramping up preparation for the oncoming hurricane season. The easiest time of the year for interview data collection for this research study was deemed to be at the beginning of the calendar year, roughly between the beginning of January to the middle of March in order to give some degree of calendar margins on each end to account for residual effects of the previous hurricane season and

the aforementioned potential frenetic activity surrounding the next oncoming hurricane season.

As far as examining HP during the heart of the hurricane season in CWF, one of the most challenging aspects of ethnographic research across HP environments is that it is inherently difficult for researchers to access field sites in post-hurricane timeframes due to safety factors and the risk of impeding the efforts of EM, insurance personnel, and the activities of the recovering hurricane victims themselves. It may be of great value to obtain qualitative data in close chronological proximity subsequent to the culmination of any hurricane, particularly to distil how hurricane victims are coping in the aftermath, what they may have been considering prior to the hurricane striking, what preparedness behaviour they engaged in, and what they might do differently the next time around (International Hurricane Research Center, 2004, p. 2). However, the objective issues of conducting research in a post-disaster environment during major clean-up and restoration efforts were deemed too ethically vulnerable for this research study.

Linguistic analysis was utilised as a research strategy to elicit some of the language forms pertaining to HP from HRBO and DMP in a manageable research environment devoid of the pressures of longitudinal duration or potentially catastrophic post-hurricane field environments. The building blocks gained from this research study could however be potentially utilised globally in a subsequent research study by other hurricane researchers interested in adopting an ethnography research strategy. As long as the aforementioned factors of extended duration and challenging field environment aspects are accounted for, this will help ensure both research team viability and the strict adherence to the ethical standards that hurricane victims deserve.

3.4.1.6 Rationale for Not Using Action Research

Action research may be generally defined as a multi-type research strategy whereby research study participants collaborate with a researcher to examine a specific problem or issue and then co-create a solution, which is based on their collective evaluation (Bryman, 2012, p. 397). Action research may be characterised by the following steps as listed in Table 3.9 below.

Table 3.9: Action Research – Steps (Adapted from original source: McNiff, 2017)	
Problem/issue identification and research design	Determine an issue or problem to research.
	Establish the aims of the research study.
	Detail the criteria and the standards by which the aims will be judged.
	Build the research design.
Research execution, analysis, and report creation	Conduct the data collection.
	Conduct the data analysis and interpretation.
	Develop some initial conclusions based on the findings.
	Build the initial conclusions into a report.
First peer review	Present the report for critique from peers.
	Receive critique from peers.
	Incorporate critique from peers in conclusions and refine the report.
First findings dissemination	Describe the significance of the research study.
	Share the report with a broader audience.
Second peer review	Receive critique from the broader audience.
	Incorporate critique from the broader audience in conclusions and refine the report.
Research design revision and second execution, analysis, and report creation	Modify research design given the critique from the broader audience.
	Conduct new data collection.
	Conduct new data analysis and interpretation.
	Compare and contrast the new data analysis with the old data analysis.

	Combine new knowledge with existing knowledge.
	Develop refined conclusions based on the collective findings.
	Build refined conclusions into an updated report.

To justify the rationale for using linguistic analysis instead of action research, some additional detail must be provided as to the thematic foci of action research as elucidated by Saunders et al. (2009) below:

1. It is research in action rather than research that is about action.
2. It entails researchers, academics, other types of practitioners, and various consultants working together in partnership in a collaborative and democratic manner.
3. It takes an iterative approach in order to diagnose, plan, then takes action by research, and subsequently evaluates this research.
4. It will yield results that have implications beyond the initial research study and could thus inform other areas of understanding and contexts (p. 147)

The basic approach of understanding a problem space, devising a research design, executing the research, analysing data, and coming to conclusions is a parallel between action research and linguistic analysis. However, action research is geared toward solutions. This research study was focused on the discovery of elemental language components of HP utilised by HRBO in CWF. The solution stage as far as this research study was concerned was out-of-scope. While optimism was maintained about the utilisation of a social-centric HP communication model for hurricane-focused DMP that is tailored to HRBO, putting the onus of creating a research study that is action-based and has implications that inform other contexts would have also been out-of-scope. Furthermore, the assistance and support of others was critical to completing this research study, but excessive involvement with external entities beyond the normal scope of the study advisors, university examiners, individuals facilitating research study participant recruitment, and the research study participants themselves would have necessarily diluted the focus of this research study. An

overly complex, highly iterative, peer-reviewed process for this research study would have detracted from the essential focus of discovering basic language forms of HRBO. Having DMP and HRBO engage in an extended critique process feeding into iterative research activities would have lengthened this study to the point whereby it was untenable due to hurricane season constraints as aforementioned (see Section 3.4.1.5).

3.5 Research Choice

Research choice is a term that pertains to the type of data collection techniques which are generally qualitative or quantitative in nature. Saunders et al. (2009) delineated that a qualitative research choice is associated with a data collection or data analysis technique that creates or utilises non-numerical data such as an interview, focus group, or data categorisation; a quantitative research choice is associated with a data collection or data analysis technique that creates or utilises numerical data such as a questionnaire, graphs, or statistics (p. 151). However, the debate of the qualitative versus quantitative definition does not detail two types of research choices: mono method and multi method. Mono method refers to the utilisation of one data collection technique and one corresponding data analysis technique, and multi method refers to the utilisation of more than one data collection technique and corresponding data analysis techniques (Saunders et al., 2009, p. 151). Saunders et al. (2009) further qualified that multi method entails that qualitative data collection techniques must be used in parallel with qualitative data analysis techniques, and quantitative data collection techniques must be used in parallel with quantitative data analysis techniques (p. 152). Mixed method however is a third research choice, which is defined by either qualitative or quantitative data collection techniques and the data analysis techniques can also be qualitative or quantitative, and these can be in parallel or sequential, but never combined (Saunders et al., 2009, p. 152). The research choice for this research study was multi method qualitative, with the characteristics as detailed in Table 3.10 below.

Table 3.10: Multi Method Defined as a Research Choice (Adapted from original sources: Bryman, 2010; Reiss, 1968)	
Design and conduct	Research must be well designed and conducted. When research is not well designed and/or conducted, the insights

	derived may lose integrity despite the number of methods utilised.
Research appropriateness	Research must be appropriate to the research questions or areas of research. It will not help to simply collect more data to try and compensate for any inadequacies in appropriateness.
Research question focused	Research must be built around the research questions thoughtfully, particularly because multi method research often utilises more resources than mono method research.
Resource appropriateness	Since resources are never infinite for research, resources have to be allocated more carefully across multi method research at times than mono method research. This process requires a lot of thoughtfulness about where and when to use resources.
Resource integration	Multi method research often entails research teams that have some qualitative and some quantitative specialists. It is essential that the diversity of skills act as a collective strength and not as a divisive factor.

The design of the research study was carefully conceived in conjunction with the research advisory team, and with DMP as subject matter experts in counsel. The study was conducted with a disciplined effort to maintain ethical and methodological standards. The area of research and the propounded need for the specific type of research in this area guided the appropriateness of the research design.

Rather than a research question, this research study was driven by the justification, research problem, aim, and objectives (see Chapter 1). Resources were appropriately allocated for the research strategy, time horizon, sampling, and data collection techniques and optimised for the realities of this research study and its constraints. Resource integration was not an issue in this research study due to the fact that only one researcher was conducting the study.

3.5.1 Rationale for Research Choice

Bryman (2010) argued that there is no absolute rule that states that multi method research is somehow unequivocally superior to mono method research (p. 52). The critical need for data collection technique design and conduct integrity was accepted, as well as the need to neither collect too much or too little data. Furthermore, the limit on resources was considered as well. The rationale taken regarding choosing a multi method research choice with a focus on qualitative data collection techniques was that for the purpose of this research study, it would have been ineffective to try and understand the broader landscape of high-risk buildings, hurricanes, building codes, and then streamline this examination with HRBO and DMP in an HP and CWF context by using a mono method research choice. The rudimentary stage of the research domain being explored with this research study predicated utilising multiple qualitative data collection techniques and no quantitative data collection techniques whatsoever, thus ruling out both a mono method research choice as well as mixed method research choice.

3.6 Time Horizon

Time horizon refers to whether the research to be conducted should be a 'snapshot' that is taken at a particular time or if it should be 'a series of snapshots and be a representation of events over a given period' (Saunders et al., 2009, p. 155). There are two types of time horizon choices in research: cross-sectional or longitudinal. The snapshot version is cross-sectional, which reflects researching specific phenomena or a specific phenomenon at a pre-determined time (Saunders et al., 2009, p. 155). Cross-sectional time horizons pertain to the details of social life including social structures, social groups, institutions, and organisations, characteristics of population and demographics; and social interaction, behaviour, beliefs, values, and attitudes (Blaikie, 2009, pp. 201-202). Conversely, Saunders et al. (2009) defined

a longitudinal time horizon as being a series of snapshots which reflect researching specific phenomena or a specific phenomenon across a protracted time period (p. 594). There are four types of longitudinal studies which are detailed in Table 3.11 below.

Table 3.11: Longitudinal Studies Defined as a Time Horizon (Adopted from original source: Blaikie, 2009)	
Before-and-after design	This is conducted at two points in time. an example of this could be two cross-sectional studies that are conducted at different points in time.
Time series research	This is conducted at different points of time. The parameters of the research environment generally remain constant, but some slight changes may occur.
Panel study	This is conducted over a period of time with the same individuals, group, or organisation.
Cohort analysis	This is conducted over a period of time. It is a variant of a panel study that examines the categories of individuals (cohorts) instead of the same individuals themselves. Cohorts are defined as having specific criteria that pertain to individuals with similar life experiences that are related to a common critical life event. Typical examples of cohorts are people who left or joined an organisation around the same time, were born in the same year, or who are in the same year in educational institutions.

The time horizon chosen for this research study was cross-sectional since the research data collection was covered within a very specific period of time, January and February of 2019,

which was an in-between phase of the 2018 and 2019 Florida hurricane seasons. This research was very early stage in the context of the breadth of questions which surround HP communication. This lent itself well to the time constraints inherent to a cross-sectional time horizon. Furthermore, the linguistic analysis research strategy and qualitative multi method research choice were reflected in social-centric foci from a research perspective, which in turn corresponded well to a cross-sectional time horizon by focusing on social interactions, beliefs, values, and a sociolinguistic examination of interaction between HRBO and DMP in terms of HP communication in CWF.

3.6.1 Rationale for Time Horizon

A longitudinal time horizon choice would have eventually pushed the research data collection timeframe right into an oncoming Florida hurricane season. The unpredictability of this could have meant the possibility that the research study would have been characterised by an attempt to collect data in the midst of either immediately pre-hurricane, during-hurricane, or post-hurricane environments. Trying to elicit responses from participants may have been difficult, to impossible, to patently unethical and dangerous to them. The basic action of data collection could have had the potential for grave outcomes due to a research study turned into a misadventure. What is certain is that regardless of the level of hurricane activity during the Florida hurricane season, DMP at FEMA, FDEM, or local government levels are simply unavailable then as they are completely engaged in frenetic activity and the maintenance of a vigilant state as they watch tropical waves forming off of the west coast of Africa and wending their way slowly toward the Florida coast with the possibility of forming into hurricanes. Using reverse logic, a commitment to a longitudinal time horizon would have indicated that a research study may have been better off being designed to account for these factors and be specifically seeking insights that would be related to different stages of the DM cycle.

While cross-sectional research is conducted with only one snapshot, the additional boon to this research study was that when this time horizon was coupled with a linguistic analysis research strategy, there was a significantly large amount of interview data collected from each research participant, which helped to detail and elucidate the specifics of the HP communication reality of interest with increased granularity and accuracy (Rasinger, 2013,

p. 36). Linguistic data can generally be gathered en masse in qualitative research due to the fact that by definition it includes a far greater level of focus on language. Thus, gathering data from a number of HRBO and DMP on the topic of HP yielded copious fodder that helped to create a social-centric HP communication model for hurricane-focused DMP that is tailored to HRBO.

3.7 Research Data Collection Techniques

A broad range of data collection techniques were employed in this research study as detailed in Table 3.12 below.

Table 3.12: Research Data Collection Techniques – Multidata, Primary and Secondary Data	
Multidata collection technique	Data collection triangulation
Secondary data collection technique	Literature review
Primary data collection techniques	Document review
	Sampling (respondent-driven sampling)
	Questionnaires (screeners)
	Interviews (based on PEN technique)

All of these data collection techniques were qualitative in nature. There are important differences between qualitative and quantitative techniques for data collection. When observation and interpretation of reality is needed, a qualitative data collection technique is appropriate; when a theory or hypothesis, and according testing for confirmation or disconfirmation of this theory or hypothesis is needed, then a quantitative data collection technique is appropriate (Newman & Ridenour, 1998, p. 3). This research study was conducted using qualitative techniques for data collection to develop a foundational level of knowledge regarding the language domains of HRBO in CWF as they pertain to HP. This knowledge was then utilised to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy. The decision to utilise qualitative techniques for data collection was also based on the fact that research studies using linguistic analysis as a research strategy to critically explore language differences between the government and the public in the U.S. regarding HP are limited.

Qualitative research is based on the premise of an unstable research domain in which there are multiple perspectives. Under the aegis of The National Hurricane Program, FEMA conducts hurricane evacuation studies to develop evacuation zones cooperation with state and local emergency departments of coastal communities (Stevens, 2018, p. 30). However, even the threat of potential imminent destruction may be doubted by the public: television media coverage just prior to the onset of a hurricane strike in the U.S. often focuses on the extraordinary efforts the federal, state, and local governments in the U.S. have to go through just to enforce mandatory evacuations as illustrated in Figure 3.4 below.

Figure 3.4: Florida – Hurricane Matthew, Evacuation Enforcement, Vero Beach (Source: NBC News, 2007)

This photograph depicts a police car roaming a beachfront neighbourhood of high-risk buildings in Vero Beach, Florida during the mandatory evacuation period just prior to the onset of Hurricane Matthew in 2007. While a few of the residents had already left, many others refused to evacuate and were actually down at the beach to *enjoy* the large pre-hurricane surf conditions by surfing, bodysurfing (surfing waves using the human body instead of a board), kitesurfing (using a parachute or large kite and a surfboard), or walking and taking pictures of the rough surf (NBC News, 2007). This perplexing resistance to mandatory evacuation orders underscores the divide in perspectives on HP in the U.S.

between the government and the public. The impetus of this research study was to examine the perspectives of HRBO in CWF to perhaps uncover some of this unstable domain qualitatively to help shed light on how hurricane hazards warnings can be summarily ignored. Adame (2018) proposed that preparedness behaviour can be motivated by 'cueing audiences to their risk of specific, real hazards and providing potentially lifesaving information' (p. 293). An objective of qualitative research is to gain insight through the collection of narrative data pertaining to HP perceptions. Quantitative research is based on the premise of a stable research domain in which perspectives are well understood and can be measured and then tested with a deductive hypothesis so as to creative predictive models. Research of the HP language domains of HRBO in CWF is simply not in the quantitative arena at this time.

To ensure the data collection techniques of respondent-driven sampling, questionnaires (participant screeners) and interviews were constructed with well-designed questions, and that the target participants to be recruited would be reached through these research techniques and their according instruments, these were pre-tested in a pilot study (Bryman, 2012, p. 264). Pilot studies are quite small in size and test techniques of upcoming larger studies to ensure these techniques are adequate and also identify potential shortcomings in the techniques or in the participant recruitment (Lowe, 2019, p. 117). The identification of shortcomings can assist in the refinement of techniques and recruiting. This pilot study was conducted with two hurricane-focused DMP and two HRBO who would not have been recruited to participate in the study anyway. The feedback from individuals piloting these instruments was favourable. Only a few slight modifications to the order of questions and the wording was required. In addition, the initial model and the technique used to verify that the initial model was accurate were also assessed by the same four individuals who piloted the research instruments and the model and technique met their approval. These four participants also found the respondent-driven sampling technique to be appropriate to cover the large area of CWF in a manner which would elicit study participants. This pilot study feedback was obtained from these four individuals through a basic questionnaire, which also acted to triangulate methods. Triangulation is detailed subsequently.

3.7.1 Multidata Collection Technique (Data Collection Triangulation)

In addition to the clear direction of the multi method research choice which was selected for use in this research study (see Section 3.5), part of the rationale to use multiple data collection techniques was supported by the concept of data collection triangulation in research. Triangulation is a term that is derived from the field of land surveying; it entails examining the distance from and direction to two distinct landmarks in order to derive the location of a distinct third point and thus be reflected by a complete triangle (Baker & Egbert, 2016, p. 3). In the case of research, data collection triangulation entails utilising multiple data collection techniques within the same study so that the data provide intra-context and diversity to reflect and contrast with itself in order to elucidate a clearer picture in sum total than in isolation if only one data collection technique was utilised (Saunders et al., 2009, p. 146).

Data collection triangulation is not a data collection technique in a classical sense but is rather a carefully crafted framework for how multiple data collection techniques can complement each other in a number of ways. King and Horrocks (2010) posited that there is value in triangulation in that it helps to make a research study easier to understand due to the manifold approaches to the subject matter, which in turn promotes reflexivity in research (p. 164). By using this array of data collection techniques in this research study, data from each collection technique were forced to triangulate with each other, helping not only to validate the data, but also to augment the data with reflexivity to account for bias in the data itself. Multiple perspectives and sources of information can help mitigate biases and even reveal ways to identify what these biases might be, thus helping to balance the research study (Polit & Beck, 2009, p. 107).

One type of data collection triangulation that was used in this research study was method triangulation. Method triangulation consists of the use of multiple data collection techniques to build a consistent and coherent understanding of a specific phenomenon (Polit & Beck, 2009, p. 498). Using a multi method research choice predicated the use of method triangulation to ensure that the techniques used were able to cross-check each other and offer a stronger opportunity to result in data which would have more integrity. In this research study, the data collection techniques used to triangulate data were literature

review, document review, respondent-driven sampling, geographical sampling, questionnaires (screeners), and semi-structured interviews. The use of literature review provided the state of enquiry and understanding within the broad global domains of HP, communication, linguistic theory, and the other areas of secondary research review. This helped to enhance a baseline level of knowledge and context. Document review was a critical technique that counterbalanced the literature review and gave the opportunity to examine how the corpus of global research knowledge may have reflected on the state of HP plans and communication developed by DMP and shared with the public in different countries. The literature review and document review collectively acted as a foil to reflect the HP interview perspectives offered by both HRBO in CWF and DMP by examining linguistic parallels and disconnects between individuals and the aforementioned corpus of review.

Respondent-driven sampling and geographical sampling helped to sharpen the focus on the research study participants that would best help this research study, and to find the locations in which these participants might be available. Additionally, the locations were refined due to the sampling itself. The questionnaires helped to counterbalance the broad domains of potential participants across the geographic area, screen out the participants who did not meet the criteria, and screen in the participants that did meet the criteria. Also, these questionnaires offered specific information about each research study participant, which was then utilised in the interview process as well as the analysis to better align and qualify the interview responses. Within the interviews, there were two distinct participant pools: DMP working within government organisations and members of the public who are HRBO. The responses from the interviews with the DMP acted as a counterbalance to the interview responses from the HRBO. As is inherent to method triangulation, this research study benefitted from all the techniques supporting each other very well by creating a rich stockpile of contextualised data that had integrity and comparative support for analysis.

Another type of data collection triangulation that was used in this research study was data triangulation, which is represented by three categories as listed in Table 3.13 below.

Table 3.13: Data Triangulation – Three Categories (Adapted from original source: Polit & Beck, 2009)	
Person	Entails collecting data pertaining to the same phenomenon from different types of individuals.
Space	Entails collecting data pertaining to the same phenomenon or research study participants across different research sites.
Time	Entails collecting data pertaining to the same phenomenon or research study participants at different points in time.

Person triangulation was achieved in this research study by recruiting participants that are DMP, and members of the public who are HRBO in CWF. Within the DMP participant pool, there were two professionals from FEMA, two professionals from FDEM, and two professionals from different county EM offices in CWF respectively. This offered the research study the ability to triangulate perspectives between FEMA, FDEM, and local (county) DMP. Within the pool of HRBO, there were six females and six males. The intention in this regard was to provide some degree of gender balance. These individuals were also screened across a range of hurricane experience backgrounds so that their perspectives would counterbalance the perspectives of each other as well as DMP.

Space triangulation was achieved in this research study by recruiting participants from various cities across the broad expanse of CWF. These participants were based in a number of different geographic locations, with some living near the coast and others living inland. These different areas have experienced a variety of hurricanes over the years. Water bodies are prevalent in CWF, so hydrometeorological concerns abound and are regularly exacerbated during hurricane events. Collateral effects from hurricanes such as flooding are different in coastal zones, often resulting from ocean storm surges, as well as inland flooding which occurs in riparian zones and non-riparian zones such as the shorelines of estuaries, lakes, ponds, reservoirs, and swamps. However, hurricanes can also contribute to riparian and non-riparian flooding near the coast. Hurricane flooding experience does differ

from coastal to inland zones and thus so does the experience that HRBO might have depending on where they live in CWF. Communication regarding HP may also differ across locations and this further supported the space triangulation effort of this research study.

Time triangulation was one category of data collection triangulation that this research study did not attempt to achieve. There is a relatively small window in which both DMP and HRBO are seasonally less likely to be as engaged in HP activities in Florida. This period is roughly from 1 December to 31 May, after the previous hurricane season and before the next one when participants were better available for participation in this research study. Accordingly, longitudinal time horizon research studies that would lend well to time triangulation were not considered to be feasible. Furthermore, ethnography was not considered as a research strategy either for these reasons and this would have also been well suited to time triangulation.

3.7.2 Secondary Data Collection Technique (Literature Review)

Literature review was the secondary data collection technique used in this research study. Saunders et al. (2009) argued that a literature review is intended to place a research study within a wider context to inform readers how the study supplements other research which has already been done on the specific topic (p. 534). Within the literature review, there is a tacit expectation to deliver a critical, accurate, and comprehensive level of knowledge about the issues within a specific topic, offer relevant comparisons of various theoretical frameworks and research studies, uncover gaps in this body of literature, and convey a clear path on what is needed to accomplish a legitimate advancement in what is known about this specific topic (Efron & Ravid, 2018, p. 2). This research study employed the literature review at the onset to develop and refine the background, justification/research problem, aim, and objectives as elucidated in Chapter 1, and on through to the rest of the components that comprise the framework of this study. Of particular note: the literature review revealed the dearth of studies that have been conducted using linguistic analysis as a research strategy in the area of disaster preparedness, let alone global HP communication, to the point that there were very few research studies even pointing out the lack of research of this type. The factor of limited literature on linguistic analysis within a HP paradigm provided a driving force that the corresponding literature review in turn helped point

toward the selections made for research philosophy, research approach, research strategy, research choice, and the data collection and analysis techniques.

3.7.3 Primary Data Collection Techniques

A range of primary data collection techniques was used as part of this research study and these are detailed subsequently below.

3.7.3.1 Document Review

Document review was used as the first primary data collection technique in this research study: a technique that consists of examining policy documents, protocols, recommendations, and guidelines. Literature review and document review were used together as complementary data collection techniques to provide a more comprehensive understanding that was informed by a review of both research-based and DM industry-based documents respectively. Specifically, the U.S. federal government agency referred to as the Centers for Disease Control and Prevention [CDC] described document review as being used to review existing documents on a topic that may be found internally to an organisation or a program (CDC, 2018). This research study employed document review along with literature review at the beginning of the study to develop and refine the background, justification/research problem, aim, and objectives as elucidated in Chapter 1, and throughout the rest of the components that comprise the framework of this research study. There were eleven documents reviewed in this research study which are detailed in Table 3.14 below.

Table 3.14: Document Review – Eleven Documents Examined

Type	Geographical Relation/Entity
Disaster preparedness task categories for the public	U.S./FEMA
HP plans	U.S./FEMA
	Taiwan/Community Services Center
	Australia/Bureau of Meteorology
NPS	U.S./FEMA

Building codes	Florida/Florida Building Commission
	Bangladesh/ The Housing and Building Research Institute
	Australia/ Australian Building Codes Board
Maps of wind and risk regions	Florida/Florida Building Commission
	Australia/ Australian Building Codes Board
	Australia/Royal Melbourne Institute of Technology

These documents were reviewed to build a basic level of knowledge in each specific area. At the same time, these documents were not only reviewed for their content, but importantly, for the language used within the content and how this might have been reflected in the interview responses of HRBO and DMP. Aspects of these documents were utilised in the creation of the interview questions as well as the research analysis of the interview data to further qualify the responses of the participants. These documents also helped to guide the synthesis of the interview data coding template. Furthermore, document review was utilised in the conclusions of this research study to augment the research analysis by comparing and contrasting it with language elements present in official HP communication that is expressed by DMP.

3.7.3.2 Sampling

Sampling is generally defined as the method used to identify specific data or data sources from a larger possible set of data or sources so that the data collection process itself is manageable operationally and targets research objectives (Saunders et al., 2009, p. 210). Sampling is often delineated first as to whether it is probability sampling, which is exemplified by random selection in order to ensure that each there is a known chance of selecting each unit in the sample, or non-probability sampling in which no random selection has been used for the sample (Bryman, 2012, p. 187). Saunders et al. (2009) posited that probability sampling (also known as representative sampling) is usually connected with the research strategy of survey in which research study objectives or research questions are met by utilising inferences based on a sample of the population being studied (p. 213). Given the

extensive breadth of different types of probability sampling, rather than detail a sizeable number of these sampling varieties, the fact that probability sampling is geared toward quantitative data collection techniques and generally requires a large sample size, probability sampling was not chosen for this research study. Non-probability sampling has its own extensive breadth of types that have been detailed in numerous research treatises and will not be redundantly explicated further here. On a fundamental level, this research study utilised purposeful sampling, a broad type of non-probability sampling method which focuses on small sample sizes that are targeted for their perceived opportunity to provide rich insights on a topic or subject area that is highly relevant to the research objectives (Gupta, Shaheen, & Reddy, 2018, p. 28). The general hurricane experience and relative ability to communicate about this was gauged during the initial contact and the subsequent vetting process (invitation, information, consent, screening). During these steps of the initial contact and vetting process, all of the study participants were able to clearly articulate that they had definitive and developed HP communication perspectives and would be eager to share them in a reflective manner, irrespective of their hurricane experience, evidencing how purposeful sampling was utilised (Etikan, I., Musa, S., & Alkassim, R., 2015, p. 2). These steps went beyond the convenience sampling that would have been hallmarked by the ease of simply recruiting participants based on geographic location (Etikan, et al., 2015, p. 2). The research objectives (see Section 1.5) were leveraged along with the counsel of academic advisors and DMP to further refine sampling criteria.

3.7.3.2.1 Sample Size

A critical pillar of any qualitative research study pertains to the reasoning for how many interviews should be conducted in that study. The decision to utilise a small sample size was guided by the data collection tenets of the research philosophy of this study: interpretivism (see Table 3.1). The limited resources available to conduct this research predicated that too many interviewees would not only result in exceeding qualitative data saturation, but drain the meagre means on hand to actually manage a research endeavour. At the same time, too few interviewees would have been insufficient since the discovery of specific linguistic domains was paramount in order to derive robust qualitative insights for this research study. For an optimum combination of research integrity and operational austerity to guide a research design, it is critical to know how many interviews would be feasible within

budget constraints and then build this understanding into the research design prior to going into the field to collect data (Guest, Bunce, & Johnson, 2006, p. 60). In the time-intensive environment of qualitative research, it is imperative that only the necessary amount of interviews be conducted to elicit these domains.

Fusch and Ness (2015) argued that ‘there is no one-size fits all to reach data saturation’ and in order to do so, it is imperative to have a combination of rich (quality) and thick (quantity) data (p. 1409). Analysing the extensive data found in life stories predicates that 'the process of analysis can seem an overwhelming undertaking' (Ford, 2011, p. 27). At the heart of its research design, this study examined the real life HP narratives of HRBO residing in Risk Category II buildings and the hurricane-focused DMP charged with tasks that relate to HP communication. This study was different in that instead of using a more commonplace interview question design framework, the interview questions for this study were guided by the PEN technique, which is specifically designed to elicit language-rich responses (see Section 2.8.2.1). Furthermore, the data analysis techniques were guided by frame analysis, discourse analysis, and paradigmatic analysis, and were used to examine the very words and phrases that comprise the interview responses, to further distil rich insights from these data rather than a linear interpretation of interview responses (see Section 2.8.2). The insights gained from both the document review and literature review augmented the data-rich sampling from the interviews (see Sections 3.7.2 and 3.7.3.1). All of these aforementioned factors contributed to the elicitation of data ripe for analysis.

Under the aegis of purposeful sampling, further critical guidance was found in the work of Guest et al. (2006), as they opined that if the objective is to elucidate shared behaviours, perceptions, or beliefs from qualitative interviews within a relatively homogenous participant pool, then 12 participants would be a sufficient sample size (p. 76). Hennink et al. (2007) reviewed the aforementioned study by Guest et al. (2006) and reflected that this study found that ‘by 12 interviews, 88% of all emergent themes had been developed, and 97% of all important themes were developed’ (p. 593). Furthermore, Hennink et al. (2007) conducted their own study and found that ‘that code saturation was reached after nine interviews’ and that ‘the range of common thematic issues was identified, and the codebook had stabilized’ (p. 604). Thus, the amount of HRBO that were interviewed for this

research study was 12 participants in following the direction set by Guest et al. (2006) to achieve thematic saturation from this data-rich, linguistic-orientated study. The participants that were HRBO had the relatively homogenous characteristics of being HRBO of Risk Category II buildings in CWF, a region that regularly experiences hurricanes, and all of the participants were English first-language speakers (see Section 1.6). The language aspect is critical to note, as the bulk of HP communication documentation in the U.S. and Florida is specifically in the English language. Also, Florida has a very large Spanish-speaking population, but such participants were out of scope for this study. The participants also had the screening criteria that they also must not be employed in either the EM or DM fields. The intention was for the research study participants that were HRBO to have a wider range of perspectives on HP that were not coloured by professional exposure to the field.

There was a different decision on how many DMP to interview, and the choice was made to interview six of them. The rationale behind interviewing six participants who are hurricane-focused DMP is that because of their mandated specific focus on HP, they may have greater relative cognitive homogeneity as a group regarding hurricanes than members of the public. Again, the work of Guest et al. (2006) was leveraged as they argued that if the qualitative interview objectives are utilised to develop overarching, high-level themes, then six participants would be a sufficient sample size to yield viable interpretation for these themes (p. 78). Reinforcement for the rationale regarding this sample size was offered by Kunert (2009) in citing Virzi (1990, 1992) and Nielsen (1993) by making the case that five participants would yield 80% of insights and that choosing a participant pool beyond five participants would seldom yield further new insights (p. 214). Those six interviews with DMP were further divided as follows: two interviews each with FEMA, FDEM, and local (county) representatives.

This research study sought to distil high-level, overarching HP communication themes from hurricane-focused DMP and more granular-level themes from members of the public (HRBO) for the purpose of analysing these data. The study also had a decidedly public-centric communication focus to enable hurricane-focused DMP in creating HP messaging that is more understandable by the public. Thus, the participant sample size was larger for members of the public (HRBO) than it was for DMP. Hagaman and Wutich (2017) reviewed

the aforementioned study by Guest et al. (2006) and conducted their own research study to determine if the sample size of 12 would be sufficient for qualitative interviews and found that a sample size of 12 – 16 would be acceptable for a study conducted with a homogeneous participant pool that is targeted for highly focused topics (p. 35). One research study premise was that the focus on the U.S. (CWF specifically), HP, HRBO residing exclusively in Risk Category II buildings, and hurricane-focused DMP were effectively represented by a homogeneous participant pool and highly focused topics. Thus, the collective sample size of the entire research study of 18 participants was considered to be sufficient. This collective sample size of 18 participants was also supported by Hennink et al. (2007) as their study found that meaning saturation (a complete understanding of issues) occurred between 16 and 24 interviews (p. 605). In the data-rich, narrative-based study conducted, the overall sample size of 18 participants was considered sufficient as well.

Each participant group, HRBO, FEMA, FDEM, and local (county) DMP, was screened so that the requisite amount of interviews was conducted per group. One specific obstacle that was anticipated included the extra effort required to elicit study participants that were HRBO when there was no financial incentive attached for interview participation. However, given the near folklore status that numerous hurricanes have achieved in the U.S., it was anticipated that sufficient participants would be obtained, and this was indeed the case. Another anticipated obstacle was that the interviewees would have varying degrees of experience with previous hurricanes. Given that the focus was primarily going to be on pre-hurricane perceptions of preparedness and awareness, a mix of recent and not-as-recent hurricane experiences was sought. Immediate aftermath perceptions were not what this study was focused on but rather a contemplative analysis from a pre-hurricane state of mind. The question design for the interview guides was accordingly focused on current perspectives of HP that HRBO held regarding a pre-hurricane, preparedness communication thought space.

An unforeseen obstacle when it came to contacting and screening DMP was the U.S. federal government shutdown. The longest government shutdown in U.S. history started on 22 December 2018 and ended on 25 January 2019, and included a significant reduction of FEMA resources throughout the shutdown duration (CBO, 2019). During that time period, it

was absolutely impossible to even engage in cursory non-interview based investigation of schedules of when FEMA professionals might be available in-office as many of these individuals and their support staff were furloughed. Furthermore, during this time period, investigating when FDEM and local (county) DMP might be available in-office was also impossible as these professionals were over-burdened while they were shouldering the added DM responsibilities given the vacuum left by the absence of their FEMA colleagues. Unfortunately, the resumption of the U.S. federal government on 26 January 2019 did not result in any of these professionals being readily available as they were all still coping with the chaos created by federal government shutdown. However, perseverance paid off and contact was finally made resulting in all six requisite DMP being interviewed ultimately.

3.7.3.2.2 Respondent-driven Sampling

This research study used the non-probability sampling technique of respondent-driven sampling, which is a variant of snowball sampling. Saunders et al. (2009) instructed that traditional snowball sampling is commonly used when it is challenging to pinpoint individuals that are part of the population of focus, thus necessitating the following:

1. Connect with one or two individuals that meet the criteria within the population of focus.
2. Request that these individuals pinpoint other new individuals that meet these criteria.
3. Then request that these next new individuals pinpoint other such individuals, and so on.
4. Stop seeking new individuals when the sample is as large as is manageable, or when no new individuals that meet these criteria can be found (p. 240).

As opposed to snowball sampling, the main difference with respondent-driven sampling is that instead of asking individuals for contact information on new individuals within the target population that meet that criteria, these individuals are requested to actually recruit further individuals from the target population that they know personally who meet these criteria (Daniel, 2011, p. 111). The key to this difference is subtle: it is the distinction between collecting contact information from a research study participant about another potential participant, versus having a research study participant actually recruit further

participants. Daniel (2011) described a critical difference between traditional snowball sampling and respondent-driven sampling: in snowball sampling, the initial individuals usually give the contact information on further individuals without any prior consent from these new individuals (p. 113). This difference was the driving factor to utilise respondent-driven sampling as a technique instead of snowball sampling due to the importance this research study attached to ethics in research. Sharing contact information of potential research study participants that may have been unwilling to participate could have resulted in individuals being upset that their contact information had been shared without consent. This possibility was simply not worth the risk from an ethical standpoint in order to adhere to the strict ethical standards this research study is governed by from university, legal, and personal standpoints. The respondent-driven sampling and an in situ method was used to achieve a large enough pool of vetted participants in order to gather the requisite 12 participants from the public and six participants from the government in a manner which upheld the standards of research methodology and ethics.

Another advantage of using respondent-driven sampling was the focused recruiting of participants based on study criteria across the large study area of CWF that one researcher alone would have been unlikely to reach, thus improving the estimation of characteristics of the participant group as a whole (Daniel, 2011, pp. 111, 113). This strength of respondent-driven sampling over snowball sampling and convenience sampling was critical due to this research study being qualitative, with a research philosophy of interpretivism predicating small sample sizes, and the resultant non-probability sampling. Whether sampling is representative in non-probability sampling studies is unknown because such sampling is not based on probability, by definition. Thus, the use of purposeful and respondent-driven sampling combined with the initial contact and participant vetting process was deemed instrumental in vaulting this study as close to providing a representative sample as possible. Geographical sampling provided further support in helping this sample be as representative as possible, as evidenced below.

3.7.3.2.3 Geographical Sampling

The geographical area of focus for this study (CWF) is affected by hurricanes every 2-3 years (FEMA, 2013b). The rationale utilised in choosing this location was that not only would there

be HRBO that may have opinions about HP, but there would also be DMP within a logistically manageable distance from these locations so as to increase the likelihood of potential HP communication interaction. The study location of CWF and the criteria for recruiting HRBO as participants were aspects of the study guided by engaging a rigorous approach to sampling within this research study. Sampling entails a comprehensive focus on how data are selected from the wide range of possibilities within the context of research observation, whether the data selection has been more controlled by either the research environment or the researchers, and importantly, how these data are used to draw broad conclusions about the study participants and the environment they represent (Thompson, 2012, p. 2). Saunders et al. (2009) emphasised that the methods used in research are guided by sampling techniques in order to minimize the amount of data collected by researchers by virtue of targeting a specific sub-group within the broader population, thereby reducing the sheer amount of effort required (p. 210).

Participants from the public (HRBO) were initially recruited with the guidance of two non-participant DMP, and subsequently recruited by the HRBO participants themselves. These 12 participants lived in the following parts of CWF as depicted in Figure 3.5 below.

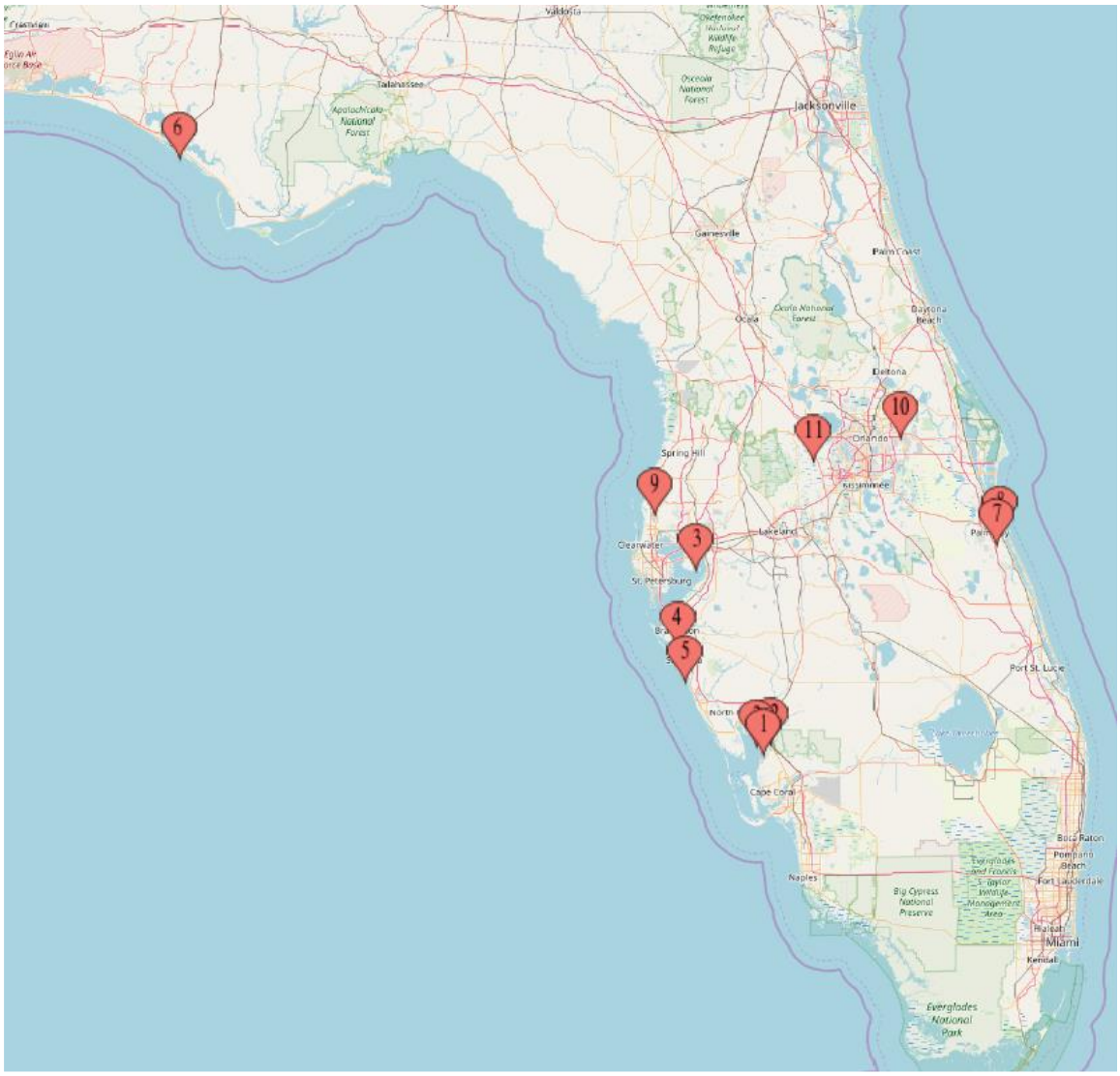

Figure 3.5: Public Participant Locations

The rationale for the location of participants being from CWF was guided by the major hurricane (see Appendix H) strike frequency as documented in Figure 3.6 below

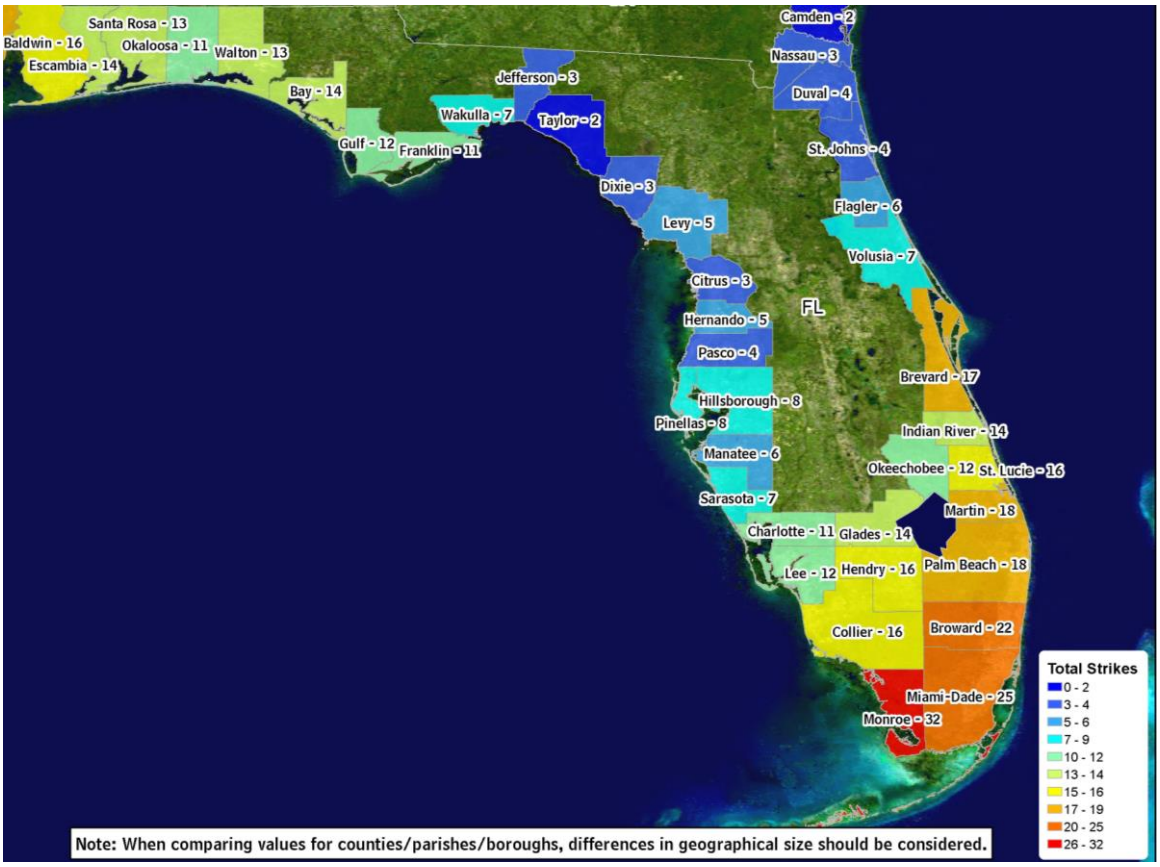

Figure 3.6: Florida - Hurricane Strikes by County 1900-2010 (Source: NOAA, 2018c)

Extreme South Florida has the greatest hurricane strike frequency, yet is also the farthest from the Tallahassee operation centre for FEMA and FDEM DMP. The larger region of CWF does not have the same level of hurricane frequency as extreme South Florida, but this region still sees its fair share of hurricane strikes, and thus experiences excessive damage (see Appendix H). The traditional South Florida counties of Monroe, Miami-Dade, and Broward all have greater than 20 hurricane strikes. Accordingly, a large portion of the geographical area of South Florida depicted in Figure 3.6 of Miami-Dade County and Broward County, is regarded as the High-Velocity Hurricane Zones (HVHZ) characterised by high-risk buildings that are mandated to bear winds up to 274 – 290 km/h (170 – 180 mph) (Florida Building Commission, 2012a, p. 3). Using Figure 2.14, Figure 3.5, and Figure 3.6 as geographic references, the distribution of public participants and the hurricane strike frequency of their counties from south to north is depicted in Table 3.15 below.

Table 3.15: Public Participant County Hurricane Strike Frequency and Representation			
County	Hurricane Strikes	High-risk Building Wind Speed Maximum	Number of Participants
Charlotte	11	257 km/h (160 mph)	3
Sarasota	7		1
Manatee	6	241 km/h (150 mph)	1
Hillsborough	8		1
Brevard	17	257 km/h (160 mph)	2
Pasco	4	241 km/h (150 mph)	1
Lake	0	225 km/h (140 mph)	1
Seminole	0		1
Bay	14		1

The high-risk building wind speed threshold of the counties of the participants was 225 – 257 km/h (140 – 160 mph). Part of the rationale behind choosing participants from these counties was that this range of high-risk building wind speed threshold was generally in the middle of the entire range of wind speeds throughout the state of Florida: 185 – 290 km/h (115 – 180 mph) as depicted in Figure 2.14. The intention was also to not have participants in this research study recruited from the more extreme counties at the lower and higher ends of the wind speed thresholds because these participants could have a priori knowledge (or lack thereof) regarding HP commensurate with these wind speed thresholds and the hurricane strike frequencies of these areas.

The geographic factors detailed in Figure 3.6 and Table 3.15 are reflective of the controlled diversity of potential HP communication and experiential environments that this study sought. Given the fact that this research study utilised non-probability, purposeful sampling, geographical sampling was critical in helping push the overall sampling as close to being representative as possible, given the small sample size. The respondent-driven sampling was instrumental in helping reach participants across the broad area of CWF.

Participants from the governmental sphere (hurricane-focused DMP) were in the roles of oversight, messaging, or HP and were recruited similarly through the guidance of the aforementioned two non-participant DMP, and additionally through phone calls/visits to individuals that have their reporting structure based in the following offices:

1. FEMA (headquartered in Washington, DC)
2. FDEM office (headquartered in Tallahassee, Florida)
3. Two County EM Offices (headquartered in separate cities in CWF)

The roles of the governmental participants that were interviewed are as follows:

1. FEMA
    a. Federal Incident Management Assistance Team Section Manager
    b. Hurricane Program Manager
2. FDEM
    a. Bureau Chief, Preparedness
    b. Hurricane Program Manager
3. Two Florida County EM offices
    a. Department Director
    b. Director

3.7.3.3 Questionnaires (Participant Screeners)

Questionnaires are a set of questions which are given to participants to answer and thus obtain self-responses from. Bechhofer and Paterson (2012) argued that structured questionnaires have distinct advantages as data collection techniques:

- Participants can answer questions at their convenience, thus saving the researcher valuable time that need not be used to interact with the participant to collect this data
- Participants answer standardised questions that have transparent, commonly understood meaning: ambiguity would be counterproductive for a self-administered research instrument
- Participants can provide a mix of data that are fact-laden and designed for statistical descriptions and simple analysis (pp. 74-75).

Perhaps the most typical use of a questionnaire is as a quantitative data collection tool. Questionnaires are usually designed for statistical analysis or interpretation, but some questionnaires can be designed for qualitative analysis and interpretation as well (Remenyi, 2012, p. 93). In this research study, questionnaires were utilised as *screener* documents (see Appendix D and Appendix E) to collect demographic and experiential data about the study participants, with separate ones for DMP and HRBO. Screeners are documents that are sent out to potential research study participants that help the researcher to check their broad-based profiles to ensure consistency. This is achieved by setting out strict criteria such as age limits, experience types, or location. These criteria help to determine if potential participants match the profile range of what the research study requires in order to achieve its data collection objectives. Screeners help to eliminate potential participants that do not match the criteria and would thus skew the data and possibly weaken the integrity of the research study. On a basic level, screeners are questionnaires comprised of multiple-choice questions (Nunnally & Farkas, 2016, p. 96). A more detailed definition offered by Travis and Hodgson (2019) is that participant screeners are useful in filtering potential study participants based on criteria including past experience and demographics (pp. 69-70). Thus, in this research study, the screeners were not only used to include or eliminate research study participants, but were also used to augment the qualitative interview data gathered from each participant by providing experiential background for each participant. These screeners, despite having the mechanical appearance of being a survey designed to collect data for a quantitative research study, were used to find out fundamental data about each participant that were leveraged in better elucidating a holistic, qualitative assessment of the experiential social environments that characterised the HP perspectives of each participant. The data collected included:

- Gender
- Age
- Job occupation (for DMP)
- Years lived in Florida
- Hurricanes experienced in Florida (for HRBO)
- Hurricanes deployed on in Florida (for DMP)
- Hurricanes experienced outside of Florida (for HRBO)

- Hurricanes deployed on outside of Florida (for DMP)

The screener also served the valuable purpose of gathering the aforementioned data prior to the research study participants being interviewed, thus saving the time that simply did not need to be spent gathering this basic information from each participant during the interview process.

Once identified, participants were initially contacted either in-person or via phone. After determining their basic interest in participating in the study, participants were e-mailed or personally handed a set of documents including:

1. The Participant Invitation Letter (see Appendix A)
2. The Participant Information Sheet (see Appendix B)
3. The Participant Consent Form (see Appendix C)
4. The Participant Screeners (see Appendix D and Appendix E)

The Participant Screeners were also utilised to gather demographic data of the participants. The combination of demographic and experiential data in a participant screener helps the researcher to optimise the pool of potential participants to those that have a higher likelihood of exhibiting the background and behaviour that the researcher can gain from given the research design (Nunnally & Farkas, 2016, p. 97). Additionally, the Participant Screeners helped in ensuring that public participants had even gender distributions along with an even mix of hurricane experience. Ross (2010) described how by asking carefully worded questions in participant screeners, researchers can eliminate participants that are unrepresentative of the research study participant requirements or uncommunicative participants, as they might refuse to answer some questions in the screener. Should any participant have either refused to complete or return these forms via e-mail or handed to directly to the researcher, or have had visible difficulty navigating simplistic aspects of these forms, this would have been construed as criteria to proactively eliminate them respectfully from the study and to then seek alternate participants. A number of potential participants were never included in the study because they simply did not return the screener. All of the participants that returned screeners ended up having responses which showed that they had both the demographic background and the basic communicative intelligibility necessary

for the study. Thus, the screeners never had to be used as a mechanism to eliminate potential participants from the study due to responses that would have required exclusion.

3.7.3.4 Interviews

The remaining data were collected from the participants via the Participant Interview Guides (see Appendix F and Appendix G). These interview guides were designed to elicit rich linguistic responses that have provided a strong foundation for the aforementioned communication-centric research objectives (see Section 1.5). The particular linguistic data sought in this research study were reflected in the construction of these interview guides as evidenced by the three categories of questions regarding hurricanes:

1. Pre-hurricane experience
2. Pre-hurricane strategies
3. Words, concepts, phrases, communication channels

Interviews are data collection techniques that involve a researcher directly asking questions of a research study participant in a one-to-one format. This is often characterised as a question-and-answer session whereby the researcher poses questions to the research study participant in order to get responses that will provide data that will be fed into the research study. The three basic types of interviews are detailed in Table 3.16 below.

Table 3.16: Interviews Defined as a Primary Data Collection Technique (Adapted from original sources: Brinkmann, 2013; Bryman, 2012; Galletta, 2013)

Structured interviews	These types of interviews generally have close-ended questions with the same structure as those found in questionnaires or surveys. The research logic behind these questions is to elicit responses that quantitative in nature, with the main exception being that the researcher is asking these types of questions directly to the research study participant.

Unstructured interviews	These types of interviews have questions which are based on a list of issues or topics. The research logic behind these questions is to give the research study participant the widest latitude to respond to these questions.
Semi-structured interviews	These types of interviews have questions that are structured as both open-ended and closed-ended questions (often driven by theory). The research logic behind these questions is that the responses given by the participant will be based in the experience and background of the participant. Additionally, these responses will be framed by the specific area of focus or enquiry in which this research study is being conducted.

The type of interview technique chosen for this research study was semi-structured via a combination of in-person and telephone interviews. The rationale for this choice of semi-structured interview technique, beyond the strength of the aforementioned definition, was that this type of interview technique is characterised by a variable set of tools and resources that are used with questions and follow-up prompts that are well served to support a broad range of research objectives and immerse participants deeply in the topics of the research study (Galletta, 2013, p. 45). The questions and prompts were slightly different for HRBO than they were for DMP (see Appendix F and Appendix G). The choice to conduct both in-person and telephone interviews was critical due to the large geographic distribution of HRBO, FDEM, and local (county) DMP in the regions of Florida researched. Furthermore, the federal DMP (FEMA) interviewed have foci in Florida, Texas, other hurricane-prone regions of the U.S., and some of these individuals have been and continue to be occasionally deployed to assist in hurricane environments around the world. The effort to reach these

individuals in-person or via telephone was quite involved due to the intensity of their job requirements.

The interview questions were developed using the PEN technique that examines clauses in communication (see Section 2.8.2.1). The PEN technique was chosen to help design questions that assisted research study participants to convey rich perspectives on their HP experiences. This technique is useful in deconstructing language elements within story-telling. The PEN technique was utilised to create interview questions which compelled research study participants to envelop their responses within a narrative context. Further interview techniques based on linguistic analysis principles bolstered the capability to conduct the interviews. Interviewers are ultimately participants in research studies themselves and thus part of the discourse, with their approach to asking questions, interrupting, encouraging, facilitating, or acknowledging responses has a significant effect on the narratives elicited (Mishler, 2009, p. 105). It is for these reasons that a reflexive and emic approach was taken in this research study to reduce bias and encourage rich participant responses in as authentic a voice as possible. The experiences of hurricane survivors have been displayed by the U.S. media for years after a major event. Such storms do more than just make a mark on weather and financial statistical records: they provide the impetus for stories which can even distil into folklore status. Storytelling has been utilised for a long time in human history to help explain the world in a rational manner: the core of human existence can be expressed in narrative (Johnstone, 2008, p. 635).

3.7.4 Research Data Collection Technique Rationale

One important qualitative data collection technique that was absent from this research study was focus groups. Liamputtong (2011) described how the term *focus group* came about from the term *focused interview* and as the interview data collection technique faded in the 1960s, companies began increasingly using focus groups in the course as one of their market research data collection techniques (p. 10). Focus groups bear some resemblance to interviews in that there is an interviewer (moderator), and in the case of focus groups, multiple participants are being asked questions at times. However, focus groups offer the opportunity for the participants in the group to work together to answer questions, come up with ideas, and to share individual perspectives with the moderator and each other.

Kamberelis and Dimitriadis (2013) asserted that focus groups are characterised by three main functions: pedagogy, enquiry, and political effectivity (p. 36). The pedagogic function is characterised by engaging the collective participants to interact with each other in dialogue to elevate their understanding of the issues that are of import to the group personally or to transform these issues through their insights (Kamberelis & Dimitriadis, 2013, p. 36). Some of the rationale for choosing interviews over focus groups is evidenced in Table 3.17 below.

Table 3.17: When to use Focus Groups vs. Interviews (Adapted from original source: Azzara, 2010)

Choose focus groups	Choose Interviews
When seeking diverse perspectives and gaining consensus or argumentation is required	When research study participants are easier to interact with one at a time
When seeking to create deep discussions that involve debates with points and counterpoints that end in resolution ultimately is required	When the basic aspect of research study budgets predicate that interviews would not exceed cost limits
When there are exploratory or expansive topics, or in order to encourage research study participants to generate new ideas and share them	When seeking responses from research study participants that might be less biased than if they were reflected within a group format and thus open to group influences
When seeking an environment in which group discussions can be robust enough to shine light on a topic and thus reveal hidden or chronic issues	When it might be necessary to reframe or probe after initial questions and/or ladder responses to more intrinsic or hidden attributes that could be personal
When seeking an environment where teamwork would yield insights that would be helpful	When there is a lot of specificity required from the responses of research study participants and/or the research study is focused on specific segments and their targeted responses

When seeking commonality in trends or when robust interaction between research study participants is required	When there is a need to test a device, website, application, or process using usability methods
When having a group engage in discussion about a concept or topic would be helpful in the nascent discovery process due to groupthink	When the research study participant pool is small or distributed across a broad geographical area that is difficult to cover easily
[redacted]	When there is a higher risk of research activity failure due to various reasons such as difficult screening of participants due to targeting ambiguity, or the possibility of no-shows for groups rendering group/team research activities impossible to conduct; the logic is that risk is mitigated when recruiting one participant at a time for a research activity
	When seeking very deep insights from research study participants, such as from specialists or experts on specific topics or concepts

Conducting focus groups with the participants was considered in the planning stages of this research study due to benefits of using this data collection technique. However, this technique was not chosen to be utilised for a number of reasons. Firstly, the design of the focus group itself, including objectives, questions, exercises, and location was deemed too premature to identify without first going through an in-depth qualitative interview phase with both HRBO and DMP themselves. At issue was the need for the design of the focus group to be based on some more solid foundation from these aforementioned interviews plus the analysis thereof. Secondly, attempting to organise DMP from FEMA, FDEM, and county governments to all meet at one specified time and in one place would have proven to be impossible, particularly given the unforeseen circumstance of the aforementioned

federal government shutdown (see Section 3.7.3.2.1). Similarly, even scheduling all of these DMP to participate in a remote-administered focus group over the telephone or web would have proven to be logistically quite difficult.

Focus groups were also not chosen to be utilised with the HRBO either. The rationale behind this was manifold as well. Firstly, the geographic areas explored in this research study are quite large, despite the fact that CWF is only one part of the state of Florida. As a comparison: Florida is roughly half the size of the entire UK and twice the size of Ireland. Organising focus groups with HRBO would have required a much narrower geographic focus down to a city level and that was deemed too granular for this research study to build broad perspectives. Secondly, without offering any financial incentive for focus group participants, it was deemed highly unlikely that HRBO would take the two hours out of their evening to attend a scheduled focus group, or that the failure to appear rate could be enough to render group or team activities in focus group environments impossible to conduct.

At the same time, interviews themselves were chosen over focus groups due to this research study being conducted at such a fledgling stage. Interviews offered the opportunity to probe individual experiences. The HRBO were screened individually: if one potential research study participant would have been either screened out or somehow became unavailable, replacing that participant would have been achieved by simply looking for the next potential participant. The no-show factor can weaken or even render a focus group untenable if enough participants fail to appear. Focus groups can be much better utilised when more definitive discussion topics developed from an interview phase would benefit from collective participant exercises. Finally, the large geographic distribution of the research study participants was handled in this research study without the need for incentives because of the decision to use interviews instead of focus groups.

3.8 Research Data Analysis Techniques

The broad range of data analysis techniques utilised in this study are detailed in Table 3.18 below.

Table 3.18: Research Data Analysis Techniques – Multidata, Primary and Secondary Data		
Multidata analysis technique	Data analysis triangulation	
Secondary data analysis technique	Literature review analysis	
Primary data analysis techniques	Document review analysis	
	Based on Research Strategy: Linguistic Analysis (see Table 3.4)	Template analysis
		Frame analysis
		Discourse analysis
		Paradigmatic analysis

All of these data analysis techniques were qualitative in nature, which corresponds to the data collection techniques, which were all qualitative as well. This research study utilised qualitative data analysis to help articulate a foundational level of knowledge regarding the language domains of HRBO in CWF as they pertain to HP. In turn, the analysis helped to provide the elemental understanding needed to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

3.8.1 Data Analysis Triangulation

In parallel fashion with data collection triangulation, data analysis triangulation involves using multiple data analysis techniques within the same study so that the data collected are examined with a variety of perspectives, thus helping to make the most of the data as an insight-generating corpus. Data analysis triangulation is reflected by being a combination of two or more data analysis methods for the same data for the purpose of achieving a broader understanding of these data (Renz, Carrington, & Badger, 2018, p. 827). Similar to data collection triangulation not being a data collection technique in a classical sense, data analysis triangulation is also not a data analysis technique in a classical sense. It is a way that various data analysis techniques can be leveraged in a complementary fashion. In this research study, the data analysis triangulation technique used was *within-method triangulation*, which was seminally propounded by Leech and Onwuegbuzie (2007) as being focused on using different analytical techniques on the same data in order to converge the research study insights and help corroborate them (p. 580). In this research study, literature

review analysis, document review analysis, frame analysis, paradigmatic analysis, discourse analysis, and template analysis were all forced to triangulate with each other to validate the analysis, provide further reflexivity, and to account for bias in the analysis itself. The literature review analysis and document review analysis were complementary in providing the overview of the current state of HRBO, DM, HP globally, HP in the U.S., communication, and related subjects, along with the academic enquiry on these areas.

It was the research strategy of linguistic analysis which led to four of the six data analysis techniques that were triangulated: template analysis, frame analysis, discourse analysis, and paradigmatic analysis. Kvale and Brinkman (2009) maintained that to execute linguistic analyses of interviews in a systematic manner, two components are needed: linguistic training and verbatim transcriptions (p. 220). The researcher has had years of linguistic training and the interview data from the study were transcribed verbatim in order to optimise the linguistic analyses. Then template analysis was conducted on these transcriptions by using a coding method.

Subsequent to template analysis, frame analysis, discourse analysis, and paradigmatic analysis were then applied to these coded interview data to provide a more holistic review of these data under the aegis of the broader research strategy of linguistic analysis. This linguistic direction was framed within the context of the document review analysis, literature review analysis, and template analysis. Thus, the research study benefitted from all these data analysis techniques supporting each other critically through the assembly of a more complete collection of analysed data.

3.8.2 Document Review Analysis

The document review analysis is based on the document review which was detailed in Chapter 2. The interpretation phase of the document review is what comprises the document review analysis itself. This phase of the document review was based on an analysis of each document with a focus on comparing and contrasting the insights that could be combined with the literature review analysis. In this research study, the document review analysis specifically yielded a critical analysis of the current statutes regarding building codes and global HP communication both in the U.S. (FEMA) and the comparative

countries of Australia, Bangladesh, and Taiwan by exploring in particular hurricane language elements.

3.8.3 Literature Review Analysis

The literature review analysis, similar to document review analysis, was based on the literature review which was detailed in Chapter 2. The interpretation phase of the literature review is what comprises the literature analysis itself. This phase of the literature review is characterised by a thorough analysis of each source from the literature assembled and the subsequent synthesis of the inferences and implications of the literature in a manner that provides a cohesive foundation for the research study and its foci (Onwuegbuzie & Frels, 2016, p. 57). In essence, the literature review analysis is the culmination of the literature review from an operational standpoint and the results of this analysis are then leveraged as part of the overall research study analysis, and conclusions of the research study. The insights gained from the literature review analysis were combined with the document review analysis for further use in the research study.

3.8.4 Frame Analysis

This study utilised a modified frame analysis approach in which the interview responses of participants was examined using exemplars (see Section 2.8.2.2). The assumption was made that timelines, impact or consequences, human interest, and conflict were all quite likely to be components of studying HP. In addition, the near-folklore status of hurricanes in Florida was assumed to reflect in familiarity with hurricane events that was leveraged to distil participant responses on HP.

3.8.5 Paradigmatic Analysis

One particular aspect of paradigmatic analysis utilised in this research study was sentence deconstruction to examine language changes in interview responses when words were substituted (see Section 2.8.2.3). Both paradigmatic analysis and frame analysis were employed in the course of analysis of the data collected via the data collection methods guided by the PEN technique (see Section 2.8.2.1). This paradigmatic transformation of substitution was used specifically to explore how various words and phrases might be substituted within sentences and how that would change the connotation of messages. The

intention was to establish language domains that are comprised of words and concepts that represent perceptions of preparedness and awareness specific to hurricanes. The substitution of words and phrases pertaining to HP language within the sociolinguistic environment of HRBO and DMP was examined for behavioural implications. This research study attempted to uncover how language usage reflects the perceptions, beliefs, opinions, and attitudes of study participants toward HP. Of particular importance in this specific research study was to explore any communication disconnect between hurricane-focused DMP and HRBO in CWF. The intersection of this dialogue is the space in which the miscommunication may have deleterious and even deadly consequences due to the violent nature of hurricanes themselves.

3.8.6 Discourse Analysis

The elementary approach of examining contextualised words, phrases, and sentences using discourse analysis was one of the most prevalent data analysis techniques used in this research study (see Section 2.8.2.4). Some stories from research study participants in CWF regarding HP were suited for further exploration in terms of their schemata. Two related areas of schemata were examined including the organisation of background knowledge and how this may result in expectations or predictive behaviour among HRBO in a HP reality. Schemata utilised by participants pertaining to HP was derived in a secondary level of discourse analysis in this research study after frame analysis and paradigmatic analysis were conducted on interview data (see Sections 2.8.2.2 and 2.8.2.3). The key words and key phrases that provide the connection of schemata to new information are also dependent on the frame of the situation (see Section 2.8.2.2). In this research study, key words and key phrases in the larger HP context were explored within specific frames to understand how they might activate specific schemata and how they led to various behavioural responses that were analysed and examined using paradigmatic analysis.

Themes within HP language usage were derived from interview responses using discourse analysis. The themes were a target for this research study to couple with exemplars, thus evidencing another example of how frame analysis and discourse analysis were used in conjunction with each other in the analysis of interview responses. This study had a specific focus on themes as these were paramount to distil from interview responses in order to

better elucidate the broader frameworks that characterised the participant insights.

3.8.7 Template Analysis

The range of data that was collected included recorded audio responses to interview questions. These recordings were transcribed such that responses to specific questions were then coded. The coding system was designed for linguistic analysis so that the words, phrases, and concepts reflected by the research study participants were able to be analysed with the data analysis techniques utilised in this study. The specific data that were coded were the primary data derived from interviews, according the four steps of coding (see Table 2.14).

For the construction step of coding, a template was created with a customised coding structure that was based on the linguistic theory frameworks of frame analysis, discourse analysis, and paradigmatic analysis as detailed in Table 3.19 below.

Table 3.19: Template Analysis – Interview Coding System

Code	Linguistic Component (corresponding Linguistic Theory)
E	Exemplar (frame analysis)
K	Schema (discourse analysis)
P	Phrase (discourse analysis)
S	Substitution (paradigmatic analysis)
T	Theme (discourse analysis)
W	Word (discourse analysis)

The second step of coding is implementation. In the first sub-step of implementation, two of the aforementioned linguistic components identified, phrase and word, comprised the *units* within the coding system that were used for analysis. Units are defined as the smallest set of textual segments (spoken or written) that would be used for analysis (Lampert & Ervin-Tripp, 1993, p. 170). The phrases and words of import were identified from the interview responses and then targeted. In the second sub-step of implementation, the other linguistic components that were given codes, substitution and exemplar were applied to the targeted

phrases and words for later data analysis use.

The third step, evaluation, was determined through the codes being representative of the entire set of linguistic components that were necessary to utilise the data analysis techniques of frame analysis and paradigmatic analysis. The adequacy of this coding was evaluated by the virtue of these codes being synthesised from the basic discourse analysis elements of phrases and words, and the paradigmatic analysis of substitution. Given the fact that analysis of known language components was the charge of this research study, the coding as aforementioned was well qualified to satisfy the requirement of the third step of evaluation. Discourse analysis is a broad area in linguistic theory and the specific codes used for phrases and words are a fraction of the amount of codes that could be used in a comprehensive discourse analysis technique application.

Finally, the fourth step of application was where the coded data insights were grouped together in order to then conduct further analysis. Since the elements of schemata and themes are more esoteric parts of discourse analysis beyond the basic contextual examination conducted on interview responses, a secondary level of analysis was conducted on this data after some of the other coding was completed in order to elucidate schemata and themes. Some language elements were isolated to highlight other language domains which were elucidated from the interview data. These language domains in turn were then broadened into themes which were well suited for the specific argumentation and conclusions that they were based upon.

3.9 Data Reliability, Replication, and Validity

One area of focus to ensure that the research study had credibility pertains to the concepts of reliability, replication, and validity. Adherence to rigour as it pertains to these concepts helped support the overall integrity of the research study.

3.9.1 Reliability

'Reliability involves the extent to which an experiment, test, or any systematic procedure yields the same results across replicated trials under identical conditions' (Allen, 2017, p. 732). In quantitative-based research studies, reliability is critical as it helps to clarify that the

methods utilised are stable. Allen (2017) further described the stability aspect of reliability in detail suggesting that it refers to the trend toward consistency in observed phenomena that are measured repeatedly (p. 732). There are however four potential issues that can threaten reliability, as detailed in Table 3.20 below.

Table 3.20: Threats to Reliability – Four Issues (Adapted from original sources: Mitchell & Jolley, 2009; Lehner, 1998; Hollenbeck, 1978)	
Participant error	This issue can occur if research study participants produce responses that do not reflect their true feelings or behaviour because their responses are inconsistent.
Participant bias	This issue can occur if research study participants alter their behaviour to help the researcher. Participants can engage in such behavioural modification to impress or thwart the efforts of the researcher.
Observer error	Basic: An observer may interpret responses in a manner that does not accurately reflect what participants are trying to convey. This could be caused by numerous factors, including an inexperienced observer, or if the design of the observation/measurement instrument is faulty.
	Drift: An observer may move their perspective from an ideal neutral base point in either a positive or negative direction.
	Decay: An observer and/or the instrument, including measurement criteria may drift beyond the boundaries of what is considered an acceptable level of measurement error.

Observer bias	An observer may have expectations regarding participant responses, which instead of being neutral, could be regarded as being high/low or consistent/inconsistent.

Roller and Lavrakas (2015) argued that skills such as building rapport and active listening that promote researchers showing interest to the participants during the interview process are critical to mitigate the potential of participants biasing the data by concocting or concealing information (p. 340). To address potential participant error or bias, active listening was engaged in and the observation of paralinguistic cues were paid special attention to in order to determine when participants may have been responding beyond the pale of what was required to answer specific questions. Participants may exhibit signs of anxiety through paralinguistic cues such as subtle changes in pitch or volume, or more obvious such as a sarcastic tone (Miller, Gayfer, & Powell, 2018, p. 27). Active listening is often used to decrease anxiety as information and explanation can convey interest in needs, concerns, and problems, and conveys empathy (Perry, Potter, & Ostendorf, 2019, p. 829). Observer and participant bias were both accounted for by an emic and reflexive approach to the research study and particularly, the interviewing process. An aspect of reflexivity which factored into the research design for this study was the intention of keeping the study as climate change agnostic as possible, in particular, in the design of its research data collection instruments as well as in the analysis. Furthermore, the prodigious use of both method and data triangulation helped to account for bias and actively support the design of the research study so as to mitigate bias. In particular, the interview questions were semi-structured in order to provide ample opportunity for research study participants to express perspectives and insights in an emic manner without the creation of closed-ended interviewing techniques that could reveal observer bias. As for drift, a vigilant level of self-awareness was maintained at all times in this research study to ensure consistency in adhering to the base point of enquiry. Finally, as far as decay was concerned, the instrument (interview guide) and the observer were cohesive and consistent, and the type and quality of data gathered were reflective of this. In sum total, by paying strong attention to these threats to reliability, the results of this study were dependable.

3.9.2 Replication

Bryman, 2012 described replication as follows: 'to assess the reliability of a measure of a concept, the procedures that constitute that measure must be replicable by someone else' (p. 47). Quantitative-focused research studies may be a bit easier in general to replicate due to the fact that the measures are numerically-bound. The conceptual measures of qualitative-focused research are heavily dependent on the analysis and the training of the researcher. In the case of this research study, the details of the entire gamut of components of the Research Onion in Figure 3.2 was expressed in as lucid terms as possible to ensure this qualitative-focused research study could be well understood and potentially replicated.

3.9.3 Validity

Validity is focused on eliciting research results that have integrity in their conclusions (Bryman, 2012, p. 47). For there to be validity in research observations or research instruments, the phenomena and variables should have the correct names and labels, and the measurements in research should find wide acceptance (Kirk & Miller, 1986, p. 21). Bryman (2012) related that there are four types of validity as detailed in Table 3.21 below.

Table 3.21: Validity – Four Types (Adapted from original source: Bryman, 2012)

Internal validity	This type of validity pertains to the question of whether a conclusion that is based on a causal relationship between two or more variables has integrity.
External validity	This type of validity pertains to the question of whether a study has results that can be generalized beyond the specific research context.
Ecological validity	This type of validity pertains to the question of whether social scientific insights are applicable to the everyday lives of people within natural social settings.

Measurement validity	This type of validity is also known as construct validity. It is generally utilised in quantitative research and is concerned with the measurement of social scientific concepts. It also examines whether a conceptually-devised measure actually reflects the concept it is intended to measure.

3.9.3.1 Internal, External, and Ecological Validity

Internal validity was achieved in this research study by gathering deep, rich data through the creation and execution of a research instrument (interview guide) with questions influenced heavily by linguistic theory. Similarly, the questions used in the questionnaire provided to the research study participants to verify the accuracy of the model were also heavily influenced by linguistic theory. Additionally, triangulation helped to ensure the credibility of these rich data. The use of the questionnaire to collect data on the model represented additional data collection triangulation and the analysis of this data represented additional data analysis triangulation. The external validity of this research study was not as important given that the study had a cross-sectional time horizon, a specific location for research study participants (CWF), and the focus was on studying HP, and not on preparedness for other types of natural hazards. Furthermore, the transferability of research findings was strictly ruled out due to guidelines stipulated by electing to utilise an abductive research approach rather than an inductive research approach: in abduction, the observations do not apply to individuals beyond those participants within the study unlike with induction. Finally, the ecological validity was achieved by the cross-sectional time horizon, the narrow selection of geographical location of CWF, and the specificity ensured by the linguistic technique-driven research design.

3.9.3.2 Measurement Validity, Accuracy, and the Most Significant Change Technique

Because of the strong emphasis on a qualitative focus in this research study, measurement validity was not utilised. However, the model which was the aim of this study, was verified for accuracy using a modified version of the Most Significant Change (MSC) technique. It

must be clarified that accuracy is not the same as validity. Accuracy examines the closeness of a measure to its expected value: having the research study participants verify that the model developed was reflective of their interview responses (Saunders et al., 2009, Bryman, 2012). The MSC technique was pre-tested as well conceptually by two DMP and two HRBO as part of the same pilot study that assessed the questionnaires (participant screeners), interview questions, and the model accuracy verification questionnaire, and determined by them to be a sound technique to use to verify the accuracy of the model (see Section 3.7). In essence, MSC is a qualitative technique that is focused on eliciting participant narrative or story-based feedback on an intervention such as a new or proposed program, initiative, or process. Participants conduct an evaluation on this intervention with a particular focus on identifying elements of the MSC due to this intervention, which they verify for accuracy and effectiveness along with the context surrounding this change (Somda et al., 2017; Serrat, 2017). A document with the model and a questionnaire was provided individually to the same 18 participants that were interviewed for this research study (see Appendix O). The intention was for these HRBO and DMP to consider what the MSC narrative would be if this Hurricane Preparedness Communication Model was utilised. The participants were given the following hypothetical scenario and then asked the two feedback questions in the questionnaire:

Imagine this Hurricane Preparedness Communication Model was implemented. Please answer the following questions:

1. *How would things change for each of these groups (HRBO, FEMA, Florida State Government, Local Governments, Academic Institutions)?*
2. *Out of all these changes, which one would be the most significant?*

There were nine participants who returned this document with their responses: six HRBO and three DMP. These responses were then analysed using MSC in order to verify the accuracy of model.

3.9.3.2.1 Rationale for the Technique Used to Verify the Model for Accuracy

The MSC technique was used within this research study, which was guided by the research philosophy of interpretivism and its pillar of symbolic interactionism: the examination of social behaviour of individuals interacting with each other and how that reflects on the

perception of meaning (see Section 3.2). Storytelling was at the core of the HP perspectives reflected by the participants in their interviews. Narrative analysis is often inherently qualitative and communication within a community environment can be judged by members of the community to be valid within a symbolic interaction context (Polkinghorne, 2007, p. 474). The use of the word *valid* is perhaps a bit generic, and the word *accurate* better describes how the MSC technique was used to evaluate the model. The research design for the questions used in the questionnaire that was given to the study participants for the model accuracy verification was guided by the PEN technique in order to elicit rich insight, story-based responses see 2.8.2.1 and 3.7.3.4).

The MSC technique was well suited to examine aspects of the participant feedback on the Hurricane Preparedness Communication Model, which was the part of the aim of this qualitative research study. Since the sample size of this research study was small (18 participants), the typical validation techniques of score- and scale-based questions were inappropriate feedback mechanisms. Score- and scale-based questions are utilised with quantitative research and when such measures are used with very small sample sizes, they result in a high margin of error. Narrative research is often an inherently qualitative exercise that derives themes from the experiences and perceptions of a small number of participants, while quantitative research is an exercise in deriving generalizations from large samples (Ford, 2011, pp. 25-26). The HP personal experiences and perceptions of participants as elucidated in narrative-laden interview responses were a major foundation for the objectives of this study (see Section 1.5).

In addition, the MSC technique offered a feedback mechanism to give research study participants the opportunity to qualitatively evaluate this communication model, which was guided from their interview responses. The interpretations of human experience depend on ‘personally reflective descriptions in ordinary language and analyses’ (Polkinghorne, 2007, p. 475). This language-based Hurricane Preparedness Communication Model was thus determined to be accurate by the research participants themselves through language-based feedback that was reflective of their evaluation.

3.10 Research Ethics and Data Protection

Ethical considerations represent another set of factors to bear in mind. Four critical areas of focus for disaster research ethics were influential in conducting a research study with high ethical standards as detailed in Table 3.22 below.

Table 3.22: Issues and Considerations in Disaster Research Ethics (Adapted from original source: Tansey et al., 2017)

Issues	Considerations
Justification for the research study	Whether the research has a value to society
	Whether the research has to be conducted in an active disaster environment or if it can be conducted at a later time
	Understanding the risks and benefits of the research
Vulnerability of the research study	Ensuring that research study participants are not re-traumatised by the research study
	Creating a research study consent process that is informative and tailored to the specific research study participants
	Understanding where various sources of vulnerability might intersect
	Being able to respond to levels of risk that could change, possibly increase
	Understanding the strengths, competencies, and weaknesses of the team
Integrity of the research study (confidentiality, safety, data security)	Ensuring that research study participants have confidentiality
	Ensuring that all research study data are secured
	Ensuring the safety of both research study participants and research study team

Community engagement of the research study	Ensuring that the community where the research study is going to be conducted is engaged in the process before the research design is developed and during the research study when it is conducted
	Seeking out new opportunities for the community to provide input to the research study

A number of the aforementioned considerations were adhered to critically. Risk/benefit considerations weighed heavily into the research design overall and the spectre of vulnerability was always kept at the forefront so as to ensure that HRBO in CWF would not relive their experiences in a way that would re-traumatise them. The researcher personally engaged with the community in CWF, as well as individuals working with DMP at FEMA, FDEM, and local (county) government levels so as to ensure that the research study would be well designed and well received once the details of it and the need for participants was revealed after the Ethical Approval had been granted by the university and the process was completed. Finally, the consent process, confidentiality, and data security were addressed through the rigorous adherence to ethical guidelines.

The multi-faceted data protection and ethics code standards that were adhered to were a strength that was emphasised in all the documents that the participants received, notably, in the Participant Consent Form (see Appendix C). These standards are elucidated in the following documents:

- UK Data Protection Act, 2018 (UK Department for Digital, Culture, Media & Sport, 2018)
- UK Research Integrity Office: Code of Practice for Research (UK Research Integrity Office, 2009)
- The University of Salford documents: Academics Ethics Policy and Data Protection Policy (University of Salford, Associate Director Research and Enterprise Division, 2017; University of Salford, Head of Information Governance, Governance Services

Unit, 2013)

- Familiar ethical issues amplified: how members of research ethics committees describe ethical distinctions between disaster and non-disaster research (Tansey et al., 2017)

These documents covered issues including anonymity, consent, data protection, and data storage.

Participants were advised of the following:

- In order to retain ultimate confidentiality, the names of participants and organisations will be anonymised into coded representations for the purpose of data analysis. There is no need for the true names of these entities to ever be revealed as part of the data analysis, thesis write-up, and any subsequent publications.
- Data and other materials from and about participants in academic activities will be collected, managed, processed, retained, stored, and disposed of, in accordance with current legislative requirements and the University Information Governance policies.

To further clarify the commitment to these standards, all data were stored in the following username and password protected location: the secure 'F' Drive, which is housed within the University of Salford IT system.

3.11 Summary

This chapter covered the research methodology portion of the research study. The research methodology was guided by the detailed, multi-layered Research Onion. This model helped in charting the path for the rationale for research philosophy, research approach, research strategy, research choice, time horizon, data collection techniques, data analysis techniques, data reliability, data replication, data validity, and research ethics and data protection.

The choice for research philosophy was interpretivism, which was coupled with the research approach of abduction. The research strategy was linguistic analysis, which in turn was coupled with a multi method qualitative research choice. The time horizon was cross-sectional, within which the triangulated research data collection techniques were all

qualitative in nature. The data collection techniques included data collection triangulation, literature review, document review, respondent-driven sampling, questionnaires (screeners), and interviews. A pilot study was conducted with two DMP and two HRBO, to improve the screeners, refine the interview questions, to confirm the recruiting targets were correct, and to ensure the technique used to evaluate the HP communication model, the aim of this study, was adequate. The sample size for the interviews for public participants that are HRBO in CWF was 12 and the sample size for the interviews of hurricane-focused DMP government participants was six. Florida was chosen as the region of the U.S. to conduct the research, with CWF being the specific part of the state of Florida for the interviews of HRBO. The research data analysis techniques included: data analysis triangulation, document review analysis, literature review analysis, frame analysis, paradigmatic analysis, discourse analysis, and template analysis.

The research study had credibility based on its conformity to acceptable standards for reliability, replication, and validity. This research study expressed its validity through internal validity and ecological validity. The research study did not use measurement validity. Instead, the MSC technique was used to guide the participant evaluation of the model to verify its accuracy. This technique was deemed appropriate during by two DMP and two HRBO during the pilot study, as aforementioned.

Research ethics and data protection were ensured in this research study through the adherence to university, UK government, and EU guidelines. The ethical objectives of this research study placed the physical and social well-being of HRBO, DMP, and general society as the top priority beyond any other considerations.

Chapter 4 – Results

4.1 Overview

This chapter details the results of the data analysis that is conducted in the research study. The demographic and experiential characteristics of the interview participants are surfaced through an accumulation of this data by tallying all of the participant screener data. This helps to provide context regarding the individuals that are interviewed. Subsequently, the responses to the interviews are focused on as the main source for the data analysis in this research study. The data analysis techniques include frame analysis, paradigmatic analysis, discourse analysis, and template analysis. To provide a more contextualised understanding of these responses, these analyses are triangulated with each other and also with the literature review analysis and document review analysis. Data analysis triangulation involves using multiple data analysis techniques in conjunction with each other to give the data more context and comparative value by examining data from multiple analytical perspectives.

The result of this overall data analysis include 10 exemplars, which refer to components within frame analysis that describe what is going on in a specific situation. These 10 exemplars are further examined with the other aforementioned data analysis techniques resulting in 27 themes. The language-rich data of the narrative-intensive questions yield themes which are both broad and deep, and are reflective of thematic saturation. These themes cover areas such as perceptions, strategies, communicational channels, internal and external LOC communication, culture, memory, interpersonal interactions within and between DMP and HRBO, and the language elements that comprise all of these areas within the broader context of HP. This analysis is ultimately conducted to achieve the objectives of the study and to provide support to the aim: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

4.2 Overview of the Participants

This research study included 18 total participants: 12 members of the public who are HRBO from CWF, and six DM government professionals from FEMA, FDEM, and local (county) EM agencies. Each of the research study participants was given a questionnaire, referred to as a

Participant Screener (see Appendix D and Appendix E), in order to gain valuable demographic and experiential information about them. This information was not gleaned for the typical purpose questionnaires serve in quantitative-based studies, but rather to augment the understanding of each participant to facilitate the qualitative, contextual aspects of the interview process, particularly in probing beyond the interview questions and then the according analysis.

4.2.1 Overview of the High-risk Building Occupants

The 12 members of the public who are HRBO and participants in this research study were comprised of an even gender distribution. This was intentional in the study to help potentially aid in the diversity of perspectives. On a general level, female participants tended toward HP responses that were more relationship-based, and male participants tended toward HP responses that were property-measure based. Study participants were screened to ensure that they were able to clearly articulate their perspectives on HP, regardless of their previous experience with hurricanes. Half of the participants were between the ages of 50-59. The study participants had a diverse mix of experience residing in Florida that was partially a result of the aforementioned age distribution. Another resultant area of balance that was achieved in the research study was that participants had an even mix of Florida hurricane experience with 3-5 participants in each grouping pertaining to the number of hurricanes experienced (Low: 0-3, Medium: 4-7, High: >8). This aided in providing a broad range of responses regarding HP. Their general hurricane experience and relative ability to communicate was gauged during the initial contact and the subsequent vetting process (invitation, information, consent, screening).

A table of the aggregated data collected from the participant screeners yielded a collective profile of HRBO as detailed in Table 4.1 below.

Table 4.1: HRBO Collective Profile

Total HRBO	12

Gender	Female	Male
	6	6

Age	30-39	40-49	50-59	60-69	70-79	80-89
	1	3	7			1

Years lived in Florida	< 10	11-20	21-30	31-40	41-50	51-60
	2	2	5	2		1

Hurricanes experienced in Florida	0	1	2	3	4	5	6	7	8	9	10	> 10
	1	1	2			1	2		1		1	3

Hurricanes experienced outside Florida	0	1	2	3	4
	7	1	3		1

4.2.2 Overview of the Disaster Management Professionals

Members of various government agencies who are DMP and were participants in this research study did not have any predetermined criteria regarding age or gender distribution. This data was still collected for consistency purposes. Three of these individuals were between the ages of 30-39, and there was one each in the age ranges of 40-49, 50-59, and 60-69. There was one female and five male participants. An alternative focus was placed on eliciting participants with a range of hurricane experience across FEMA, FDEM, and local (county) EM agencies with two representatives from each branch of government respectively, and from a balanced mix of DMP roles as elicited from the job title/occupation question in the screener (see Section 3.7.3.3). Overall, the mix of roles across federal, state, and local government representation in the participant pool provided a comprehensive DM perspective on the HP paradigm for Florida. While the screener reflected hurricane deployment, the non-deployed hurricane experience of these participants for post-hurricane activities augmented their HP knowledge bases. All of these roles as DMP reflected a great deal of HP experience due to the elevated status of the roles predicating hurricane-focused career journeys. Hurricane experience was distributed as well with participants having a mix of experience of hurricanes in Florida and in other areas of the U.S. and the world. This diverse hurricane experience resulted in these DMP as participants being able to reflect on how HP in Florida fit into the broader HP paradigm in the U.S. and

globally. Study participants were screened to ensure that they were able to clearly articulate their perspectives on HP, regardless of their previous experience with hurricanes. Their general hurricane experience and relative ability to communicate was gauged during the initial contact and the subsequent vetting process (invitation, information, consent, screening).

A table of the aggregated data collected from the participant screeners yielded a collective profile of DMP as detailed in Table 4.2 below.

Table 4.2: DMP Collective Profile

Total Government Participants	6

Age	30-39	40-49	50-59	60-69
	3	1	1	1

Gender	Female	Male
	1	5

Hurricanes deployed on in Florida	0	1	2	3	4	5	6	7	8	9	10	> 10
	1	1			2	1						1

Hurricanes deployed on outside of Florida	0	1	2	3	4	5	6	7
	3	1				1		1

4.3 Interview Data: Analysis and Insights

The following data analysis is reflective of an analysis of the interview responses of the research study participants. There were 12 HRBO and six DMP that comprised this group. Their responses to the interview questions were examined using data analysis techniques including frame analysis, paradigmatic analysis, discourse analysis, and template analysis, which in turn were triangulated with each other and with literature review analysis and document review analysis, which were conducted earlier. The template analysis included coding the participants for anonymisation and tracking purposes: 12 HRBO who are members of the public (coded 1P – 12P) and six DMP who are members of various

government agencies (coded 1G – 6G). In addition, the template analysis included coding for all of the interview responses for the linguistic analysis elements of exemplars, words, phrases, substitution, themes, and schemata that are components of the frame analysis, discourse analysis, and paradigmatic analysis. The analysis resulted in 10 exemplars. The term *exemplar* is defined as a component of frame analysis, which succinctly describes what is going on in a situation. The term *substitution* is defined as a component of paradigmatic analysis that indicates that a word or phrase may be substituted for an alternative word or phrase which could change the meaning of the containing sentence. Substitution was utilised in this analysis to provide a deeper examination of words and phrases. The term *theme* refers to the main initial point and what characterises a narrative; theme is a component of discourse analysis. The term *schema* is defined as a component of a discourse analysis regarding a type of knowledge which was examined in this study for how new information might trigger actions based on this knowledge.

These aforementioned 10 exemplars in turn were individually examined further resulting in 27 themes. The themes reflected HP in terms of perceptions, strategies, communicational channels, interpersonal interactions within and between DMP and HRBO, and the language elements that comprise all of these areas. As the interview process went on, the emergent themes became increasingly become repetitive across participants. Fusch and Ness (2015) reinforced that 'when a research study has reached that point of no new data, this is likely the point of no new themes and the point of data saturation (p. 1409). This research study was narrative-based, and due to the linguistic technique-driven collection and analysis conducted, distilling thematic-rich narratives was a predictable outcome. In addition, the use of multiple, deep linguistic techniques predicated that methodology triangulation was highly enhanced. The extensive methodology triangulation was necessary to extrapolate the data in order to attain thematic saturation from the data collection and analysis (Fusch & Ness, 2015, pp. 1411-1412). Person and space triangulation also contributed to the thematic saturation (see Table 3.13). These reasons reflect that with the language-data rich 10 exemplars and 27 themes, thematic saturation had indeed been achieved in this research study. These exemplars and themes are detailed in Table 4.3 below.

Table 4.3: Exemplars and Themes	
Exemplar	Theme
1: Perceptions Regarding High-risk Buildings Withstanding a Hurricane	1: Distrust of High-risk Building Safety Messaging
	2: Emotional Assessments of High-risk Buildings
	3: High-risk Building Elevation, Storm Surge, and Evacuation Implications
	4: High-risk Building Shelter Language Ambiguity
2: Building Code Understanding	5: Building Code Language Specificity Versus Ambiguity
3: Preparedness for a Hurricane Strike Without Warning	6: Imminent Hurricane Strikes and Preparedness Without Warning
4: Communication Channel Sources for an Impending Hurricane	7: Shortcomings in the Hurricane Communication Channels for HRBO
	8: Hurricane Communication Channel Consistency for DMP
5: Next Steps after Receiving Impending Hurricane Information	9: Post-Information Evacuation Schema
	10: Post-Information Remain Schema
	11: Post-Information Armed Home Defence Schema
	12: Post-Information FEMA Next Steps
	13: Post-Information FDEM Next Steps
	14: Post-Information Local Government Next Steps
6: Communication Receivers for Impending HP Next Steps	15: Post-Information HRBO Next Steps Communication Receivers – Mutual Support Structure
	16: Post-Information HRBO Next Steps Communication Receivers – Message Consistency and Continuity
	17: Post-Information DM Next Steps Communication Receivers – Pathway from FEMA to FDEM to Local to HRBO
7: HP Language Constructs	18: HRBO – Escape Versus Evacuation Language

	19: HRBO – Preference for Positive Emotional Rather Than Fear-based Language
	20: DMP – Prescriptive Language
8: Communication Receivers for HP Messaging	21: Most Vulnerable Groups First
	22: Audience and Channel Agnostic
	23: Social Nexuses and Interactors
9: Government and Community HP Partnerships	24: Intergovernmental Partnerships – Decentralisation, Hierarchy, and Siloes
	25: Government-Community Partnership
	26: Intercommunity Partnerships
10: In-person HP Communication	27: In-person HP Communication

These 10 exemplars and the 27 corresponding themes are reflected below.

4.3.1 Perceptions Regarding High-risk Buildings Withstanding a Hurricane

The following section examines the exemplar of perceptions of research study participants regarding high-risk buildings withstanding a hurricane. HRBO were asked a more generic question to derive responses while DMP were specifically asked for their perceptions regarding Risk Category II buildings. Selected interview responses were further analysed to derive words and phrases that were subsequently examined through frame analysis, discourse analysis, paradigmatic analysis, and document review analysis techniques. Insights were then surfaced from these analyses to support the elucidation and contextualisation of these perceptions.

4.3.1.1 Purpose of the Interview Questions

Participants who are HRBO were asked the following question: *How do feel about the place you live in withstanding a hurricane?*

The purpose of this question was to get the participants to reflect in a more open-ended manner about their physical dwellings if the buildings were to face a hurricane.

Members of various government agencies who are DMP were asked a more specific question: *What are your thoughts about Risk Category II buildings withstanding a hurricane?*

The purpose of this question was to get a highly targeted response from DMP on the specific virtues and challenges of Risk Category II buildings facing a hurricane. The question also explored the level of awareness that DMP might have regarding the specificity SFG applies to designating Risk Category II buildings.

4.3.1.1.1 Exemplar 1: Perceptions Regarding High-risk Buildings Withstanding a Hurricane

Both of these questions, as posed to HRBO and DMP, were collectively regarded as mechanisms to elicit responses within the context of frame analysis that would be exemplars of high-risk building hurricane withstanding perceptions.

4.3.1.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in a number of themes that are further elucidated below. The nature of these questions (*How do feel about the place you live in withstanding a hurricane?* and *What are your thoughts about Risk Category II buildings withstanding a hurricane?*) predicated that frame analysis, paradigmatic analysis, and discourse analysis were utilised.

4.3.1.2.1 Theme 1: Distrust of High-risk Building Safety Messaging

A request to help further clarify the response to the question (*How do feel about the place you live in withstanding a hurricane?*) which arose during the interview of one the HRBO (participant 2P) was as follows:

> ***Because there's a basement, and (with) hurricanes, a lot of time there's tornados, and (they) tell you (that you) are much <u>safer in myth</u>.***

The use of the phrase *safer in myth* was examined in paradigmatic analysis through a substitution comparison with other potential phrases as follows:

> Since tornadoes can strike during hurricanes you are **safer in myth** in a basement.
> Since tornadoes can strike during hurricanes you are **safer generally** in a basement.
> Since tornadoes can strike during hurricanes you are **safer** in a basement.

The phrase *safer in myth* illustrates the element of distrust in HP messaging in any advice that argues that basements are actually safer to go to during tornadoes that occur because of hurricane activity. The sample comparative substitutions of *safer generally* and *safer* were offered as examples that could render the altered statement with progressively lower levels of risk. The implications of the *safer in myth* phrase used by participant 2P reflected a deeper issue: that of distrust with the HP messaging that would suggest that the basement was safer to go to than another part of the building for HRBO. This lack of trust could also indicate a decoding issue caused by sender-centric communication, which is biased towards internal LOC communication (see Section 2.8.1.2). The reason for doubting such messaging was stated by participant 2P as follows:

> ***I know it's near the beach, which is dangerous in and of itself because of the storm surge.***

Members of the public who are HRBO that face potential tornadic activity during a hurricane event may be stuck with the choice of protecting themselves from the wind effects of a tornado in a basement and then face potential flooding from hurricane-induced storm surge. Clarification language regarding safety on a comparative basis gauging tornadic risk versus the risk from a hurricane is at the crux of this issue. In terms of safety being regarded as a myth, clearly myths tell a story, but they do not always reflect facts since story elements may be completely false (Badcock, 2015, pp. 25, 52). Similarly, preparedness strategies for the purpose of safety propounded by DMP may be in jeopardy of being doubted by the public due to perceptions based on anecdotal experience of HRBO having to choose between wind versus flooding risks. This anecdotal experience could reflect shared memories and active remembering (see Section 2.8.1.4). In the case of the choice between facing wind risk versus flooding risk as reflected by participant 2P, such scepticism appears to be warranted according to the participant response. Communication gaps such as conflicting preparedness advice and false alarms could reduce the levels of trust the public has in DMP (Powell & O'Hair, 2008). Myth and distrust are unlikely to be concepts that DMP

would hope to inculcate in the public they are working so diligently to protect.

4.3.1.2.2 Theme 2: Emotional Assessments of High-risk Buildings

Selected interview responses from participants who are HRBO also included emotionally-laden words such as *comfortable,* which appeared three times, and *concerned*, *dangerous*, *dark*, *hopeless*, and *sad*. Anxiety during extreme weather situations may reflect how much the public trusts weather information that emanates from the authorities (Powell & O'Hair, 2008). Emotional language does not appear in Table 2.6: FEMA – HP Guidelines for the Public. A response to the question (*How do feel about the place you live in withstanding a hurricane?*) which arose during the interview of one of the HRBO (participant 7P) was as follows:

> ***We live in a house that's only about four years old, so for the most part, barring the complete doomsday kind of hurricane, we're very <u>comfortable</u> where we're at.***

The use of the word *comfortable* was examined in paradigmatic analysis through a substitution comparison with another potential phrase as follows:

> We are **comfortable** where we are.
> We are **safe** where we are.

Due to the context of participant 7P comparing the age of the house versus the intensity of a potential hurricane, it is inferred that building integrity is what is being alluded to as an unstated factor that contributes to comfort. However, risk communication is generally focused on hazard-based preparedness behavioural guidance and not focused on the emotional components that could influence how the public perceives risks (Höppner et al., 2010, p. 84). Hurricane realties may foist upon the public the potential for creating false equivalencies between emotions such as comfort and more empirical high-risk building assessments such as safety. The use of negative emotional language however is extant in the documentation of HP messaging. Impact-based messaging has not been disambiguated from fear-appeal messaging in DM, as evidenced by the research literature pertaining to risk communication and meteorology (Morss et al., 2018, p. 46). Acknowledgement of the potential need for positive emotional language in HP is paramount even in the course of

creating rigorous communication, which addresses the consistent need to support the proactive behaviour of HRBO.

4.3.1.2.3 Theme 3: High-risk Building Elevation, Storm Surge, and Evacuation Implications

A request to help further clarify the response to the question (*What are your thoughts about Risk Category II buildings withstanding a hurricane?*) arose during the interview of one of the DMP (participant 3G):

> ***Storm surge is a big deal, so elevation would be the first one (factor to consider).***

Elevation and storm surge are not specifically mentioned in Table 2.6: FEMA – HP Guidelines for the Public. Thus, HRBO in the U.S. do not have any overt messaging guiding them to consider the factors of elevation and storm surge. However, this language does exist in Table 2.9: Australia – Example of a HP Plan:

> ***In case of a storm surge/tide warning, or other flooding, know your nearest safe high ground and the safest access route to it.***

This preparedness messaging is actually conveyed in the Before Hurricane Season section of the plan. Paradigmatic analysis is unnecessary in order to examine how HRBO could benefit from such proactive messaging that is specific to storm surge/tide warning or flood warning. In particular, the suggestion that members of the public should be aware of the access route to the safest high ground provides specificity beyond Table 2.6: FEMA – HP Guidelines for the Public, which suggests generically: 'Review your evacuation zone, evacuation route and shelter locations' (FEMA, 2018b).

However, this suggestion is conveyed in the When a Hurricane is 36 Hours from Arriving section of the FEMA plan, which is inherently far less time from a preparedness standpoint than the Australia plan. Participant 3G, who suggested elevation as a critical consideration factor, was thus going beyond the FEMA preparedness messaging. SFG has designated evacuation zones as illustrated in Figure 4.1 below.

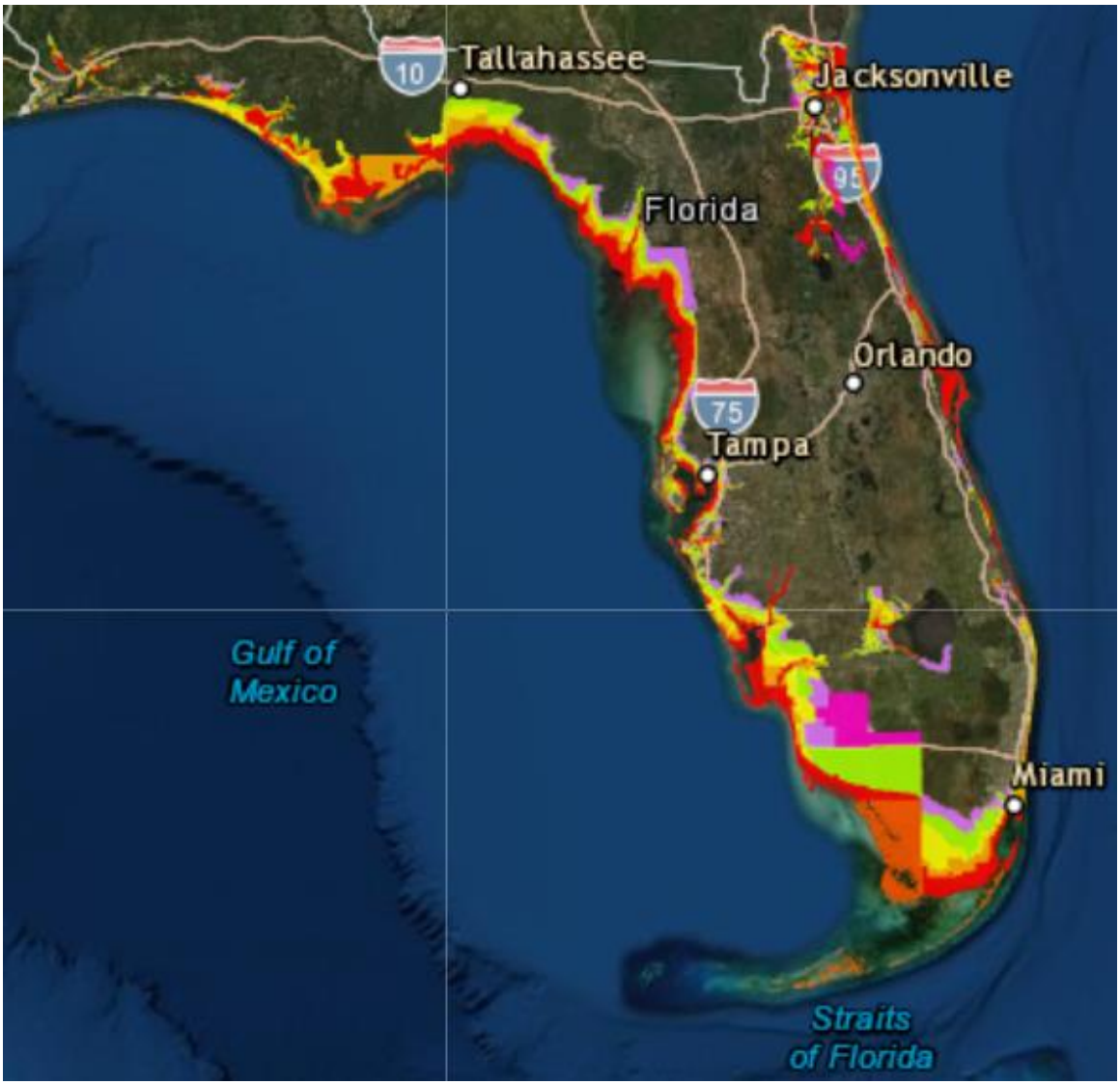

Figure 4.1: Florida – Hurricane Evacuation Zones (Source: Florida Division of Emergency Management, 2019c)

The colour coding in Figure 4.1 is indicative of separate evacuation zones. As a point of clarification, FEMA does not provide overt hurricane evacuation zone information. Evacuation zoning is governed by the state and local government bodies. The lack of centralised information puts the onus of understanding a potentially nebulous evacuation data environment on HRBO to scramble and figure out evacuation specifics for 36 hours prior to a storm striking. Thus, the tenet of proactivity imbued in preparedness itself remains elusive for HRBO.

4.3.1.2.4 Theme 4: High-risk Building Shelter Language Ambiguity

Another of the DMP (participant 4G) conveyed that one aspect of how a Risk Category II building would withstand a hurricane was also characterised by the necessity of any HRBO needing to protect themselves within the building as evidenced by the following interview response:

> ***(Consider) what can you do to at least put yourself in a very safe situation: you hunker down, ride out the storm.***

The use of the phrase *hunker down* was examined in paradigmatic analysis through a substitution comparison with another potential phrase as follows:

> If you remain in your home, **hunker down** and ride out the storm.
>
> If you remain in your home, **find a safe place** and ride out the storm.

The phrase *hunker down* may not be as specific as possible. The perception of risk may not be well understood by the public, thus necessitating that the use of various language elements needs to be carefully considered (Wilkins, 2012, p. 123). By substituting the phrase *find a safe place* instead, simpler and focused language may be allowed to support preparedness messaging that could be more predictable for DMP. However, it remains to be seen as to whether phrases such as *hunker down* would be common in the language usage of HRBO. The use of this phrase appears to be an example of internal LOC communication (see Section 2.8.1.2).

4.3.2 Understanding of Building Codes

The following section examines the exemplar of the perceptions of research study participants regarding building codes. While HRBO were asked a more generic question to derive responses, DMP were specifically asked for their perceptions regarding Risk Category II buildings. Selected interview responses were further analysed to derive words and phrases that were subsequently examined through frame analysis, paradigmatic analysis, discourse analysis, and document review analysis. Insights were then surfaced from these analyses to support the elucidation and contextualisation of these perceptions.

4.3.2.1 Purpose of the Interview Questions

The following question was asked to HRBO: *What do you know about the building codes of your home?*

The purpose of this question was to get the participants to reflect in a more open-ended manner about their background knowledge of building codes and how they obtained this knowledge.

Members of various government agencies who are DMP were asked a more specific question: *How do you communicate with Risk Category II building occupants about the building codes of their homes?*

The purpose of this question was to get a highly targeted response from DMP on the specific language-based elements of Risk Category II building code communication.

4.3.2.1.1 Exemplar 2: Building Code Understanding

Both of these questions, as posed to HRBO and DMP, were collectively regarded as mechanisms designed to elicit responses within the context of frame analysis that were exemplars of building code understanding.

4.3.2.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in a number of themes that are further elucidated below. The nature of these questions (*What do you know about the building codes of your home?* and *How do you communicate with Risk Category II building occupants about the building codes of their homes?*) predicated that frame analysis, paradigmatic analysis, and discourse analysis were utilised.

4.3.2.2.1 Theme 5: Building Code Language Specificity Versus Ambiguity

When asked the question (*What do you know about the building codes of your home?*), one of the HRBO (participant 1P) remarked that the following building code information would be potentially more helpful than what is currently conveyed:

> ***I would probably want to hear it is <u>Category 5</u> compliant.***

The use of the phrase *Category 5* was examined in paradigmatic analysis through a substitution comparison with another potential phrase as follows:

I would probably want to hear it is **Category 5** compliant.

I would probably want to hear it is **160 mph** (257 km/h) compliant.

A Category 5 hurricane has a minimum wind speed of 157 mph (252 km/h) (see Appendix H). Building code compliance was designated by SFG for ultimate design wind speed of V_{ult} for a minimum of 160 mph (257 km/h) (see Table 2.12), which is being substituted in the above paradigmatic analysis for comparative purpose. What this substitution illustrates is that members of the public may be more used to the category of hurricanes being conveyed in HP messaging. This reflects an example of preferred message construction for easier decoding, a hallmark of external LOC communication (see Section 2.8.1.2). Building code standards that are wind speed-based may not be as easily understood. As elucidated in Section 1.2, there may be confusion regarding the geographically-based nomenclature pertaining to the wind speed definitions of hurricane categories worldwide (Huddart & Stott, 2019, p. 78). At the same time, building code statutes from SFG, and worldwide, are specified in wind speed. This is contrasted with hurricane messaging in the U.S., which is often conveyed in terms of categories of storms. Thus, DMP conveying building code messaging in the specific terms of hurricane categories rather than wind speeds might be better understood by the inherently vulnerable audience of HRBO attempting to understand a potentially ambiguous factor of wind speed-based building codes.

The potential for building code messaging ambiguity was further expressed during the interviews of both HRBO and DMP in this research study. In reflecting on building codes in the dwelling, one of the HRBO (participant 2P) stated:

I'm assuming they're <u>up to code</u> because I pay rent to my – to a legitimate company.

The use of the phrase *up to code* was examined in paradigmatic analysis through substitution comparisons using various phrases gathered in other interviews with research study participants:

I am assuming it's built **up to code**.

I am assuming it's built **to code**.

I am assuming it's built **to standard**.

The semantic differences in these substitutions may be minimal, particularly the comparison of *up to code* with *to code*. However, it remains to be seen if *up to code* is truly a semantic equivalent of *to code*. A stronger case can be made that there may be semantic differences between *to code* and *to standard*. Of note in this example is the potential for ambiguity as to what constitutes a *code* versus a *standard*. While these terms could mean exactly the same thing, they are not the same words. Ambiguity in such messaging may reflect internal LOC communication (see Section 2.8.1.2). The standardisation of words and reduction of synonyms and maintaining such use to a minimum may be useful in helping to avoid ambiguity in communication (Gromann & Schnitzer, 2017, p. 556). The assertion is that the use of one or the other may be misleading or confusing and that in general if these two words do not have the same meaning, it might have behavioural consequences such as HRBO making or not making the correct or well-informed decisions regarding the high-risk buildings they reside in.

A language element related to building codes that was common during the interviews to both HRBO and DMP pertained to inspections. An example was evidenced in the following response offered by one of the HRBO (participant 6P):

> ***Oh, wind mitigation is probably one of most interesting ones (building code related issues) now.***

Part of the Uniformed Wind Mitigation Inspection from SFG is a verification that the building codes have been adhered to such that the structural and non-structural features of the building are strong enough to reduce the possibility of damage from high wind events (Florida Office of Insurance Regulation, 2019). Yet, *mitigation* is a word that could be a bit vague for HRBO. The use of the phrase *wind mitigation* was examined in paradigmatic analysis through substitution comparisons:

An important aspect of building codes is **wind mitigation**.

An important aspect of building codes is **water resistance**.

An important aspect of building codes is **wind resistance**.

The phrase *water resistance* was used for comparative purpose in this exercise. The logic behind this is the premise that physical objects are routinely rendered water resistant for numerous situations. The phrase *wind resistance* was illustrated to make the case that there is a possibility that *wind resistance* could be used as a potential phrase instead of *wind mitigation*. The words *resistance* and *mitigation* necessarily have different meanings, however. The case is made that the word *resistance* is more likely to be used by members of the public due to the aforementioned common usage of the phrase *water resistance* than the word *mitigation*. The main insight here is that the concept of mitigation itself may be ambiguous to HRBO and the importance of wind mitigation in the building codes could be an area of language that requires greater specificity, explanation, and usage consistency within a HP messaging context. The spectre of internal LOC communication and potential decoding issues is possible (see Section 2.8.1.2).

Along similar lines in the realm of DM language is perhaps a more esoteric linguistic debate between what constitutes a *hazard* versus what constitutes a *disaster* (see Section 1.2). The following statement made by one of the DMP (participant 6G) illustrated some word usage:

> ***Building codes have to conform to certain standards that are dependent upon the risks and hazards defined by FEMA and other organizations.***

The use of the word *hazard* was examined in paradigmatic analysis through substitution comparisons:

> *Building codes are dependent on the definitions of* ***hazards****.*
> *Building codes are dependent on the definitions of* ***disasters****.*

An argument in this research study is that the difference between the concept of *hazards* and the concept of *disasters* is a semantic distinction that is reflected in the stark reality of loss in the physical and social environments. Table 2.6: FEMA – HP Guidelines for the Public conveys the following: 'Remember that during disasters, sending text messages is usually reliable and faster than making phone calls because phone lines are often overloaded' (FEMA, 2018b).

Yet, prior to a hazard becoming a disaster, communication as part of preparation is often

paramount for the *pre-hazard* time period. Thus, the case is made that building codes may also be based on the definition of *disaster*s in addition to the definition of *hazards*. Rather than debate what constitutes hazard preparedness versus disaster preparedness, a simple assertion is that potential ambiguity exists within the DM field regarding the words *hazard* and *disaster* that reflects on building codes and by default, the perceptions of building code language by HRBO as well.

A further point regarding building codes is that mention of them is absent from U.S. HP plans, specifically as detailed in Table 2.6: FEMA – HP Guidelines for the Public. This is in contrast to Australia as detailed in Table 2.9: Australia – Example of a HP Plan. The lack of building code language in U.S. HP plans is a critical communication gap that certainly affords no extra support to HRBO to even consider the importance of buildings codes in the HP paradigm.

4.3.3 Preparedness for a Hurricane Strike without Warning

The following section examines the exemplar of the perceptions of research study participants regarding preparedness in the event that a hurricane could strike without warning. The same question was posed to HRBO and DMP and designed to elicit the first word that might occur to them if such an unpredicted situation were to arise. The words and phrases from interview responses were further analysed with frame and discourse analysis. Insights were then surfaced from these analyses to support the elucidation and contextualisation of these perceptions.

4.3.3.1 Purpose of the Interview Question

The same question was posed to HRBO and DMP: *Imagine a hurricane is going to hit without warning. What is the first word that comes to mind?*

The purpose of this question was to evoke a top-of-mind, immediate response to a question that was designed to challenge the notion of preparedness and a priori HP language knowledge. Furthermore, given the typical advance notice of hurricanes striking populated areas, this question acted as an elicitation mechanism to examine perceptions regarding consistent preparation that was irrespective of hurricane seasons and reactive behaviour to

hurricane activity that might be unprecedented and imminent. In short, the essence of warning was challenged to try and evoke deeper reflection on the part of the research study participants as to the consequences of an environment that may be devoid of either physical or mental preparedness for a hurricane strike.

4.3.3.1.1 Exemplar 3: Preparedness for a Hurricane Strike Without Warning

Ultimately, this question was regarded as a mechanism to elicit a response type that would be regarded within the context of frame analysis as an exemplar of preparedness for a hurricane strike without warning.

4.3.3.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in a number of themes that are further elucidated below. The nature of this question (*Imagine a hurricane is going to hit without warning. What is the first word that comes to mind?)* predicated that frame analysis and discourse analysis were utilised without the unnecessary step of paradigmatic analysis, due to need to document fundamental HP impacts through the use of a generally impossible hypothetical scenario as an elicitation mechanism, and not how any of the words or phrases participants expressed might have functioned in a substitution exercise. The elemental nature of this specific question (*Imagine a hurricane is going to hit without warning. What is the first word that comes to mind?*) elicited words and phrases from research study participants during interviews that were both emotional and practical responses to a hurricane environment that could be foisted on them hypothetically sans warning. While evacuation, protection, safety, and rapid preparation characterised the practical responses, the emotional responses were indicative of shock and fear.

4.3.3.2.1 Theme 6: Imminent Hurricane Strikes and Preparedness Without Warning

In support of the rationale behind the evocative mechanism within this interview question (the essential nature of warning being non-existent) one of the DMP (participant 4G) remarked about the possibility of such a phenomenon:

> ***I would say rapidly and, I guess, intensifying, you know, that's something that we've discussed in the meteorological world.***

The possibility of rapidly intensifying hurricanes certainly exists. This may not be scientifically defined as *without warning*. However, members of the public who have not maintained a preparedness state of readiness and may not have kept up-to-date on weather forecasts may get *surprised* by a rapidly formed hurricane, thus creating from their perspective a de facto hurricane that could strike *without warning*. Furthermore, in perhaps a more common case, if HRBO receive a hurricane message that conveys a *hurricane warning* (conditions are expected or imminent) and conflate this with a *hurricane watch* (conditions are possible), then they may not take the appropriate steps (Powell & O'Hair, 2008). This is another example of what could arguably be construed as a veritable hurricane that could strike *without warning*.

There were a number of responses by research study participants to this question that reflected that they believed a hurricane strike without warning was simply impossible. An example of this was conveyed by one of the HRBO (participant 6P) who stated:

> ***We got too much technology in place that tells us what our weather patterns are doing far in advance of that actually occurring.***

While this statement could generally be regarded as being unassailable, at least one case bears scrutiny: the strike on Florida of Hurricane Michael in October 2018, which in the span of three days went from a low pressure system to a monster Category 5 hurricane (see Appendix H), the strongest level of hurricanes. Furthermore, Hurricane Michael pounded an area of Florida which had never experienced a hurricane of this intensity, as evidenced in Figure 4.2 below.

Figure 4.2: Florida – Hurricane Michael Damage, Mexico Beach (Source: NBC News, 2019)

The storm devastated the city of Mexico Beach, Florida. Hurricane Michael can be regarded in an idiomatic manner as a *surprise hurricane* and a *perfect storm* (Barnett, 2019, p. xv). Hurricane Michael was an example of a hurricane that did strike *without warning* in a sense. The utilisation of technology to convey weather warnings also includes communication channels by default, which could be a source of the messaging disconnects (see Section 2.8.1.1).

Another one of the HRBO (participant 7P) remarked similarly about the unlikelihood of a surprise hurricane:

> ***I don't foresee a situation where a hurricane was to surprise me.***

However, participant 7P stated later in the interview regarding previous hurricane experience:

> ***The thing that that most struck me having gone through these storms is how quick***

the society breaks down in a storm.

It is for this aforementioned reason that the urgency of HP necessitated this specific interview question in order to elicit such responses. As stated by one of the DMP (participant 5G):

Anytime that something comes without warning, I mean it's some protection is always better than no protection.

In the course of this research study examining HP language, it was clear from all the responses to this question, whether hurricane strikes without warning were deemed realistic or not, that HP was far too critical to ever ignore. When posed with the question about a hurricane striking without warning, despite the doubts conveyed that this could ever occur, the contextualised responses participants offered around what might transpire should such an unlikely event ever become reality reflected that active remembering of other hurricane events supported detailed perspectives supporting speculation of the possibility (see Section 2.8.1.4).

4.3.4 Communication Channel Sources for an Impending Hurricane Strike

The following section examines the exemplar of the communication channel sources that research study participants would utilise in the event that a hurricane was forecast to strike. The questions asked in this section reflect some of the topics discussed earlier regarding communication channels (see Section 2.8.1.1). While HRBO were asked about their main information sources for hurricanes forecast to hit the areas they live in, DMP were asked a slightly similar question, with the exception being that it pertained specifically to the areas of focus specific to their work as government employees. The communication channels identified during the interview responses were further analysed along with statements some of the participants made through frame and discourse analysis. Insights were then surfaced from these analyses to support the elucidation and contextualisation of these communication channels, particularly highlighting their diversity, specificity, and implications for HP messaging.

4.3.4.1 Purpose of the Interview Questions

The following question was posed to HRBO: *What is your main source of information when a hurricane is really forecast to hit your area?*

The purpose of this question was to better understand the types of communication channels HRBO utilised when a hurricane was truly forecast to affect the areas that they live in. At a minimum, this question was designed to examine communication channel and according messaging diversity, which may play a part in preparedness.

Members of various government agencies who are DMP were asked the following question: *What is the main source of information you use to find out about when a hurricane is really forecast to hit your area of focus?*

The purpose of this question was to better understand the types of communication channels DMP utilised when a hurricane was truly forecast to affect the areas that fell under their foci as government employees. Similar to the HRBO, the question was designed to examine communication channel and messaging diversity and if there were preparedness messaging implications that varied accordingly.

4.3.4.1.1 Exemplar 4: Communication Channel Sources for an Impending Hurricane

Ultimately, both of these questions were designed to elicit responses, which in turn were regarded within the context of frame analysis as exemplars of communicational channel sources for an impending hurricane.

4.3.4.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in a number of themes that are elucidated below. The nature of these questions (*What is your main source of information when a hurricane is really forecast to hit your area?* and *What is the main source of information you use to find out about when a hurricane is really forecast to hit your area of focus?)* predicated that frame analysis and discourse analysis were utilised without the unnecessary step of paradigmatic analysis due to need to document the elemental difference in communication channels as basic sources and preparedness

messaging impacts, and not how any of the words or phrases functioned in a substitution exercise.

4.3.4.2.1 Theme 7: Shortcomings in Hurricane Communication Channels for High-risk Building Occupants

An overt finding in this research study was that 10 out of 12 of the HRBO conveyed that local television stations were some of the main sources of information when a hurricane was forecast to strike their areas. There was not a consensus on the quality of this information source, thus reflecting the possibility of communication designed with a sender-centric, internal LOC bias (see Section 2.8.1.2). One of the HRBO (participant 7P) remarked positively:

> ***Most of the local media stops with routine programming and they go pretty much into to non-stop hurricane mode, so you get a mix of not only weather, but you get the local information you need from the different entities where you can go, what you can do, when things will close.***

In sharp contrast to this, there were intimations of local television stations exaggerating hurricane impacts, such as the following statement by one of the HRBO (participant 2P):

> ***Sometimes it's hard to tell if there's a sensationalistic slant to the information or, is it really as dangerous as they say?***

The cable television Weather Channel was described as an alternative source for hurricane information by four of the participants that were HRBO. Additionally, when media information sources were either regarded as dubious or insufficient, some participants utilised the traditional information source of experiential human intelligence, as elucidated by one of the HRBO (participant 6P):

> ***Equally as important as you know (is) anybody that's currently experiencing or has experienced the passing of the same storm, somebody geographically impacted already.***

The urgency of such information was also highlighted by one of the HRBO (participant 10P):

> ***They're watching the news; they're watching their freaking cell phones—***

> ***everybody is on, you know—'cause we need to know immediately what we need to do—because it (hurricane) can change from a (Category) 1 to a (Category) 4 whatever so quickly that usually word of mouth, honestly is the best.***

At the same time, the consistency of utilising hurricane impact information from human sources was not regarded as comprehensively sound, as evidenced by the response of one of the HRBO (participant 2P):

> ***You can't really go by word-of-mouth because every brain has different ideas about what's going on.***

Thus, it appears that a combination of information sources is required for HRBO to triangulate their own data in order to determine what they believe to be a more accurate understanding of the hurricane risk at hand.

4.3.4.2.2 Theme 8: Hurricane Communication Channel Consistency for Disaster Management Professionals

The responses from DMP were generally different than HRBO regarding the main sources for hurricane information when a storm was forecast to hit their areas of focus. All six DMP conveyed that both NWS and NHC were the main sources for this information. To delineate: NWS was perceived to be more useful in providing an understanding of localised weather impacts and NHC was perceived to be more useful in providing an understanding of more scientific, hurricane-based data. In support of this latter distinction regarding NHC, one of the HRBO (participant 7P) remarked thus:

> ***The National Hurricane stuff tends to be very storm-centric. They're not focused on the local types of things that you need to be doing as far as road closures, school closures, where are shelters, those sorts of things.***

This statement by participant 7P also highlighted part of the reason that the local television stations were generally regarded by HRBO as the main information sources for impending hurricane strikes: relevant, actionable information at a community-level that could be utilised by HRBO to make preparedness decisions. These are hallmarks of recipient-centric, external LOC communication (see Section 2.8.1.2).

However, the messaging utilised by these local television stations was not regarded as being either universally consistent or comprehensible. One of the HRBO (participant 2P) recalled that the phrase *hunker down* was used by the local television stations, and this was conveyed by one of the DMP (participant 4G) in reference to the perceptions of high-risk buildings elucidated in an earlier question. Another one of the HRBO (participant 10P) went into further detail critiquing the use of this phrase:

> ***They (local television stations) always say the same thing—hunker down, but no one can ever quite understand what it really means, but that's what they always say—hunker down. What does hunker down mean? A lot of people laugh at that because it doesn't really give you very specific information.***

Unfortunately, HRBO may be at the mercy of local television stations for critical hurricane impact information that is specific and relevant to their local area but potentially conveyed with highly variable messaging. In contrast, DMP are able to rely on resources such as NWS and NHC that appear to have consistent and well-organised information and messaging, as evidenced by the response of one of the DMP (participant 5G):

> ***The National Weather Service does a much better job (than local television stations) of keeping it (messaging) all the same so everybody is talking the same language and they all know that we're talking about the same thing.***

The literature supports this finding, as evidenced by Goldsmith, Sharp, Santos, Ricks, and Moreland (2016) who delineated that NWS is relied upon for weather information and NHC is the source for hurricane wind probability and storm surge forecasts (p. 3). From a hurricane information source standpoint, FDEM plays a critical role as a bridge between FEMA and the local governments when a hurricane is bearing down on any area of the state of Florida. One of the DMP (participant 4G) emphasised the following:

> ***We certainly would be using the same phrases that the National Hurricane Center puts out. What can we do to put it into just very normal plain language to the citizens, you know, hey, this is what it means. Larger counties sometimes get more (national news) coverage than smaller counties. But if we can reconvey that information (the situation in smaller counties) through our press conference, through our outlets, through our social media, that really helps amplify and get***

> ***people to focus on what the situation is at the local level. All disasters are local, but we have a job at the state levels to help amplify that message.***

It was clear from responses from HRBO and DMP regarding information sources for hurricanes and their impending impact that regardless of messaging inconsistencies, that the local television stations played a critical role in conveying vital localised information to communities. Additionally, FDEM was able to help channel important information from FEMA to communities and to ensure that there is consistent focus across all counties. Finally, FEMA itself could be regarded as a de facto information source that was a HP data progenitor for FDEM and local governments, due to FEMA being on the front-end in leveraging NWS and NHC data, and then providing guidance.

Another group of information sources utilised by DMP are academic institutions, generally universities with weather faculties, researchers, and students that formally monitor hurricane data and conduct numerous studies and analyses of these data. One of the DMP (participant 1G) provided details about three of these information sources as follows:

> ***The University of Texas has a good emergency management project. I know Texas has it – so they've done some modelling of storms. University of Delaware has come up with some excellent research. They have studied storms and behaviours of people in the past. LSU (Louisiana State University) is another one that's done some very good studies in terms of water and storms.***

Participant 1G also mentioned Colorado University as an information source. Together, these universities are examples of academic institutions that contribute to the data that DMP use for their endeavours including HP messaging.

What remains a powerful information source conveyed by HRBO during interviews that is not formalised into any customised, dedicated communication channel is the human intelligence resource of people communicating with each other about current, imminent, or impending hurricane impacts. It is this unformalised, yet traditional method of inter-personal communication which highlighted an important area of focus for the aim of this research study: to develop a model for hurricane-focused DMP that informs social-centric

HP communication that is tailored to HRBO, and verify its accuracy.

4.3.5 Next Steps after Receiving Impending Hurricane Information

The following section examines the exemplar of the next steps that research study participants would engage in as a result of receiving information that a hurricane was forecast to strike. Members of the public who are HRBO had responses which were more aligned to their requisite tasks of preparedness. Alternatively, DMP had responses which were more aligned to the tasks that their respective agencies across FEMA, FDEM, and local (county) governments had to engage in to support each other and the public in their HP efforts. The steps identified during the interview responses were further analysed along with statements some of the participants made, and subsequently examined through frame and discourse analysis. Insights were then surfaced from these analyses to support the rationale of these steps. There was a particular focus on the differences and relationships between next steps for HRBO and DMP.

4.3.5.1 Purpose of the Interview Question

The following question was posed to both HRBO and DMP: *What are the next steps you take once you find out this information?*

The purpose of this question was to better understand the next steps HRBO and DMP engaged in after they received the information that a hurricane was truly forecast to affect the areas that they lived in or their areas of work focus respectively. This question had the intention of examining how the information received would comprise new knowledge and what behavioural consequences there might be thereof.

4.3.5.1.1 Exemplar 5: Next Steps after Receiving Impending Hurricane Information

Ultimately, this question was designed to elicit responses, which in turn were regarded within the context of frame analysis as an exemplars of post-information preparedness next steps for an impending hurricane.

4.3.5.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in

a number of themes that are further elucidated below. This question (*What are the next steps you take once you find out this information?*) predicated that frame analysis and discourse analysis were utilised without the unnecessary step of paradigmatic analysis. This was due to need to document the steps themselves, compile them, examine them critically looking for details and comparisons between the next steps of HRBO and DMP, and not to examine how any of the words or phrases in these steps functioned in a substitution exercise.

4.3.5.2.1 Theme 9: Post-Information Evacuation Schema

One of the HRBO (participant 3P) remarked that the next steps taken would be as follows:

> ***If I think I'm in a hurricane (strike) area, then I'm going to make an evacuation plan. If I think I'm safe or in a tropical storm band (affected area), then I'm gonna button my house down, make sure I have plenty of food and water in the house that'll last for a few days and go through it.***

This type of response was reflected by many of the HRBO. Responses regarding evacuation were fairly consistent and involved coordinating with family and friends, collecting essentials, and finding the right evacuation route. The evacuation steps could be referred to using discourse analysis as an *evacuation schema* that emanated from an extant baseline of evacuation knowledge that HRBO had, that when triggered by the new knowledge of hurricane information would predicate evacuation.

4.3.5.2.2 Theme 10: Post-Information Remain Schema

For those not evacuating, this could be referred to using discourse analysis as a *remain schema*: a baseline of knowledge that HRBO had that when triggered by the new knowledge of hurricane information would predicate that there was no need to evacuate but to instead fortify their physical living environment, obtain any last minute supplies that were not in sufficient quantity, and prepare to wait out the storm in the dwelling. Water was one of the main supplies that needed to be obtained in a remain schema, as evidenced by the response from one of the HRBO (participant 9P):

> ***The one thing you have to have is water, you can go without food, but you have to have water for drinking, for cleaning, for whatever.***

This response was reflective of past experience and learned behaviour, thus evidencing active remembering (see Section 2.8.1.4). Petrol (*gas/gasoline* in the U.S.) was the other essential for a remain schema that a number of participants highlighted, as reflected by one of the HRBO (participant 12P):

> ***And then it's gas man, honest, it's an insanity for gasoline, when you think about getting gas, one gas can is not even enough to run a generator for half a day, so, you know, you need just simple things you won't think about – you need 4 or 5 gas cans to get you through a few days.***

Adequate petrol was deemed critical for those evacuating to ensure vehicles could endure potentially lengthy journeys where petrol was not available. For those remaining, petrol was equally important, to ensure that generators could be utilised to maintain electricity, or to top off vehicles in case sudden mandatory evacuation orders were issued.

4.3.5.2.3 Theme 11: Post-Information Armed Home Defence Schema

An additional insight that was related to the remain schema was reflected by one of the the HRBO (participant 8P) in elucidating the following:

> ***(I'm also) preparing to defend myself in case there's looters.***

This subset of the remain schema, using discourse analysis, could be referred to as the *armed home defence schema*. The spectre of criminality has often appeared during hurricane events in the U.S. and this brazen behaviour of looting has been well documented by television media in the aftermath of these storms (see Section 2.6.2.1). Organisations such as the Society of Professional Journalists grapple with issues in citizen journalism such as blogs, which actually encourage looting in disaster environments (Steffens, 2012, p. 108). Tragic video of scores of looters ransacking stores and homes and countless stories of this type reflect a nightmarish social characteristic of disaster that caused one of the HRBO (participant 8P) to activate the armed home defence schema once hurricane information predicated that remaining rather than evacuating was the right decision. Palpable fear was evidenced by another of the HRBO (participant 4P) in stating the following:

> ***We're afraid of looters.***

This assertion related by participant 4P appears to be potentially reflective of shared memory and active remembering (see Section 2.8.1.4). However, researchers have found that the typical approach in the U.S. during and after a hurricane to prevent looting through the deployment of the police and National Guard troops appears to be unwarranted because the looting would generally not happen regardless of this deterrent (Tierney et al., 2006; Huang et al., 2016). The prevailing research-based argument that looting is *minimal* appears to be based on quantitative research rather than qualitative research. Researchers with the International Hurricane Research Center (2004) found in their interview-based qualitative study of hurricane victims that some residents were concerned about leaving their homes at all because they might not be able to return in time after the storm had passed to be able to save their belongings from looters (p. 11). It is undeniable that looting occurs and sometimes under the most horrific circumstances beyond the pale of the hurricane disaster itself. Steffens (2012) recalled a tale of a physician who was attempting to obtain medical supplies from a pharmacy in an extreme emergency situation after Hurricane Katrina and how his police escort literally had to hold looters back at gunpoint who were intent on harming him (p. 106). Looting is a documented issue pre-, during-, and post-hurricane in the U.S. and despite its arguable relative lack of frequency, the devastating results of looting to those victims compound the disaster losses to the point where some HRBO feel the need to be well armed if they remain in their dwellings. Phillips and Jenkins (2013) emphasised that 'violence remains one of the least examined and least understood behaviors in disaster contexts' (p. 312). In their research study on Risk Category II buildings in South Florida, Prasad and Stoler (2016) stated that the social environment must be considered within the ‘context of Florida’s ‘‘Stand Your Ground’’ law, which permits the use of deadly force if someone reasonably believes it is necessary to prevent great bodily harm or death’ (p. 437). The rampant gun violence that plagues the U.S. may be the broader cultural framework under which the armed home defence schema resides (see Section 2.8.1.3).

For DMP, the next steps after receiving information regarding an impending hurricane strike are more prescriptive. These actions are predicated on the nature of their specific positions within FEMA, FDEM, and local (county) agencies respectively. Thus, unlike HRBO, the next steps for DMP vary widely.

4.3.5.2.4 Theme 12: Post-Information Federal Emergency Management Agency Next Steps

The next steps for all DMP in the U.S. depend on the initial actions taken by FEMA. When describing hurricane-specific communication, one of the DMP (participant 5G) mentioned a communication system that FEMA employs once the impending hurricane information has been obtained:

> ***(We use the) IPAWS system on the federal side: we work to communicate down through our states.***

The communication system of IPAWS was depicted in Figure 2.25. Beyond the alerts that FEMA and its federal partners aggregate and then send on to other DMP partners through IPAWS, there are numerous other steps that ensue in which FEMA then coordinates with its range of federal partners along with its state partners. It is the state partners which operationalise much of strategic actions in each respective state before, during, and after a hurricane event as described below.

4.3.5.2.5 Theme 13: Post-Information Florida Division of Emergency Management Next Steps

At FDEM, there is yet another series of steps that occur as elucidated by one of the DMP (participant 2G):

> ***They will go to a Level 2, which is partial activation, or a Level 1, which is full activation. We bring in all our requesting parties, you know, all our parties who support us – all our state agencies, the NGOs, the private organizations – they all come into the State Emergency Operation Center.***

When a hurricane is forecast to strike Florida, FDEM engages the State Emergency Operations Center Activation (SEOCA) Levels, which include a full activation at Level 1, a partial activation at Level 2, or monitoring at Level 3 (Florida Division of Emergency Management, 2019a). In addition to the other entities identified by participant 2G, FEMA is also present at the State of Florida Emergency Operation Center (EOC) to support and assist in the hurricane operations. Additionally, representatives from local governments in Florida may also be present at EOC during this time. Participant 2G went on to detail how FDEM would assist the local governments as they are tasked on the ground level generally to

directly assist the population:

> ***Normally, this happens about 3 or 4 days before the hurricane actually hits, so that we can start making plans as to where the impact areas are, what they may or may not need, and get ready to start receiving mission requests from our locals. Locals are sitting there thinking, you know, what resources do I need, what resources do I have, what do I need to request?***

With the state acting in a centralisation and strategic support capacity, along with FEMA, the local governments operationalise much of their tactical activities in each respective local area before, during, and after a hurricane event as described below.

4.3.5.2.6 Theme 14: Post-Information Local Government Next Steps

One of the DMP (participant 6G) remarked how FEMA would also feed information into another system to assist local governments take next steps:

> ***Hurrevac is a software program that's designed for local emergency managers to integrate risk products, aka, stuff from the Hurricane Center in this case with study products that are done through my (FEMA) program and that identifies how long it takes to evacuate and some other planning factors for effecting evacuations.***

It is at the local level of government where DMP are able to actively engage the public in the course of HP next steps. One of the DMP (participant 1G) clarified some of these steps as follows:

> ***In terms of notifying or public messaging, notifying people to be prepared to take action, notifying various organizations as to what they need to do to protect themselves, protect their businesses, what they need to do to protect or keep informing their employees, what actions they need to keep themselves safe, what safe areas are available for them to go to, what evacuation routes are available, what time you might do evacuations, where they can evacuate to, basically a list of the shelters that we can provide them, and just kind of open up any social media outlets so that if they have any questions that we can provide answers to through the social media as well.***

The importance of ensuring these steps are taken by the public was further emphasised by participant 1G as follows:

> ***You provide them information that actionable. It's much better than providing them with information that they can't do anything with. So, that's the other thing is we don't provide them with so much information that they get overloaded because that just confuses them. And if they get confused, they will take no action at all. So, we give them steps and information that they can use – keep it very simple, keep it very generic and keep it very easy for them to follow, then provide that as we go along and constantly keep them informed of what's going on, so they not only know what they're doing, but what their local government's doing, what their state government's doing, what other resources are also taking action in conjunction with what they are doing.***

Participant 1G related offering recipient-centric messaging, reflective of external LOC communication (see Section 2.8.1.2). This complex medley of next steps that starts with FEMA, goes through FDEM, and thence to the local governments comprises a series of actions that is initiated by the hurricane information triggers, thus resulting in a coordinated effort. It is this effort on the part of the DMP with their next steps that in turn provides both the framework and impetus for the next steps that the HRBO take themselves.

4.3.6 Communication Receivers for Impending Hurricane Next Steps

The following section explores the exemplar of the communication receivers for the next steps that research study participants would engage in as a result of receiving information that a hurricane was forecast to strike. Members of the public who are HRBO had responses which were more aligned to their immediate social circles. Alternatively, DMP had responses which were more aligned to the tasks that their respective agencies across FEMA, FDEM, and local (county) governments had to engage in to support each other and the public in their HP efforts. The interview responses regarding communication receivers were further analysed along with statements some of the participants made, and subsequently examined through frame, and discourse analysis. Insights were then surfaced from these analyses to understand the rationale for these communication receivers.

4.3.6.1 Purpose of the Interview Question

The following question was posed to both HRBO and DMP: *Who do you communicate with regarding your next steps?*

The purpose of this question was to better understand who HRBO and DMP communicated with regarding next steps after they received the information that a hurricane was truly forecast to affect the areas that they lived in or their areas of work focus respectively. This question had the intention of identifying the communication receivers for these next steps.

4.3.6.1.1 Exemplar 6: Communication Receivers for Impending Hurricane Next Steps

Ultimately, this question was designed to elicit responses, which in turn were regarded within the context of frame analysis as exemplars of communication receivers for impending HP next steps.

4.3.6.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in a number of themes that are further elucidated below. The question (*Who do you communicate with regarding your next steps?*) predicated that frame analysis and discourse analysis were utilised without the unnecessary step of paradigmatic analysis. This was due to the need to document the communication receivers that HRBO and DMP reached out to respectively, and not to examine how any of the words or phrases describing these entities functioned in a substitution exercise.

4.3.6.2.1 Theme 15: Post-Information High-risk Building Occupants Next Steps Communication Receivers – Mutual Support Structure

The set of people that HRBO would communicate with through omnichannel communication channels once they received information regarding an impending hurricane strike in their area included family, friends, neighbours, employers, and schools if the participants had children or grandchildren. The purpose of these communications was summarised by one of the HRBO (participant 2P):

> ***We all communicate, you know, we help keep each other safe, you know preparing the sandbags or, you know, boarding up houses, or helping to evacuate.***

This sentiment was echoed by another one of the HRBO (participant 12P):

> ***It is amazing how people come together when stuff like that happens because, I'm pretty prepared for a storm at any given moment, even in the winter when there's no chance of it happening – but once you're prepared, that's when you reach out to people that need help.***

These perspectives were reflective of a cultural norm for HP collaboration, reminiscent of Japan (see Section 2.8.1.3). The mutually-supportive nature of these communications directed HRBO on the order and choices of these communication receivers.

4.3.6.2.2 Theme 16: Post-Information High-risk Building Occupants Next Steps Communication Receivers – Message Consistency and Continuity

The types of messages HRBO conveyed to their receivers once they received information of an impending hurricane strike was also very consistent across all research study participants regarding coordination and timing. One of the HRBO (participant 11P) reflected this succinctly:

> ***Are we ready? Do we have everything? Are you ready? Do you have everything?***

Additionally, to ensure that communication itself was effective in the event of chaotic and unpredictable circumstances, proactive and informative communication was paramount from a coordination standpoint as evidenced by one of the HRBO (participant 4P):

> ***A lot of times, the phones don't work, so you have to let people know where you're going to be because otherwise, they think you're missing and you—you're out of town.***

The perspective of 4P reflects HP behaviour based on active remembering (see Section 2.8.1.4). This proactive communication also served the purpose of reducing the confusion and mystery as to whether individuals within a communication circle were accounted for, thus reducing the risk of them being considered to be potential casualties of a hurricane strike.

4.3.6.2.3 Theme 17: Post-Information Disaster Management Professionals Next Steps Communication Receivers – Pathway from FEMA to FDEM to Local to HRBO

The chain of communicating messages in the post-information state for an impending hurricane strike follows the path from FEMA to FDEM to local DMP. This was evidenced by the response of one of the DMP (participant 5G):

> ***We have vertical, horizontal and—and downward communication going on simultaneously, you know, at every level from local, county, state.***

One of the direct communication receivers from FEMA is FDEM. With FEMA in a strong partnership and supportive capacity, FDEM is charged with directly communicating with the local governments through a set of supporting foci as expressed by one of the DMP (participant 4G):

> ***We have our Emergency Support Functions, we have 18 of them; if I'm trying to convey information that I know needs to go to a certain person, I will certainly convey to the person, given the information, you know, help them to get it, and then they decide what they want to do with it. I'll make sure that any of my supervisors or any people up my chain of command is aware of certain information, especially, the critical information.***

These 18 Emergency Support Functions (ESF) are detailed in Table 4.4 below.

Table 4.4: SFG – 18 Emergency Support Functions (Source: Florida Division of Emergency Management, 2019b)

ESF1	Transportation
ESF2	Communications
ESF3	Public Works
ESF4	Firefighting
ESF5	Information and Planning
ESF6	Mass Care
ESF7	Resource Support
ESF8	Health and Medical
ESF9	Search and Rescue

ESF10	Hazmat
ESF11	Food and Water
ESF12	Energy
ESF13	Military Support
ESF14	Public Information
ESF15	Volunteers and Donations
ESF16	Law Enforcement
ESF17	Animal Protection
ESF18	Business, Industry and Economic Stabilization

An omnichannel technology system used by FDEM to communicate with the local governments was reflected by one of the DMP (participant 2G):

> ***We use Everbridge, which is a notification system that pushes out notifications to, like I say, all our state partners, all our stakeholders.***

The use of Everbridge is reflective of how FDEM prioritises communication channels (see Section 2.8.1.1). Once the local governments have the impending hurricane strike and related information from FDEM, they have their own sets of action-related messages they push out to the public. A common approach to these messages was outlined by one of the DMP (participant 3G):

> ***(We use) expressive words, action-oriented words, you know, we want people to act on our – our decisions, so you know, act now.***

The importance placed on which words to use underscores some of the impetus for using paradigmatic analysis as a data analysis technique (see Section 2.8.2.3). At the same time, DMP are keenly aware that members of the public do not all have the same access to communication or resources. Clearly, FEMA focuses on the public as the end-receiver of communication. Yet the ideal communication prioritisation may not exist comprehensively, as expressed by one of the DMP (participant 5G):

> ***(The first focus of communication should be) at-risk populations just by nature of being at-risk, right. It's not so much a matter of—of behaviour, it's a matter of***

resources and lack thereof.

Clearly, DMP identified the external LOC communication distinction that at-risk populations *should* be the communication receivers that would be the first focus for the collective of DMP from FEMA, to FDEM, to the local governments (see Section 2.8.1.2). Undoubtedly, HRBO, comprise part of the at-risk population that is the targeted end-receiver for impending hurricane strike next steps information. However, prioritising communication receivers is the ultimate charge of local governments and they are by definition operating with distinct protocols for their tactical actions that vary by locality.

4.3.7 Hurricane Preparedness Communication Language

The following section reflects the exemplar of the type of language elements that research study participants would choose to use if they were individually in charge of communicating HP to the public. HRBO and DMP conveyed similar language elements. Selected interview responses were further analysed to derive words and phrases that were subsequently examined through frame, discourse, and paradigmatic analysis. Insights were then surfaced from these analyses to help better elucidate these language elements.

4.3.7.1 Purpose of the Interview Question

The following question was posed to both HRBO and DMP: *If you were in charge of communicating to the public regarding HP, what words or phrases would you use?*

The purpose of this question was to better understand the HP language elements that HRBO and DMP would choose to use if they were charged with communicating such information to the public. This question was designed to help participants synthesise these language constructs in order to help better elucidate the types of messages, the intention, and the objectives of these messages.

4.3.7.1.1 Exemplar 7: Hurricane Preparedness Language Constructs

Ultimately, this question was designed to elicit responses, which in turn were regarded within the context of frame analysis as exemplars of HP language constructs.

4.3.7.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in a number of themes. The nature of this question (*If you were in charge of communicating to the public regarding HP, what words or phrases would you use?*) predicated that frame analysis, discourse analysis, and paradigmatic analysis were utilised. The responses from both HRBO and DMP were words and phrases that consistently pertained to preparedness, wind, storm surge, flooding, power outages, storm effects arrival timing and intensity, supplies, and evacuation. Some themes of particular note that surfaced are elucidated below.

4.3.7.2.1 Theme 18: High-risk Building Occupants – Escape Versus Evacuation Language

When faced with either mandatory evacuation or a perceived hurricane risk threshold that exceeds their comfort level, HRBO engage in the activity of securing their dwelling, packing what belongings and such that they wish to take with them, and then leaving the affected area. However, the perception of what this activity or behaviour is on a deeper level was illustrated by one of the HRBO (participant 6P) who referred to an important HP phrase in the following terms:

> ***escape route***

The use of the phrase *escape route* was examined in paradigmatic analysis through a substitution comparison with another potential phrase as follows:

> The ***escape route*** we heard about should be clear.
>
> The ***evacuation route*** we heard about should be clear.

The phrase *escape route* may have a different meaning than that of the phrase *evacuation route*. The sample comparative substitution was utilised to illustrate that the traditional DM concept of *evacuation* connotes a larger-scale, coordinated effort in which the routes are well planned. The more colloquial concept of *escape* connotes a more individual effort in which the routes may not be well planned and could be a more last-minute endeavour. Furthermore, *escape* may also indicate that there is no other choice and that could reflect the potential issues that may have contributed to a hasty retreat such as limited preparation time, a compromised plan, or a plethora of missteps any of which could have severe

consequences. Hurricane conditions are difficult enough without the added pressure of efforts to preserve well-being with individual evacuations that are potentially conducted too late.

4.3.7.2.2 Theme 19: High-risk Building Occupants – Preference for Positive Emotional Rather Than Fear-based Language

None of the HRBO suggested using fear-based language as an effective structural approach to communicate HP messages. One of the HRBO (participant 10P) suggested the following type of preparedness messaging:

> ***I would probably use reassuring words: please do not get worried, as long as you get, you know, your water and your food, and you're in a safe place, you will be fine.***

The choice to use practical rather than fear-based language in HP messaging was conveyed in an example offered by one of the HRBO (participant 11P):

> ***These winds are very powerful, but I wouldn't try to put fear into people, but would urge them to be prepared or get prepared and take shelter if they're in an area where it's going to be very bad.***

Messages that appeal to fear can sometimes induce people to question the severity of hurricane threats, the level of effort needed for risk reduction or evacuation (Morss et al., 2018, p. 47). Both HRBO and DMP consistently suggested the use of practical HP messaging. Additionally, DMP offered different specificity as elucidated in subsequent themes.

4.3.7.2.3 Theme 20: Disaster Management Professionals – Prescriptive Language

The threat posed by hurricanes creates numerous preparedness communication issues which need to be focused on, and DMP do so largely using prescriptive language. One of the DMP (participant 4G) highlighted how in DM the imperative focus can be reduced as follows:

> ***There's five hazards of a hurricane: storm surge, high winds, rainfall, tornados and rip currents.***

Whereas HRBO may or may not focus on a number of mutually recognised areas of HP activities they would choose to communicate to other individuals, these consistent ones reflected by participant 4G are indicative of a core of hurricane hazard foci that can also include consistent terms such as coastal erosion, heavy rain, large waves, mudslides, and windblown debris (Mitchem, 2011, p. 328). This language usage is indicative of a prescriptive approach, whereas HRBO may use a more descriptive approach at times when describing HP activities. Prescriptive communication approaches often parallel internal LOC communication (see Section 2.8.1.2).

4.3.8 Communication Receivers for Hurricane Preparedness Language

The following section explores the exemplar of the communication receivers for HP language that research study participants would choose to reach out to. Members of the public who are HRBO had responses which were more aligned to their immediate social circles. Alternatively, DMP had responses which were more aligned to the tasks that their respective agencies across FEMA, FDEM, and local (county) governments had to engage in to support each other and the public in their HP efforts. The communication receivers identified during the interview responses were further analysed along with statements some of the participants made, and subsequently examined through frame and discourse analysis. Insights were then surfaced from these analyses to understand the rationale for these communication receivers.

4.3.8.1 Purpose of the Interview Question

The following question was posed to both HRBO and DMP: *If you could communicate to the public regarding HP, who would you communicate with?*

The purpose of this question was to better understand which members of the public that HRBO and DMP would communicate with regarding HP if such tasks were their respective charges. This question had the intention of identifying the communication receivers for this information.

4.3.8.1.1 Exemplar 8: Communication Receivers for Hurricane Preparedness Messaging

Ultimately, this question was designed to elicit responses, which in turn were regarded within the context of frame analysis as exemplars of communication receivers for HP

messaging. This question was designed to gauge the extent of receiver-centric, external LOC communication utilised by the participants (see Section 2.8.1.2).

4.3.8.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in a number of themes that are further elucidated below. The question (*If you could communicate to the public regarding HP, who would you communicate with?*) predicated that frame analysis and discourse analysis were utilised without the unnecessary step of paradigmatic analysis. This was due to need to document the communication receivers that HRBO and DMP would choose to reach out to respectively, and not to examine how any of the words or phrases describing these entities functioned in a substitution exercise.

4.3.8.2.1 Theme 21: Most Vulnerable Groups First

There were a number of responses across both HRBO and DMP that if they were in charge of communicating HP messaging to the public that they would reach out first to the most vulnerable groups. One of the HRBO (participant 7P) reflected thus:

> ***The people at a higher risk are always the priority: things like mobile homes, elderly, people with special needs, those folks that may need more time to react or to prepare.***

Beyond the realm of those groups under typical consideration as being vulnerable, one of the HRBO (participant 3P) identified younger people as being a priority and suggested communicating with them first:

> ***I would actually target the youth, meaning those 18 – 30 – that's what they need to do – because those are the ones that don't seem to understand preparedness and what it means when a hurricane hits, until they've been through it.***

In addition, one of the DMP (participant 2G) identified that non-English speaking communities as one of the most vulnerable groups and in need of early communication:

> ***Our non-English speaking populations, just to let them know: please go to the shelter, it's okay, you know, we really want to get you out of harm's way because we have found that a lot of them do not evacuate.***

These perspectives are indicative of a prioritised list of vulnerable communication receivers that would warrant being reached out to first if the HP messaging systems were optimised.

4.3.8.2.2 Theme 22: Audience and Channel Agnostic

Most of the participants, HRBO and DMP alike, thought that messages should not change regardless of the channel used or communication receiver to be reached. There were however a few perspectives that supported customising messages depending on the channel used and the audience, such as the view shared by one of the DMP (participant 3G):

> ***(The messages could) change based on the – the actual audience, so if we're reaching out to a low income group, or a Spanish speaking group, or Creole speaking group, we may work through a different list of stakeholders in communicating – that may be better – if it comes from churches, or the school district, if we're trying to reach kids.***

The lack of Spanish language HP resources compounds this issue. Additionally, participant 3G conveyed a lack of HP communication audience timeline prioritisation on the local government level:

> ***We don't rank the different, you know, folks that we reach out to in order.***

The implication of these responses reflects the reality that currently there is no prioritisation mechanism that local governments use to decide which group to reach out to first regarding messaging. This reflects a potential messaging homogenisation of vulnerable groups, such as some HRBO, along with those who are less vulnerable from a HP communication standpoint. Such an approach runs counter to that of general communication theory as expressed by Lenassi (2015) in emphasising how in complex situations, comprehensive language competence by message senders that is customised for channels and message receivers is critical to ensure effective message objectives are met (p. 95).

4.3.8.2.3 Theme 23: Social Nexuses and Interactors

The diversity of local government structures from a DM leadership standpoint across geographies predicates that the best points-of-contact to communicate with to influence HP

efforts are sometimes individuals that function as social nexuses. This was reflected by one of the DMP (participant 6G):

> ***(Sometimes the point-of-contact is the person that has) the greatest influence on the community: it could be a – it could be a fire marshal or something like that, that is a trusted official within their town.***

The knowledge about this human element on-the-ground in each locality, knowing which is the person who is the correct communication receiver for HP information from DMP is a type of social interaction intelligence that underscores the complexity of the communication environment. At the same time, it also reflects that the human element is audience- and channel-centric simultaneously because of this very diversity. From a perspective of what the possibilities are for a human-centric HP approach, one of the DMP (participant 5G) proposed the following:

> ***One of the things that I would like to see change is more of a human interaction, but now when we talk about preparedness, we focus a lot on electronic mediums, right, the internet, you know, YouTube, our websites, things like that. I would really like to see a more human element injected in this process.***

Both of these aforementioned reflections emphasise the human interaction focus, which is part of the driving force behind the aim of this research study: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

4.3.9 Hurricane Preparedness Government and Community Partnerships

The following section explores the exemplar of the partnerships that governments and communities engage in for HP. Both HRBO and DMP had responses which generally reflected the existing structure of FEMA, FDEM, and local (county) governments engaging with each other to support the public in their HP efforts. There were a number of interview responses which addressed other perspectives outside of this traditional government-community structure, which were subsequently examined through frame and discourse analysis. Insights were then surfaced from these analyses to understand the rationale for these perspectives.

4.3.9.1 Purpose of the Interview Question

The following question was posed to both HRBO and DMP: *How does the government currently work with communities to prepare for hurricanes?*

The purpose of this question was to better understand the views of HRBO and DMP on how the government and communities, collectively and independently, work on HP. This question had the intention of identifying areas where these efforts are working well, facing challenges, and where there are opportunities for improvement.

4.3.9.1.1 Exemplar 9: Government and Community Hurricane Preparedness Partnerships

Ultimately, this question was designed to elicit responses, which in turn were regarded within the context of frame analysis as exemplars of government and community HP partnerships both collectively and independently.

4.3.9.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in a number of themes that are further elucidated below. The question (*How does the government currently work with communities to prepare for hurricanes?*) predicated that frame analysis and discourse analysis were utilised without the unnecessary step of paradigmatic analysis. This was due to need to document the types of partnerships that HRBO and DMP engaged in on collective and independent bases, and not to examine how any of the words or phrases describing these partnerships functioned in a substitution exercise. Both HRBO and DMP identified the traditional partnerships of FEMA, FDEM, and local governments in a mutually supportive capacity for the public. At the same time, further perspectives were elaborated upon regarding intergovernmental, intercommunity, and collective partnerships that reflect both current states and future implications.

4.3.9.2.1 Theme 24: Intergovernmental Partnerships – Decentralisation, Hierarchy, and Siloes

As aforementioned, the traditional partnership between government and community is contingent upon the primary intergovernmental partnership between FEMA, FDEM, and local governments. This is characterised by FEMA and FDEM in a support capacity for the

local governments, which in turn end up being the main support structure for the public. At the same time this is a decentralised system in which local governments are ultimately responsible for the public, and the hierarchy between chains of command from FEMA, to FDEM, to the local governments and the decision-making process is characterised by siloes and boundaries that are tactically determined. This perspective was elucidated by one of the DMP (participant 6G) who stated:

> ***(We are there to support and not) to step on the counties as far as evacuations, their sheltering, and things of that nature.***

These clearly defined lines from a DM perspective reflect that the hierarchy of these intergovernmental relationships is one which is defined by strong boundaries. There also appear to be operational limitations in terms of either FEMA or FDEM potentially interfering in local government HP endeavours. This is particularly an issue when local governments refuse mandatory evacuation advice they receive from FEMA or FDEM and decide that the risk is not high enough, the timeframe is insufficient, or the resources they have are not available. A consequence of this siloing is that HRBO often feel that they are left to fend for themselves as evidenced by one of the HRBO (participant 1P):

> ***(It is) every man for themselves when it comes down to something (hurricane strike) like that.***

This perspective was reflective of active remembering and influenced the self-reliant HP behaviour of participant 1P (see Section 2.8.1.4). There was also a palpable sense of personal culture that emanated from the response of participant 1P, perhaps emblematic of the highly individualistic nature of culture in the U.S., as compared to a country like Japan (see Section 2.8.1.3). While all branches of government generally work very well together within this DM framework for HP in Florida, an element of rivalry was identified one of the DMP (participant 6G):

> ***(If) I could somehow remove the competition amongst cities and local folks, I think that would make a big difference.***

This response by participant 6G, reflected a perceived divide between cities and counties, and between the local government and the public. Such disconnects are unlikely to create a

better HP reality for HRBO, but rather potentially exacerbate an already difficult DM operational environment.

4.3.9.2.2 Theme 25: Government-Community Partnership

There is a combined effort from FEMA, FDEM, and local governments to coordinate and support the community from a HP standpoint even outside of hurricane season in Florida as described by one of the DMP (participant 1G):

> ***We constantly do public outreach. We do a variety of different events: we'll do radio shows, TV shows, we'll go out to community events, we'll host events here, anything that will work with our elected officials for their speaking engagements, we'll assist them.***

At the same time, there are public perceptions that there is not enough HP support from government organisations in terms of HP, as stated by one of the HRBO (participant 3P):

> ***They don't really do a good job of reaching out until it's on top of them. That's when you start hearing messages from the government. They don't do a year-round thing. I think they can have community outreach during the year. So, community centres put out the message locally. I would think direct talking to them.***

In sharp contrast, DMP reflect that they find the opposite issue and would hope for improvement from a proactive public, as opined by one of the DMP (participant 4G):

> ***I'd like to say the perfect world is not how our government should work with communities, it's how the communities should work with the government.***

A social climate of enmity does not appear to exist between the government and the public when it pertains to HP. Both groups do have the intention to work closer together to achieve results. One of the DMP (participant 5G) remarked:

> ***(What could help with HP is) the human element, you know, having (DM) folks down to the individual city block level that help communicate these messages.***

Further intent on the part of the government to help the public become more self-sufficient

in HP was offered by one of the DMP (participant 2G):

> ***(FDEM) sponsors a lot of the citizens' emergency response teams, which play a very big part in any event.***

The drive to achieve optimal HP, according to DMP, does not solely depend on governmental actions but also on both collective and independent efforts with and by the communities themselves.

4.3.9.2.3 Theme 26: Intercommunity Partnerships

Partnerships within and between communities are other vital facets of HP. As DMP work to stretch their time and resources as far as possible, they also convey that the more the communities can depend on themselves, the better the HP efforts will collectively be as reflected by one of the DMP (participant 3G):

> ***In a perfect world, the communities would do this on their own, and recognize the importance of HP and – and kind of drive that boat themselves.***

The desire for self-sufficiency was echoed by HRBO and the benefits of such an achievement was reflected in a stark manner by one of the HRBO (participant 10P):

> ***It would be nice for the communities to make sure that we're aware of anybody in the area, that (is) maybe elderly or needs power to live, you know. You know, there's a lot of people that live alone, old people that live alone, nobody knows that they live there. So, they (the community) come back after a hurricane and (they find) they're dead.***

One of the DMP (participant 5G) gave further information which described resources for intercommunity support:

> ***One of the biggest tools that communities are able to help one another is through the EMAC agreements.***

The Emergency Management Assistance Compact (EMAC), administered by the U.S.-based non-profit National Emergency Management Association [NEMA], is an agreement between all states and territories that are part of the U.S. in which during times of emergency arising

from disasters or terrorism, that they can share commodities, equipment, and personnel (NEMA, 2019). On the surface EMAC appears to be designed to work for *interstate* rather than *intercommunity* partnership. Given that the aim of this research study was to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy, it stands to reason that efforts like EMAC are certainly a step in the right direction toward a social-centric outcome.

4.3.10 Hurricane Preparedness Participant Reflections and Further Thoughts

The following section details reflections and further thoughts that HRBO and DMP had after the more semi-structured questions were asked during interviews. These responses were subsequently examined through frame and discourse analysis. Insights were then surfaced from these analyses to better understand these perspectives. The resultant exemplar that was surfaced pertained to in-person HP communication.

4.3.10.1 Purpose of the Interview Questions

The following questions were posed to both HRBO and DMP: *Well, those are all the questions I have for you right now. What are your closing thoughts given the topics we discussed today?* and, *What questions do you have for me?*

The purpose of these questions was to elicit responses from HRBO and DMP that were contextualised with the research study given the battery of interview questions that had preceded these final questions. It was a premise that these responses could be a bit more tailored to topics of interest framed by the previous questions and that perhaps the responses themselves might have a more holistic HP communication orientation as a result.

4.3.10.1.1 Exemplar 10: In-person Hurricane Preparedness Communication

Ultimately, the responses to these questions which were of the most interest given the aim of this research study were regarded within the context of frame analysis as exemplars of in-person HP communication.

4.3.10.2 Insights from the Interviews

Insights that were derived from the interview responses given by HRBO and DMP resulted in

a theme that is further elucidated below. The questions (*Well, those are all the questions I have for you right now. What are your closing thoughts given the topics we discussed today?* and *What questions do you have for me?*) predicated that frame analysis and discourse analysis were utilised without the unnecessary step of paradigmatic analysis. This was due to need to document the broad range of responses that HRBO and DMP conveyed, and not to examine how any of the words or phrases describing these responses functioned in a substitution exercise.

4.3.10.2.1 Theme 27: In-person Hurricane Preparedness Communication

Some of the insights that emanated directly and indirectly from both HRBO and DMP at times during responses to other interview questions and definitively in the final questions elucidated the merits and utility of DMP engaging directly, in-person with members of the public. One of the HRBO (participant 2P) described this need:

> ***If there was a way to get information to people that may not have access to all the technology, nursing homes, and that kind of thing or, you know, poor communities, someone to reach them.***

This response from participant 2P addressed socioeconomic inequities that reflected in limited technology access, thus leading to a reduced ability to access HP communication. The value of in-person HP communication was also highlighted by another of the HRBO (participant 7P):

> ***I mean a lot of it's (HP) word of mouth, as people come and go in Florida. You know, somebody that just moved, which obviously in Florida, we receive a lot of new folks – they're like watching the neighbour going – ooh, what's he doing -- ooh, we better do something – he's putting up his shutters, do we have shutters?***

Since Florida is a state in the U.S. that receives a lot of vacationers, tourists, snowbirds (people that flee winter climes seasonally), and people that move there from different states and countries, HP is a topic that faces a profound unfamiliarity factor as evidenced by one of the HRBO (participant 5P):

> ***Before I moved here, I never gave it (HP) a second thought.***

Demuth et al. (2012) argued that in-person, collaborative interactions between DMP, the media, and the public, would better help to achieve a shared understanding of hurricane risk information (pp. 1141-1142). With an enhanced public understanding of hurricane risks, preparedness efforts may stand on firmer ground.

4.4 Summary

This chapter covered the data analysis portion of the research study. An overview of the participants of this research study was reflected by an examination of the demographic and experiential characteristics of these individuals. The bulk of the data analysis for this research study and the content of this chapter was expressed in the exploration and analysis of the interview responses of these participants. These responses were examined using data analysis techniques including template analysis, frame analysis, discourse analysis, and paradigmatic analysis, which in turn were triangulated with each other and with literature review analysis and document review analysis which were conducted earlier.

This overall analysis resulted in 10 exemplars. The term *exemplar* is defined as a component of frame analysis which succinctly describes what is going on in a situation. These 10 exemplars in turn were individually examined further resulting in 27 themes. These themes covered areas such as perceptions, strategies, communicational channels, internal and external LOC communication, culture, memory, interpersonal interactions within and between DMP and HRBO, and the language elements that comprise all of these areas within the broader context of HP. The language-rich data of the narrative-intensive questions yielded themes which were both broad and deep and were reflective of thematic saturation.

As it pertains to the exemplar of perceptions of high-risk buildings, HRBO may regard these buildings not just in physical safety terms, but also in emotional terms such as comfort that may reflect more of a psychological sense of safety and well-being. Issues that HRBO may have trusting safety messaging associated with these buildings could be because the risk assessments of these buildings might not account for extra-structural factors such as storm surge and elevation. This evidences a contrast between internal LOC communication by DMP and active remembering by HRBO that differs with this messaging. The language

constructs within the FEMA HP plan do not make mention of the elevation of where a building is located as being a factor, unlike the HP plan language from Australia. Furthermore, the FEMA HP plan does not address building codes at all, which is another difference it has with the HP plan from Australia.

These factors of elevation, storm surge, and building codes could be utilised in the calculus that HRBO use individually to make determinations on when to evacuate and where to seek shelter. Evacuation zone and shelter location information for the public is handled on a local government level in Florida and not by FEMA. This predicates a high degree of variability for how these pre-storm activities are conducted by DMP, which reflects in a high degree of variability of how HRBO prepare for hurricanes.

An examination of the exemplar of building code understanding revealed that HRBO might prefer that building code standards be expressed using hurricane category (see Appendix H) language terms rather than wind speed threshold terms. This evidences how HRBO might prefer external LOC building code communication. Similarly, building code language ambiguity issues may also appear to HRBO. The use of words such as codes versus standards, mitigation versus resistance, or hazard versus disaster could result in variable meanings and associated interpretations, and consequential preparedness actions and behaviours which are not optimised for safety and well-being.

The exemplar of preparedness for a hurricane that is going to strike without warning was discussed vigorously by participants as needless effort for a phenomenon of impossibility. Yet, the very notion of without warning can be highly subjective. Confusion over the hurricane weather messaging alert stages of what constitutes a hurricane watch versus a hurricane warning could result in misinterpretation of imminent strike potential. This predicates that hurricanes can strike without warning depending on how well informed HRBO or DMP are.

The possibility of HRBO such as the most vulnerable populations not having access to technology-based constant weather messaging predicates that hurricanes could strike physically and that these individuals might regard this strike as without warning.

Furthermore, rapidly intensifying hurricanes, such as Hurricane Michael in 2018, can go from low pressure systems to destructive hurricanes within a matter of days or even hours, thus rendering any HRBO who are not in receipt of constant hurricane updates to perceive that such storms struck without warning. The implications of this supposed phenomenon of an imminent hurricane strike without warning could have dire social consequences due to the degree of lack of preparedness.

As it pertains to the exemplar of communication channels for an impending hurricane strike, themes varied distinctly between the more social-centric channels of HRBO and the more job responsibility-based channels of DMP. As an example, HRBO largely conveyed that local television stations were the main sources of impending hurricane information, but also commented that this information source could be prone to sensationalizing impacts. An example of questionable language that local television stations used to describe seeking safety at home during a storm was the phrase hunker down, which was ridiculed for its ambiguity by HRBO and DMP participants. The use of this phrase appears to be an example of internal LOC communication. The traditional information source of vocalised human intelligence (word-of-mouth) was also expressed as common among HRBO. The human source was also regarded as being susceptible due to wide interpretation and opinion, and thus potentially unreliable as a source of impending hurricane information. Yet, the importance of human intelligence in impending hurricane information gathering and sharing was reflected by participants in the value of its utility of reach despite the fact that this information source does not have any dedicated, unified structure. This aforementioned insight provided robust support for the aim of this research study: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

In sharp contrast, communication channels for an impending hurricane strike were consistent for DMP. As an example, NHC was regarded as being a reliable source of storm-centric information, NWS was regarded as the reliable source for local weather impact information, and FDEM acted as a messaging conduit to the public, and attempted to convey impending hurricane information in as similar language as possible to the public. DMP expressed the utility of local television stations in being critical purveyors of highly

localised information such as evacuation routes or shelter locations. At the same time, DMP concurred with the perspectives of HRBO in the potential for local television stations to have language quality issues pertaining to impending hurricane information.

An examination of the exemplar of next steps once the information for an impending hurricane strike is conveyed was reflected by research study participants in a number of themes. Active remembering features prominently in all these themes. A critical example is how HRBO maintain an a priori knowledge structure that when triggered by impending hurricane information, may analysed by discourse analysis and labelled as an a posteriori evacuation schema. When the evacuation schema is triggered by information on an impending hurricane strike that contains language that reflects a high enough degree of potential hurricane risk, the a posteriori state of the evacuation schema is defined by HRBO springing into action and executing their evacuation plans. Conversely, HRBO can maintain an a priori knowledge structure that when triggered by impending hurricane information, may analysed by discourse analysis and labelled as an a posteriori remain schema. This would reflect that the hurricane risk remains below the evacuation schema threshold that HRBO have. Thus, the a posteriori state of the remain schema is defined by HRBO executing their plans that allows them to remain in their dwellings and ride out the storm.

Another subset of the remain schema is the armed home defence schema. The remain schema is augmented by HRBO executing their plans to ensure that they are armed and prepared to defend their dwellings from any looters or other criminally-inclined individuals. Despite numerous other research studies that have documented the relative lack of extremely widespread looting and criminal behaviour during- and post-hurricane strike, the prevalence of such illicit activity and its deleterious impacts on HRBO still remains. Television media video coverage of wanton acts of looting and personal experiences of HRBO who have suffered from such delinquency during and after large hurricane strikes underscores the rationale behind the armed home defence schema. The armed home defence schema may also be a subset of larger cultural issue of gun violence in the U.S.

The next steps for FEMA once the information for an impending hurricane strike is conveyed to them by their sources consists of an immense amount of diverse actions depending on

the specific job roles within FEMA of which there are hundreds. One major step is the activation of IPAWS, which is a centralised communication system that leverages all major communication channels available from electronic, through telephony, and internet and everything in between to convey messages to their partners and FDEM. Accordingly, SFG initiates its SEOCA Levels, which is the cornerstone of numerous activities to support operations that include the local governments as execution partners. The local governments execute activities such as evacuation, sheltering, and moving resources and assets around as needed in local areas. This is characterised by FEMA and SFG remaining in a strong support capacity for all these efforts. Accordingly, these efforts remain highly coordinated between FEMA, SFG, and the local governments.

The exemplar of communication receivers for next steps once the information for an impending hurricane strike, was again reflected by themes varying distinctly between the more social-centric channels HRBO and the more job responsibility-based channels of DMP. This distinction is characterised by how HRBO would communicate first with family, friends, neighbours, co-workers, or school officials depending on their personal situations. This evidenced a culture reflecting a mutual support structure whereby a veritable social safety net was maintained. In addition, HRBO made sure to be clear in their communications with these individuals to confirm not only that planning was coordinated, but also that timelines and locations were communicated so that it would be easier for individuals within familial or social circles to keep track of each other.

Alternatively, DMP have a linear communication receiver chain that flows from FEMA (with the support of its federal partners), to FDEM, and thence to local governments. To further detail this chain, SFG has its ESF that include 18 different functions, each of which connects to various local entities. A software system called Everbridge is also utilised by FDEM to reach its local partners. From local entities the messaging goes through to the final communication receivers: the public. Ideally, the members of the public that are the greatest focus for DMP would be the most vulnerable groups, of which HRBO certainly comprise a segment. However, the high degree of variability of DM approaches on the part of local governments entails that HP messaging does not always get prioritised with the most vulnerable groups being contacted first.

As it pertains to the exemplar of HP language constructs, HRBO again reflected emotional language in their perceptions. They shunned fear-based language and supported the use of positive emotional language to convey HP. Language usage by HRBO also revealed a semantic issue across HP in which the phrase evacuation route might be used interchangeably with the phrase escape route. Messaging flexibility with these phrases could be inherently problematic since the words evacuation and escape have different meanings. The word evacuation conceptually pertains to an inherently organised, well-planned, and larger scale endeavour, whereas the word escape could pertain to a more individualised and potentially last-minute endeavour that could be reflective of varying levels of planning.

In contrast, DMP tended to align HP language constructs around the traditional five hazards of hurricanes: storm surge, high winds, rainfall, tornados and rip currents. While this list of five hazards was certainly not exhaustive, what it did represent is that hurricane language usage within the professional context of DM was somewhat prescriptive, canonical, and consistent. This is reflective of internal LOC communication. This can be contrasted with the external LOC communication of the descriptive and highly flexible HP language constructs used by HRBO.

An examination of the exemplar of communication receivers for HP messaging revealed that the nexus of this language interaction is indeed human and social. There was a focus by DMP on reaching the broadest audiences for HP messaging connect with individuals from larger to smaller settings that inevitably have the widest social reaches possible. This helps to ensure that the HP messaging reaches the largest audience. Furthermore, DMP remarked how human interaction is at the centre of this communication paradigm as this traditional form of connection may transcend the more recent technology-based forms of HP messaging. These perspectives again underscore the aim of this research study: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

At the same time, the reality of who should ideally be focused on first ideally as communication receivers for HP messaging was a matter of general agreement between

HRBO and DMP: the most vulnerable members of the public. The importance of this is the fact that HRBO necessarily comprise part of this group. Curiously however, HRBO and DMP also did not generally feel that HP messaging should change depending on the communication receivers to be reached or the channels utilised. Furthermore, DMP did not convey that there was any overt system for prioritising which members of the public would receive HP messaging first. The only exception to altering HP communication language appeared to be when DMP considered the necessity of translating such messaging into another actual language such as Spanish.

The exemplar of government and community hurricane HP partnerships was generally expressed by HRBO and DMP as the existing support structure between FEMA, FDEM, and local governments, with a few notable exceptions that bore exploration. In terms of intergovernmental partnerships, the decentralised nature of the relationships was predicated by both FEMA and FDEM ensuring support of local government HP efforts while also maintaining a degree of responsibility-centric distance from some of the local strategic efforts and almost all of the local tactical level efforts. Furthermore, there was a sense from FEMA and FDEM that local governments were actually in competition with each other and the public at times regarding HP efforts, and that any animus between these groups could only lead to reduced HP support for the public ultimately. Overall, these potential disconnects evidenced that the organic view of the DM framework was characterised by a degree of siloing. Perhaps HRBO may experience certain shortcomings in governmental support because of this and some HRBO felt that they were left to their own devices regarding HP as a result.

At the same time, DMP make concerted efforts to immerse themselves in communities, events, and functions in order to promote HP. Despite this, there are still sentiments in the public that the government is not doing enough. Regardless of these understandable imperfections, DMP and the public still seek to collaborate more in regard to HP. Intercommunity partnerships is an area where DMP unequivocally want to see much more activity so that the baseline of HP can be raised by the public themselves, thus reducing the strain on government resources which are already being stretched to their limits. A model

for communities to potentially follow is EMAC that offers guidelines for how states can share resources for HP and other DM endeavours.

As it pertains to the exemplar of in-person HP communication, HRBO and DMP both generally found great value in the endeavour of in-person communication regarding HP. Part of the rationale for this was detailed in the identification that some of the most vulnerable members of society such as the elderly and impoverished groups might not have the same degree of access to technology-based HP messaging channels such as the internet or mobile phones. Another reason that in-person HP messaging interactions have value particularly in a place like Florida is due to the prevalence of non-English speaking residents (largely Spanish speakers), the influx of tourists, vacationers, and new residents who flock there due to the generally year-round balmy and tropical climate found in the bulk of the state. This ensures that there are many people there without the same degree of exposure to hurricanes, let alone experience in HP, or the ability to leverage the English language HP information structures as easily. Thus, such individuals, and other HRBO in the communities they live in, may be better reached through in-person communication in order to help achieve a baseline of knowledge regarding HP. The in-person communication focus in the insights from the participants of this research study pointed clearly toward the aim of the study: to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy.

Chapter 5 – Initial Model

5.1 Overview

In the following chapter, the background is detailed of how the initial model was developed through an analysis of DM, DC, and other research study-related literature, an analysis of HP planning documentation from U.S. and other countries, the synthesis of the six communication models reviewed and two communication models synthesised in Chapter 2, and critical input from the data analysis presented in Chapter 4. Then an overview is provided highlighting critical components including the stakeholder groups and language input, the Repository for HP Language, the HRBO-DMP Working Group, and then the Initial Hurricane Preparedness Communication Model itself. The model is referred to as *initial* in this chapter due to the model being refined in order to elicit the *final* model, which is detailed in Chapter 6.

To aid in readability of the initial model in this section, the following acronyms and initialisms are used extensively as detailed in Table 5.1 below.

Table 5.1: Model Acronyms and Initialisms	
FDEM	Florida Division of Emergency Management
DMP	Disaster Management Professionals
FEMA	Federal Emergency Management Agency
HRBO	High-risk Building Occupants
NHC	National Hurricane Center
NWS	National Weather Service
RHPL	Repository for Hurricane Preparedness Language

5.2 Initial Model Overview

The model from a technology perspective would likely use an Open Platform Communications specification (OPC), which is a set of industrial telecommunication standards and specifications that facilitates machine-to-machine (M2M) communication to a central data source despite varying software running on different machines (Salimi and Salimi, 2017; Ngo, 2019). An in-depth explication of the technology that could support this

model was not in scope for this research study. This model is focused on its sociolinguistic and social-centric characteristics that were derived through a combination of insights gained in the research study from the following sources as elucidated subsequently.

5.2.1 Analysis of Research Literature in Disaster Management and Other Areas Relevant to this Study

A literature review was conducted of peer-reviewed journal articles, books, and other reference material regarding research studies and subject matter analyses including from the fields of DM as part of Chapter 2. This helped to provide a baseline of broad knowledge regarding this field that was relevant to the focus of HP communication. These materials were analysed after this literature review for content relevant to this specific research study, which also helped to shape the model. One key finding from the literature review was that the definition of disaster that is focused on social structures was found to be much broader than the typical interpretation of disaster in more physical structure terms (see Section 2.3). The benefit of community- and neighbourhood-based HP collaboration was also highlighted in the literature as beneficial (see Section 2.4). Both of these aforementioned examples helped to influence developing a model that was social-centric and collaborative. High-risk buildings and building codes were also critical areas focused on in the literature review. The literature review surfaced that building owners in Florida are responsible to keep their buildings up to code (see Section 2.7.2). This translates into a potential lack of control for HRBO who have unwittingly purchased a home that is not up to code or are renting or leasing from a negligent owner. Such building code-centric vulnerability for HRBO was influential in ensuring that the model included this group as a language input stakeholder.

5.2.2 Analysis of Hurricane Preparedness Planning Documentation from the U.S. and other Countries

Planning pertaining to HP and other documents relative to DM from FEMA, FDEM, and two countries (Taiwan and Australia) were reviewed (see Section 2.6.2). These documents were then analysed to provide a baseline knowledge of HP language created for the public. This also influenced the model. A potential issue with the FEMA HP plan that surfaced during the document review was that HP communication is scattered across numerous channels to

ensure redundancy (see Sections 2.6.2.1 and 2.8.1.1). However, this could render messaging inherently incongruent for HRBO. Different channels have slightly different messages at a minimum, causing potential sender-centric, internal LOC bias (see Section 2.8.1.2). By comparison, the Taiwan plan has a single source for HP information (see Section 2.6.2.2).

One critical building code language gap discovered in the document review of FEMA HP planning guidelines was that there is no mention of the need for residents to proactively check on whether their residences are up to code (see Section 2.6.2.1). By comparison, the Australia HP planning guidelines did instruct residents to enquire about whether their residences were up to code. The Australia plan was inherently more social-centric than the FEMA plan (see Section 2.6.2.3). The Australia plan outlined the necessity of residents to check on neighbours as part of HP efforts, and to take enhanced steps to ensure that pets were accounted for. These differences the document review revealed between FEMA, Taiwan, and Australia pointed toward the need for a social-centric, public-orientated HP communication model.

5.2.3 Analysis of Research Literature in Communication, Language, and Linguistics

Literature pertaining to a broad range of communication issues, language and linguistics were reviewed. These areas of the literature are detailed below.

5.2.3.1 Communication Issues

There were four main areas of communication issues reviewed: communication channels, LOC, culture, and memory (see Section 2.8.1). A wide variety of communication channels are used to transmit HP messaging in the U.S. (see Section 2.8.1.1). This influenced the development of the model to ensure that it was omnichannel. An omnichannel model allows for this wide variety of communication channels to be used to push or pull messaging. In communication, internal LOC often characterises sender-centric messaging, and external LOC often characterises recipient-centric messaging (see Section 2.8.1.2). Recipient-centric messaging is geared toward better decoding of messages and thus better interpretation of the intent of messages. For this reason, the model was developed so that the stakeholders could collaborate to ensure that senders and receivers would synthesise mutually intelligible language. Culture and memory are complex areas of communication

which include many facets (see Sections 2.8.1.3 and 2.8.1.4). This model was built on the premise that language is inherently imbued with qualities that are based on culture and memory. For this reason, the repository of HP language in the model would allow for the language elements coloured by diverse influences such as culture and memory to be collected from a range of stakeholders. Then the HRBO-DMP working group would be able to examine these language elements to construct language output with mutual intelligibility for all stakeholders.

5.2.3.2 Language and Linguistics

Frame analysis, paradigmatic analysis, and discourse analysis were three areas that were influential in the development of the model (see Sections 2.8.2.2, 2.8.2.3, and 2.8.2.4). The concepts of exemplars, substitution, themes, and schemata are all deeply ingrained in language. This linguistic reality helped support the rationale behind the collaborative structure of the model, the repository so that language from stakeholders could be collected, and the working group where mutual intelligible language could be distilled.

5.2.3.3 Communication Models

Six communication models were examined as part of this research study to gain a broad understanding of how such models are constructed and how they work. This supported the creation of two initial HP communication models, which were based on some elements from the first two models reviewed (see Section 2.8.1 and Table 2.13). Insights from the analyses of HRBO and DMP interviews, and the analyses of the literature and document reviews collectively reflected a need for an enhanced sociolinguistic interaction focus. This led to the refinement of the two initial HP communication models version, with the end result being the Initial Hurricane Preparedness Communication Model. The part of the literature review specifically pertaining to DC surfaced a study on Hurricane Sandy that revealed that the public did not feel that wind-based strength measurements were truly reflective of the threat of the storm, which the public felt could be better described in non-wind and societal threats (see Section 2.8.1). This pointed towards the need for a HP communication model which incorporated public input in terms of descriptive language. Other aspects of the review of the six communication models that sequentially led to the development of the model for this study were detailed in Table 2.13. This culminated in the key finding: the

need for direct public access to messaging critical to HP efforts and a feedback mechanism for message recipients to ensure recipient-centric HP messaging language.

5.2.4 Interview Responses from High-risk Building Occupants and Disaster Management Professionals

Some of the key language-based insights that were derived from the analysis of research study participant interview responses were the themes; they guided the development of the sociolinguistic characteristics of the model. These responses are detailed in Table 5.2 below.

Table 5.2: Synthesised Interview Response Insights that Guided the Model Development
Descriptive Hurricane Preparedness Language of High-risk Building Occupants
• Distrust of High-risk Building Safety Messaging (see Section 4.3.1.2.1) • Emotional Assessments of High-risk Buildings (see Section 4.3.1.2.2) • Building Code Language Specificity Versus Ambiguity (see Section 4.3.2.2.1) • Escape Versus Evacuation Language (see Section 4.3.7.2.1) • Preference for Positive Emotional Rather Than Fear-based Language (see Section 4.3.7.2.2)
Prescriptive Hurricane Preparedness Language of Disaster Management Professionals
• Local: High-risk Building Elevation, Storm Surge, and Evacuation Implications (see Section 4.3.1.2.3) • FDEM: High-risk Building Shelter Language Ambiguity (see Section 4.3.1.2.4) • FEMA: Building Code Language Specificity Versus Ambiguity (see Section 4.3.2.2.1) • FDEM: DMP – Prescriptive Language (see Section 4.3.7.2.3)
Hurricane Information Comprehension and Channels
• HRBO, FEMA, FDEM: Imminent Hurricane Strikes and Preparedness Without Warning (see Section 4.3.3.2.1) • HRBO: Shortcomings in the Hurricane Communication Channels for HRBO (see Section 4.3.4.2.1) • FEMA, FDEM, Local: Hurricane Communication Channel Consistency for DMP (see Section 4.3.4.2.2)
Hurricane Language Effects on Hurricane Preparedness Behaviour

• HRBO: Post-Information Evacuation Schema (see Section 4.3.5.2.1) • HRBO: Post-Information Remain Schema (see Section 4.3.5.2.2) • HRBO: Post-Information Armed Home Defence Schema (see Section 4.3.5.2.3) • FEMA: Post-Information FEMA Next Steps (see Section 4.3.5.2.4) • FDEM: Post-Information FDEM Next Steps (see Section 4.3.5.2.5) • Local: Post-Information Local Government Next Steps (see Section 4.3.5.2.6) • HRBO: Post-Information HRBO Next Steps Communication Receivers – Mutual Support Structure (see Section 4.3.6.2.1) • HRBO: Post-Information HRBO Next Steps Communication Receivers – Message Consistency and Continuity (see Section 4.3.6.2.2) • FEMA, FDEM: Post-Information DM Next Steps Communication Receivers – Pathway from FEMA to DOEM to Local to HRBO (see Section 4.3.6.2.3) • Local: Audience and Channel Agnostic (see Section 4.3.8.2.2)
Hurricane Preparedness Communication and Partnerships
• HRBO, FDEM: Most Vulnerable Groups First (see Section 4.3.8.2.1) • FEMA: Social Nexuses and Interactors (see Section 4.3.8.2.3) • HRBO, FEMA: Intergovernmental Partnerships – Decentralisation, Hierarchy, and Siloes (see Section 4.3.9.2.1) • HRBO, FEMA, FDEM, Local: Government-Community Partnership (see Section 4.3.9.2.2) • HRBO, FEMA, Local: Intercommunity Partnerships (see Section 4.3.9.2.3) • HRBO: In-person HP Communication (see Section 4.3.10.2.1)

These language insights identified in Table 5.2 were triangulated with key elements from the literature review of DM and other areas (see Section 5.2.1), the document review of HP plans (see Section 5.2.2), and an analysis of literature from communication, language, and linguistics (see Section 5.2.3) to help guide the development of the Initial Hurricane Preparedness Communication Model detailed below.

5.2.5 Operational Details of the Model

The Initial Hurricane Preparedness Communication Model is focused on providing DMP a

repository of HP language elements that are tailored to HRBO. The term *language* in this model and this overview section refers to words and phrases that are used within any communication or messaging relevant to HP. For the model to produce language that is holistic, the following diverse stakeholder groups provide language inputs as an information flow to a central data location in the model: HRBO, DMP (FEMA, FDEM, and local governments), and academic institutions (universities, research institutions). The collected language data from the central data location then flows as information to be analysed by a FEMA-facilitated collaborative working group comprised of HRBO and DMP in order to optimize the language, which then flows as information again for further use by broader groups of DMP in their HP efforts focused on HRBO. Arrows indicate the direction of information flow, which starts with stakeholder input, then goes into the central data location, which is then accessed by a working group comprised of representatives of stakeholder groups, and then finally flowing back out to DMP as holistic HP language that they can leverage for their HP communication efforts. The elements depicted in the model are detailed subsequently followed by the model itself.

5.2.6 Stakeholder Groups and Language Input

This model is constructed such that language-based data regarding factors relevant to HP that were uncovered in this study (see Sections 5.2.1, 5.2.2, 5.2.3, and Table 5.2) are input as an information flow to the communication model by the following stakeholder groups detailed in Table 5.3 below.

Table 5.3: Model Stakeholder Groups and Language Input

Stakeholder Groups	Language Input
HRBO	HP and building code language they would prefer to be used rather than some of what is currently used by DMP
	Language regarding broad knowledge they have about potential impacts to their immediate social and physical environments, i.e. their families, friends, homes, neighbourhoods if a hurricane was going to strike

FEMA	Hurricane data from the NHC and local weather data from the NWS
	The general HP Guidelines for the public
	A list of resources available for SFG and the public
SFG	A list of resources that FDEM and other SFG agencies have available for local governments and the public
	The information on wind speed threshold building codes
Local Governments	Information on evacuation routes
	Information on shelter locations
	Other information relevant to the public
Academic Institutions	Hurricane data and probable path (*spaghetti*) models that universities and research institutions have

5.2.7 Repository for Hurricane Preparedness Language

The language input from these stakeholders is information that flows and is collected in a secure, central data location (Repository for HP Language – RHPL). One critical finding in the document review that pointed toward the need to centralise language information was identified from research conducted on Hurricane Sandy, which highlighted how often the public looked to resources other than the government for hurricane information (see Section 5.2.3.1). Another finding from the literature which highlighted the advantages of single-source information was the HP plan from Taiwan, which described that the main source for hurricane information was a dedicated radio station (see Section 5.2.2). This RHPL location includes all the information that stakeholders have that is relevant to HP. The collected information flows again and is then accessed by the HRBO-DMP Working Group.

5.2.8 High-risk Building Occupants – Disaster Management Professionals Working Group

A FEMA-facilitated working group of selected HRBO and DMP assesses the collected language information that has flowed from the RHPL and collaborates to create HP language that is optimized for HRBO. Finally, this language information can then flow to DMP so that they could use this holistic HP language for more effective communications and messaging. Part of the rationale for this working group came from the literature review and interview

data, which pointed toward the need for HRBO and DMP to work together in a markedly increased manner on social-centric HP efforts (see Sections 5.2.1, 5.2.2, and Table 5.2).

5.2.9 Presentation of Initial Model

The initial Hurricane Preparedness Communication model is depicted in Figure 5.1 below.

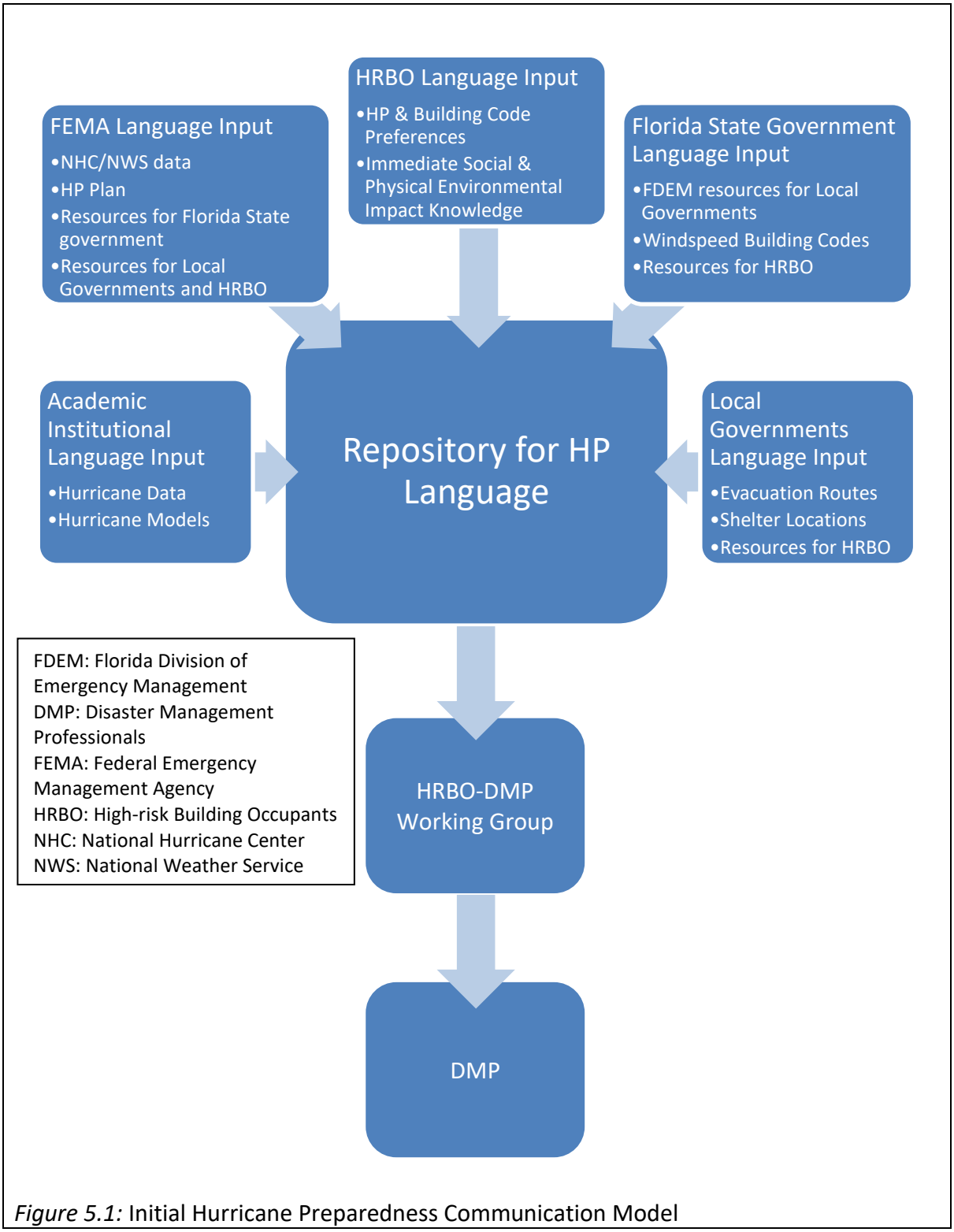

Figure 5.1: Initial Hurricane Preparedness Communication Model

5.3 Summary

The development of the Initial Hurricane Preparedness Communication model (see Figure 5.1) was reflective of a number of influences from this research study. Insights gained from the analyses of interview responses from HRBO and DMP highlighted critical gaps and

opportunities in HP communication, which helped in the synthesis of individual elements of the model (see Table 5.2). One exemplar and one theme are examples of a number of insights from the interview analyses which helped in the development of the model. Exemplar 10: In-person HP Communication (see Section 4.3.10.1.1) corresponded to one theme relevant to Objective 2. Theme 27: In-person HP Communication (see Section 4.3.10.2.1) highlighted the uniformity of perspectives that HRBO and DMP had that HP communication would benefit immensely from them engaging directly in-person with each other in a vastly increased manner. This perspective was also found in Theme 23: Social Nexuses and Interactors (see Section 4.3.8.2.3) and Theme 26: Intercommunity Partnerships (see Section 4.3.9.2.3) as detailed in Objective 3. The consistency of participant responses regarding the value of in-person HP communication was influential in the synthesis of an inherently social-centric model for this research study that features stakeholder collaboration at its core.

The structure of this initial model was guided by an analysis of existing communication models that reflected effective aspects of model structures as well as essential elements these models lacked (see Table 2.13). The literature review and analysis conducted for this research study revealed that there is a considerable lack of HP communication research that uses linguistic theory as a framework. A review and subsequent analysis of HP-related DM documents from the U.S. and other countries showed a number of communication strategies which were well conceived, but missing vital components including the lack of a feedback mechanism from the public (see Sections 2.6.2 and 2.7). Communication issues were also identified including a general lack of omnichannel HP communication and a bias toward internal LOC communication (see Section 2.8.1.2). Language and linguistics literature were also examined, which were largely focused on data collection and analyses, but shaped thematic saturation which was reflected in the language-centric framework of the initial model (see Section 2.8.2). Six communication models were reviewed, two communication models were synthesised, and the collective interpretation of these was detailed (see Section 2.8.3.9). All of these aforementioned efforts in this research study were combined with the interview analysis to elicit the Initial Hurricane Preparedness Communication Model (see Figure 5.1).

The details in the subsequent chapter pertain to the model accuracy verification from the participants and the feedback which led to the refinement of the initial model to elicit the final model.

Chapter 6 – Discussion, Accuracy Verification, and Final Model

6.1 Overview

This chapter describes how the initial model is forwarded to all 18 research study participants: 12 HRBO and six DMP. The MSC technique is used to verify the accuracy of the model. Ultimately half of these participants, six HRBO and three DMP, review the model with four out of the six HRBO and all three DMP verifying the accuracy of the model. Two out of the six HRBO did not find the model useful. The participant feedback which determines the model is accurate is discussed, including context from literature and document review analyses and interview analyses. Meta-insights are also derived from deeper analysis of this participant feedback. These meta-insights predicate that while the initial model is determined by the participants to be accurate, it can be refined further using an Influences layer, which describes how input language from the stakeholders is coloured and shaped by a variety of their personal and societal influences. This Influences layer is also supported by the research literature and a number of the communication models previously reviewed. The refinement is conducted on the initial model to develop the Final Hurricane Preparedness Communication Model, which is presented at the conclusion of this chapter.

6.2 Research Study Participant Accuracy Verification of the Model

The aim of this research was to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy. The literature and document review analyses (including the analysis of communication issues, language and linguistics, and other communication models), the analysis of the research study interviews, and the continued model development resulted in the Initial Hurricane Preparedness Communication Model (see Figure 5.1). This initial model was forwarded for accuracy verification to the same 18 participants that were interviewed for this research study. Nine of these research study participants ended up reviewing the initial model and gave feedback: three DMP (one each from FEMA, FDEM, and a local county government) and six HRBO. Seven of these participants verified that the initial model was accurate, including all three of the DMP and four of the six HRBO. Two of the six HRBO participants did not find the initial model useful. The seven participants found that the MSC this initial model would affect if it was implemented would be to serve as a repository and centralised

location for the stakeholders (DMP, HRBO, and Academic Institutions) to create and share mutually intelligible HP language. The critical facet of in-person HP communication highlighted by HRBO and DMP in interviews (see Sections 4.3.9.2 and 4.3.10.2.1) features in this MSC and is illustrated in the initial model, thus lending further credence to this accuracy verification.

A questionnaire including the initial model was provided individually to the 18 participants (see Appendix O). The intention of this questionnaire was for these HRBO and DMP to consider what the MSC narrative would be if this Hurricane Preparedness Communication Model was utilised (see Section 3.9.3.2). This questionnaire also served as another method triangulation technique to support data collection triangulation and data analysis triangulation (see Sections 3.7.1 and 3.8.1). Internal validity was also supported by the use of this questionnaire (see Section 3.9.3.1). The participants were given the following hypothetical scenario and then asked the two feedback questions:

Imagine this Hurricane Preparedness Communication Model was implemented. Please answer the following questions:
1. How would things change for each of these groups (HRBO, FEMA, Florida State Government, Local Governments, Academic Institutions)?
2. Out of all these changes, which one would be the most significant?

There were nine research study participants who returned this document with their responses: six HRBO (4P, 5P, 6P, 8P, 9P, and 12P) and three DMP (1G, 4G, and 5G). The DMP research study participants represented one each from FEMA, FDEM, and a Florida County EM department. The responses of all nine of these research study participants were analysed using MSC. Seven of these participants, including all three DMP, verified that the initial model was accurate and two HRBO participants did not find the initial model useful. The seven participants found that the MSC this initial model would affect if it was implemented would be to serve as a repository and centralised location for the stakeholders (DMP, HRBO, and Academic Institutions) to create and share mutually intelligible HP language. The responses leading to the accuracy verification of the initial model are detailed below.

One of the DMP (participant 5G) described the RHPL as the MSC the implementation of this initial model would elicit as evidenced in this accuracy verification:

> ***I believe that the repository construct presents the most significant tool in this model. However, the true value of this tool is derived from the comprehensive varying inputs, which represent a true whole community approach. While the concepts of working groups and central information data repositories is well established, there still is a substantial lack of inclusiveness within current disaster preparedness, response, and recovery modalities. By focusing on a very specific hazard and vulnerable population that reside in these HRBs (high-risk buildings) we can gain a better understanding of their specific preparedness, response and communication needs.***

The focus on 'specific preparedness, response and communication needs' of receivers expressed by participant 5G reflects an external LOC communication framework, and components such as risk perception, and resources found in the review of communication issues, the Extended Parallel Process Model, and the Iterative Warning Response Model (see Sections 2.8.1.2, 2.8.3.2, and 2.8.3.6). The focus on 'vulnerable populations' reflects demographics from the Iterative Warning Response Model as well. Additional support for how this initial model would be specifically valuable to FEMA was cemented by further feedback from research study participant 5G:

> ***This model would provide an additional platform for whole community engagement that is aligned with FEMA's mission and strategic priorities. Would provide a central repository of resources available to STTL (State, Tribal, Territory, Local) partners, citizens and private sector partners.***

Document review analysis identified the intention of FEMA to galvanise community engagement, as reflected in the community-centric elements presented in Disaster Preparedness Task Categories for the Public (see Table 2.5). Thus, such feedback as reflected above by research study participant 5G certainly supports the value of the RHPL and the initial model itself. Furthermore, given the aim of this research including creating this model for use by DMP, this feedback offered by research participant 5G was robust accuracy verification of the initial model.

Further support for the value of the RHPL was offered in the feedback given by another of the DMP (participant 1G) regarding the model:

> ***I believe that the model could serve as a good repository of past, current, and potential new language that will be used to communicate with a variety of partners. As we have seen recently, the NHC is using new language for their public advisories as well with local and state agencies (this is done mainly to introduce EM professionals ahead of public use so that they can answer any questions from the public). I recently watched a segment on the Weather Channel that discussed the new terminology that the public is using, especially on social media. Some of these terms have been in the meteorological discipline for decades but not widely used until now. This was attributed to weather media sources using these terms and the public now hearing them more often, thus, old/new terms are now becoming commonplace.***

The feedback offered by participant 1G highlighting the value of the initial model featuring 'past, current, and potential new language' is reflective of knowledge from the sender factors and the general message factors featured in Berlo's SMCR Model (see Section 2.8.3.1). Participant 1G also described that there is 'new terminology' the public is using on 'social media,' which then reflects the importance of communication channels that was identified in the review of communication issues, Berlo's SMCR Model, the Iterative Warning Response Model, the Floodplain Occupant Perspective on Warning Model, and the IPAWS Model (see Sections 2.8.1.1, 2.8.3.1, 2.8.3.6, 2.8.3.7, and 2.8.3.8). The social system from the sender factors from Berlo's Model would also be relevant due to the public focus on language and social media.

The benefits of centralisation and mutually intelligible HP language were regarded as the MSC by participant 1G in verifying the initial model was accurate, as follows:

> ***The ability to have a central location by which all parties can collaborate and keep up to date not only on new terms being introduced by weather sources, but by those on social media as well. This will enable to allow all parties to be aware of changes to terminology as well as possible definition revisions in real time, and thus reduce the possibility of confusion, which is a constant challenge when***

> ***providing information to the HRBO community to help them prepare for, respond to, and recover from severe weather such as hurricanes.***

Concepts such as message factors and decoding as part of external LOC communication were all evident in the response by participant 1G (see Section 2.8.1.2). The potential for confusion and variability on the part of the public regarding the use of weather terms was well represented in the literature, as evidenced by Patt and Schrag (2003) who remarked that the interpretation, description, and risk assessment of weather events are quite fluid and depend on the frequency and negative associations they have pertaining to such events (pp. 19-20). The mutual intelligibility that the initial model would conceivably facilitate was also supported by the feedback from one of the HRBO (participant 12P):

> ***I would like to think it would force them to come together and adopt the same terminology the public understands. Potentially retiring useless terms and ideas that only a professional (trained) would understand. Most language as it relates to meteorology and construction, etc., is for above average persons' capacity and in a time of urgency, simple and precise is key. Simplicity will also help carry the message between the public more efficiently.***

The concepts of 'simple and precise' in messaging to make communication with the public work more 'efficiently' is reflective of the sender factor of communication skills found in Berlo's SMCR Model, and the importance for messaging to be understood outlined in external LOC communication (see Sections 2.8.3.1 and 2.8.1.2). Yet another of the HRBO (participant 4P) shared feedback on how HP language simplicity offered by the initial model would be beneficial:

> ***The new model you have created will certainly make communication to citizens in a hurricane prone area simple and easy to understand. Language elements that mean the same with all the organizations and government will make the human interaction take notice and get out of the way before the disaster strikes. From past experience, it felt like the right hand didn't know what the left hand did. Mass confusion! People in FL joke about the cone of uncertainty and all of the spaghetti models the FEMA professionals refer to.***

Participant 4P referred to 'past experience,' which is detailed as a component the Iterative Warning Response Model, and is also reflective of active remembering (see Sections 2.8.3.6 and 2.8.1.4). Academic institutions were identified as impending hurricane information sources by DMP, as elucidated earlier in this chapter (see Section 4.3.4.2.2). The HP language conveyed by DMP that often utilises potentially pedantic terms such as the metaphoric 'cone of uncertainty' and 'spaghetti model' may not be well understood by HRBO, to the point where it becomes a 'joke,' thus evidencing the sender factor of attitudes from Berlo's SMCR (see Section 2.8.3.1). Such use of language which does not resonate with all audiences is part of what the initial model would seek to help with. The benefit of mutual intelligibility offered by the initial model was echoed by the feedback of another of the HRBO (participant 6P):

> ***With the use of common vernacular, the stakeholders would be better suited to communicate plans and actions. Same language = same expectation and cause and effect outcome.***

Messaging factors and external LOC communication featured again in this feedback offered by participant 6P (see Section 2.8.1.2). The benefit of centralisation and language-driven HP support for the public was regarded by one of the DMP (participant 4G) verifying the accuracy of the model as being the MSC implementing the initial model would elicit:

> ***Making it part of the population's knowledge that there is one location to find all of this disaster prep information. Like a Google for disasters. Just as we use the word Google when we mean searching online, when we think to buy something, you might think Walmart, Target, Amazon etc. If we could successfully make the population think of a name or branded website. For disaster information that would be interesting.***

Again, the importance of knowledge is reflected by this response by participant 4G. Additional support for how this initial model and its RHPL would be a valuable HP information source was cemented by further feedback from research study participant 4G:

> ***It has been said that there is a lot of information out there, it is just hard to find. There is more activity searching when a hazard is threatening but it's at all levels. Some know to go look at their local EM, others seek out state EM or FEMA. It***

> ***would be nice everyone managed their information in a central repository and promoted one location.***

Knowledge featured again in this feedback from participant 4G. Centralisation as a benefit of the initial model that would help HRBO was also supported by the feedback of one of the DMP (participant 1G):

> ***Having a central location where all entities can go to have a common communication process using relevant terms which are all defined in the same manner would be very helpful to the HRBO community.***

This centralisation was reflected in the IPAWS Model and having 'relevant terms which are all defined in the same manner' is reflective of external LOC communication (see Sections 2.8.3.8 and 2.8.1.2). However, not all research study participants found the initial model to be useful, as evidenced by one of the HRBO (participant 9P) who opined regarding the MSC in the model as follows:

> ***I do not think we need more government involvement in how to survive a hurricane. We need a simple list of instructions with directions on where and when to leave and best routes to do so. Unfortunately, where I live there are not a lot of options of ways to go and I see accidents everyday that would put many in jeopardy if trying to leave the area and are stuck in traffic. Because of this sometimes it is better to wait it out.***

Participant 9P reinforced this perspective on the initial model:

> ***I am not sure how things would change if this was implemented. The average person is concerned about safety routes to leave and if the roads will be clear to do so or if they should stay at home.***

While participant 9P did not verify the accuracy of the initial model, this participant did highlight the importance of knowledge, as detailed in Berlo's SMCR Model (see Section 2.8.3.1). In contrast, the inclusion of HRBO in the initial model in order to mitigate the potential for danger for dismissing government direction regarding HP was cited by another of the HRBO (participant 4P) as being the MSC implementing the model could offer, in the

accuracy verification below:

> ***I believe the most significant change would be to include the High Risk Building Occupants. I live in a 15 story condo and we had a dozen condo owners refusing to evacuate the buildings even when it became mandatory. They were riding it out. They were just lucky. Next time maybe not.***

The perspectives shared by participant 4P on 'riding it out' was reflective of a personal culture orientation as detailed in communication issues (see Section 2.8.1.3). This also contrasted with the view of another of the HRBO (participant 6P) in feedback verifying the accuracy of the MSC implementing the model could bring by affecting the following:

> ***Underestimating storm impact is the most prevalent attitude held by long-time residents.***

The potential for local governments to help HRBO understand HP was expressed by one of the HRBO (participant 12P) as being the MSC the initial model could bring as elucidated in the accuracy verification below:

> ***Passing the message from the local governments to the actual HRBO. Possibly having to mark every structure in their area with a designated potential wind/water failure value. Example being you live in a CAT 1 and your neighbour is in a CAT 4 structure. While this may have negative effects on values and cause other issues, human safety is the key. At some point, local government approved the building code and most homeowners or occupants have no clue what they are harbouring in.***

Participant 12P described the possibilities of DMP marking 'every structure in their area with a designated potential wind/water failure value,' evidencing an example of location from the Iterative Warning Response Model (see Section 2.8.3.6). The lack of knowledge regarding the high-risk building status of a dwelling featured prominently in feedback offered by one of the HRBO (participant 5P) in not finding the initial model useful:

> ***I can only give feedback on HRBO, although I don't believe I am in a high risk building. As stated during my interview, I believe the state of Florida has excellent communication in place during times of disaster. That being said, I'm not sure how***

changing any of the models could improve what I see as sufficient. Please note, I've only been in Florida for a short time and have only experienced one direct hurricane (Irma).

Participant 5P was screened specifically as an occupant of what is definitively construed by SFG as being a high-risk building; yet this participant was unaware of this hurricane risk reality, evidencing risk perception from the Iterative Warning Response Model (see Section 2.8.3.6). Furthermore, the experience participant 5P had with Hurricane Irma may have become a case in active forgetting due to a lack of relevance: this storm perhaps did not damage the community this participant lived in as much as adjacent areas (see Section 2.8.1.4 and Figure 3.5). In contrast, one of the DMP (participant 5G) framed that this very lack of knowledge about the dwelling was something that the initial model could help HRBO with by improving their awareness of the following:

Better understanding of their physical spaces, protective abilities/limitations in direct correlation to the communicated impact messages by DMP. Increase HRBO level of preparedness through a better understanding of response and recovery efforts and impacts for hurricanes.

The necessity of government preparedness for hurricane events was described in feedback by one of the HRBO (participant 8P) as being the MSC the initial model could offer as evidenced in the accuracy verification below:

Federal, state, and local Governments must be proactive with every hurricane and have stored ready to deploy said supplies shelters immediately.

Participant 8P further supported this perspective of the initial model being beneficial for HRBO as follows:

For HRBO, FEMA would have supplies in place well before a hurricane hits ready to deploy 24 to 48 hours after a hurricane hit the affected areas.

The coordination on the part of DMP was highlighted by another of the HRBO (participant 6P) in verifying the accuracy of the MSC the initial model would bring:

Cooperative Emergency Management approach, early dissemination of storm data

and greater evacuation enforcement for storm prone areas.

Data sharing by academic institutions was supported as well by the feedback given by one of the DMP (participant 5G) regarding another benefit of the initial model:

> ***Would provide a forum that would allow academic institutions to lend more comprehensive support to DMP at the local, state, and federal levels. Could serve as a model program for other such working groups focused on other types of natural and or man-made disasters.***

Participant 5G also highlighted other HP benefits the initial model would bring to FDEM, including:

> ***Would provide focused support of federal and whole community partners that could enhance current preparedness activities while providing academic based and supported communication options for this specific natural hazard. Increased preparedness and better understanding of resources and support available from federal and whole community partners to state and local level DMP***

The elicitation specifically of the accuracy verification of the MSC stories and corollary feedback from seven participants (all three DMP and four out of six HRBO) was contrasted with the feedback from the other two HRBO who did not find the initial model useful. Using this narrative analysis MSC technique, the initial model was verified for accuracy. Of particular note within this verification was how these seven participants found that the MSC this initial model would affect if it was implemented would be to serve as a repository and centralised location for the stakeholders (DMP, HRBO, and Academic Institutions) to create and share mutually intelligible HP language. Further conclusions pertaining to the initial model are detailed subsequently.

6.3 Conclusions Regarding the Model

Nine research study participants reviewed the model and gave feedback. Seven of these participants verified the initial model was accurate, including all three of the DMP participant and four of the six HRBO participants. Two of the six HRBO participants did not find the initial model useful. It is acknowledged that having seven out of nine participants

verifying the initial model to be accurate is indeed a majority, but also represents a small number of participants overall. Furthermore, two out of the nine participants not finding the initial model to be accurate is a minority, and a small number, but still comprises a sizeable portion of the evaluation group. The argument is made that examining HP communication language on such a deep level using linguistic techniques is relatively novel research. The interpretative research philosophy and language intensive focus of this research study predicated small sample sizes, yet in its achievement of thematic saturation, it reflected the bias to obtain *rich*, qualitative data rather than *thick*, quantitative data (see Table 3.1 and Section 3.7.3.2.1). This study elicited very rich narrative data that was analysed and yielded thematic saturation, ultimately leading to the development of a language-centric model. The seven participants found that the MSC this initial model would affect if it was implemented would be to serve as a repository and centralised location for the stakeholders (DMP, HRBO, and Academic Institutions) to create and share mutually intelligible HP language. The accuracy verification was highlighted by the consistency of these MSC stories, along with other feedback offered by these seven participants, which evidenced a firm conviction regarding this model. Of particular note was the verifying feedback from all three of the DMP that reviewed this initial model and found it to be accurate. They expressed that it would assist in helping achieve the mission and strategic objectives of FEMA and also provide a collaborative, centralised information source for DMP and HRBO (see Section 6.2). The HRBO provided robust verifying feedback, including how the initial model would be vital in providing mutually intelligible HP language, and how the HRBO- DMP Working Group mechanism of the model would also facilitate government-community HP collaboration, thus reflecting external LOC communication as well (see Section 2.8.1.2).

The two HRBO that did not find the initial model useful provided useful feedback that contrasted sharply with other feedback from both HRBO and DMP. The feedback of these two HRBO focused on the belief that either their dwelling was actually not high-risk and/or that government HP efforts were already sufficient such that further HP efforts would be unnecessary due to their perceived lack of risk and a willingness to ride out storms. In both cases, responses to other questions during the interview would contradict their feedback on the initial model. The reasons behind this discrepancy may be related to active forgetting of

the experiences participants related that contradict their views on the initial model (see Section 2.8.1.4). However, all HRBO participants were specifically screened in this study because they unequivocally live in high-risk buildings. The views of all seven of the other research study participants were diametrically opposed to the perspectives of the aforementioned two HRBO. The seven participants who verified the model and found it to be accurate decried the dangers in HRBO underestimating hurricane risks and engaging in the stubborn behaviour of other HRBO in refusing to evacuate. Thus, the feedback provided by these two HRBO participants actually helped to reinforce the accuracy verification of the other seven participants that reflected the consistency and vigour of the model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO.

Meta-analysis of the participant feedback also revealed that there were a number of personal and societal communication factors that influenced language from stakeholders that were not overtly detailed in the initial model. These factors were also reflected in the research literature and the review of the communication models. The factors influencing language and their source in this document are detailed in Table 6.1 below.

Table 6.1: Influences on Language Input

Categories	Influence Factors	Source(s)
Sender/Receiver	Communication Skills Attitudes Knowledge Social System Culture	Berlo's SMCR Model (see Section 2.8.3.1)
		Culture (see Section 2.8.1.3)
	Past Experience/Memory Location Demographic Factors Resources Risk Perception	Iterative Warning Response Model (see Section 2.8.3.6)
		Memory (see Section 2.8.1.4)

	LOC	Locus of Control (see Section 2.8.1.2)
Message	Content	Berlo's SMCR Model (see Section 2.8.3.1)
	Elements	
	Treatment	
	Structure	
	Code	
Channel	Voice	Communication Channels (see Section 2.8.1.1)
	E-mail	Integrated Public Alert Warning System (see Section 2.8.3.8)
	Web	
	Chat	
	Text	
	Application	
	Social Media	

Critical content in messages such as warning information, as detailed in the Iterative Warning Response Model, would be subsumed under message content (see Section 2.8.3.6). Characteristics regarding age, gender, language spoken at home other than English, disability, education, employment, income, and vulnerability factors such as poverty, would be subsumed under demographics and as reflected by the data categories collected by the U.S. government (U.S. Census, 2020). One benefit of the Influences layer is that it necessarily emphasises the characteristics of influences on language. These influences are critical elements reflective of external LOC communication that shape messaging in a way that improves the encoding by senders and decoding by receivers, thus improving the mutual intelligibility of the messaging (see Section 2.8.1.2). Mutual intelligibility in HP communication language is at the heart of the Final Hurricane Preparedness Communication Model.

Table 6.1 detailed components which were utilised in the refinement of the initial model. These components became part of the depicted Influences layer of the final model. The

Influences layer characterised the components that influence language input from the stakeholders that is input as an information flow to the repository. The revised operational details of the final model are presented subsequently.

6.4 Operational Details of the Final Model

The Final Hurricane Preparedness Communication Model is focused on providing DMP a repository of HP language elements that are tailored to HRBO. The term language in this model and this overview section refers to words and phrases that are used within any communication or messaging relevant to HP. For the model to produce language that is holistic, the following diverse stakeholder groups provide language inputs: HRBO, DMP (FEMA, FDEM, and local governments), and academic institutions (universities, research institutions). These language inputs are characterised by an Influences layer that details personal and societal factors pertaining to senders/receivers, messages, and communication channels. This language input flows as information to a central data location in the model. The collected language data from the central data location then flows again as information to be analysed by a FEMA-facilitated collaborative working group comprised of HRBO and DMP in order to optimise the language. This optimised language flows as information again for further use by broader groups of DMP in their HP efforts focused on HRBO. Arrows indicate the direction of information flow, which starts with stakeholder language input characterised by the flow through the Influences layer, then going into the central data location, which is then accessed by a working group comprised of representatives of stakeholder groups, and then finally flowing back out to DMP as holistic HP language that they can leverage for their HP communication efforts. As compared to the initial model, the previously detailed Stakeholder Groups and Language Input (see Section 5.2.6), Repository for Hurricane Preparedness Language (see Section 5.2.7), and High-risk Building Occupants – Disaster Management Professionals Working Group (see Section 5.2.8) remain the same, with the exception that the initial language input information flow is characterised by the added Influences layer. The Final Hurricane Preparedness Communication Model is presented with this refinement subsequently.

6.5 Presentation of the Final Model

The Final Hurricane Preparedness Communication model is depicted in Figure 6.1 below.

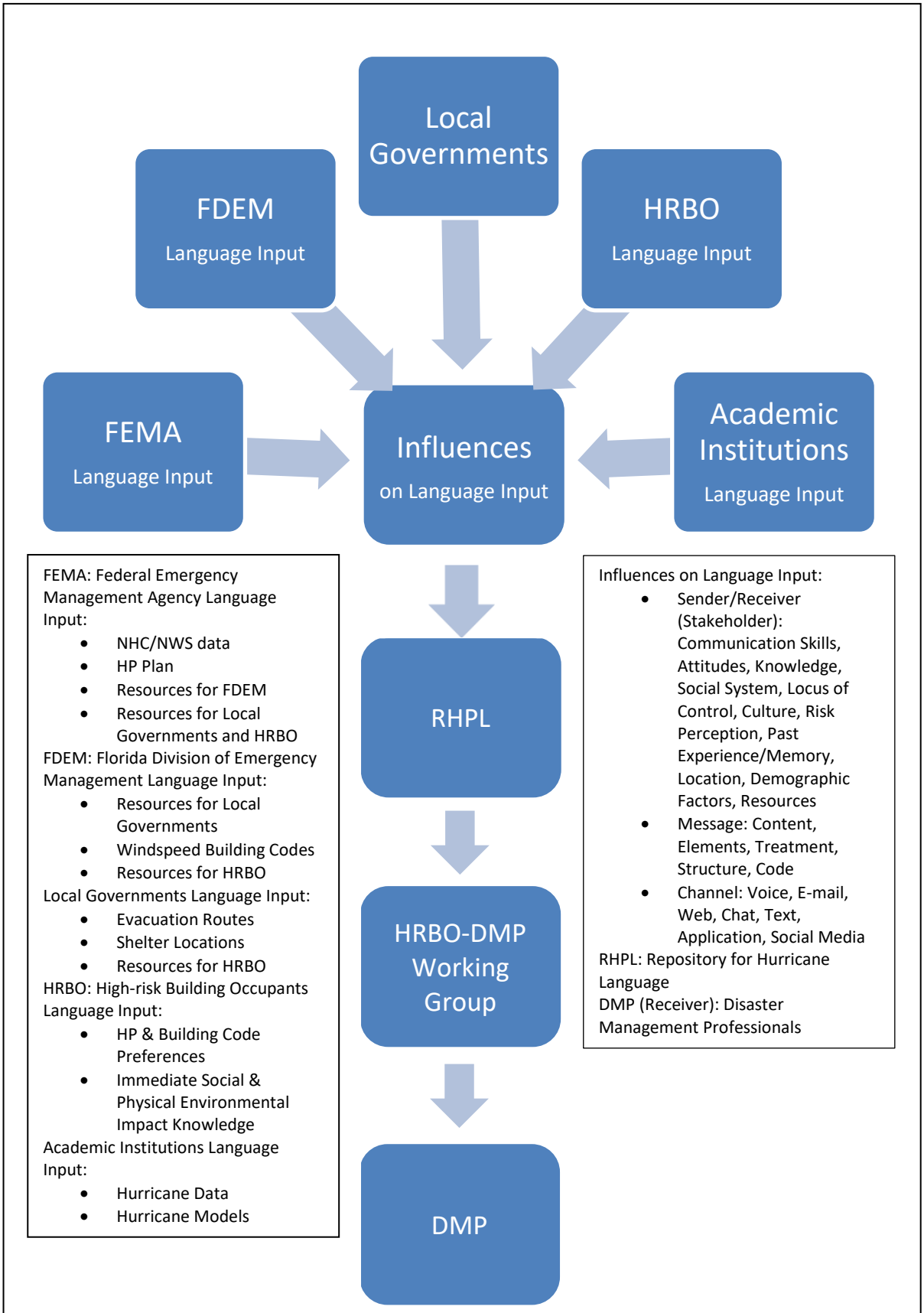

Figure 6.1: Final Hurricane Preparedness Communication Model

6.6 Summary

A qualitative technique was used to verify the accuracy of the model, the MSC technique (see Section 3.9.3.2). This technique is predicated on finding a narrative that research study participants believe would be most reflective of the MSC affected by the implementation or proposed implementation of the change being examined. The change that was proposed is the implementation of the Initial Hurricane Preparedness Communication model. The initial model was forwarded for accuracy verification to the same 18 participants that were interviewed for this research study. Nine of these research study participants ended up reviewing the initial model and gave feedback: three DMP (one each from FEMA, FDEM, and a local county government) and six HRBO. Seven of these participants verified the initial model was accurate, including all three of the DMP and four of the six HRBO. Two of the six HRBO participants did not find the initial model useful. The seven participants found that the MSC story this initial model would affect if it was implemented would be to serve as a repository and centralised location for the stakeholders (DMP, HRBO, and Academic Institutions) to create and share mutually intelligible HP language. The facet of in-person HP communication features in this MSC, as illustrated in the initial model (see Figure 5.1), thus lending further credence to this accuracy verification.

Through a deeper analysis of this participant feedback, meta-insights were derived. While the initial model was determined by the participants to be accurate, the meta-insights pointed towards the importance of influences on language. This predicated that the initial model could be refined further by incorporating an Influences layer, which describes how input language from the stakeholders is coloured and shaped by a variety of influences. The added Influences layer was also reflective of elements derived from the research literature and a number of the communication models previously reviewed. The initial model was refined accordingly in order to develop the Final Hurricane Preparedness Communication Model.

Chapter 7 – Conclusion

7.1 Overview

The final chapter is divided into six further sections:

- Section 7.2 includes the achievement of the research study objectives and the conclusions derived.
- Section 7.3 discusses the contribution to knowledge of the research study.
- Section 7.4 examines the limitations of the research study.
- Section 7.5 details further research that could be conducted based on this research study.
- Section 7.6 presents recommendations that are guided by this research study.
- Section 7.7 offers some broader perspectives on the implications of this research study.

7.2 Conclusions and the Achievement of Objectives

This section covered the conclusions which specifically pertain to the achievement of the objectives. The objectives of the research study were provided again for clarity in Table 7.1 below. This section details how Objectives 1-3 and Objectives 5-6 were achieved through the research activities along with relevant exemplars and themes, as well as literature and document references to help illustrate the conclusions. This section also details how Objective 4 was achieved by similar means to the other objectives, with the addition of verifying the accuracy of the model.

7.2.1 Objectives

The objectives of this research study pertained to how language constructs might be leveraged in building a sociolinguistic-based HP communication model. These objectives are depicted in Table 7.1 below.

Table 7.1: Research Study Objectives	
Objective 1	Examine the pre-hurricane perceptions of HRBO
Objective 2	Evaluate the pre-hurricane strategies of HRBO
Objective 3	Explore and identify specific words, concepts, communication channels used by HRBO and hurricane-focused DMP regarding pre-hurricane realities such as preparedness and awareness
Objective 4	Develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy
Objective 5	Extract contextualised findings which expand existing knowledge
Objective 6	Formulate conclusions and recommendations of HP communication measures for policy-makers

The research that was conducted for this study resulted in the conclusions drawn and the achievement of the six objectives as evidenced subsequently.

7.2.2 Achievement of Objectives and Conclusions Drawn

The six objectives of this research study were achieved through the results of the research activities conducted. These objectives are detailed below along with the conclusions that are relevant to each objective.

7.2.2.1 Achievement of Objective 1 and Conclusions Drawn

Objective 1 was to examine the pre-hurricane perceptions of HRBO. The achievement of this objective is illustrated by the following research study insights. The insights themselves were obtained from the literature and document reviews and the interview data analyses.

The literature review revealed that the pre-hurricane perception of safety could be enhanced through increased communication between members of social circles (see Section 2.4). This review did not reveal anything regarding pre-hurricane perceptions specific to building safety messaging. The research study was able to uncover through interviews with HRBO a critical aspect of pre-hurricane perceptions: that HRBO at times do not trust HP messaging emanating from DMP that pertains to building safety (see Section 4.3.1.2.1). This is because HRBO perceive that the HP messaging is based on risk assessments by DMP that do not take into account many variables based on exact geographic location vulnerability and specific building integrity factors, thus evidencing sender-centric, internal LOC communication on the part of the DMP (see Section 2.8.1.2). There was another aspect of building safety that was not revealed in the literature review: how HRBO may not consider building integrity in the types of engineering and architectural terms that are commonplace in the DM field. The interviews of HRBO surfaced that they may view building safety in a manner that creates false equivalencies between emotions such as comfort and more empirical high-risk building assessments such as safety (see Section 4.3.1.2.2). The discovery in this research study of the emotional assessment of building integrity by HRBO is a pre-hurricane perception that extends the current corpus of literature reviewed.

Part of the pre-hurricane perceptions of HRBO examined in this research study pertained to language ambiguity regarding building codes. Literature in support of the justification and research problem of this study did reveal that changes to building codes contributed to confusion about them (see Section 1.3). However, there were no research studies revealed during the literature review that examined members of the public in terms of their language-based understanding of building codes specifically. This research study thus provided an initial effort in interviewing HRBO about building code language and surfaced the perception of building code language ambiguity. Almost every one of the HRBO interviewed in this research study expressed an overt level of unawareness about building codes. These HRBO did highlight however that building code language used by DMP can be confusing, one reason being because these building codes are expressed in wind speeds as opposed to hurricane categories (see Section 4.3.2.2.1). Currently, HRBO partially determine their building safety based on the large scales presented by wind speed-based pre-hurricane messaging from DMP and the media. This is contrasted with by the other wind speed-based

pre-hurricane messaging from DMP and the media: the Saffir-Simpson hurricane category scale used in the U.S., which is a drastically smaller scale from Category 1-5 (see Appendix H). The illustration of issues with wind speed scale language is one example which underscores the discovery of pre-hurricane perceptions of HRBO pertaining to building code language ambiguity outside of the gamut of sources reviewed in the literature. This language disconnect is reflective of sender-centric, internal LOC communication on the part of the DMP (see Section 2.8.1.2).

One mechanism which was used to examine pre-hurricane perceptions of HRBO was to pose the possibility of a hurricane strike without warning. Such a scenario was not revealed in the literature or document review. In modern times with extensive technology and modelling, a hurricane strike without warning does not seem possible as evidenced by interviews with HRBO (see Section 4.3.3.2.1). However, an effort was undertaken in this research study to examine whether the entire notion of *warning* may be fluid, and if so, to then examine what pre-hurricane perceptions are in a veritable state of surprise. All of the HRBO interviewed in this research study did not believe that hurricanes could strike without warning (see Section 4.3.3.2.1). However, HRBO did reflect that if for some impossible reason that a hurricane could strike without warning, then the consequences would be devastating. The research study participants conveyed that mass social unrest would ensue in such a scenario. Part of the explanation for how HRBO were able to express such responses is because some hurricanes have hit Florida with *relatively* little warning, such as Hurricane Michael in 2018 (see Section 4.3.3.2.1). This reflects the leveraging of past experience in the course of active remembering (see Section 2.8.1.4). Thus, a contention of this research study which differs from that of current HP literature is that the concept of a hurricane strike without warning is inherently dynamic in the minds of HRBO and not as definitive as it is for DMP, and that pre-hurricane perceptions of HRBO account for this possibility.

7.2.2.2 Achievement of Objective 2 and Conclusions Drawn

Objective 2 was to evaluate the pre-hurricane strategies of HRBO. The achievement of this objective is illustrated by the following research study insights. The insights themselves were obtained from the literature and document reviews and the interview data analyses.

Pre-hurricane strategies were elucidated in the literature review revealing that NHC, NWS, and local television were among the top information sources utilised during a pre-hurricane timeframe (see Section 2.8.2). However, the findings from the interviews indicated that these sources are not necessarily credible in the eyes of HRBO, thus potentially putting the quality of their pre-hurricane strategies at risk. The HRBO interviewed expressed that while television stations and in-person communication were important sources of information useful for HP, that these sources had to be relied upon with caution due to the potential for sensationalism and broad interpretation of hurricane threats and potential impacts (see Section 4.3.4.2.1). In contrast, the DMP interviewed expressed that there was great consistency in their hurricane communication channels with NHC and NWS predominating (see Section 4.3.4.2.2). These perspectives reflected by HRBO and DMP cover a range communication issues regarding the differences between internal and external LOC (see Section 2.8.1.2). This research study identified that while these sources may be useful for DMP, the requirements of HRBO for actionable information predicated that they had different information source needs. The HRBO interviewed delineated that NHC was more relevant for hurricane information, but local television channels actually gave them more actionable information relative to their local area (see Section 4.3.4.2.2). These insights on the influence of communication channels such as the NHC and in-person communication on pre-hurricane strategies emphasised a strength of the Final Hurricane Preparedness Communication Model (see Figure 6.1) in featuring information flows from NHC, NWS, and the facet of in-person communication imbued in the working group. The rationale behind this is that HRBO are in a vulnerable position relying so heavily on local television stations and the model could offer a more reliable HP language resource that DMP could use to disseminate information to the public and to local television stations that would ideally contain language elements less prone to creative licence and more aligned to the needs of HRBO. In turn, perhaps this could help local televisions to offer more reliable information to the public.

Evacuation planning is another aspect of the pre-hurricane strategies employed by HRBO. The document review revealed how FEMA details the guidance offered to the public that contains personalised and comprehensive evacuation plans as part of their pre-hurricane strategies (see Section 2.6.2.1). However, literature supporting the justification and research

problem for this study revealed that members of the public do not necessarily follow these guidelines. Quite often, HRBO have a definitive understanding of their own vulnerability which governs their evacuation decisions that is based on social-centric protective measures such as the need to care for pets, or even the need to defend the home against looters (see Sections 1.3 and 4.3.5.2.3). Interviews with HRBO helped to better detail how there are actually language-based systems at work that determine the variability of pre-hurricane evacuation strategies. One such example of a language-based pre-hurricane strategy was derived from interviews with HRBO and was analysed and subsequently labelled as the evacuation schema (see Section 4.3.5.2.1). This reflected how once HRBO received specific information regarding an impending hurricane, that this could trigger the behaviour for them to engage their evacuation plans. The triggering information includes aspects of this pre-hurricane information significant enough to catalyse evacuation behaviour.

In justification for this research and identification of the research problem, literature revealed how some members of the public refuse to evacuate under any circumstance due to the lack of appropriate facilities where they may bring along their animals (see Section 1.3). The HP documentation from FEMA does not address evacuating with animals, which contrasts with the documentation from Australia (see Section 2.6.2.3). Some interviews with HRBO revealed an according language-based pre-hurricane strategy, which was subsequently labelled the remain schema (see Section 4.3.5.2.2). This reflected how HRBO could receive messaging regarding an impending hurricane that contained specific information that made them feel that remaining at home during the hurricane was the right choice, thus triggering the steps pertaining to this behaviour. The decision to stay could be governed by numerous types of information, one such example being when the forecasted intensity of the hurricane is perceived to be strong enough that animals left behind may not survive without human protection.

Looting and the potential for robbery before, during, and after hurricane events was highlighted in the literature and featured in a potentially dangerous subset of the language-based pre-hurricane strategy of the remain schema, labelled the armed home defence schema (see Section 4.3.5.2.3). In this scenario, HRBO feel that that complex combination of information pertaining to hurricane intensity and lack of neighbourhood security and

policing entails that there is a significant enough potential for their homes to be robbed by looters. Thus, they load up on weapons and ammunition to ensure that while they remain at home during a hurricane event, that they are able to defend their property and belongings against looters. This language-based explanation is a unique perspective not revealed in the literature review for explaining the motivations behind HRBO resorting to potentially armed acts of self-protection in hurricane environments. Aspects of violence embedded in the culture of the U.S. may be at the root of this volatility (see Section 2.8.1.3).

These three aforementioned schemata highlighted an opportunity for a solution to the minimally researched effect of language-based hurricane messaging on evacuation behaviour. The exigency of the messaging quality critical to the evacuation decision process and sharing of this information between DMP and HRBO influenced the information flows of the Final Hurricane Preparedness Communication Model (see Figure 6.1), particularly the synthesis of the RHPL component of the model, to provide a collaborative mechanism for HP information to be rendered mutually intelligible. This could perhaps promote greater levels of evacuation due to an enhanced level of hurricane information quality and availability through a collaborative means that was not reflected in the literature.

Intercommunity collaboration was another area of the pre-hurricane strategies surfaced during this research study. Documentation from FEMA showed that there was not as much of a focus on intercommunity collaboration for HP in the U.S. as there was for HP in Australia, as that nation focused more on aspects such as checking on neighbours as part of HP (see Section 2.6.2). This distinction between nations could be reflective of cultural differences with the U.S. being more personal culture-orientated, and Australia being more public-culture-orientated (see Section 2.8.1.3). Australia also utilises language that reinforces communication between individuals and their social circles that promote HP, which contrasts with FEMA (see Section 2.4). Interviews with HRBO paralleled these document findings, showing the importance of a mutual support structure (see Section 4.3.6.2.1). The HRBO interviewed reflected that once they receive impending hurricane information, they engage in steps in which they support their social circles through shared activities such as property-level measures. The interviews with HRBO also highlighted the consistency of HP messaging that they use themselves in checking to make sure that their

social circles have their HP plans in order (see Section 4.3.6.2.2). Also, HRBO ensure that each other are aware of their destinations and timetables in the case of evacuation so that a loss of communication systems does not compound the post-hurricane activity of determining the fate of others. These collective findings influenced the highly collaborative and stakeholder-rich character of the Final Hurricane Preparedness Communication Model (see Figure 6.1), which brings stakeholders together for the purpose of synthesising language that is vital to HP efforts.

7.2.2.3 Achievement of Objective 3 and Conclusions Drawn

Objective 3 was to explore and identify specific words, concepts, communication channels used by HRBO and hurricane-focused DMP regarding pre-hurricane realities such as awareness and preparedness. The achievement of this objective is illustrated by the following research study insights. The insights themselves were obtained from the literature and document reviews and the interview data analyses.

The language of pre-HP and awareness was explored in the document review pertaining to Table 2.6: FEMA – HP Guidelines for the Public, which reflected how evacuation guidelines are detailed by FEMA. This research study revealed that HRBO may instead use descriptive and conceptual language, such as *escaping* an impending hurricane, which offers a clue into the potential lack of preparedness, as compared to a more structured approach to *evacuating* before an impending hurricane (see Section 4.3.7.2.1).

The interviews with HRBO showed that they preferred positive emotional language rather than fear-based language in reference to pre-HP and awareness (see Section 4.3.7.2.2). In detailing the background of this research study, the literature reflected that when fear-based HP language was removed, this would support more motivated behaviour (see Section 1.2). The negative behavioural consequences of fear-control versus danger control were also highlighted in the Extended Parallel Process Model (see Figure 2.18). Whilst the existing literature discussed the shortcomings of using fear based language, it did not provide a solution that is practice orientated. However, interviews showed the use of emotionally positive HP language use, which was one of the findings in achieving Objective 3.

Pre-HP and awareness language that prioritised communicating with vulnerable social groups was not evident in the review of Table 2.6: FEMA – HP Guidelines for the Public. In contrast, the role of vulnerable social groups as pivotal and consistent elements of disaster itself was well established in the literature (see Section 2.2). This research study surfaced findings that were an extension of the literature review: interviews with HRBO revealed that they conceptually felt that the most vulnerable groups should be communicated with first with HP messaging (see Section 4.3.8.2.1). This element of prioritisation of vulnerable social groups was not discovered in official HP documentation and was not revealed in the literature review.

Another aspect of pre-HP and awareness language that was surfaced in this research study pertained to how HRBO felt that they were ultimately left to their own devices to contend with HP activities (see Section 4.3.9.2.1). The document review of Table 2.6: FEMA – HP Guidelines for the Public showed that the guidance for members of the public to be aware of local government resources was only detailed for the time period of when a hurricane is 18-36 hours from arriving. This research study uncovered that HP efforts on the part of government agencies were hampered by limitations within intergovernmental partnerships (see Section 4.3.9.2.1). These limitations were characterised by these agencies having a decentralised structure in which operational hierarchy and siloes predominated, resulting in a less than seamless HP communication environment for HRBO. In addition, HRBO that were interviewed felt that DMP were simply not doing enough to engage with them actively in a HP communication paradigm (see Section 4.3.9.2.2). Interviews with HRBO further highlighted their perspectives on self-sufficiency in the view that HP communication would be improved if communities would work with each other more (see Section 4.3.9.2.3).

The language of pre-hurricane realities for DMP was explored in the document review pertaining to Table 2.6: FEMA – HP Guidelines for the Public, which included text pertaining to the relationship between buildings and evacuation implications. During interviews, DMP highlighted how they felt that high-risk building elevation and storm surge factor into the consideration of how high-risk buildings might withstand a hurricane (see Section 4.3.1.2.3). These DMP also felt that such factors have evacuation implications. However, these perspectives offered by DMP are reflective of HP language which was not discovered in the

approach taken in the U.S. as detailed in the critical document Table 2.6: FEMA – HP Guidelines for the Public. This language does exist however in Table 2.9: Australia – Example of a HP Plan. Thus, this research study identified a gap in FEMA documentation pertaining to the factors of building elevation and storm surge and triangulated this finding through interviews with DMP.

The failure to clearly articulate risks to the public was highlighted by FEMA after Hurricane Katrina in 2005 and this was a pivotal element found in the literature that framed the justification and research problem in this research study (see Section 1.3). Language ambiguity issues proliferated by DMP pertaining to pre-hurricane realities were discovered in this research study (see Section 4.3.1.2.4). The DMP interviewed in this research study expressed HP language which can be ambiguous at times, and such language usage by DMP was confirmed by HRBO during their interviews (see Section 4.3.4.2.2). Language ambiguity is a hallmark of sender-centric, internal LOC communication that is not decoded effectively by receivers (see Section 2.8.1.2). The reality is that in the critical HP timeframe, HRBO may have difficulties in choosing which preventative actions to take due to this HP language ambiguity emanating from DMP.

Of particular focus in this research study was how language pertaining to building codes featured in the pre-hurricane realities of DMP. Despite the fact that building codes are based on language specificity due to their inherent nature as guidelines, the literature review did not reveal any research specific to building code language studies. The document review of Table 2.6: FEMA – HP Guidelines for the Public did not reveal any building code language either. In contrast, the document review of Table 2.9: Australia – Example of a HP Plan did reveal such language. Interviews with DMP also highlighted how building code language can be ambiguous (see Section 4.3.2.2.1). Language ambiguity issues emanating from DMP pertaining to pre-hurricane realities were influential in ensuring that the Final Hurricane Preparedness Communication Model features information flows from DMP, HRBO, and academic institutions and a collaborative mechanism so that these ambiguity issues can be proactively addressed (see Figure 6.1).

One mechanism which was used to examine language-based pre-hurricane realities of DMP

was to pose the possibility of a hurricane strike without warning. Such a scenario is not evident in literature or any global HP documentation. This is possibly because in modern times with extensive technology and modelling, a hurricane strike without warning does not seem possible according to DMP interviewed (see Section 4.3.3.2.1). However, an effort was undertaken in this research study to examine whether the entire notion of *warning* itself may be fluid. This was achieved by examining a pre-hurricane reality of extant HP in a veritable state of surprise scenario, such as a hurricane strike without warning. All of the DMP interviewed in this research study did not believe that hurricanes could strike without warning (see Section 4.3.3.2.1). However, DMP did reflect that if this was possible that such hurricanes would need to intensify rapidly. This evidenced a potential HP conceptual shortcoming as supported by the rapid intensification which hallmarked Hurricane Michael, which struck Florida in 2018. A contention of this research study which differs from that of current HP literature is that the concept of a hurricane warning strike without warning is inherently dynamic. While the interviews with DMP revealed that a hurricane strike without warning is perceived to be *practically* impossible, the factor of rapid intensification expressed by DMP interviewed in this research study matched the evidence from the literature review thus supporting the case for this seeming impossibility. The spectre of past hurricane experience along with active remembering and active forgetting could play a part in the HP behaviour exhibited by both DMP and HRBO should a hurricane strike without warning (see Section 2.8.1.4).

The literature review revealed that NHC, NWS, and local television were among the top information sources during a pre-hurricane timeframe that characterised messaging in a pre-hurricane reality (see Section 2.8.2). Interviews with DMP reflected that local television was a downstream information source not utilised by them, and that their sources for information in a pre-hurricane reality were quite consistent: NHC, NWS, and academic institutions (see Section 4.3.4.2.2). Hurricane data and information was elicited from NHC and academic institutions, while NWS provided local data weather information. The prevalence and critical importance for DMP of the information source of academic institutions was found periodically in the literature review, but its importance was emphasised repeatedly by DMP during interviews. This finding from the research study was influential in the decision for the Final Hurricane Preparedness Communication Model to

feature information flows from academic institutions as a definitive stakeholder element (see Figure 6.1).

A critical aspect of pre-hurricane reality for DMP pertains to the next steps after receiving impending hurricane information. Both the literature review and document review were characterised by a dearth of information regarding the detailed steps that DMP take after receiving impending hurricane information. This research study was able to elicit through interviews with DMP that the communication pathway after receiving impending hurricane information goes from FEMA, to FDEM, to local governments, thence to HRBO (see Section 4.3.6.2.3). After FEMA communicates with FDEM and some local governments, FEMA has a highly variable set of next steps pertaining to what they do and who they communicate with further, which is omnichannel and channel-specific depending on the receiver. Interviews with FEMA were very informative in these regards (see Section 4.3.5.2.4). These DMP detailed how once they received information from sources such as NHC, NWS, and academic institutions that a hurricane was impending, that they would activate the alert and warning communication system of IPAWS (see Figure 2.25) that would send critical HP messages to state and local DMP partners. This information flow is fairly linear for Florida with FDEM being the primary recipient of this messaging from FEMA.

The DMP that were interviewed from FDEM detailed the next step they would take after receiving information that a hurricane was impending: activating their DM system SEOCA, which comprises a multi-level state of activities and communication depending on the severity of the hurricane threat (see Section 4.3.5.2.5). Another step FDEM engages in is to activate their notification system called Everbridge. Then FDEM initiates the operations to focus on the 18 ESF support functions that are focused on local governments and other stakeholders (see Table 4.4).

The DMP that were interviewed from local county governments detailed that one of the key next steps that they would take after receiving information that a hurricane was impending was to activate their Hurrevac software systems so that they could leverage incoming HP information from FDEM and FEMA to manage evacuation planning (see Section 4.3.5.2.6). Due to the highly variable nature of localities, the range of further HP communication

activities depended on the types of populations and administrative infrastructures in place in these areas.

These aforementioned next steps specific to a pre-hurricane reality that were detailed by all these DMP across FEMA, FDEM, and local governments were not revealed in the literature or document reviews. This highlighted part of the rationale for synthesising the Final Hurricane Preparedness Communication Model so as to include HRBO and these DMP in a more open, language-based, collaborative mechanism (see Figure 6.1). One motivation for this collaborative approach with the model was also borne out through the interviews with DMP, which reflected how they generally use prescriptive HP language (see 4.3.7.2.3). Such language consists of the types of words and phrases that are common to DM and some of these may not be in regular usage outside of the DM field. Prescriptive HP language from DMP is contrasted with the more descriptive HP language that is used by HRBO (see Section 4.3.7.2.3). The HP language divides between HRBO and DMP remain critically under-researched as reflected in the lack of literature in these regards (see Section 2.8.1). This research study highlighted this communication gap and attempted to provide a mechanism to address it with the Final Hurricane Preparedness Communication Model (see Figure 6.1).

One major focus of the pre-hurricane reality identified in this research study through the interviews was the need for DMP to account for and communicate with the most vulnerable groups first (see Section 4.3.8.2.1). A focus on vulnerable social groups was not revealed in the review of the U.S. document Table 2.6: FEMA – HP Guidelines for the Public. In contrast, the identification of vulnerable social groups as a critical element of disaster itself was prevalent in the literature (see Section 2.2). What was not revealed in the literature or document reviews was an identified need to alter HP messaging depending on the communication channel used specific to messages and intended audience. Literature from the broader field of communication did however reflect the standard of customising messaging depending on channel and audience (see Section 4.3.8.2.2). This research study found through the interviews with DMP that they believed that regardless of the HP messaging being sent or which specific audience is to receiving HP messaging, that the communication channel should not change (see Section 4.3.8.2.2). However, DMP did specify that communication channels for HP messaging could change if the audience

included native Spanish speakers. Thus, this research study identified that the broader focus found in the communication literature as to customising messaging across channel and audience could also apply within the HP communication paradigm.

The pre-hurricane reality of DMP reaching vulnerable groups also reflected on the importance of using social nexuses and interactors in communication (see Section 4.3.8.2.3). The DMP interviewed remarked that on a local level, they recognised the critical need to funnel in-person HP communication through traditional social networks that leveraged vital individuals in communities, such as local law enforcement, religious leaders, or other important people. The importance of community-based communication was also reflected by DMP with respect to intercommunity partnerships (see Section 4.3.9.2.3) and in-person HP communication (see Section 4.3.10.2.1). The focus on community-based communication was also highlighted in the document review of Table 2.5 FEMA – Disaster Preparedness Task Categories for the Public. The literature also supported the benefits of public culture communication in a disaster context, evidenced to an extensive degree by the country of Japan (see Section 2.8.1.3). However, this culturally advantageous communication focus was not revealed in the review of Table 2.6: FEMA – HP Guidelines for the Public. Thus, it was critical to highlight findings from this research study regarding the vital elements of social nexuses, interactors, and community-based communication.

An overarching framework for community-based communication is the partnership between governmental agencies. Interviews with DMP across federal, state, and local levels highlighted that intergovernmental partnerships are characterised by decentralisation, hierarchy, and siloes (see Section 4.3.9.2.1). One of the biggest reasons that understanding intergovernmental partnerships between DMP is critical is because HP communication to HRBO depends on the relationship between government DMP agencies. The interviews with DMP revealed that this relationship was characterised by these agencies having a decentralised structure in which operational hierarchy and siloes predominate, resulting in a less than seamless HP communication environment for HRBO. This finding from the interviews with DMP of shortcomings in intergovernmental partnerships pertaining to HP was limited in the literature review.

In examining the partnership between the government and communities, DMP that were interviewed expressed that HRBO were simply not doing enough to engage with them actively in a HP communication paradigm (see Section 4.3.9.2.2). Furthermore, DMP felt that HP communication would be improved if communities would learn to be more self-sufficient and have better intercommunity communication (see Section 4.3.9.2.3). These DMP also identified the use of the EMAC system to assist communities (see Section 4.3.9.2.3). However, the EMAC system is actually designed for states to work with each other in support of communities. Thus, this research study identified a pre-hurricane reality that there is no current mechanism for DMP within communities to work with each other directly in Florida, which was a finding not revealed in the literature review. This evidenced a communication channel gap rendering HP communication efforts on a local level vulnerable in Florida (see Section 2.8.1.1).

7.2.2.4 Achievement of Objective 4 and Conclusions Drawn

Objective 4 was to develop a model for hurricane-focused DMP that informs social-centric HP communication that is tailored to HRBO, and verify its accuracy. The achievement of this objective is illustrated by the following research study insights, and the model development and accuracy verification. The insights themselves were obtained from the literature and document reviews, the interview data analyses, and supported by the efforts to develop and verify this model for accuracy.

The development of the Final Hurricane Preparedness Communication model (see Figure 6.1) was reflective of a number of influences from this research study (see Sections 5.2.1, 5.2.2, 5.2.3, 5.2.4, and 6.4). The literature review and analysis conducted for this research study revealed that there is a considerable lack of HP communication research that uses linguistic theory as a framework (see Section 5.2.1). A review and subsequent analysis of HP-related DM documents from the U.S. and other countries showed a number of communication strategies which were well conceived, but also missing vital components reflective of a lack of a feedback mechanism from the public (see Sections 2.6.2, 2.7, and 5.2.2). The structure of this model was also guided by an analysis of existing literature pertaining to communication, language and linguistics, and communication models that reflected effective aspects of these model structures as well as essential elements these

models lacked (see Sections 2.8.1, 5.2.3, and Table 2.13).

Insights gained from the analyses of interview responses from HRBO and DMP highlighted critical gaps and opportunities in HP communication, which helped in the synthesis of individual elements of the model (see Table 5.2). Interviews with HRBO and DMP highlighted the uniformity of perspectives that both sets of research study participants had that HP communication would benefit immensely from HRBO and DMP engaging directly in-person with each other in a vastly increased manner (see Section 4.3.10.2.1). The consistency of participant responses regarding the value of in-person HP communication was influential in the synthesis of an inherently social-centric model for this research study that features stakeholder collaboration at its core.

A qualitative technique was used to verify that the model was accurate: the MSC technique (see Section 3.9.3.2). This technique is predicated on finding a narrative that research study participants believe would be most reflective of the most significant change affected by the proposed implementation of the change being examined. The change that is proposed is the implementation of the Final Hurricane Preparedness Communication model (see Figure 6.1). The initial model (see Figure 5.1) was forwarded for accuracy verification to the same 18 participants that were interviewed for this research study (see Section 6.3). Nine of these research study participants ended up reviewing the model and gave feedback. Seven of these participants verified that the model was accurate.

7.2.2.5 Achievement of Objective 5 and Conclusions Drawn

Objective 5 was to extract contextualised findings which expand existing knowledge. The achievement of this objective is illustrated by the following research study insights detailed in the subsequent Contribution to Knowledge section (see Section 7.3). The insights themselves were obtained from the literature and document reviews, the interview data analyses, and supported by the efforts to develop and verify the model for accuracy.

7.2.2.6 Achievement of Objective 6 and Conclusions Drawn

Objective 6 was to formulate conclusions and recommendations of HP communication measures for policy-makers. The achievement of this objective is illustrated by the following

research study insights detailed in the subsequent Recommendations and Epilogue sections (see Sections 7.6 and 7.7). The insights themselves were obtained from the literature and document reviews, the interview data analyses, and supported by the efforts to develop and verify this model for accuracy.

7.3 Contribution to Knowledge

This research study contributed to knowledge by means of both theory and practice. This will be detailed below.

7.3.1 Addressing Hurricane Preparedness Miscommunication in Florida

Bier (2011) argued that prior to the landfall of Hurricane Katrina in 2005, that beyond the lack of planning for flooding and the uncertainty about the speed at which federal resources would be available, there was also a lack of understanding about which areas would actually be at risk from the hurricane (p. 248). Bayley, Cameron, and Lucas (2015) emphasised that in general, there is an absence of comprehensive linguistic models that measure mutual intelligibility and linguistic distance between two languages (p. 209). Given the dearth of HP communication research in the literature, it is unlikely that knowledge such as a highly specific communication model exists that measures or reduces the linguistic difference in HP language between HRBO and DMP, a hallmark of HP miscommunication. The communication models reviewed for this research study were generally devoid of a recipient-centric, external LOC communication, and all of them lacked a centralised mechanism to reduce miscommunication between DMP and the public (see Section 2.8.3.9). The Final Hurricane Preparedness Communication Model (see Figure 6.1) developed in this research study is a contribution to practice that provides a centralised mechanism to leverage a combination of the descriptive HP language used by HRBO with the prescriptive language used by DMP in, along with recipient-centric, external LOC communication, in order to synthesise holistic HP language. The Influences layer in the model leverages critical communication issues identified in the literature review, including a mechanism to promote external LOC communication and recipient-centric messaging that is more easily decoded (see Section 2.8.1). This model can also help to more effectively leverage preparedness opportunities derived from knowledge the public has available as evidenced by active remembering and the strength of past hurricane experience, similar to the findings from

memory research on flood experience and earthquake experience (see Section 2.8.1.4).

The main end-users of this model will be DMP focused on hurricanes in Florida. These DMP include FEMA, FDEM, and local DM officials. There are numerous communication opportunities in the DC and HP communication realms that can be addressed by this model, including synthesising language that will encourage the public to engage in more HP efforts, disambiguating HP messaging language to increase trust in HP communication by DMP, and encouraging more collaboration between DMP themselves, and between DMP and the public (see Section 1.3). The HP planning documents FEMA is responsible for could be optimised by more recipient-centric language from the model and move HP policies further toward the more humanistic approach seen by the HP planning documents from Australia (see Section 2.6.2.3). In the state of Florida, the HP communication gaps between DMP have already been highlighted by government audit (see Section 1.3). The implications for high-risk buildings and the vulnerability of HRBO is evident. The literature review and the data collection and analysis in this study revealed that HRBO in Florida do not appear to have a clear understanding of building codes or where to find out information on Risk Category II buildings (see Sections 1.3, 4.3.1, and 4.3.2). The interview responses identified HP language decoding issues with often ridiculed phrases like *hunker down* that could be disambiguated through the external LOC communication imbued in this model (see Sections 2.8.1.2, 4.3.1.2.4, and 4.3.4.2.2).

The Final HP Communication Model not only offers a mechanism to synthesise useful HP communication language for messaging, it represents an opportunity to bring DMP, HRBO, and academic institutions together to collaborate on the type of HP communication language that is mutually intelligible and thus more effective at encouraging HP efforts. With its core component of the HRBO-DMP working group, the model will promote human interaction focused on community-level impacts in Florida. All levels of DMP, including FEMA, FDEM, and local governments in Florida have struggled to connect with the community to truly optimise HP efforts and this model could help bridge this social divide (see Section 4.3.8.2.3). The participants verifying the accuracy of the model highlighted how the model would serve to bring DMP and the public together to synthesise HP language and thus influence HP efforts (see Section 6.2). This type of collaborative mechanism in the

model could be examined to inform how similar research studies could lead to other collaborative mechanisms in various parts of the U.S. that face hurricanes. Both HRBO and DMP agreed in this research study that more in-person interaction was a critical improvement to HP that they wanted to see increased (see Section 4.3.10.2.1). In-person interaction could potentially lead to larger scale behavioural and social change in Florida that could be considered a cultural shift to a more public disaster preparedness culture, which is evident in countries like Japan (see Section 2.8.1.3). Ultimately, miscommunication takes multiple entities to resolve and the Final Hurricane Preparedness Communication Model seeks to bring people together to promote language-based understanding (see Figure 6.1). The success of this model in general will be measured by the effects it has on a plethora of HP policies, documents, and communication and efforts that DMP are engaged in. Fundamentally, how well the model brings together the most important HP stakeholders that have been disconnected at times will be the clearest measure of success. FEMA will be at the forefront as they have policy-based, mission and strategic objectives to collaborate and improve HP efforts in the community that the Final Hurricane Preparedness Communication Model can directly support on a language-based level (see Sections 4.3.8.2.2, 4.3.8.2.3, 6.2, and Figure 6.1).

7.3.2 Consolidation of Hurricane Names Through the Standardisation of Hurricane Nomenclature

NOAA (1989) stated that tropical-origin cyclonic storm names such as cyclone, depression, disturbance, hurricane, and typhoon can be inherently confusing (p. 45). The lack of uniformity in global storm nomenclature reflects a knowledge gap whereby researchers, students, the public, government administrators, policy-makers and other individuals that have diverse interests in hurricanes have to swim through a sea of befuddling information regarding the names of these storms. This renders reading on the topic of hurricanes across more than one geography, from basic understanding through deep comparative analysis, to be an exercise wrought with uncertainty, difficulty, and potential misunderstanding. The different systems of hurricane nomenclature are highly variable across global geographies, but all of these systems of nomenclature are comprised of names reflective of strength as measured by wind speed factors. Table 1.2: Comprehensive Hurricane Synonyms Based on Geographic Location was synthesised during this research study by melding disparate pieces

of this nomenclature puzzle from different government agencies across the world to make sense of the global hurricane landscape. The detailed information in Table 1.2 is a contribution to knowledge that offers researchers and non-researchers who take an interest in hurricanes across multiple geographies a *decoding* mechanism to compare and contrast research studies, articles, books, and other informational sources without getting confused as to the nomenclature differences globally (see Section 2.8.1.2). Further accompanying resources to this end were adapted from sources for this research study to delineate storm categories and names specific to each major region of focus around the world, and are found in Appendixes H-N. Table 1.2 represents an initial attempt to collate hurricane names from across the world and provide a consolidated list of these names. The practice of hurricane research could benefit from a nomenclature system that is standardised globally. The language usage of the scientific community and the public regarding these weather phenomena would then be consistent globally. A standardised hurricane nomenclature could also help ensure that HP, cyclone preparedness, tropical storm preparedness, and typhoon preparedness would all be linguistically be subsumed under TCP. This could aid the preparedness efforts of both HRBO and DMP by linguistically homogenising this group globally from a nomenclature perspective.

7.3.3 Promoting the Use of Linguistic Theory in Disaster Management Research

Patt and Schrag (2003) emphasised that the public often uses a wide variety of language to describe risk and uncertainty, and this usage can vary depending on the specific weather event and its context (p. 23). However, the literature review in this research study revealed a knowledge gap: there is a limited amount of language-focused DM research, and a severe dearth of such research specific to HP (see Section 3.7.2). This research study purposefully chose to utilise linguistic theory in the research design in order to directly investigate the HP communication paradigm. The PEN technique was used in the interview question construction to create a qualitative research tool that was inherently optimised for exploring narrative responses (see Section 3.7.3.4). This research study went outside of the construct of the Research Onion (see Figure 3.2), and chose linguistic analysis as a Research Strategy. Template analysis, frame analysis, discourse analysis, and paradigmatic analysis were all used in analysing the interview data to further explore numerous linguistic facets of the HP communication paradigm. The use of these linguistic analysis techniques also served

to triangulate the interview data (see Section 3.8.1).

Patt and Schrag (2003) argued that a prescriptive linguistic approach is a partially a result of DMP often using numbers rather than words to express weather phenomena (p. 23). When DMP use words, they reflect a consistent, professional, scientific terminology that is less open to interpretation. At the same time, prescriptive language usage in hurricane impact situations which reflects a societal impact can be modified in a descriptive manner to better fit the needs of the public (Goldsmith et al., 2016, p. 4). The convergence of the prescriptive language used by DMP and descriptive language used by HRBO is the linguistic intersection at which enhanced understanding can be established. Linguistic theory is the backbone of this convergence. With the intrinsic value of understanding more about how the social environment impacts issues with the built environment, linguistic theory was shown in this research study to be very effective at eliciting and elucidating insights in the HP communication research realm. Perhaps this offers a glimpse of what linguistic theory could contribute to the broader field of DM research.

7.3.4 Identifying Emotional and Conceptual Hurricane Preparedness Language

Höppner et al. (2010) provided the social constructionist argument that the public may subjectively consider risk in terms of emotions rather than the objective view of risk that DMP might espouse in which building integrity is reflected in more engineering-based terms (p. 25). The research philosophy of interpretivism was adopted for this study because of its social constructionist focus (see Section 3.2.1). This research study contributed to theory by showing that through the exploration of the perceptions that HRBO have regarding high-risk buildings withstanding hurricanes, that they may consider building integrity in emotional terms (see Section 4.3.1.2.2). An emotional linguistic assessment of building integrity would necessarily run counter to the intent of building codes that are comprised of language predicated on structural integrity standards that are engineering-based.

Kunreuther (2006) posited that residents who live in areas with flood risks may be sceptical about the safety of their buildings due to a lack of building code enforcement (p. 200). This research study contributed to theory by showing that through the exploration of the perceptions that HRBO have regarding high-risk buildings withstanding hurricanes, that they

may consider building integrity in conceptual terms in addition to emotional terms (see Sections 4.3.1.2.1 and 4.3.2.2.1). Should such distrust in safety messaging be circulated by the public socially, widespread public safety issues could compound the difficult work DMP have to undertake before, during, and after hurricane events. Thus, the onus of building code enforcement and accurate risk assessment by DMP regarding trade-offs between hurricane, tornadic, and flooding risks that may be simultaneous during a storm are critical to help HRBO align preparedness behaviour with the expectations of DMP. This research study revealed the knowledge that conceptual terms are used extensively in reference to building integrity.

Perspectives gleaned from the literature review and interview data from the research study evidenced a disconnect between spheres of high-risk building integrity realities that DMP and HRBO independently hold. This research study is a bridge between these two realities, which points to a theoretical of understanding of how the integrity of high-risk buildings should harmonise a reflection of emotions, concepts, and structural realities linguistically. The Final Hurricane Preparedness Communication Model is a mechanism by which emotional and conceptual HP language can be surfaced, by giving HRBO a stronger voice in the HP conversation (see Figure 6.1).

7.3.5 Augmenting Messaging in the Integrated Public Alert and Warning System

Prior to Hurricane Irma striking Florida in 2017, FDEM used IPAWS-generated alerts to help evacuate almost 6.5 million people, and coordinated alert information by alternate means with some Florida counties that did not have access to IPAWS (FEMA, 2019). While this achievement is certainly laudable, there is no way for these county-level DMP to provide feedback messaging to IPAWS (see Figure 2.25). Although IPAWS has the benefits of comprehensive messaging output for DMP partners of FEMA, some DMP partners do not have access. Furthermore, there is no feedback mechanism for the public within IPAWS. These are critical gaps as it pertains to HP communication, particularly because IPAWS is the main communication mechanism in the U.S. that pushes messaging out to DMP and the public that helps them determine preparedness actions.

The literature review detailed that without hurricane alerts, the public in the U.S. would be unaware until the storm strikes, yet the public still conflates the alerts of hurricane watch

versus hurricane warning (Morss et al., 2018; Vultee & Wilkins, 2012). For FEMA, the Final Hurricane Preparedness Communication Model developed in this research study is a contribution to practice that can act as a companion to the IPAWS system (see Figure 6.1). While IPAWS is focused on hurricane alert messages, the language that forms this type of messaging would necessarily be subsumed under the aegis of HP language optimised by the Final Hurricane Preparedness Communication Model. Language constructs generated by the Final Hurricane Preparedness Communication Model are contributions to knowledge that can augment the hurricane alert messages that alerting authorities would need to push to the IPAWS-OPEN aggregator found in the middle of the depiction of IPAWS in Figure 2.25. In turn, the messages that IPAWS pushes to DMP partners and the public would automatically be optimised for the public.

7.3.6 Establishing a Link Between Property-level Security Perceptions and Evacuation Resistance

Part of the justification for this research and identification of the research problem included the resistance to evacuation that members of the public have due to the perceived need to remain at home to protect their animals (see Section 1.3). While mainstream research discovered in the literature review revealed that perceptions of looting and property-security uncertainties were exaggerated by the public, there was still ample literature that did reflect that looting and criminal activity were significant before, during, and after hurricane events (see Section 2.6.2.1). When hurricanes are impending or imminent, HRBO necessarily depend on messaging to make decisions on whether or not to evacuate, whether the evacuations are mandatory or not.

Interviews and subsequent analyses revealed the contribution to knowledge that property-level security perceptions are part of the vulnerability assessment: some HRBO believe based upon specific impending hurricane information, that when potential evacuation situations could result in them being not allowed home for extended periods, the armed home defence schema could be activated (see Section 4.3.5.2.3). This entails HRBO preparing to defend their homes by stocking up on weapons and ammunition and then remaining in their homes during the storm instead of evacuating. Some HRBO will not evacuate and risk the loss of their belongings or damage to their homes, and thus they risk

their lives in the process. The theoretical understanding of violence in the disaster context remains minimal due to the lack of research in this specific area (see Section 2.6.2.1). The potential for the armed home defence schema to have violent outcomes is palpable given the presence of weaponry as a defence mechanism against the possibility of looting. Thus, this research study established a new link between property-level security perceptions and evacuation resistance that reflects a contribution to theory. Perhaps hurricane messaging that enhances perceptions of property-level security could lead to less HRBO remaining at home and a reduced potential for confrontations between HRBO and prospective looters.

7.4 Limitations of the Research

There were five limitations in this research study. These limitations will be detailed below.

7.4.1 Limited Global Hurricane Preparedness Language Research Studies Available

The biggest limitation this research study faced was that there is not an abundance of research globally on how language plays a part in HP (see Section 3.7.2). This drove the decision to use abduction as the research approach guiding this study (see Section 3.3). Language was a critical aspect of global HP that was explored in this research study. In particular, the literature that was reviewed did not reflect numerous studies on language and HP in an HRBO context. Cox et al. (2008) asserted that there is not an overabundance of research conducted on how psychological and linguistic constructs affect perceptions of disaster risk and vulnerabilities (p. 470). Of critical note: none of the research studies examined in the literature review specific to HP used linguistic analysis as a research strategy, nor did these studies use corollary data analysis techniques such as frame analysis, discourse analysis, and paradigmatic analysis. Kim and Kang (2010) found that previous research studies conducted in the U.S. on HP focused on knowledge, motivation, and resources, but these research studies lacked a specific focus on communication variables (pp. 474-475). Thorson (2012) discussed how frame analysis and schema (from discourse analysis) have been used generally in the U.S. in media coverage of disasters (p. 70). These aforementioned research studies provided the rationale to use linguistic analysis and corollary techniques to conduct this research study in a more constrained environment such as Florida to explore HP communication.

7.4.2 Geographical and Linguistic Constraints of Hurricane Preparedness Research in Florida Versus Global Hurricane Preparedness Research

One limitation of this research study was that it focused on Florida, the state in the U.S. that receives the most hurricanes per year, rather than other parts of the country (see Section 1.3). However, different states in the U.S. are affected by hurricanes as well. Characteristics such as language use and HP may differ in these other states. The language used for this research study was English and only English-speaking HRBO were interviewed. Florida has many native Spanish-language HRBO but none were interviewed for this study. These Spanish-language speaking HRBO engage in HP activities and are thus social actors in the broader HP communication paradigm and were focal points of DMP that were interviewed.

This study was entirely conducted in the English language as well from the literature and document reviews, as well as the interviewing of the participants. The experience of HRBO in Florida who are native Spanish speakers may be markedly different from that of native English HRBO due to the preponderance of English language HP messaging that is available and proliferated. It was only after Hurricane Andrew struck Florida in 1992 that emergency managers started to consider the specific communication needs that Spanish speakers have (Liu, 2010, p. 337). However, the document review conducted in this research study found that there were only a limited number of FEMA HP documents that have Spanish language versions. Further understanding of any bilingual imbalance in HP documentation was far out of scope for this research study due to the monolingual English component of the research design.

This research study examined language specifically pertaining to HP in the U.S. and Florida as the word *hurricane* is what is used in the U.S. and that pertains to a strong, tropical-origin, cyclonic storm. Before storms become hurricanes, as they continue to strengthen, they are known as *tropical storms* in the U.S. (see Table 1.2). Tropical storms however do enough damage that they should necessitate preparedness activities. Damage estimates from Tropical Storm Imelda, which struck the U.S. in October 2019, are still being calculated, but NOAA expects this to be above $1 billion (NOAA, 2019b). Yet, *tropical storm preparedness* was not something either found in the literature or document reviews or in common usage among research study participants. The government and the public in the

U.S. focus on HP and thus this research study focused on language pertaining to *hurricane* experience and not *tropical storm* experience.

Other geographical and language limitations in this study pertained to the comparison countries for HP planning and high-risk building documents: Australia, Taiwan, and Bangladesh. The rationale behind choosing these countries was based on the study itself focusing on English language HP communication. This predicated that the HP planning and high-risk building documentation focused on would be comparable linguistically if they were in the same language (see Section 1.6).

7.4.3 Timeframe Constraints and Hurricane Preparedness Language Usage

One constraint of this research was that it was specifically conducted during the time of the year in between hurricane seasons when the participants were the least engaged in HP activities, so as to optimise the availability of participants for interviews (see Sections 1.6 and 3.4.1.5). Observation of HP activities themselves was not conducted concurrently with the language-based research that was done for this research study. The language usage of participants during HP activities was what this research study was attempting to explore. Participants were prompted to recall or recite the language they believe they use during the time periods in which they are engaging in HP activities or language usage they would optimally use given the opportunity. Thus, it remains to be seen if HP language usage would be different if this language usage were observed in situ during actual HP activities on the part of HRBO and DMP.

7.4.4 Sampling and Other Study Criteria Limitations

The sampling utilised was not definitively representative. This was a non-probability sampling study design and did not have the advantage of probability-based, representative sampling (see Section 3.7.3.2.1). Purposeful sampling was used and therefore only a small sample size was gathered, as this was determined to be a narrative-rich participant group well capable of eliciting a breadth and depth of responses so as to elicit thematic saturation (see Sections 3.7.3.2 and 3.7.3.2.1). Only 12 HRBO and 6 DMP were interviewed, thus only limited perspectives could be gathered in this study. These 18 total participants were selected due to their narrative-rich response abilities deciphered through the use of the

screeners (see Section 3.9.3.2). The screeners did not capture data like education or issues like disabilities, which may have been influential in the relative abilities of participants to communicate. For DMP, gender balance in screening was not sought after as the DM industry in Florida, with a particular focus on individuals employed in HP communication roles, has an anecdotally observed gender imbalance with mostly males in these roles. There was only one female DMP participant as compared to five DMP participants in this study. Participants from academic institutions and the media were not recruited for this study because the main HP communication sender-receiver framework involves DMP creating the source messaging with HRBO as the end-recipients. Respondent-driven sampling was utilised to deliver targeted participants, but this sampling technique can also cause bias in a study if the participants were influenced by opinions of the participant-recruiter about the study. Geographical sampling was conducted through selecting an expansive area of Florida, CWF (see Section 3.7.4). However, Florida is quite a large state and HP experience differs across the state (see Figure 3.6). The median hurricane frequency locations in the geographical sampling also left out participants in areas where there was the highest and lowest hurricane frequencies in the state, thus rendering extremes of hurricane experience out of the data capture.

This study only examined communication pertaining to hurricanes and no other types of natural hazards. The words and phrases which are components in HP communication were elucidated through interviews conducted with participants that were not engaged in HP behaviours at the time of the interview. The HP communication language used by the participants during actual HP activities may differ. Only Risk Category II buildings were examined within this study. Activities and communication pertaining to HP were not explored for other types of high-risk buildings, as this study was focused on typical one- or two-family residences in order to examine occupants that may have a more vested interest in property-level measures (see Section 2.7.1).

The Initial Hurricane Preparedness Model was verified for accuracy through the MSC technique. However, this model was not formally validated, in a quantitative study phase. Since this was a narrative-based, qualitative study, nine out of the 18 participants ended up evaluating the model, with 7 verifying it as being accurate. It is acknowledged that these

participant numbers are small overall. The small sample size was productive from a data standpoint due to the PEN technique being quite effective at eliciting narrative-rich responses that are geared toward thematic saturation (see Section 6.3). This accuracy verification group was not broadened in this research study because of the nascent stage of HP communication research within the broader realm of DM research.

7.4.5 Research Design Limitations

Interpretivism was the research philosophy employed, ensuring small sample sizes within a qualitative study (see Table 3.1). This limited the study from conducting a large sample, quantitative, probability-based sampling study. The research approach for this study was abductive, which entailed extrapolating insights far beyond data without an intention of fitting data into a theory (see Table 3.3). Linguistic analysis was the research strategy used. Grounded theory could have been a viable choice to a certain extent as a research strategy, but developing new theory in a study with an abductive research approach was determined to be an excessive extension of scope (see Table 3.8). The research choice used was multi method qualitative. Mixed method could have allowed for validation if the qualitative interview phase was followed by a quantitative phase with a survey as an example, but the interpretative research philosophy and abductive research approach predicated that multi method qualitative was more appropriate for exploring the germinal HP communication realm (see Table 3.1 and Table 3.3). This study used a cross-sectional time horizon. A longitudinal time horizon would have allowed for extended data collection across more HP communication and according behavioural events, but this was determined to be too difficult to execute due to the high probability of interfering with the exigencies of the field environment during hurricane season in Florida, and the according potential unavailability of participants (see Sections 3.6.1 and 7.4.3). There were limitations on the data collection techniques of literature review and document review due to the study being monolingual in English (see Section 7.4.2). The data collection technique of interviews based on the PEN technique was narrative-rich, but not executed in-situ during the hurricane season where the HP narratives could be captured in real-time (see Section 3.4.1.5). Furthermore, focus groups as a data collection technique could have allowed for enhanced participant data production as a group, but was deemed too difficult to execute across a broad region like CWF (see Section 3.7.4). As far as data analysis techniques, the linguistic analysis techniques

chosen were quite complex. A grounded theory research strategy may have allowed for an organic, theme elicitation analysis to be conducted, but the development of new theory was deemed premature and therefore more formalised linguistic analysis techniques were selected in order to explore language specifically (see Table 3.4).

7.5 Further Research

As a result of this research study, a number of potential future research areas became apparent. These will be detailed below.

7.5.1 Case for Further Global Hurricane Preparedness Language Studies

On a fundamental level, the dearth of literature available on language usage research pertaining to global HP predicates that there is ample room for a wide variety of such research studies to be conducted (see Sections 3.7.2 and 7.4.1). There are numerous language usage aspects within this area to explore. A fundamental example of such a study would involve an extension of frame analysis that was used in this study: the signature matrix technique. This technique involves examining category sets of metaphors, exemplars, catchphrases, depictions, visual images, roots, consequences, and appeals to principle (Creed et al., 2002, p. 41). Utilising the signature matrix approach in research studies about HP could yield enhanced linguistic knowledge.

An extension of paradigmatic analysis could also be employed as well by examining global HP language through the commutation technique: which involves using two transformation from syntagmatic analysis (addition, deletion), along with two transformations from paradigmatic analysis (substitution, transposition) (Chandler, 2007, p. 90). Substitution, the other paradigmatic analysis transformation, was the only element from paradigmatic analysis used in this research study (see Sections 2.8.2.3 and 3.8.5). When combined with the other aforementioned three transformations, these four transformations form the commutation technique. The commutation technique is better suited to a more narrowly defined language study that examines specific sentence construction in which words or phrases could be added, deleted, or transposed in addition to substituted within a sentence to change meaning. This could be used in global HP language construction by DMP. The signature matrix technique and commutation technique could also be used to delve into

more global HP language specifics pertaining to messaging by the media (television, radio, etc.). Previous disaster media research using linguistic techniques such as frame analysis has been conducted (see Section 3.8.4). This points to the opportunity for further language-based research on the media pertaining to HP language.

7.5.2 Building a Cross-functional Disaster Management Language Working Group

Perhaps the most relevant recommended future research study would be one that is focused on how to actually build the working group for the Final Hurricane Preparedness Communication Model (see Figure 6.1). This cross-functional group comprised of HRBO and DMP would need to have individuals that are screened and recruited based on a number of criteria. A research study could determine how this could be achieved.

7.5.3 Relationship between Educational Levels and Global Hurricane Preparedness Language Usage

On a fundamental level, studies could be conducted in any country to specifically examine how educational levels of HRBO and DMP are related to their HP language usage. Another language-based research study on educational levels could take a deep look at language pertaining to the evacuate schema versus the remain schema (see Section 4.3.5.2). While a review of the literature clearly supported evacuation as a lifesaving strategy, Schultz et al. (2005) argued that mass evacuations are also characterised by injuries that occur as a result of the inherent chaos of the evacuation itself and issues such as increased vehicle crashes (p. 25). The importance of the communication-based behavioural decision regarding evacuation within the HP communication paradigm is critical enough to warrant its own specialised research study. Educational levels could be a focal point of such a study.

7.5.4 Hurricane Preparedness Language Ambiguity in the U.S.

The DMP that were interviewed for this research study clearly delineated between the words *hazard* and *disaster* and what each word entails. Yet, FEMA uses the word disaster exclusively in numerous preparedness messaging documents, including Disaster Preparedness Task Categories for the Public (see Table 2.5). There are two potential language ambiguity studies that could elucidate how HRBO interpret critical words in HP language. The first study could examine how HRBO might differentiate between the words

and concepts of *hazard* and *disaster*. Utilising language in HP messaging that presupposes a state of disaster does not convey that the natural phenomenon that is causal to the disaster is actually a hazard. The literature certainly addresses this semantic issue well as evidenced by Bokwa (2013) who described that hazards may be beneficial in nature, such as bushfires being stimuli for forest growth, but hazards become disasters only when they damage the social environment (pp. 712-713). Preparing for the effects from hazards may mitigate the levels of subsequent disasters or prevent hazards from becoming disasters at all. It remains to be seen if this critical distinction is understood by HRBO and further research could potentially uncover this.

Vultee and Wilkins (2012) posited that *watch* and *warning* can be conflated and without further clarity there can be dire consequences (p. 17). An additional research study could be conducted to explore how HRBO in the U.S. conduct HP efforts comparing behaviour triggered by the hurricane alerts of *watch* versus *warning*. Similar to the need to explore hazard versus disaster, how HRBO interpret differences between the terms *watch* versus *warning* could determine various HP behavioural choices.

7.5.5 Psycholinguistic Study of Emotional Assessment of High-risk Buildings in the U.S.

This research study highlighted how HRBO may consider building integrity in terms of emotions (see Section 4.3.1.2.2). A potential psycholinguistic research study in the U.S. that could be conducted would focus on exploring how HRBO create an *emotional construction* of the perceptions regarding the integrity of their dwellings as opposed to an architectural or engineering based assessment. Maskrey (2010) asserted that notice of impending hazards may simply create chaos and panic without some degree of attention paid to preparedness (p. 41). This research study would examine how this emotional assessment reflecting comfort compares and contrasts with a physical assessment reflecting safety, as building integrity assessment is a vital component of HP.

7.5.6 Tropical Storm Preparedness in the U.S.

One area of enquiry that could provide further insight is a U.S.-based research study of what *tropical storm preparedness* entails from a language perspective as compared to HP. It remains to be seen how much people in the U.S. know about the difference between

tropical storms and hurricanes and how much they realise they need to prepare for both (see Section 1.2). In the U.S., it is HP that is focused on by DMP despite the fact that tropical storms do an enormous amount of damage each year (see Section 7.4.2). A comprehensive study on tropical storm preparedness could help bolster the overall scope of HP and potentially bring it more in line with the more comprehensive state of TCP globally, since tropical cyclones are inclusive of tropical storms and hurricanes. By definition, TCP covers preparedness for a far greater range of these storms than HP.

7.5.7 Spanish Language Research on Hurricane Preparedness in the U.S.

A fundamental research study that could be conducted in the U.S. would replicate the current research study on HP language, except focusing on native Spanish speakers who are HRBO. The review of HP documentation conducted in this research study revealed that there are less Spanish language FEMA HP resources available than English HP language resources (see Section 4.3.8.2.1). From the perspective of Spanish speakers, FEMA HP resources would be considered an extreme example of internal LOC communication (see Section 2.8.1.2). Further interaction with the most vulnerable groups to receive HP messaging was an insight offered by DMP who identified non-English speaking groups as vulnerable due to the potential for miscommunication (see Section 4.3.8.2.2). There may be sociolinguistic and socioeconomic factors associated with native Spanish speaking HRBO in Florida: there are more than 2.5 times the number of Hispanics in Florida living in poverty as compared to Whites (Florida Senate Committee on Children, Families, and Elder Affairs, 2016, p. 17). Understanding how native Spanish speakers who are HRBO contend with this linguistic inequity would provide a unique view into a group that may be currently rendered more vulnerable due to linguistic exclusion from HP resources.

7.5.8 Government Disaster Management Communication and Coordination in the U.S.

A consistent theme in the literature was reflected by Tierney et al. (2006) as they argued that holistic DM depends unequivocally on the partnership between the government and the public (p. 75). The public is critically impacted by DC from DMP. There are two systems used by governmental agencies that could have a number of research studies specifically dedicated to each. IPAWS is managed by the federal government (see Section 2.8.3.8). There are numerous language-based studies that could be conducted on various aspects of

this complex system, from how the language inputs are homogenised, to what linguistic structures are most effective or least effective for the end receivers. The other government-enabling system that could be examined through a number of research studies is EMAC (see Section 4.3.9.2.3). Research studies on EMAC could range from understanding the language differences between how various states coordinate efforts, to how well EMAC efforts translate to HRBO from a linguistic basis.

7.5.9 Armed Home Resistance Schema Study

The armed home defence schema represents a glimpse into the unique, aggressive culture of the U.S., which at times seemingly approaches disaster contexts like military campaigns (see Sections 2.6.2.1 and 4.3.5.2.3). Not every occupant facing an impending hurricane chooses to remain and defend their home: some occupants will choose to simply evacuate or remain at home in a non-violent manner (see Sections 4.3.5.2.1 and 4.3.5.2.2). However, the reasons that occupants will remain at home and defend their residences by any martial means necessary remains under-researched (see Section 4.3.5.2.3). The Final Hurricane Preparedness Communication Model certainly offers a collaborative, language-based mechanism by which individuals who espouse violence as an HP strategy can have an opportunity to share the language-constructs which may contribute to such behaviour (see Figure 6.1). Further research could uncover whether these language-constructs are rooted in issues like miscommunication due to diminished decoding resulting from internal LOC communication regarding the safety and security during a hurricane (see Section 2.8.1.2). Alternatively, bellicose, personal culture orientation, active remembering, or shared memory may influence decision-making (see Sections 2.8.1.3 and 2.8.1.4). A research study which explores this violent phenomenon deeply seems to be well needed as identified in the gap in literature that has been expressed by other researchers (see Section 4.3.5.2.3).

7.5.10 Broadening the Final Hurricane Preparedness Communication Model Evaluation Group

The Initial Hurricane Preparedness Communication Model was evaluated by nine out of the 18 research study participants (see Section 6.2). This number of participants was sufficient in a narrative-rich, qualitative research study using MSC technique to verify the accuracy of the model, which was part of the aim of the study (see Section 3.9.3.2.1). The refined Final

Hurricane Preparedness Communication Model could be well served in a secondary study to be evaluated by a broader evaluation group (see Figure 6.1). This group could include DMP and HRBO as before, but could also include participants from academic institutions and the media. The media was identified by participants in the study and in the literature as being highly influential interlocuters in HP communication (see Section 4.3.10.2.1). The model could also be evaluated within a study that was mixed method, in which qualitative feedback on the Final Hurricane Preparedness Communication Model could first be gathered from a smaller sample of these aforementioned four participant types (see Section 3.5). Then the model could be evaluated by a larger sample of these four participant types in a survey in order to achieve measurement validity on the Final Hurricane Preparedness Communication Model (see Sections 3.4.1.2 and 3.9.3). Measurement validity of the model was not in scope in this current research study due to the nascent stage of the research into HP communication, and the limitations of the research design itself (see Section 7.4).

7.6 Recommendations

There is scope for recommendations to enhance global HP communication. This will be detailed below.

7.6.1 Increasing Government-Community Interaction to Increase Trust in Hurricane Preparedness

Both HRBO and DMP conveyed during the research study that they wanted to have more interaction with each other in the hopes that this would result in better HP communication (see Section 4.3.10.2.1). There was limited literature reviewed on in-person communications in a HP context, but Höppner et al. (2010) provided a corollary argument as to the benefits of risk communication that focuses on cooperation, coordination, relationships, trust, and task-sharing (p. 57). FEMA (2014) suggested that working with traditional social-based networks can help to bolster the collective strength of a community (p. 52). This research study showed that both HRBO and DMP participants want an increase in interactions between them, and this can help to enhance trust and ideally improve HP communication. The Final Hurricane Preparedness Communication Model offers a path for government-community interaction can build trust through a language-based mechanism (see Figure 6.1).

7.6.2 Standardising Global Hurricane Nomenclature

Perhaps one of the most important recommendations from this research study is for DMP and academics to work together globally to come up with standardised nomenclature for hurricanes. The efforts in this research study to disambiguate hurricane names across geographies was a result of the severe lack of uniformity. This endeavour required collating a number of these hurricane synonyms into one place as a point of reference and as a mechanism for clarity (see Table 1.2). In their research on disaster communication, Shittu, Parker, and Mock (2018) discovered that common language elements between two or more parties helped to reduce the ambiguity in messaging (p. 383). With the current state of disparate global hurricane nomenclature systems, discourse regarding hurricanes is inherently sender-centric, internal LOC communication orientated (see Section 2.8.1.2). Global standardisation of these names across regions would help to reduce potential confusion about these phenomena and create a linguistic bridge that would allow DMP, academia, and members of the public across nations to *speak the same language* regarding the global phenomena of hurricanes. This mutual intelligibility would then hopefully translate into a better global dialogue regarding HP for HRBO and the public all over the world.

7.6.3 Consolidating Disaster Management Hurricane Preparedness Operations in Florida

Fairchild et al. (2006) described how in the U.S., DMP at the state government level and FEMA are under pressure to provide stopgap support for any local governments that do not react effectively to messaging regarding impending hurricanes, thus creating an unpredictable operational environment for these entities in an already difficult situation (p. 965). Dynes and Quarantelli (1975) found that most community organisations engage in cyclical, reactive planning that instead of building capabilities, maximises their own organisational functions in isolation from other community organisations (p. 16). In Florida, reducing HP compartmentalisation between DMP would potentially solve a plethora of issues. The mutually exclusive task sets that are divided between FEMA, FDEM, and local governments are representative of a siloed system (see Section 4.3.9.2.1). While this operational segregation may make sense on some level, there appears to be potential for inefficiency, time lost in coordination, and a lack of consistency for DMP across federal, state, and local agencies in following HP protocols such as evacuation criteria. This

hierarchical and siloed structure also increases the risk that HRBO can slip through the cracks of HP efforts put forth by DMP because of this inherent decentralisation (see Section 4.3.9.2.1). A less consolidated DM and HP operational environment could potentially provide better support for HRBO and the public in general.

7.6.4 Diversifying Hurricane Preparedness Messaging According to Communication Channels

An aspect of channel agnostic HP communication philosophy was reflected in this research study: DMP conveyed in their interview responses that HP messaging was comprised of the exact same language, regardless of the communication channel being used (see Section 4.3.8.2.2). This approach to communication does not consider that language necessarily has to be optimised according to the communication channel used. A communication channel optimised system would entail that core messages are altered in a manner to effectively utilise the differences in communication channels (see Section 2.8.1.1). Even when conveying the same essential message, there are characteristics which should change across communication channels. Length, formality, and complexity of messages generally increase from text, to e-mail, to telephone calls, to web content (Lenassi, 2015, pp. 82, 93). The assertion is that HP messaging that is optimised according to communication channel would leverage the inherent strengths of each communication channel and account for channel shortcomings.

7.6.5 Prioritising Hurricane Preparedness Message Delivery According to Recipient Vulnerability

There is no overt prioritisation mechanism that local governments use to decide which group to reach out to first regarding HP messaging in Florida (see Sections 4.3.6.2.3, 4.3.8.2.1, and 4.3.8.2.2). This reflects a potential homogenisation of vulnerable and non-vulnerable groups from a HP communication standpoint. However, prioritising who gets HP messaging first was an ideal pre-hurricane communication strategy that both HRBO and DMP conveyed in the research study. Fairchild et al. (2006) propounded the need for DM legal statutes and operations to create specific frameworks to identify and serve vulnerable groups first by establishing a registry for such groups (p. 963). Perhaps HP messages could get released at different times according to the vulnerability of recipients across such a

registry. The release timing should be coordinated with an assessment of who should get the messaging first and how long these people might need to get prepared to ride out the storm or evacuate. This effort could be enhanced through the effort of mapping and registry of vulnerable groups.

7.6.6 Enhancing Building Code Approach in Florida and the U.S.

It was of particular note that HRBO interviewed in this research study barely articulated any specifics regarding their knowledge about building codes. What might be helpful is a building code companion resource for the public in which the language is optimised for HRBO to accompany the engineering- and architecture-centric resources, which are useful for construction. Perhaps HP language such as hurricane categories might be included (see Section 4.3.2.2.1 and Appendix H). Also, there is a critical lack of building code enforcement in Florida (see Section 7.3.4). In the absence of enforcing building codes, perhaps authorities can provide better messaging for the HRBO so that they can understand not only what current building codes actually entail, but how enforcement of these codes can be exacted. FEMA could perhaps include building code language in their HP documentation for the public, which was not revealed in the document review of Table 2.6: FEMA – HP Guidelines for the Public, with at least some language encouraging members of the public to seek out local building code resources. This is one area where FEMA can perhaps benefit from the approach taken in Australia: there is guidance offered to public to enquire locally about building codes, which is detailed in Table 2.9: Australia – Example of a HP Plan. Furthermore, the Final Hurricane Preparedness Communication Model offers a mechanism for shared language, which could easily include building code language as a subset of HP language (see Figure 6.1).

Part of the issue with building code enforcement in Florida, and other parts of the U.S., is that there is extensive variability in enforcement across localities (see Section 2.6.2.3). What could be more useful perhaps than any language or messaging modification, would be creating a centralised authority which would actively ensure enforcement of building codes down to a local level across Florida and the entire U.S. In turn, such an authority could coordinate with FEMA to enhance HP awareness for the public.

Finally, building elevation and storm surge risk are not part of HP language in Florida or the U.S. (see Table 2.6). Again, Australia does include HP language pertaining to storm surge and elevation in terms of high ground awareness (see Table 2.9). However, FEMA (2006b) did discover in their own post-disaster research after Hurricane Katrina that 'the elevation of a building was the most critical factor in its success at withstanding storm surge' (p. iii). These factors certainly come into play when hurricanes strike, and flooding ensues. Providing elevation and storm surge language within building codes and HP messaging would help address issues that were surfaced in the literature and document review as having an impact on building risk. Again, the Final Hurricane Preparedness Communication Model is designed to help with such HP language demand endeavours (see Figure 6.1).

7.6.7 Standardising Media Hurricane Preparedness Language in Florida

In interviews, both HRBO and DMP decried the media for being inconsistent in HP language usage. Some of the research study participants cited specific examples of questionable language use by the media (see Section 4.3.4.2.1). Patt and Schrag (2003) emphasised that risk consequences can often be exaggerated by those in charge of communicating such messages, but audiences expect this and are able to decipher this encoding (p. 18). While it may be a difficult task to achieve, some degree of media regulation as to the use of standardised HP language in Florida could potentially enhance the credibility the media has as a source of HP information and render this HP information resource more reliable for HRBO.

7.6.8 Creating a Community-based Emergency Management Assistance Compact Model for Florida

The basic overview of EMAC is that it includes interstate agreements to share resources during times of crises such as disasters, but these agreements do not serve as an intercommunity resource coordination mechanism (see Section 4.3.9.2.3). Perhaps the single most in-depth reference on the subject of language and HP reviewed for this research study was that of Kim and Kang (2010) who found that pre-hurricane messages that are focused on community preparedness are the most effective because individuals are more likely to take preparedness steps for the community than they would for themselves (p. 484). This perspective combined with findings from the interviews conducted for this

research study clearly point toward the need to reinforce pre-hurricane strategies with a foundation in language that leverages the strength of people and of community (see Sections 4.3.8.2.3, 4.3.9.2.3, and 4.3.10.2.1). At a minimum, from an HP communication standpoint, this can be supported by the HRBO-DMP working group from the Final Hurricane Preparedness Communication Model (see Figure 6.1). Perhaps EMAC could be used as a model for the creation of an analogous compact that is on a true community level in Florida. A central authority such as FDEM that already facilitates the sharing of resources *with* communities could help to collectively strengthen HP efforts in Florida *between* communities (see Sections 4.3.5.2.5 and 4.3.6.2.3). A structured system like an EMAC for communities might help to promote better communication regarding critical HP supplies within Florida, as this has already been a documented problem there (see Section 1.3). The literature supports this as well, as reflected by Wukich and Mergel (2015) in describing how DM agencies can benefit from community collaboration in disaster preparedness to co-create solutions (pp. 712-714).

7.6.9 Clarifying Hurricane Hazard Preparedness Globally

The word *disaster* is generally used globally when it pertains to HP. However, a hurricane is a *hazard* which could contribute to a *disaster* based upon its impact on the social environment, of which only the physical impacts which affect the social environment are generally focused on in DM language (see Section 1.2). On a linguistic level, hazard preparedness, essentially preparing for the impacts from hazards, is one critical component that can help to minimise the chances that a hazard becomes a disaster. It may be unrealistic to expect the entire industry of DM and academic spheres internationally to linguistically transition the broader discourse from disaster to hazard preparedness. However, encouraging this debate initially within the smaller group of HP focused DMP could result in better preparedness linguistic strategies that could help the global public face hurricanes. Better preparation could lead to reduced public impacts and help focus efforts for Disaster Response and Disaster Recovery communication endeavours in a hurricane paradigm.

7.6.10 Including Power Companies in the Warning Process in Florida

The critical impact of power outages was reflected in HP documents from government

agencies and described by participants in the research study (see Table 2.6 and Section 4.3.9.2.3). Given the importance placed by both DMP and HRBO on HP behaviour specifically designed to prepare for power outages, it is quite likely active remembering pertaining to power outage events has parallels with flood event active remembering (see Section 2.8.1.4). Yet, power companies are not formally involved in the warning process in Florida. There are flood risk maps, wind risk maps, and evacuation maps but there does not appear to be any power outage risk maps that are formally shared with the public. Power companies in Florida may have maps that are internal to their organisations which identify vulnerabilities in their power grids that could be leveraged into power outage risk maps. These power outage risk maps could also be part of the warning process in Florida. Huang et al. (2016) emphasised the need for DMP to communicate the highest risk impacts to the public so that they minimise their own interpretations of wind and storm surge impacts (p. 1023). Residents living in post-hurricane areas of Florida that have lost power are unable to run their air conditioners. Then they have to bear the brunt of the tropical climate that characterises most of the state during the hurricane season. Perhaps a power outage risk warning communication strategy including accompanying power outage risk maps could offer an enhanced aspect of HP messaging that would encourage some HRBO to evacuate sooner rather than later. This in turn could save lives, particularly for those HRBO that are at risk for heat exhaustion in post-hurricane areas that could be without power.

7.7 Epilogue

The loss of life due to hurricanes is significant. It is estimated that hurricanes have caused 1.9 million deaths worldwide over the past 200 years (Schultz et al., 2005, p. 23). The region of CWF served as a focal point for this research study, but the hurricane impact explored in CWF is a microcosm of the greater impact that hurricanes have around the world. As reflected in language diversity, HP has varying constructs ranging from the prescriptivist realms of DMP to the descriptive narratives of HRBO. ‘Freeing the concept of information from its roots in scientific modernism and technological rationality helps it capture its larger affective, process-oriented, critical meaning’ (Pyati, 2006, p. 88). The quality of language focused on in HP by definition has paramount implications. This is where holistic HP language that is a synergistic product of collaboration between HRBO and DMP can flourish.

Research on HP communication appears to be in short supply, thus evidencing a gap in the literature regarding knowledge that is critical to understand better in order for DMP to help save more lives lost to hurricanes (see Section 7.4.1). On a national level in the U.S., HP policies, HP documentation, and the IPAWS Model administered by FEMA, while highly detailed and intricate at times, particularly in the case of IPAWS, are characterised by an internal communication LOC (see Sections 2.8.1.2 and 2.8.3.8). This research study offered an insight that both the government and the public actually do wish to collaborate further and affect the HP paradigm (see Section 4.3.10.2.1).

The difficulties faced by FEMA, FDEM, and local governments in Florida with the siloed HP administration environment renders HP communication at a disadvantage by default (see Section 4.3.9.2.1). In particular, FDEM has had major challenges managing the logistics of maintaining adequate HP resources for local governments (see Section 1.3). Perhaps the path toward understanding how to better affect policies, documentation, and administration pertaining to HP in Florida can begin with improved communication that can be supported by the Final Hurricane Preparedness Communication Model (see Figure 6.1). Creating a community-based EMAC could certainly help with supply chain efforts (see Section 7.6.8). During disasters in Florida, vendors have consistently shown that they are faster at moving supplies than FDEM (Goentzel & Spens, 2011, p 160). Perhaps this model could incorporate disaster supply chain entities as stakeholders in its fold.

Insurance companies are yet another potential stakeholder in the HP communication paradigm. Hurricanes can exact immense financial losses for the insurance industry (see Section 1.2). As part of HP planning documentation, FEMA also encourages the public to interact with insurance companies to ensure that policies are up-to-date (see Section 2.6.2.1). It is certainly possible that the collaborative nature of the Final Hurricane Preparedness Communication Model could accommodate representatives from supply chain and insurance companies if minor modifications to the model and structure were implemented to allow both to participate in the model as *corporate stakeholders* (see Figure 6.1). The media is an industry at the top of the list for inclusion. If the definition of the *media industry* was expanded to include social media organisations along with mainstream

media, as some of the main communicators with the public, this industry would be critical to involve in order to optimise HP communication (see Sections 7.5.1, 7.5.10, and 7.67).

On a broader level, the global impact of hurricanes to the physical environment may not always reflect proportionally across all sectors of the social environment. Vulnerable groups are susceptible to even smaller intensity hazards, due to the potential for their vulnerability to be magnified by the lack of prioritisation and preparation on the part of DMP, who are tasked with diverse and large responsibilities with limited resources (Pichler & Striessnig, 2013, p. 31). Furthermore, Jakobsen (2012) argued that when hurricanes strike, the poorest sections of society 'risk losing most or all of their asset holdings' (p. 2587). The social impact of this is devastating to entire communities and regions around the world that are affected by hurricanes. This is true for vulnerable populations and the general public. Hurricanes do not discriminate: they can potentially ravage everyone and everything in their paths.

The Final Hurricane Preparedness Communication Model in this research study was developed not just to help HP language be mutually intelligible for HRBO and DMP, but to serve as a mechanism to bring these critical stakeholders together so that they can better support each other in their shared goal of HP (see Figure 6.1). The importance of language in HP should not be underestimated: the storm-ravaged physical infrastructure in CWF can be rebuilt, but the lives of HRBO that are lost to hurricanes do not have reconstruction plans. On a global scale, regardless of whether these destructive weather phenomena are referred to as hurricanes, tropical storms, cyclones, typhoons, or medicanes, this does not change the fact that damage is attributed yearly across the globe to these storms. Maskrey (2010) opined that economic and political interests may outweigh humanitarian interests within DM (p. 87). Perhaps the focus on HRBO, DMP, and HP language in CWF in this research study could cast the spotlight on the broader possibilities of shared HP language that is inclusive of governments, academic institutions, and the public to help society as a whole better prepare for hurricanes. Ultimately, HP communication efforts are focused on the one paradigm that should never be unnecessarily lost because of linguistic shortcomings: human existence.

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APPENDICES

Appendix A: Participant Invitation Letter

Dear _____:

Greetings! My name is Sanjay Jayaswal. I am a PhD student in Disaster Management at the University of Salford, which is in the Manchester, UK area. I am conducting a study to understand hurricane preparedness communication. The findings from this study will help me to develop a social-centric hurricane preparedness communication model that hurricane-focused disaster management professionals can use to convey hurricane risks effectively with high-risk building occupants.

It would be very helpful for this study if I was able to spend an hour with you to gain your perspectives. Rest assured though, your insights would be most appreciated. The data I collect would not contain any personal information: your name, occupation, or any other details about you would remain anonymous. I am the only person who will have access to these data and they will be stored securely.

My promise to you is that your participation in this study will be an enjoyable experience. It is my sincere desire to help make a difference for members of the public to prepare for hurricanes by supporting the hurricane-focused disaster management professionals that are ultimately trying to save their lives. Your thoughts will help to shape this study and its outcomes.

Please do not hesitate to contact me should you have any questions or concerns:
S.Jayaswal@salford.ac.uk
(404) 789-1895

My Supervisor is Dr. Bingunath Ingirige and he would also be glad to answer your questions about this study at any time.

You may contact him at:

M.J.B.Ingirige@salford.ac.uk@salford.ac.uk

+44 161 295-3216

Thank you so much in advance for your time and support!

Sincerely,

Sanjay Jayaswal

Appendix B: Participant Information Sheet

STUDY TITLE

Paradigm Lost: The Pre-Hurricane Language of Preparedness and Resistance

RESEARCHER AND SUPERVISOR

Researcher: Sanjay Jayaswal

Supervisor: Dr. Bingunath Ingirige

INTRODUCTION

The aim of this interview is to understand the perspective of a member of the public (or hurricane-focused DM professional – substitute accordingly) about hurricane preparedness communication. The findings from this study will help me to develop a social-centric hurricane preparedness communication model that Disaster Management professionals can use to convey hurricane risks effectively with high-risk building occupants.

What I am seeking is a reflection of your experience and the expression of your thoughts on these matters. You will notice me taking notes on my laptop. With your permission I will also record the interview so that I can double-check my notes. The recording and my notes will only be accessible to me. All of the information gathered will be treated confidentially and your name, occupation, and any other personal details you might share will remain anonymous.

THE REASONS YOU WERE CHOSEN

As a member of the public living in Florida in a building that is deemed high-risk for hurricane wind speeds (or hurricane-focused DM professional concentrated on Florida – substitute accordingly), your perspectives on hurricane preparedness communication will be quite valuable to this study.

WILL I GET PAID?

Due to the financial impacts of being a PhD student, I would not be able to compensate you for your time.

IS THERE ANY RISK TO ME?

There is no risk to you whatsoever. You are only being asked to participate in a 1 hour interview at a location of your choice. The data collected would not contain any personal information: your name, occupation, or any other details about you would remain anonymous. I am the only person who will have access to these data and they will be stored securely.

DO I HAVE TO PARTICIPATE?

Your participation in this study is completely voluntary. Rest assured though, there is no risk whatsoever for participation and your insights would be most appreciated.

IF I CHOOSE TO PARTICIPATE, WHAT'S THE NEXT STEP?

If you choose to participate, I will contact you to schedule a date/time for a 1 hour interview.

WHAT WILL HAPPEN TO THE RESULTS OF THIS STUDY?

I will utilize the results of this study in the writing of a PhD thesis. The ultimate focus of this study will be to develop a social-centric hurricane preparedness communication model for hurricane-focused Disaster Management professionals that is tailored to high-risk building occupants. Additionally, the study results will be published in industry and academic journals, and presented at conferences and seminars. To expand the knowledge that will be developed from this study, the results may be shared with other researchers and professionals. Wherever the results of the research may be used, each participant will always remain anonymous unless you have specifically given me a written consent to disclose your information.

TIME COMMITMENT

This interview will take a maximum of 1 hour. My promise to you: I will take no more of your time than that.

RIGHTS

You can decide to stop being a part of the research study at any time without explanation.

You can omit or refuse to answer or respond to any question.

You can ask me any questions about the procedures involved with the study (unless answering these questions would interfere with the study outcome).

You can ask me at any point in the study about anything covered in this information sheet.

CONFIDENTIALITY/ANONYMITY:

The data I collect do not contain any personal information about you. I am the only person who will have access to these data and they will be stored securely.

FOR FURTHER INFORMATION:

My Supervisor is Dr. Bingunath Ingirige and he or I will be glad to answer your questions about this study at any time.

You may contact him at:

M.J.B.Ingirige@salford.ac.uk@salford.ac.uk

+44 161 295-3216

You may contact me at:

S.Jayaswal@salford.ac.uk

(404) 789-1895

Appendix C: Participant Consent Form

STUDY TITLE

Paradigm Lost: The Pre-Hurricane Language of Preparedness and Resistance

RESEARCHER CONTACT INFORMATION

Sanjay Jayaswal, PhD Researcher

School of the Built Environment, University of Salford

4th Floor, Maxwell Building, The Crescent

Salford, Greater Manchester, UK

M5 4WT

S.Jayaswal@salford.ac.uk

(404) 789-1895

I confirm that I have read and understood the information sheet for this study and what my participation will be.	Select Yes or No
I understand that my participation is voluntary and that I am free to withdraw at any time without giving reason.	Select Yes or No
I understand that all the information that I give will be used solely for the purpose of research and will not be revealed to a third party.	Select Yes or No
I have been given the opportunity to ask questions (face-to-face or via telephone or e-mail).	Select Yes or No
I agree to take part in the above study.	Select Yes or No
I agree to the interview discussion being audio recorded.	Select Yes or No

I agree to the use of anonymised quotes in publications.	Select Yes or No

_____	_____	_____
Participant Name	Date	Participant Signature

_____	_____	_____
Researcher Name	Date	Researcher Signature

Appendix D: Participant Screener (Public)

The purpose of the following questions is to gather some detailed information about you for the study you are participating in. Please answer the following:

Gender	Female	Male	Other
	☐	☐	☐

Age	<20	20-29	30-39	40-49	50-59	60-69	70-79	80-89	> 90
	☐	☐	☐	☐	☐	☐	☐	☐	☐

Years lived in Florida	<10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	>80
	☐	☐	☐	☐	☐	☐	☐	☐	☐

Hurricanes experienced in Florida (hurricane names and locations if possible)	0	1	2	3	4	5	6	7	8	9	10	> 10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Hurricanes experienced outside Florida (hurricane names and locations if possible)	0	1	2	3	4	5	6	7	8	9	10	> 10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Appendix E: Participant Screener (Disaster Management Professionals)

The purpose of the following questions is to gather some detailed information about you for the study you are participating in. Please answer the following:

Age	<20	20-29	30-39	40-49	50-59	60-69	70-79	80-89	> 90
	☐	☐	☐	☐	☐	☐	☐	☐	☐

Gender	Female	Male	Other
	☐	☐	☐

Job title/occupation (describe):	

Hurricanes deployed on in Florida (hurricane names and locations if possible)	0	1	2	3	4	5	6	7	8	9	10	> 10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Hurricanes deployed on outside of Florida (hurricane names and locations if possible)	0	1	2	3	4	5	6	7	8	9	10	> 10
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Appendix F: Participant Interview Guide (Public)

INTRODUCTION (10 minutes)

GREETING

Moderator Info: Sanjay + PhD Researcher + University of Salford

Aim: To develop a Hurricane Preparedness communication model to help Disaster Management professionals convey hurricane risks with high-risk building occupants.

ACKNOWLEDGE

Thanks for sharing your thoughts with me today! I know your time is valuable and I'm grateful that you chose to spend it here with me.

DISCLOSURE

Notetaking: You'll see me typing on my laptop occasionally. That's me just taking notes.

Recording: This is the audio recording device I am using to help me make sure my notes are correct. (Only if participant has agreed to being recorded)

PERMISSIONS

Feel free at any time to take a short break if you must, but if at all possible let's try and proceed through this whole session.

GUIDELINES

- Feel completely free to share your points of view
- Please understand that I'm very grateful to hear everything you have to say

PERSONAL INTROS

Please introduce yourself and tell me:

- Something I never would've guessed about you
- The last hurricane you went through

TRANSITION

If you're ready to get into this further, let's proceed.

Pre-hurricane Reflections (15 minutes)

1. How do feel about the place you live in withstanding a hurricane?
    - Probe: What do you know about the place you live in that makes you feel that way?
    - Probe: What words and phrases describe this?

2. What do you know about the building codes of your home?
    - Probe: How did you find out about these building codes?
    - Probe: What words and phrases were used?
    - Probe: How would you prefer to find out about building codes?
    - Probe: What words or phrases would you prefer to be used to communicate building codes?

3. Imagine a hurricane is going to hit without warning. What is the first word that comes to mind?
    - Probe: What are the reasons that this is the first word?
    - Probe: What are some other words or phrases that come to mind?
    - Probe: What are the reasons for these other words and phrases?

Perceptions and Pre-hurricane Strategies (15 minutes)

4. What is your main source of information when a hurricane is really (or would be) forecast to hit your area?
    - Probe: What words and phrases are conveyed?
    - Probe: How is this different than the words and phrases you might use?
    - Probe: What are other sources of information you rely upon?
    - Probe: How do you distinguish these sources of information from each other?

- Probe: What words and phrases are conveyed by these sources?
- Probe: How is this different than the words and phrases you might use?

5. What are the next steps you take (or would take) once you find out this information?
    - Probe: How do you come up with the order for these steps?
    - Probe: What words and phrases did you hear in the information you received that helped you make these decisions regarding the order?

6. Who do you (or would you) communicate with regarding your next steps?
    - Probe: What words and phrases do you say to these people?
    - Probe: What words and phrases do these people say to you?

Words, Concepts, Phrases, Communication Channels (15 minutes)

7. If you were in charge of communicating to the public regarding hurricane preparedness, what words or phrases would you use?
    - Probe: Which words or phrases are specific to the place you live in?
    - Probe: Which words or phrases are specific to hurricanes?

8. If you could communicate to the public regarding hurricane preparedness, who would you communicate with?
    - Probe: Who would communicate with first?
    - Probe: What are the reasons for this order?
    - Probe: What ways would you communicate with them?
    - Probe: How would these communication channels change depending on the message?
    - Probe: What are the types of messages you would send out?

9. How does the government currently work with communities to prepare for hurricanes?
    - Probe: How do communities work with each other?

- Probe: What types of communication approaches are used?
- Probe: How should the government work with communities?
- Probe: How should people in communities work with each other?
- Probe: What types of communication approaches could help more with all this?

Conclusion (5 minutes)

10. Well, those are all the questions I have for you right now. What are your closing thoughts given the topics we discussed today?

11. What questions do you have for me?

Thanks so much, I sincerely appreciate you spending your time with me here today! If you have any further thoughts that come to mind, please don't hesitate to reach out. With your permission, if I have any follow-up questions or thoughts, would it be acceptable for me to reach back out to you?

Great! Thanks again! Your input is really going to help out my research!

Appendix G: Participant Interview Guide (Disaster Management Professionals)

INTRODUCTION (10 minutes)

GREETING

Moderator Info: Sanjay + PhD Researcher + University of Salford

Aim: To develop a Hurricane Preparedness communication model to help Disaster Management professionals convey hurricane risks with high-risk building occupants.

ACKNOWLEDGE

Thanks for sharing your thoughts with me today! I know your time is valuable and I'm grateful that you chose to spend it here with me.

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PERMISSIONS

Feel free at any time to take a short break if you must, but if at all possible let's try and proceed through this whole session.

GUIDELINES

- Feel completely free to share your points of view
- Please understand that I'm very grateful to hear everything you have to say

PERSONAL INTROS

Please introduce yourself and tell me:

- Something I never would've guessed about you
- The last hurricane you went through (or worked on)

TRANSITION

If you're ready to get into this further, let's proceed.

Pre-hurricane Reflections (15 minutes)

1. What are your thoughts about Risk Category II buildings withstanding a hurricane?
    - Probe: What are some specific aspects of these buildings that make you feel that way?
    - Probe: What words and phrases about these aspects stand out to you?

2. How do you communicate with Risk Category II building occupants about the building codes of their homes?
    - Probe: What words and phrases are used?
    - Probe: How would you prefer they find out about building codes?
    - Probe: What words or phrases would you prefer to be used to communicate building codes?

3. Imagine a hurricane is going to hit without warning. What is the first word that comes to mind?
    - Probe: What are the reasons that this is the first word?
    - Probe: What are some other words or phrases that come to mind?
    - Probe: What are the reasons for these other words and phrases?

Perceptions and Pre-hurricane Strategies (15 minutes)

4. What is the main source of information you use to find out about when a hurricane is really (or would be) forecast to hit your area of focus?
    - Probe: What words and phrases are conveyed?
    - Probe: How is this different than the words and phrases you might use?
    - Probe: What are other sources of information you rely upon?
    - Probe: How do you distinguish these sources of information from each other?

- Probe: What words and phrases are conveyed by these sources?
- Probe: How is this different than the words and phrases you might use?

5. What are the next steps you take (or would take) once you find out this information?
   - Probe: How do you come up with the order for these steps?
   - Probe: What words and phrases did you hear in the information you received that helped you make these decisions regarding the order?

6. Who do you (or would you) communicate with regarding your next steps?
   - Probe: What words and phrases do you say to these people?
   - Probe: What words and phrases do these people say to you?

Words, Concepts, Phrases, Communication Channels (15 minutes)

7. If you were in charge of communicating to the public regarding hurricane preparedness, what words or phrases would you use?
   - Probe: Which words or phrases are specific to the geographical area?
   - Probe: Which words or phrases are specific to hurricanes?

8. If you could communicate to the public regarding hurricane preparedness, whom would you communicate with?
   - Probe: Who would communicate with first?
   - Probe: What are the reasons for this order?
   - Probe: What ways would you communicate with them?
   - Probe: How would these communication channels change depending on the message?
   - Probe: What are the types of messages you would send out?

9. How does the government currently work with communities to prepare for hurricanes?
   - Probe: How do communities work with each other?

- Probe: What types of communication approaches are used?
- Probe: How should the government work with communities?
- Probe: How should people in communities work with each other?
- Probe: What types of communication approaches could help more with all this?

Conclusion (5 minutes)

10. Well, those are all the questions I have for you right now. What are your closing thoughts given the topics we discussed today?

11. What questions do you have for me?

Thanks so much, I sincerely appreciate you spending your time with me here today! If you have any further thoughts that come to mind, please don't hesitate to reach out. With your permission, if I have any follow-up questions or thoughts, would it be acceptable for me to reach back out to you?

Great! Thanks again! Your input is really going to help out my research!

Appendix H: U.S. Saffir-Simpson Hurricane Classification and Category System

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	119-153 km/h 74-95 mph	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	154-177 km/h 96-110 mph	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (Major)	178-208 km/h 111-129 mph	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (Major)	209-251 km/h 130-156 mph	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (Major)	252 km/h or higher 157 mph or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
(Adapted from original source: NHC, 2018)		

Appendix I: Australia Tropical Cyclone Classification and Category System

Category Name	Sustained Winds	Types of Damage Due to Hurricane Winds
1 Tropical Cyclone	90 – 124 km/h 56 – 78 mph	Negligible house damage. Damage to some crops, trees and caravans. Craft may drag moorings. A Category 1 tropical cyclone's strongest winds are GALES with typical gusts over open flat land of 90 – 125 km/h.
2 Tropical Cyclone	125 – 164 km/h 79 – 102 mph	Minor house damage. Significant damage to signs, trees and caravans. Heavy damage to some crops. Risk of power failure. Small craft may break moorings. A Category 2 tropical cyclone's strongest winds are DESTRUCTIVE winds with typical gusts over open flat land of 125 – 164 km/h.
3 Severe Tropical Cyclone	165 – 224 km/h 103 – 139 mph	Some roof and structural damage. Some caravans destroyed. Power failures likely. A Category 3 tropical cyclone's strongest winds are VERY DESTRUCTIVE winds with typical gusts over open flat land of 165 – 224 km/h.
4 Severe Tropical Cyclone	225 – 279 km/h 140 – 173 mph	Significant roofing loss and structural damage. Many caravans destroyed and blown away. Dangerous airborne debris. Widespread power failures. A Category 4 tropical cyclone's strongest winds are VERY DESTRUCTIVE winds with typical gusts over open flat land of 225 – 279 km/h.
5 Severe Tropical Cyclone	280 km/h or higher 174 mph or higher	Extremely dangerous with widespread destruction. A Category 5 tropical cyclone's strongest winds are VERY DESTRUCTIVE winds with typical gusts over open flat land of more than 280 km/h.
(Adapted from original source: Australian Government, Bureau of Meteorology, 2019c)		

Appendix J: Northwest Pacific Typhoon Classification System

Name	Sustained Winds
Typhoon	63 – 118 km/h
	39 – 73 mph
Strong Typhoon	119 – 156 km/h
	74 – 97 mph
Very Strong Typhoon	157 – 192 km/h
	98 – 119 mph
Violent Typhoon	193+ km/h
	120+ mph
(Adapted from original source: National Institute of Informatics, 2017)	

Appendix K: Arabian Sea/Bay of Bengal Cyclone Classification System

Name	Sustained Winds
Cyclonic Storm	63 – 87 km/h
	39 – 54 mph
Severe Cyclonic Storm	88 – 117 km/h
	55 – 72 mph
Very Severe Cyclonic Storm	118 – 220 km/h
	73 – 137 mph
Super Cyclonic Storm	221+ km/h
	138+ mph
(Adapted from original source: Evan and Camargo, 2011)	

Appendix L: Southwest Indian Ocean Tropical Cyclone Classification System

Name	Sustained Winds
Moderate Tropical Storm	63 – 88 km/h
	39 – 55 mph
Severe Tropical Storm	89 – 117 km/h
	56 – 72 mph
Tropical Cyclone	118 – 165 km/h
	73 – 103 mph
Intense Tropical Cyclone	166 – 212 km/h
	104 – 132 mph
Very Intense Tropical Cyclone	212+ km/h
	133+ mph
(Adapted from original source: Meteo France, 2015)	

Appendix M: South Pacific (East of 160E) Tropical Cyclone Classification System

Name	Sustained Winds
Tropical Cyclone (Gale)	63 – 88 km/h
	39 – 55 mph
Tropical Cyclone (Storm)	89 – 117 km/h
	56 – 72 mph
Tropical Cyclone (Hurricane)	118+ km/h
	73+ mph
(Adapted from original sources: Australian Government, Bureau of Meteorology, 2019c; NHC, 2018)	

Appendix N: Medicane Classification System (Unofficial)

Name	Sustained Winds
Medistorm	<62 km/h
	<39 mph
Severe Medistorm	62 – 91 km/h
	39 – 56 mph
Medicane	92 – 117 km/h
	57 – 72 mph
Major Medicane	118 – 152 km/h
	73 – 94 mph
Violent Medicane	153+ km/h
	95+ mph
(Adapted from original source: Mediterranean Cyclone Centre, 2020)	

Appendix O: Initial Hurricane Preparedness Communication Model and Feedback Request

The Hurricane Preparedness Communication Model is focused on providing Disaster Management professionals (DMP) hurricane preparedness language elements that are tailored to high-risk building occupants (HRBO). The term *language* in this model and the overview section refers to words and phrases that are used within any communication or messaging relevant to hurricane preparedness. For the model to produce language that is holistic, the following diverse stakeholder groups provide language inputs to a central data location in the model: HRBO, DMP [FEMA (Federal Emergency Management Agency), State of Florida, and Local Governments], and Academic Institutions (Universities, Research Institutions). The collected language data from the central data location is then analyzed by a FEMA-facilitated collaborative working group comprised of HRBO and DMP in order to optimize the language for further use by broader groups of DMP in their hurricane preparedness efforts focused on HRBO.

This open platform (OPC – Open Platform Communications specification) social-centric communication model was developed through a combination of insights from the following four sources:

Insights from interview responses from HRBO and DMP research study participants
Language-based insights were derived from the analysis of research study participant interview responses; this guided the development of the model.

- HRBO
    - Identified language elements related to hurricane preparedness and building codes that did not always conform to language elements used by DMP
    - Expressed language based on the most in-depth information about how a hurricane strike might affect their immediate social and physical environments
    - Proposed that increased human interaction with each other and DMP could enhance hurricane preparedness

- FEMA
    - Described how they utilize hurricane data from the National Hurricane Center (NHC) and weather data from the National Weather Service (NWS) as main information sources for language pertaining to impending hurricanes
    - Discussed the provision of general Hurricane Preparedness Guidelines for the public and numerous hurricane preparedness information and resources in support of Florida state government, local Florida governments, and the public
    - Identified how academic and research institutions have numerous hurricane data for impending systems along with the forecast track models (spaghetti models) they make available to FEMA and other DMP
    - Proposed that increased human interaction with HRBO could enhance hurricane preparedness
- Florida State Government [specifically the Florida Division of Emergency Management (FDEM)]
    - Discussed the provision of hurricane preparedness information and resources in support of local Florida governments (county, city) and the public
    - Described the provision of wind speed threshold building codes for high-risk buildings
    - Proposed that greater human interaction with HRBO could enhance hurricane preparedness
- Local Florida Governments (County, City)
    - Described responsibility for evacuation routes, shelter locations
    - Discussed provision of hurricane preparedness information and resources for the public
    - Proposed that increased human interaction with HRBO could enhance hurricane preparedness

<u>Analysis of existing communication models relevant to the field of Disaster Management</u>

Five Communication Models relevant to Disaster Management that are already in existence were examined as part of this research study to gain a broad understanding of how such models are constructed and how they work. This examination led to the creation of an initial

Hurricane Preparedness Communication Model specific to this research study which was based on some elements from these five models. This model was then optimized with an enhanced human interaction focus that was derived from insights of the analysis of HRBO and DMP interviews, and insights from the analyses of the literature and document reviews.

Analysis of research literature in Disaster Management and other areas relevant to this study

A literature review was conducted of peer-reviewed journal articles, books, and other reference material regarding research studies and subject matter analyses from the fields of Disaster Management and Disaster Communication. This helped to provide a baseline of broad knowledge regarding these fields that were relevant to foci of hurricane preparedness communication. These materials were then analyzed after this review for content relevant to this specific research study which also helped to shape the model.

Analysis of hurricane preparedness planning documentation from the U.S. and other countries

Hurricane preparedness planning and other documents relative to Disaster Management from FEMA, the state of Florida, and other countries were reviewed and then analyzed to provide a baseline knowledge of language created for the public; this also influenced the model.

Stakeholder Groups and Language Input

This model is constructed such that language-based data regarding factors relevant to hurricane preparedness is input into the communication model by the following stakeholder groups:

Stakeholder Groups	**Language Input**
HRBO	Hurricane preparedness and building code language they would prefer to be used rather than some of what is currently used by Disaster Management professionals

	Language regarding broad knowledge they have about potential impacts to their immediate social and physical environments, i.e. their families, friends, homes, neighborhoods if a hurricane was going to strike
FEMA	Hurricane data from the NHC and local weather data from the NWS
	The general Hurricane Preparedness Guidelines for the public
	A list of resources available for the Florida state government and the public
State of Florida	A list of resources that FDEM & other state agencies have available for local governments and the public
	The information on wind speed threshold building codes
Local Governments	Information on evacuation routes
	Information on shelter locations
	Other information relevant to the public
Academic Institutions	Hurricane data and probable path (*spaghetti*) models that universities and research institutions have

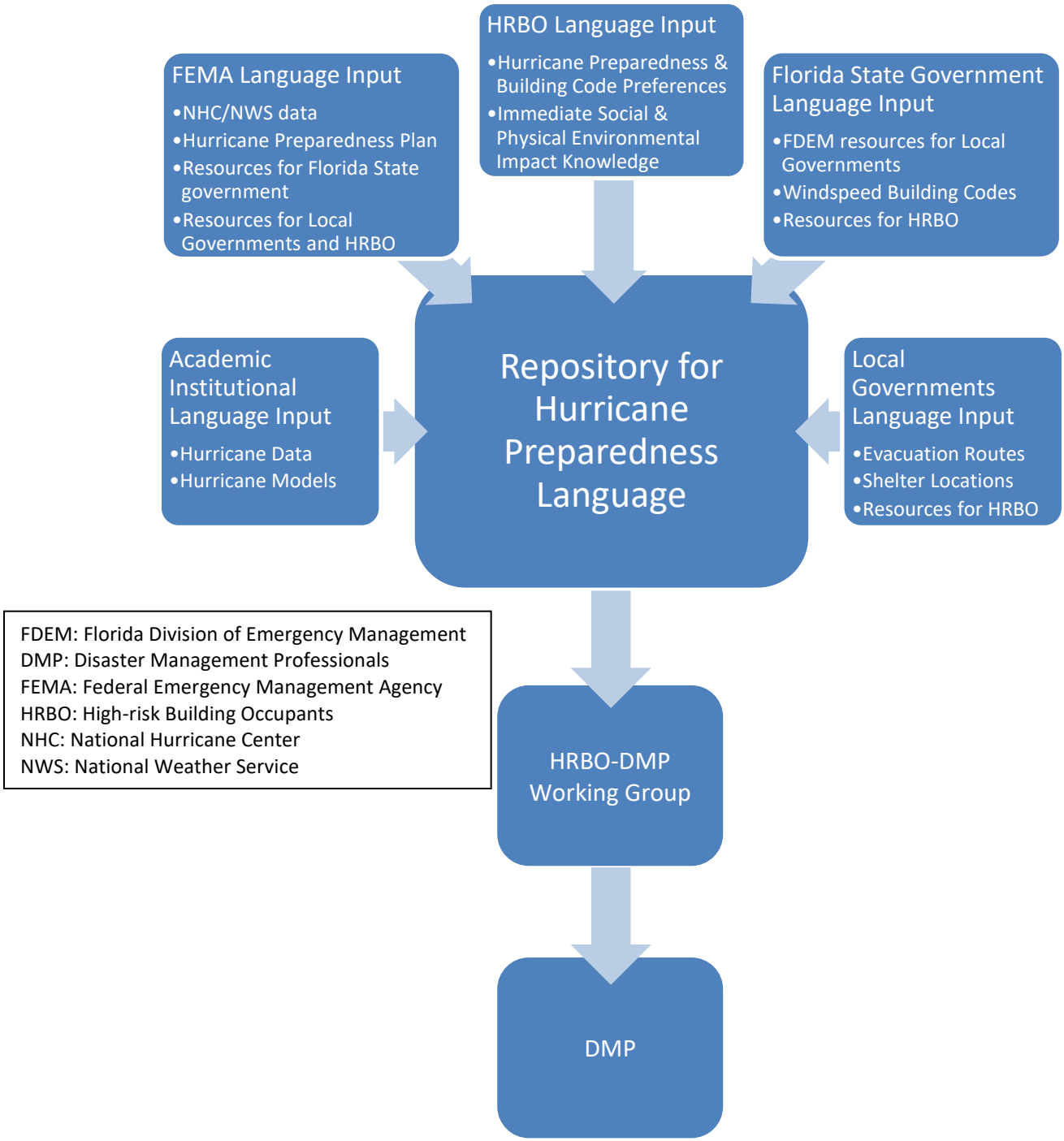
Repository for Hurricane Preparedness Language

The language input from these stakeholders is then be collected in a secure, central data location (Repository for Hurricane Preparedness Language – RHPL) that includes all the information that stakeholders have that is relevant to hurricane preparedness. This collected information is then accessed by the HRBO-DMP Working Group.

HRBO-DMP Working Group

A FEMA-facilitated working group of selected HRBO and DMP assesses the collected language from the RHPL and collaborate to create hurricane preparedness language that is optimized for HRBO. Then DMP could use this optimized hurricane preparedness language for the numerous types of communications and messaging they are responsible for that is intended for HRBO.

Hurricane Preparedness Communication Model



Please help evaluate this model by answering two feedback questions on the following page.

Feedback Questions for Research Study Participants

Imagine this Hurricane Preparedness Communication Model was implemented. Please answer the following questions.

1. How would things change for each of these groups (HRBO, FEMA, Florida State Government, Local Governments, Academic Institutions)? Please elaborate in as much detail as possible in the space below. Feel free to use extra pages if needed.

2. Out of all these changes, which one would be the most significant? Please elaborate in as much detail as possible in the space below. Feel free to use extra pages if needed.

Please e-mail me this document with your valued feedback at your earliest convenience.

ETHICAL APPROVAL CONFIRMATION LETTER

University of Salford MANCHESTER

Research, Innovation and Academic Engagement Ethical Approval Panel

Doctoral & Research Support
Research and Knowledge Exchange,
Room 827, Maxwell Building,
University of Salford
Manchester
M5 4WT

T +44(0)161 295 5278

www.salford.ac.uk/

15 February 2019

Sanjay Jayaswal

Dear Sanjay

RE: ETHICS APPLICATION STR1819-18 – Paradigm Lost: The Pre-Hurricane Language of Preparedness and Resistance

Based on the information you provided, I am pleased to inform you that your application STR1819-18 has been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible by contacting S&T-ResearchEthics@salford.ac.uk

Yours sincerely,

A P Higham.

Dr Anthony Higham
Chair of the Science & Technology Research Ethics Panel