AN ANALYSIS OF SMALL BUSINESS' FLOOD MITIGATION BEHAVIOUR IN KAMPALA, UGANDA

SAI GANESH VEERAVALLI

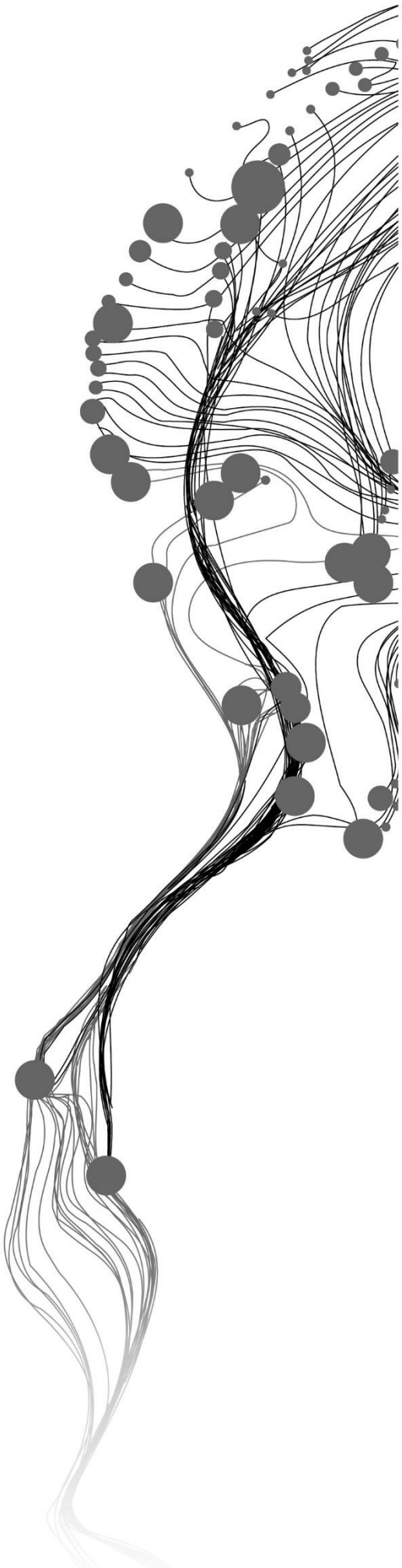
July, 2020

SUPERVISORS:

Professor, R.V, Sliuzas
Assistant Professor, J, Flacke

ADVISOR:

Simbarashe Chereni



AN ANALYSIS OF SMALL BUSINESS' FLOOD MITIGATION BEHAVIOUR IN KAMPALA, UGANDA

SAI GANESH VEERAVALLI
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Specialization: Urban Planning and Management

SUPERVISORS:
Professor, R.V, Sliuzas
Assistant Professor, J, Flacke

ADVISOR:
Simbarashe Chereni

THESIS ASSESSMENT BOARD:
Professor, P.Y, Georgiadou (Chair)
Associate Professor, J.F, Warner (External Examiner, Wageningen University and Research)
Professor, R.V, Sliuzas
Assistant Professor, J, Flacke

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ABSTRACT

Kampala faces frequent floods, which affects both livelihoods and businesses. In Kampala, both formal and informal businesses contribute about 60% of national tax revenue, mostly stacked by small businesses providing big chunk of employment opportunities. Though there is enormous potential for small business to thrive in Kampala, environmental problems like flooding is a huge obstruction for their growth. Understanding how businesses perceive flood risk and what factors influence their mitigation behaviour can be helpful in designing interventions or policies that enhance mitigation efforts of businesses. Available literature did not explore much in businesses mitigation behaviour and is scanty in a developing world context. The aim of this research is to understand the flood mitigation behaviour of MSME's and find the most influential factors affecting it in three selected neighbourhoods of Kampala, Uganda. The survey data collected in August 2017 by Mr. Simbarashe Chereni as part of an ongoing Ph.D. study at the University of Twente is used in this research. The semi-structured questionnaire is designed to capture information regarding business characteristics, perceptions, flood experience, risk attitudes, government efforts, and mitigation measures implemented by businesses. An extended version of Protection Motivation Framework (PMT) is proposed in this research with variables that relevant to businesses based on the existing literature. Correlation and regression analysis were used to establish a relationship between the extended PMT framework variables and the flood migration behaviour of businesses. The study established a significant correlation between business size; tenure status; business age; past flood induced financial impact; future flood likelihood; willingness to spend on mitigation measures on one hand and mitigation behaviour on other. Structural measures are the most common measures implemented by businesses irrespective of their size, location, tenure status, type, age, willingness and flood experience. Rebuilding/raising the floor and clearing drainage are the two structural measures about which the businesses are really positive regarding their effectiveness and ease of self-implementation. Awareness regarding the relatively low cost non-structural measures should be enhanced among businesses as very few adopted non-structural measures and only one-third of businesses expressed them as very effective measures. The responses to the question on future flood likelihood showed most of the businesses are not aware of future flood risks irrespective of their size. It is important to educate businesses about the risk of future floods and the impact it could cause to their businesses. The results also showed poor information seeking behaviour among businesses and community leaders, NGO's & CBO's should find more efficient ways of information dissemination regarding floods. The results of this research showed that not all findings of the existing literature which are based on formal businesses in a developed world context can be transferred to a developing world context such as Kampala with high levels of informality. The regression model based on the proposed extended PMT framework explained more variance in the mitigation behaviour of businesses compared to the original PMT framework though not all variables made a significant contribution to the model.

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Dedicated to my late grandparents Mr. Ganeswara Rao Veeravalli & Mrs. Sitaratnam Veeravalli

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ACRONYMS

CCCI: Cities and Climate Change Initiative

CBO: Community Based Organization

DRR: Disaster Risk Reduction

IFMK: Integrated Flood Management in Kampala

ISIC: International Standard Industrial Classification of All Economic Activities

PMT: Protection Motivation Theory

KCCA: Kampala Capital City Authority

MSME: Micro, Small and Medium size Enterprises

NGO: Non-Government Organization

SME: Small and Medium size Enterprises

UK: United Kingdom

USA: United States of America

1. INTRODUCTION

1.1. Background and justification

Floods account for about one-third of all natural disasters (Wannous & Velasquez, 2017). They are the most frequent and widespread natural hazard, which sometimes have devastating effects on human livelihoods (Bashir O. et al., 2012). Exposure to flooding is increasing due to climate change and unpreparedness (Bashir O. et al., 2012). Floods are the reason for about 45% of the deaths which happened due to natural disasters in 2013 (International Federation of Red Cross, 2014) and accounted for about 40 billion US dollars economic losses between 1998 and 2010 (Jha et al., 2012). As the world is getting rapidly urbanized, the number of people exposed to flooding is increasing as the impacts of floods are severe in urban areas. It is projected that the majority of the future urbanization happens in the African and Asian countries. In major urban centres of Africa and Asia, managing flood risks effectively has become critical than ever due to the exposure of large populations living in low-quality, overcrowded informal settlements. Many of these informal settlements are located in flood-prone areas (Adelekan, 2010; Jha et al., 2012; Lavell et al., 2012). Scholars also reported that many African cities face increased risk of flooding due to climate change and increasing sea levels (IPCC, 2015; Trenberth, 2008). Uncertainty in rainfall patterns and intensity coupled with insufficient or lack of drainage system, unregulated urban development and poor city planning have increased the risk of flooding in many African cities (Adelekan, 2015; Adelekan, 2010; Satterthwaite, 2011).

It is a massive challenge for the government authorities and policymakers to plan mitigation measures that ensure people's safety and prosperity from the impacts of floods. Mitigation is an intervention to reduce the effects of floods on stakeholders and their assets. They can be precautionary measures taken by stakeholders themselves or the government activities like broadening of primary drainage channels, capturing rainwater and building water retention pools. However, the development of effective risk mitigation measures does not emerge from the conventional method of risk analysis or physical science knowledge alone. It requires an understanding of the community knowledge, their priorities and how they perceive flood risk (Adelekan & Asiyanbi, 2016; Raaijmakers, Krywkow, & van der Veen, 2008). Many scholars identified risk perception as an important element in understanding and anticipating public responses to hazards, setting priorities, effectively channelling resources and effectively communicating risk information (Ittelson, 1978; Lave & Lave, 1991; Samuels & Gouldby, 2009; Slovic et al., 1982). Therefore, some recent studies of flood risk focused on capturing the risk perception of people in flood-affected communities to design and implement effective mitigation measures (Botzen et al., 2009; De Wit, M. S., van der Most, H., Gutteling, J. M., & Bockarjova, 2008; Heitz et al., 2009; Kellens et al., 2011; Miceli et al., 2008; Tran et al., 2008).

Kampala, Uganda's capital city, is one of the Africa's fast-growing cities and the country's crucial and largest urban area. The rapidly growing nature of the city led to an increase in the households count and created a huge demand for services and products, thereby establishing a massive potential for the businesses to flourish. But poverty, flooding, and informality have been few of the predominant features of Kampala's society and development (Sliuzas et al., 2013). The hilly terrain of Kampala and rapid urbanization leading to infringement into environmentally sensitive areas together made Kampala, a hotspot for flash flood risk (Douglas et al., 2008). Though flooding affects every section of the society, it is the urban poor who are vulnerable the most. In an urban flood event, the bigger segment of the urban poor population, their livelihoods, assets, and businesses experience detrimental effects either directly or indirectly. Therefore, government authorities and stakeholders need to implement mitigation measures to increase their resilience towards flood risk. The way households and businesses respond to a hazard, how they allocate their

resources in risk situations, and how they communicate their risk information might be different. The potential determinants of decision making regarding mitigation measures and the type of measures that are required to increase the resilience towards flood risk might be different for households and businesses. Mr. Simbarashe Chereni, a Ph.D. student at the University of Twente, is working on understanding the perception of households towards flood risk in Kampala, Uganda. This research focuses on understanding the perception of businesses towards flood risk in Kampala, Uganda while contributing to his Ph.D. research.

It is crucial to study the perception of businesses because it is estimated that both formal and informal businesses contribute about 60% of national tax revenue in Kampala (Musisi, 2017). In sub-Saharan Africa, the private sector is stacked by mostly small enterprises but provides a big chunk of employment opportunities (Thompson et al., 2017). Although there is enormous potential for small businesses to thrive in Kampala, environmental problems like flooding are hampering their growth, apart from the problems related to capital (Musisi, 2017). Small businesses are the primary source of income and provide employment opportunities in many of the formal and informal settlements (Lwasa, 2016). If the small businesses are affected by floods, it does not only lead to loss in income and employment opportunities for many people but it also has a knock-on effect on the city's economy, infrastructure, and transportation (Lwasa, 2016). Small businesses are becoming more vulnerable, due to the increased frequency and severity of floods. This would result in a substantial loss of the local economic activity and can have nationwide implications considering the crucial role small businesses have in creating jobs (Davlasheridze & Geylani, 2017). Therefore, understanding how businesses perceive flood risk and act to protect themselves, helps policymakers to anticipate their behaviour and capacity in resilience building, guiding them to design interventions or policies that enhance such autonomous efforts.

1.2. Research problem and relevance of the study

Public flood risk perception knowledge is crucial for the implementation of effective disaster reduction policies and flood risk management. Risk perception of individuals is influenced by different cognitive factors, social and cultural backgrounds (Lawless et al., 1983). Recent literature on flood risk perception has been focused on understanding the determinants of damage mitigation as private flood damage mitigation measures can significantly reduce flood damage and therefore contribute to risk reduction (Grothmann & Reusswig, 2006; Nascimento et al., 2008; Poussin et al., 2014; Reynaud et al., 2013; Wachinger et al., 2010). Most of the current literature on flood risk perception addresses the household's perception towards flood risk in the context of the United States, European and Australian cities. Most of these studies take ideas from the Protection Motivation Theory (PMT) (Rogers, 1975), a commonly adopted psychological model for explaining decision-making process in relation to threats. PMT originated in health sciences and was later adapted to the flood risk management context. The applicability of PMT, the concepts and variables that are used to explain mitigation behaviour has to be refined and tested in the developing world context. Sound studies that are relevant to businesses and African cities are scant and yet to be carried out as they differ primarily from the households and USA/European cities in terms of socio-economic status, cultural and policy context.

The literature on business perception of flood risk remains highly unexplored. Some studies have indicated that small businesses attribute their lack of risk management to factors such as lack of resources and lack of information about their vulnerability and mitigation measures available (Harries et al., 2014). The available literature identifies: operational health and safety obligations; businesses norms (Gissing et al., 2005); trust on state emergency services (Crichton, 2006); business size; previous flood experience (Heidi Kreibich et al., 2007); implementation costs; awareness of options available (Dahlhamer & D'Souza, 1995); and

insurance (Crichton, 2005) as some of the drivers and barriers for businesses towards flood mitigation. In the literature, there is no consensus on the most important drivers or obstacles to businesses flood mitigation. Furthermore, as already alluded to, all the literature mentioned are studies conducted in European and U.S. cities. This study addresses part of this shortfall by building a profile of business types in three neighbourhoods of Kampala, and the most influential factors of flood mitigation behaviour among them. Kampala is a suitable case for testing the implementation of the PMT in the context of the developing world and also for testing the significance of certain concepts and variables which could theoretically strengthen the framework because of increasing incidences of flash floods affecting different types of businesses. The results of this research contribute to the scientific literature by documenting key factors of flood mitigation behaviour among small businesses in a developing country and also in an African city context.

1.3. Research objectives and research questions

The goal of this research is to understand the flood mitigation behaviour of micro and small businesses and find the most influential factors affecting it in Kampala, Uganda. It is operationalized by the research objectives and questions listed in Table 1.1.

Table 1.1: Research design matrix

Objectives and questions	Hypotheses	Supporting literature
a) To establish the relationship between business characteristics and flood mitigation behaviour		
• How does business size influence flood mitigation behavior?	Small businesses are more likely to implement mitigation measures compared to micro businesses.	(Crichton, 2006; Dahlhamer & D'Souza, 1995; Heidi Kreibich et al., 2007)
• How does business type (sector) influence mitigation behavior?	Sectors like accommodation, restaurants, trade of consumption and non-consumption goods are more likely to implement measures.	(Dahlhamer & D'Souza, 1995)
• How does tenure status influence flood mitigation behavior?	Owners are more likely to implement mitigation measures compared to tenants.	(Dahlhamer & D'Souza, 1995)
• How does business age influence flood mitigation behavior?	Older businesses are more likely to implement mitigation measures.	(Dahlhamer & D'Souza, 1995)
b) To establish the relationship between flood experience, flood impacts, risk attitudes of businesses and their flood mitigation behaviour		
• How does flood experience influence flood mitigation behavior?	The higher the experience with floods the more likely the businesses are to implement mitigation measures	(Bubeck et al., 2012; Dahlhamer & D'Souza, 1995)

• How does previous flood impact influence mitigation behavior?	The higher the flood impacts businesses have experienced, the more likely they are to implement mitigation measures	(Alesch et al., 2001)
• How do risk attitudes influence mitigation behavior?	Businesses which are more willing to spend on mitigation are more likely to implement mitigation measures	(Alesch et al., 2001; Crichton, 2005, 2006)
c) To establish the relationship between business' perceptions about flood risk and their flood mitigation behaviour		
• How does business' perception about future flood likelihood relate to flood mitigation behavior?	Businesses with high perceived future flood likelihood are more likely to implement mitigation measures	(Bubeck et al., 2012; Dahlhamer & D'Souza, 1995)
• How does business' perception about response efficacy relate to flood mitigation behavior?	Businesses with high response efficacy are more likely to implement mitigation measures	(Bubeck et al., 2012, 2013)
• How does business' perception about self-efficacy relate to flood mitigation behavior?	Businesses with high self-efficacy are more likely to implement mitigation measures	(Bubeck et al., 2012, 2013)
• How does business' perception about response costs relate to flood mitigation behavior?	Businesses with high perception of response costs are more likely to not implement mitigation measures	(Bubeck et al., 2012, 2013)
d) To establish the relationship between government efforts and flood mitigation behaviour		
• How does risk communication relate to flood mitigation behavior?	The more flood information the businesses receive, the more likely they are to implement mitigation measures	
• How does flood assistance relate to flood mitigation behavior?	The more flood assistance the businesses receive, the less likely they are to implement mitigation measures	(Terpstra, 2011)

1.4. Thesis structure

The thesis is organized into 6 chapters as discussed below:

Chapter 1: Introduction – Gives a brief introduction to the background of the research problem and the justification for the study. It also discusses the goal of the study and how it is operationalized with the objectives and research questions. It concludes with the research matrix.

Chapter 2: Literature review – Reviews literature on risk perception and the PMT framework. It discusses the concepts of threat appraisal (perception of flood probability), coping appraisal (response efficacy, self-efficacy, response costs perception), flood experience & its impact, risk attitude, government efforts and business characteristics as determinants of flood mitigation behaviour.

Chapter 3: Methodology and study area(s) – The three neighbourhoods of Kampala which are selected for this research are discussed elaborately in this chapter. It also discusses the research design and methods used for this study together with data preparation and availability.

Chapter 4: Characteristics of businesses and flood experience as factors of flood mitigation behaviour – The first set of results are presented and discussed in this chapter. The chapter determines the relationship between the elements of (i)business characteristics and (ii)flood experience & its impact with flood mitigation behaviour.

Chapter 5: Risk attitude and flood risk perception as factors of flood mitigation behaviour – The first part of this chapter determines the relationship between risk attitudes of businesses and their flood mitigation behaviour. The second part of this chapter uses protection motivation theory elements, threat appraisal and coping appraisal to determine the influence of flood risk perception on flood mitigation behaviour.

Chapter 6: Influence of government efforts on flood mitigation behaviour – The chapter determines the relationship between risk communication and flood mitigation behaviour. It also discusses the local assistance received by businesses during floods and how it influences their flood mitigation behaviour.

2. LITERATURE REVIEW

This chapter discusses in depth each of the concepts/topics relevant to this research. Firstly, the chapter introduces the concepts of flood risk management and risk perception and how these two evolved as intertwined concepts in the scientific community. Secondly, the PMT framework is discussed in detail and how it has been the guiding framework for most of the current research on risk perception. The last two sections summarise previous flood research on businesses flood risk perception elsewhere and some flood risk related research in Kampala.

2.1. Flood risk management and risk perception

Flood risk management aims to reduce human and material damage caused by flooding by implementing precautionary measures. Businesses, households and individuals efforts to mitigate flood damage depend on their understanding of risk. The central belief of flood risk management paradigm is the equal distribution of flood mitigation and recovery among stakeholders including business and property owners (Henstra et al., 2019). The scholars concluded that sharing responsibility for flood risk management is essential as it spreads the expense of risk mitigation measures and provides an incentive for individuals to take proactive actions to reduce flood damage (Thistlethwaite & Henstra, 2017). Few of the examples of these proactive actions include property-level flood protection measures and buying an insurance that covers flood-related losses (Sandink, 2016; Wang et al., 2017).

It is the role of the government to design policies or adaption strategies that encourage stakeholders to undertake independent mitigation measures. Nonetheless, such approaches or adaptation strategies are unlikely to be successful unless the stakeholders are willing to take precautionary measures and show a sense of personal responsibility. To design interventions or strategies which transfer some responsibility of flood mitigation and recovery to stakeholders, there is need to determine whether it will be embraced by stakeholders or to what degree they accept the responsibility (Henstra et al., 2019). To formulate policies and interventions that enhance autonomous mitigation measures, it is important to know what motivates them to implement independent mitigation measures, how much responsibility they are willing to shoulder, as well as how much they expect other actors like government, NGOs, insurance agencies and international organizations to shoulder (Henstra et al., 2019).

Understanding risk perceptions provides knowledge about the willingness of people to implement mitigation measures and how well the government risk reduction policies are perceived by the public (Kellens et al., 2011). It is recognized that when the risk perceptions of the public are overlooked in flood risk management, the outcome, though theoretically appropriate, maybe unsuitable and can lead to maladaptation (Adelekan & Asiyanbi, 2016; Nye, Tapsell, & Twigger-Ross, 2011). This understanding has led to a shift in focus from primarily structural flood protection measures towards the integration of non-structural approaches in flood risk management for which understanding of social dimensions of flood risk is an essential aspect (Adelekan & Asiyanbi, 2016; Heitz et al., 2009; Nye et al., 2011). Therefore, acquiring information on risk perception contributes to the understanding of the main influential factors that should be taken into account when crafting efficient flood risk management policies or adaptation strategies.

Risk analysis approaches generally rely on the aspects of quantitative risk measures, but in the context of flood risk management, subjective risk measures such as risk perception are currently recognized as the key aspect (Schanze, 2007). Awareness of public risk perception in flood-affected communities is critical for

both policy and decision-making to design and implement effective mitigation measures (Botzen et al., 2009; De Wit, M. S., van der Most, H., Gutteling, J. M., & Bockarjova, 2008; Heitz et al., 2009; Kellens et al., 2011; Miceli et al., 2008; Tran et al., 2008). The flood risk perception of the public in flood-affected communities is thus crucial in recognizing not only the vulnerability and future impacts of floods, but also the primary factor in reducing flood damages (Filatova et al., 2011; Shen, 2010).

Risk perception is defined as a pre-scientific process influenced by different psychological, social, and cultural factors. (Samuels & Gouldby, 2009). Wachinger et al., (2010) identifies these different factors into four different context levels. They are heuristics of information processing, cognitive factors, social-political institutions, and cultural backgrounds (Wachinger et al., 2010). Heuristics refers to the individuals' common-sense, which are independent of the nature of risk and personal beliefs. Cognitive factors are personal beliefs and emotional affections. Social-political institutions include socio-economic status, political structures, and media influence. Cultural background refers to the political, societal, and economic cultural factors that govern the three lower levels of influence (Renn, 2012). Risk perception seeks to examine people's thinking by exploring their understanding of hazards, emotions and behaviours. The views and attitudes of individuals towards risk and its impacts are shaped by interpreting the physical signals(such as witnessing flooding) and the information they receive. It refers to the individuals judgment and evaluations of threats to which they or their facilities are or may be exposed. It is important to consider both the experiences and beliefs to understand risk perception (Rohrmann & Renn, 2000). Wachinger et al., (2010) argues that to gain a better and accurate understanding of risk perception, factors of all four levels of influence are important to study. Through qualitative research, insights can be gained into how these different factors of risk perception influence flood mitigation behaviour of businesses to improve their resilience towards floods.

2.2. Protection Motivation Theory

The main goal of flood risk perception studies has been to understand the underlying information processes by linking the relevant concepts and variables to the actual behaviour. Most of the flood risk perception studies have employed the extended version of protection motivation theoretical framework to guide their research. The PMT framework was initially formulated to understand how human beings protect themselves against health threats (Rogers, 1975) and is one of the four main theories in the field of psychological study on health behaviour (Grothmann & Reusswig, 2006). PMT was successful in the context of health threats and was subsequently used in the context of natural and technological hazards (Poussin et al., 2014). Scholars believe that PMT offers a much comprehensive framework to understand and study human behaviour (Grothmann & Reusswig, 2006) in the context of risks and threats. The model seeks to illustrate the key cognitive processes that contribute to motivation for people to protect themselves in response to a specific hazard. Threat appraisal and coping appraisal are the two steps of cognitive processes (Bubeck et al., 2012). Figure 2.1 shows the original formulation of the PMT framework (Grothmann & Reusswig, 2006) relevant to the field of flood risk management.

Threat appraisal

Threat appraisal is the ex-ante evaluation of a hazard in relation to the damage or loss it is likely to cause. It describes how a person assesses how he or she feels threatened by a certain risk. It is composed of the variables 'perception of flood probability' and 'perception of flood consequences' in this context, which determines the level of perceived risk resulting in the associated amount of fear or worry (Bubeck et al., 2012; Poussin et al., 2014). It is shown that such emotion-related feelings towards risk can have an important influence on decision making under risk (Loewenstein et al., 2001).

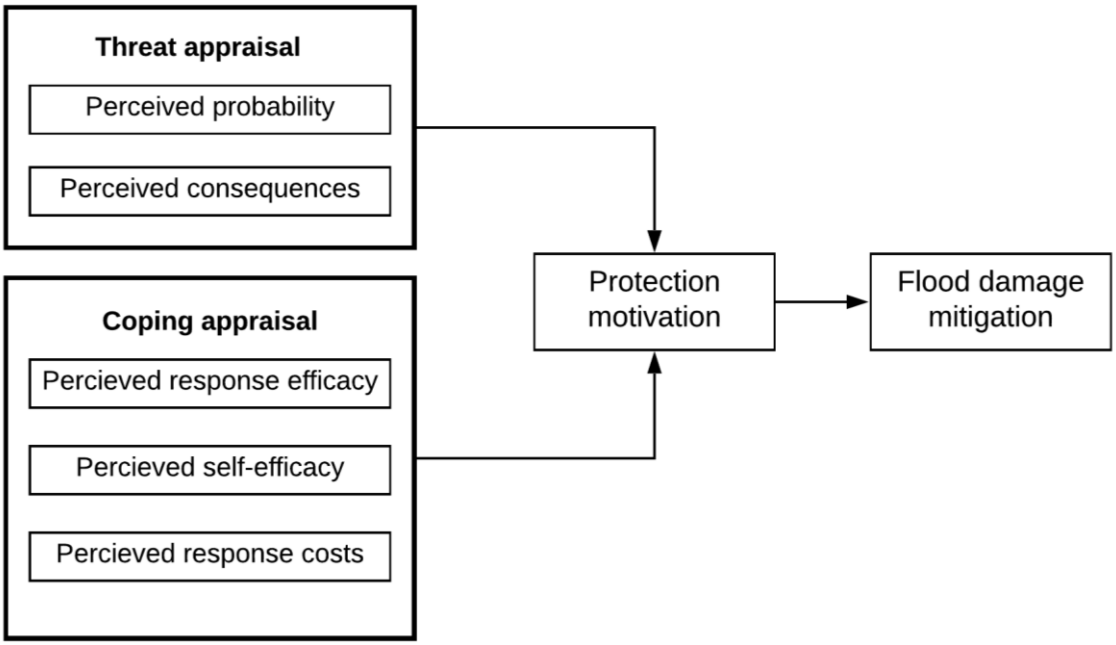

Figure 2.1: Protection Motivation Theoretical framework. Source: Grothmann & Reusswig, 2006

Coping appraisal

When a certain degree of threat appraisal has been reached, people begin to think about the advantages of available actions and assess their own ability to execute them. This process is known as coping appraisal. Coping appraisal concerns the attitudes that individuals have towards the available measures to cope with the threat. It comprises three variables: perceived response-efficacy; perceived self-efficacy; and perceived response-costs (Grothmann & Reusswig, 2006). Perceived response-efficacy describes the degree to which a person thinks a protective measure is effective and useful in reducing the damage. Perceived self-efficacy is the individual's perception of his own capacity to implement the measures. Perceived response-costs are the individual's expectations of the financial and time costs required to implement a specific protective measure (Grothmann & Reusswig, 2006).

It is the cumulative influence of coping appraisal and threat appraisal that affects the motivation of a person to implement protective measures. PMT assumes that people will safeguard themselves against a specific hazard if they feel that the risk they face is high (high 'threat appraisal') and if they consider the protective measures to be effective, within their capacity to implement and not too costly to enforce (high 'coping appraisal') (Grothmann & Reusswig, 2006).

Flood damage mitigation

Flood damage mitigation includes the efforts to reduce the impact of flooding on people and the resources that sustain their daily lives. The variable has been conceptualised in the literature as having various classes, including structural mitigation, non-structural mitigation, emergence measures, and intentions to mitigate (Poussin et al., 2014). Other distinctions have been made between voluntary and involuntary mitigation, private and public mitigation (Wamsler & Brink, 2014). In this case study, the classes used are non-structural and structural mitigation measures. Flood damage mitigation within PMT has been used as the dependent variable (Poussin et al., 2014), which will be the case in this study.

2.3. Flood research in Kampala

Kampala faces frequent floods, which affect livelihoods, businesses, properties and assets of people living there. In addition to causing deaths due to drowning, the floods destroy public health facilities and cause waterborne diseases and malaria outbreaks. For example, over 350,000 people were affected by floods in Kampala city in 2010 (Ajambo, 2013). The worst affected were the poor slum dwellers, who are significantly vulnerable to flooding because they settle in wetlands and swampy areas (Lwasa, S; Koojo, C; Mabiriizi, F; Mukwaya, P; Sekimpi, 2009).

Kampala Capital City Authority(KCCA) – a legal body regulating and administering the city on behalf of the central government, is responsible for managing the floods in Kampala city. To manage flooding issues in the city, KCCA works in collaboration with international organizations like the World Bank and some Non-Governmental Organizations (NGOs). Multiple studies were carried out in Kampala on a range of flooding problems like vulnerability (Isunju et al., 2016b; Lwasa, S; Koojo, C; Mabiriizi, F; Mukwaya, P; Sekimpi, 2009; Musoke, 2011), community level mitigation and adaptation studies (Isunju et al., 2016a; Mabasi, 2009; Mukwaya et al., 2012), climate change assessments, flood risk assessments and modelling (Aidan Mhonda, 2013; Douglas et al., 2008; Habonimana, 2014; Lwasa, S; Koojo, C; Mabiriizi, F; Mukwaya, P; Sekimpi, 2009; Lwasa, 2016; Sliuzas et al., 2013; UN-HABITAT, 2009). Such studies helped classify areas vulnerable to flooding, along with severity levels. Their results have been the basis for a series of recommendations for the Kampala city to implement flood mitigation measures.

A collaboration between KCCA and UN-Habitat's Cities and Climate Change Initiative (CCCI) partnership in 2012 sought to minimize vulnerability and flood risks in Kampala city. The main goal of this partnership is to develop an integrated strategy and action plan to manage the flood problems of Kampala city. One of the outcomes of this partnership is the Integrated Flood Management in Kampala (IFMK) project. IFMK project carried out risk assessments and suggested a few recommendations like relocation of few settlements, widening drainage channels, protection of wetlands, installation of water harvesting tanks, and planting grass on bare surfaces to mitigate flood damage (Pérez-Molina et al., 2017).

However, there has been very little effect in terms of reducing vulnerability and the risks associated with flooding has continued to rise because these suggestions were not based on broader consultation of residents in areas vulnerable to flooding (Simbarashe Chereni, 2016). Although these are important steps towards flood mitigation, understanding the communities at risk' motivation factors is needed for their implementation and sustainability. Scholars identified the minimal effect of flood reduction initiatives is due to factors like uncoordinated practice, insufficient community engagement, and negative attitudes of communities towards the interventions in place (Ajambo, 2013). Very few scholars have attempted to analyse the social aspect of risk in flood-affected communities of Kampala (Kamugisha, 2013; Odeyemi, 2013).

2.4. Research on business' flood risk perception

A significant number of small businesses throughout the United States experience substantial losses every year as a direct result of earthquakes, extreme storms, and floods (Alesch et al., 2001). Small business failures reflect major losses for communities of all sizes. Companies that are weaker, smaller, and under extreme stress before the hazard strikes are far more likely to discontinue the business activities (Alesch et al., 2001).

The little literature available on business' perception of flood risk is focused on understanding how companies perceive flood risk and what factors influence their direction of preparedness. Businesses which wish to reduce their exposure to flood have different measures available at their disposal (Harries et al.,

2014). But, the most common measure implemented by small businesses is relocating from flood-prone areas, raising water-sensitive objects, and using barriers to keep water out (Kreibich et al., 2011). In Germany, the likelihood of small businesses implementing flood mitigation measures is inversely related to turnover and number of employees (Kreibich, Thieken, Petrow, Müller, & Merz, 2005). Few of the other variables which are studied in Germany are sector, size of premises, ownership, source of warning, efficiency, and cost of emergency measures (H Kreibich et al., 2005; Heidi Kreibich et al., 2007, 2011).

In Australia, four main barriers were identified among businesses to implement mitigation measures. They are scepticism, trust, self-confidence, and time (Gissing et al., 2005). A study in the city of Wagga Wagga found that the majority of the businesses did not consider flooding as a risk and the probability of losses it might cause to their businesses. The respondents of Wagga Wagga showed a high level of trust in their state emergency services and their ability to warn and help them in the event of a flood. Similar behaviour of having a high trust level on state emergency services is observed in the Netherlands as well (De Wit, M. S., van der Most, H., Gutteling, J. M., & Bockarjova, 2008; Terpstra, 2011).

In the United States of America, Alesch et al., (2001) found that a considerable number of businesses were confident that they have adequate plans while missing the basic elements of a good flood action plan. They also observed that lack of time for flood planning was a recurring reason among the majority of the businesses. The same study also highlighted a couple of motivators for implementing mitigation measures. They are mitigation against financial impacts and ownership. A big motivator for flood preparedness is the direct and indirect financial impact of flooding, and a further motivator fact is that there is usually no insurance coverage for the losses caused due to flooding. In small businesses, the person in charge of developing a flood response plan incurs the greatest financial losses from flood damage as it is their livelihood and only source of income (Alesch et al., 2001). The study also found that the majority of the small businesses attributed their lack of preparedness to resource shortages and lack of knowledge about their vulnerability and mitigation option available (Alesch et al., 2001). Research on two cities of the USA studied the effect of business size, previous flood experience, implementation costs, and insurance as factors of damage mitigation (Crichton, 2005; Dahlhamer & D'Souza, 1995; Kreibich et al., 2007).

In the UK, a research was conducted to specifically look at the impact of climate change, mostly focusing on flood risks based on the data provided by an insurance company called AXA, a primary insurer of SMEs. The results of the research showed that small businesses are missing out help, as major assistance is provided to domestic households. It also mentioned that very few small businesses receive flood alerts or support from the local council, and most of the aid came from insurance companies (Crichton, 2006).

Kamugisha, (2013) focused in his research on establishing experiences, perceptions, and coping mechanisms of non-home based businesses about flood risk in Bwaise region. But, the scope of analysis was more focused on physical attributes like water depth, distance from a drainage channel and elevation (Simbarashe Chereni, 2016). The coping strategies identified in Bwaise region among non-home based businesses include cleaning of drainage channels, clearing floodwater from the workplace, using sandbags to avoid water from reaching the shops, and moving items to a higher level (Kamugisha, 2013). While several coping mechanisms have been addressed, they have not been related to awareness and perception, leaving the question of which socio-psychological factors lead to different perceptions of risk unanswered.

2.5. Conclusion

Research about flood damage has almost entirely focused on residential flood damage globally. There are very few studies that carried out qualitative research with concepts and variables that are relevant to businesses' flood damage mitigation. Moreover, there is no consensus in the literature about the most influential barriers or motivators to businesses flood damage mitigation. The PMT framework, which is the basis for the majority of the research on flood mitigation behaviour can be used as a reference framework to guide this research. However, a modified version of the PMT framework will be proposed in section 3.3. based on the concepts and variables present in the existing literature, and will be tested in the context of Kampala. Details of the modified framework are provided in the following chapter. Furthermore, most of the studies in this subject have been concentrated in European, USA, and Australian cities. The findings of this research can close that gap by providing results about the businesses' flood mitigation behaviour in a developing world context using a modified version of the PMT framework.

3. RESEARCH DESIGN AND METHODS

3.1. Research design

The research follows a case study design which involves selection of few areas for closer examination. A mixed-method approach was adopted as the survey data used in this research captures both qualitative and quantitative data (S. Chereni et al., 2020). Through the semi-structured questionnaires, information regarding businesses profile, perceptions, experience, attitude, and mitigation behaviour were captured. Such data are both qualitative and quantitative. The structured part of the questionnaire which consists of nominal, ordinal and scale data helped to analyse large amounts of data using appropriate statistical techniques while the open-ended questions (unstructured part) gave respondents more freedom to express their views in the text form (sentence/paragraph) helping the researcher to capture the context of what the respondents actually mean by their structured questions responses. Such a research design is chosen primarily because of resource limitation, and also it makes economic sense to focus on a few cases in order to understand how businesses mitigate flood damage.

3.2. Study area(s)

Kampala is the largest city and capital of Uganda, located in the central region of the country. It covers an area of approximately 195 sq.km with an average altitude of 1120m above sea level. The temperatures range between 17 and 22 degree Celsius with an average annual rainfall of 1200mm (Ajambo, 2013). Nevertheless, the pattern of rain occurrence is changing and is projected to increase in intensity and frequency due to climate change. Administratively, the city is governed by Kampala Capital City Authority(KCCA), established by Kampala city 'Capital City Authority Act (2010)' which replaced Kampala City Council(KCC). The act put the administration of the affairs of the city under the direct supervision of the Ugandan Central government. The city is divided into five divisions, 99 parishes, and 811 sub-parishes. The five divisions are Kampala Central Division, Kawempe Division, Makindye Division, Nakawa Division, and Rubaga Division (KCCA, 2012).

The three parishes of Kampala from which the data is collected from businesses are Bwaise 3, Natete, and Ntinda (Figure 3.1). The choice of three different neighbourhoods aims at achieving maximum variance in some characteristics and consistency in other characteristics. Neighbourhoods have been selected based on their flood experience, affluence, and location. Natete and Bwaise 3 are informal settlements, while Ntinda is an affluent neighbourhood. This is done to increase the variance of the characteristics of the respondent. The similarity among all three neighbourhoods is the coexistence of businesses along with residential settlements. Table 3.1 shows the summary of the characteristics of the three selected neighbourhoods of Kampala.

Table 3.1: Summary of characteristics of three case areas in Kampala. Source: ACT Together, 2014

Case characteristics	***Bwaise 3***	***Natete***	***Ntinda***
Year of the first settlement	1960	1900	1960
Number of people	35000	45000	5300[1]
Number of structures	1600	4000	No data
Co-existence of residential neighbourhood and businesses	Yes	Yes	Yes
Broadening of drainage channel	Yes	No	No
Proximity to industries	No	Yes	Yes
Affluence	No	No	High

Bwaise 3

Bwaise 3 is an informal settlement located in the Kawempe division of Kampala. It developed from 1960 and became the epicentre of informal development into other areas like Bwaise 1 and Bwaise 2. It is located approximately 4km from the Kampala city centre and sits on about 57 hectares of land, all of which are customarily owned by the Buganda kingdom and administered by the Buganda land board. Bwaise 3 parish has six local administrative zones namely St.Francis, Kalimali, Bukasa, Katoogo, Bugalani and Kawala road (Ajambo, 2013) with much of the area in a low-lying wetlands and swampy ground, a terrain which makes it significantly vulnerable to flooding. The parish is a densely populated area with around 35,000 people and 7,000 households (ACT Together, 2014). The settlement is largely unplanned and highly built-up with a mixture of houses, stores, schools, religious buildings, markets and health centres in the same area (Ajambo, 2013). Out of Bwaise 3's 1600 structures, 1000 are residential, 400 are mixed, and 150 are businesses (ACT Together, 2014). The majority of the population engages in informal activities that can be categorized as small to medium-sized enterprises. Bwaise 3 parish experiences frequent flooding and is considered a hotspot of flooding by UNDP (Ajambo, 2013). This exposes a large number of population, infrastructure, livelihoods, businesses, and social services to significant impacts of destruction, damage, and health challenges when faced with floods.

Natete

Natete is an informal settlement located in the Rubaga division of Kampala. Settlement in Natete parish started as early as 1900, and with several shopping centres, factories and markets, it has become an important centre of trade and other economic activity. These provide job opportunities, thus attracting a large number of people to this part of the city. It is located approximately 10km from the Kampala city centre. Natete parish covers a total area of approximately 45 hectares of land, and the majority of this land is owned by the municipality, and the rest is owned by private owners. The total population of Natete is approximately 45,000 with around 9000 households. Out of the 4,000 structures in Natete, 1000 are residential, 2500 are mixed-use, and 450 are businesses (ACT Together, 2014). Natete is an economically vibrant neighbourhood and its contribution to Kampala's economy is steadily growing (Dodman et al., 2015). Like Bwaise 3, Natete terrain is also mostly comprised of wetlands and low lying swampy ground

[1] The population for Ntinda parish is as per the Uganda Bureau of Statistics in 2014. The population for Bwaise 3 and Natete parishes are from the source (ACT Together, 2014).

making it vulnerable to flooding. This leaves the population, businesses and infrastructure to risks of financial, property and health damages.

Ntinda

Ntinda is an affluent suburb located in the Nakawa division, which grew in the 1960s as a residential area for railway company workers (Chrysestom, 2012) with few trading shops and farmers market. Ntinda is one of the twelve sub-divisions of the Nakawa division located at approximately 5km from the Kampala city centre and has a population of approximately 5300 in 2014 as per the Uganda Bureau of Statistics. The topography of the Nakawa division is mostly similar to Bwaise 3 and Natete with swampy areas making it vulnerable to flooding. Floods can lead to disruptions in economic activity and livelihoods as it is evolving into a suburban business district with industries, shops, and wholesales (Maganda, 2012).

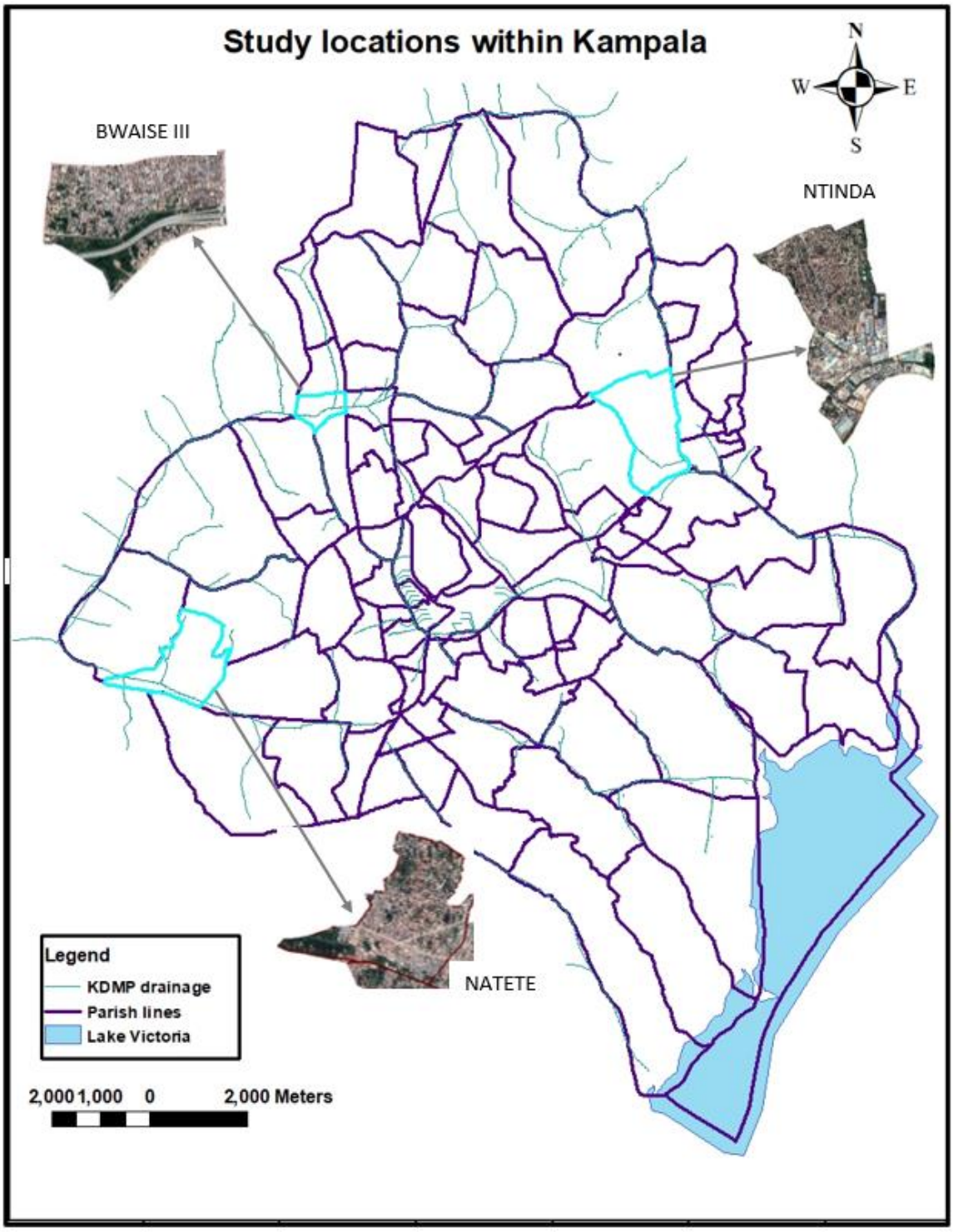

Figure 3.1: Map of case study area(s) locations

3.3. Proposed conceptual framework

To guide this study, an extended version of the PMT framework (Figure 3.2) is proposed with concepts and variables relevant to businesses which are categorized into three sets of elements. The first set is the element of perception adopted from the PMT framework, displayed in boxes with breaking lines and discussed in detail in section 2.2. The only difference in the perception variables from the original PMT formulation is that the threat appraisal that measures the associated fear or worry is analysed only by one variable, which is 'perceived flood probability'. The other two elements are extensions to the PMT framework, which are adopted based on the existing literature. The businesses element involves business-specific variables such as their profile, attitude, flood experience, and the impacts they faced due to floods. The governance element is specific to the area of study, as it involves variables that collect information about how they received flood information and what kind of assistance they received from the local authorities (like KCCA), if any. Each of the extended version's concepts is mentioned in solid blue boxes in Figure 3.2 and is discussed in detail below.

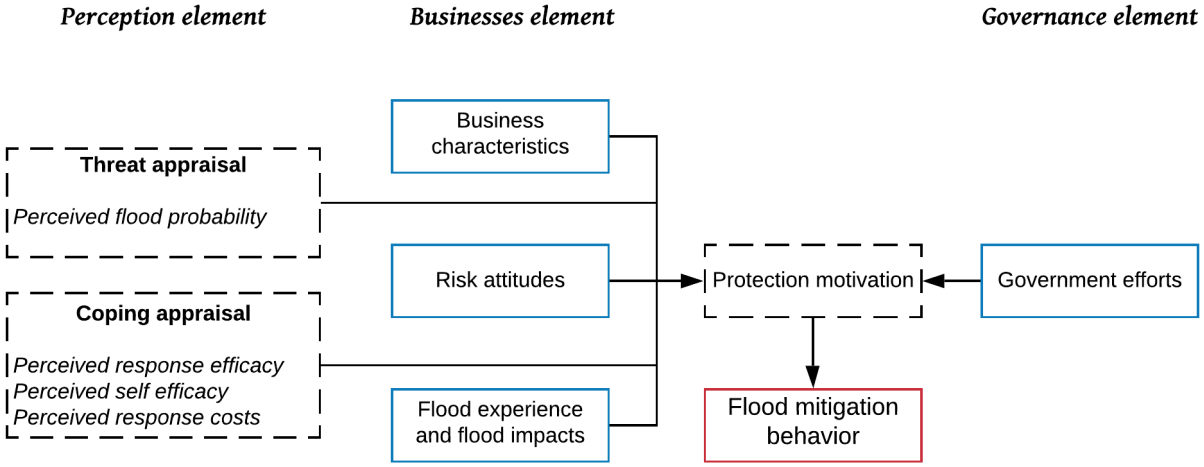

Figure 3.2: Modified PMT framework for businesses. Adapted from Grothmann & Reusswig, 2006

Flood experience and its impact

Flood experience means involvement in a hazard event. Personal experience is believed to be more influential in encouraging households and businesses to undertake precautionary measures. Past studies, however, showed mixed results, some studies found a positive correlation between flood experience and non-structural mitigation but not structural mitigation (Bubeck et al., 2012; Grothmann & Reusswig, 2006; Poussin et al., 2014), and some found a positive correlation between flood experience and structural mitigation measures (Kellens et al., 2011). It would be interesting to find out how the flood experience is linked to mitigation behaviour as well as the structural and non-structural measures in this research. Alesch et al., (2001) mentioned that flood induced financial costs are positively correlated to mitigation behaviour. In this research, along with financial problems, property damage and health problems are also considered to know their influence on flood mitigation behaviour among businesses.

Risk attitudes

Risk attitudes are strong feelings that one develops towards a hazard. These feelings include self-confidence that one's property does not need protective investment (Crichton, 2006). Risk attitudes can be assessed

using a question that elicits the individual's willingness to spend resources on mitigation measures or to buy an insurance that covers flood-related losses.

Business characteristics

Though research on businesses flood mitigation behaviour is sparse, the very few available suggest a positive correlation between the size of the company and the flood mitigation behaviour (Crichton, 2006). Past literature also studied the influence of business type, number of employees, and age of business as a determinant of flood mitigation behaviour (Dahlhamer & D'Souza, 1995).

Government efforts

Local government help can influence the businesses efforts to reduce flood damage. In the Netherlands, for instance, it is shown that government mitigation measures have created a trust, which in turn has reduced private mitigation (Terpstra, 2011). Kampala offers an opportunity to test this claim, as the local authority has implemented many measures, including the expansion of drainage channels, the cleaning of secondary channels in certain risky areas. Another important element during a crisis situation is communication, which is studied using variables like whether are not businesses received flood information and how they received it. It also helps us to analyse the information seeking behaviour of businesses. So, the influence of risk communication and local assistance are studied as a factors for flood mitigation behaviour.

3.4. Data

The survey data used in this research is collected by Mr. Simbarashe Chereni as part of an ongoing Ph.D. study at the University of Twente. The data was collected through semi-structured questionnaires from businesses in Kampala's three neighbourhoods in August 2017. The survey was conducted in 2017, but for a few variables in the questionnaire the respondents were asked to provide their answers for 2015 and 2016 as well. A sample questionnaire can be found in Annex-3. Questions were designed to establish a relationship between business characteristics, perceptions, experience, risk attitude, government efforts with their mitigation behaviour. The data are registered in the Statistical Package for Social Scientists(SPSS) software. Before proceeding with the analysis, the data has been cleaned and checked for errors. A total of 311 business records are used in the analysis, of which 161 are in Natete, 88 in Bwaise, and 62 in Ntinda.

The responses from open-ended questions of the survey are coded into relevant themes based on the literature. The themes include types of mitigation measures. Measures that involve some construction or installation on the premises were classified as structural measures; else, they are classified as non-structural measures. The measures clearing/construction of drainage, building dykes, pouring sand/maram/sandbags, construction/digging trenches, rebuilding/raising premises and rainwater harvesting are classified as structural measures while raising goods/electric sockets, capturing rainwater, relocating, clearing the water with containers and closing business are classified as non-structural measures.

If a business implemented any one of the measures mentioned above, their mitigation behaviour is recorded as 'yes', and the type is recorded structural/non-structural based on the above. If a business did not implement any of the mitigation measures, the mitigation behaviour is recorded as 'no' for that particular year.

The missing data in the database is clearly distinguished into system missing data and user missing data. System missing values are those that are entirely absent from the data (labelled as 9999 in the database).

User missing values are those that are invisible while analysing the data (labelled as 8888 in the database). Few of the reasons due to which data may contain system missing values are:

- Some respondents were not asked some questions
- Some respondents completely skipped a few questions
- Errors while converting or editing the data

In some special cases, it makes perfect sense to have missing values. However, the reasons for why some variables have huge data gaps were established. In the database, some values for certain variables are set as user missing values. For example, for the categorical data, responses such as 'don't know' and 'NA' are set as user missing values to exclude them from the analysis.

The different variables for each of the concepts used in this research are mentioned in Table 3.2.

Table 3.2: Concepts and variables in the data

Concept	**Variables in the data**
Threat appraisal	Perception about future flood likelihood assessed as fewer, about the same and much worse
Coping appraisal	• Perception about the effectiveness of flood mitigation measures assessed as ineffective, somewhat effective, effective and very effective. • Perception about the ability of the businesses to implement flood mitigation measures assessed as not able, a bit able, able and highly able. • Perception about costs of implementing flood mitigation measures assessed as very low, low, high and very high
Flood experience and its impacts	• Whether a businesses had experienced flooding in a particular year. The responses are either yes or no. • Flood induced property damage - whether a business faced property damage due to floods. The responses are either a yes or no. • Flood induced health problems - whether a business faced health problems due to floods. The responses are either a yes or no. • Flood induced financial costs - whether a business faced financial problems due to floods. The responses are either a yes or no.
Risk attitudes	• Whether a businesses is willing to spend on mitigation measures. The options given are not willing, somewhat willing, willing, and highly willing. • Insurance - whether a business was insured with an insurance that covers damage due to floods. The responses are either a yes or no.
Risk communication and local assistance	• Whether a business looked for flood risk information generating a yes or no answer • Whether a business received flood risk information generating a yes or no answer • Whether a business received flood assistance generating a yes or no answer
Business characteristics(profile)	• Number of employees - answers were provided as scale values • Business type - answers were provided as text • Age of business - answers were provided as scale values • Status of premises - either owned or rented
Flood damage mitigation(dependent variable)	Respondents were asked to list the mitigation measures they implemented in an open question. The responses were coded into structural and non-structural measures.

3.5. Statistical analysis

The researcher analyses survey questionnaire responses using bar graphs, cross-tabulations, frequency tables, summary statistics, independent sample T-test, one way ANOVA test, Pearson's chi-square, and binary logistic regression using SPSS software. The bar graphs are used to show the business characteristics like sector, size, and status of premises as they are categorical data. Cross-tabulations were used to relate two categorical variables like risk attitudes and mitigation behaviour.

3.5.1. Pearson's chi-square and Fisher's exact test

To know if two categorical variables are independent or dependent, Pearson's chi-square test is used. In case any of Pearson's chi-square test assumptions are broken, the alternative method used is Fisher's exact test. It is used when the sample sizes are small and can also be used for contingency tables larger than 2x2. For the Pearson's chi-square or Fisher's exact test to be significant, the significance values should be 0.05 or smaller. To know the strength of the association, the following two measures are used:

- Phi: Phi is accurate for 2x2 contingency table. The criteria for phi coefficient values is 0.1 for small effect, 0.3 for medium effect and 0.5 for large effect (Watson, 2001)

- Cramer's V: For contingency tables larger than 2x2 Cramer's V is checked. The criteria for Cramer's V is determined by (R-1) and (C-1) where R represents number of categories in row variable and C represents number of categories in column variable (Watson, 2001).
    - For R-1 or C-1 equal to 2(three categories): small=0.07, medium=0.21, large=0.35
    - For R-1 or C-1 equal to 3(four categories): small=0.06, medium=0.17, large=0.29

3.5.2. Binary logistic regression

To know the relationship between nominal/scale predictor variables and a binary outcome variable binary logistic regression was used. The significance of chi-square should be less than 0.05 for the model to be a good fit and the Nagelkerke R square value is checked to know how much variation in the dependent variable can be explained by the model (A. Field, 2013; Watson, 2001). The odds ratio (Exp(B)) is used for the interpretation of results. For the interpretation to be valid, the significance value should be less than 0.05. If the odds ratio is greater than 1, the odds of the outcome occurring increases as the predictor increases. If it is less than 1, the odds of the outcome occurring decreases as the predictor increases (A. Field, 2013).

3.5.3. Independent sample T-test and one way ANOVA test

The independent sample t-test is used when the researcher want to compare the mean scores of a scale variable for two different groups. For example, the scale variable can be age of business and the categorical variable can be status of premises or mitigation behaviour. The results of the independent sample t-test informs us whether or not there is a statistically significant difference in the mean scores for the two groups of a categorical variable. Equal variances is assumed(assumption is not violated) if the significance value of Leven's test is larger than .05 and if the value is less than .05 equal variances is not assumed(assumption violated) (Watson, 2001). For there to be a statistically significant difference in the mean scores between the two groups, the t value has to be significant (should be less than .05).

When the categorical variable has more than three or more distinct groups, one way ANOVA test is performed. By performing one way ANOVA tests, researcher finds out whether or not there are significant differences in the mean scores of a scale variable across different groups and post-hoc comparisons using

Scheffe test is used to find out where these differences are exactly observed. For the results of ANOVA test to be significant, the value of significance should be less than .05 (Watson, 2001).

4. BUSINESS' CHARACTERISTICS AND FLOOD EXPERIENCE AS FACTORS FOR FLOOD MITIGATION BEHAVIOUR

This chapter discusses the relationship between businesses characteristics and flood experiences with their flood mitigation behaviour in all three study areas. The four explanatory variables of business characteristics are their size, sector, age and tenure status. The four explanatory variables of the category 'flood experience' are previous flood experience and three flood induced impacts (property damage, health problems and financial costs). The sub-section 4.1. discusses the descriptive statistics of the business characteristics to get an idea about the profile of businesses in this research. The sub-section 4.2. discusses how the different variables of business characteristics influence the flood mitigation behaviour. The sub-section 4.3. discusses the influence of variables of 'flood experience' on flood mitigation behaviour.

4.1. Characteristics of businesses

The four variables used to establish the profile of businesses in Kampala are size, type, tenure status and age. The descriptive statistics for each of the variables are discussed below.

Business size

Micro, small and medium enterprises(MSMEs) in Uganda make up over 70% of the economy and contribute more than 20% of their GDP. As per the Ministry of Trade, MSMEs can be categorized based on the number of employees or using capital investments or capital turnover (Uganda MSME Policy, 2015).

Table 4.1: Classification of MSMEs. Source: Modified from Uganda MSME Policy, 2015

	MSMEs definition based on the following criteria	
	No. of employees	*Capital investments / Capital Turnover (UGX x 10^6)*
Micro	0-4	0-10
Small	5-49	10-100
Medium	> 50	> 100

UGX refers to Ugandan Shillings

The businesses are categorized into different enterprises based on the number of employees as per the criteria listed in Table 4.1 because the questionnaire lacks the data on capital investment/turnover.

Out of 311 businesses, micro-enterprises constitute about 71.2% (217), while small and medium enterprises constitute about 26.9% (82) and 1.9% (6) respectively (six of them have missing data). It is important to note that micro businesses also include informal businesses such as charcoal selling, vegetable vendors, street food sellers, among others. It is evident from Figure 4.1 that micro-enterprises predominate in the informal settlements of Bwaise and Natete, unlike Ntinda, where small businesses are dominant. The medium enterprises are only present in Natete (1) and Ntinda (5) parishes.

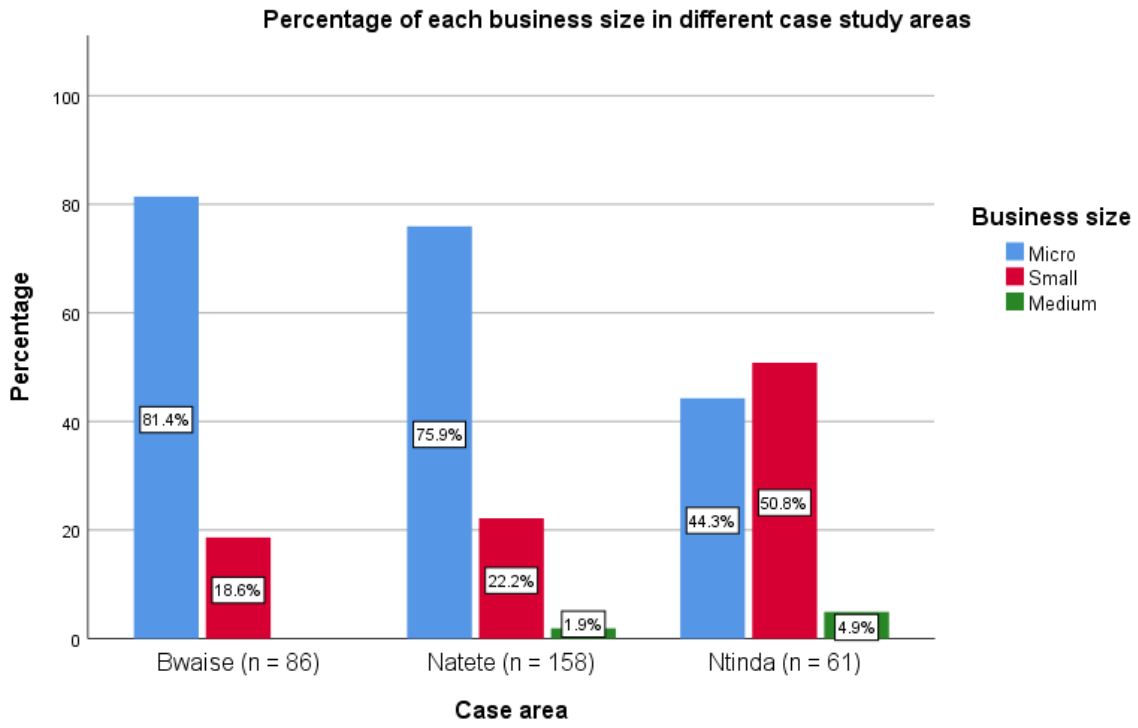

Figure 4.1: Percentage of each business size in different case study areas

Business type (sector)

Since there are many ways of doing business, it is important to categorize the different businesses into uniform general types/sectors. As per the International Standard Industrial Classification of All Economic Activities (ISIC), the different businesses recorded in the survey are classified into the following 16 sectors(UNIDO, 2008).

- Agriculture, forestry, and fishing (Category A)
- Manufacturing (Category C)
- Electricity, gas, steam and air conditioning supply (Category D)
- Construction (Category F)
- Wholesale and retail trade of consumption goods (Category G1)
- Wholesale and retail trade of non-consumption goods (Category G2)
- Transportation and storage (Category H)
- Accommodation and food service activities (Category I)
- Financial and insurance activities (Category K)
- Real estate activities (Category L)
- Professional, scientific and technical activities (Category M)
- Public administration and defense, compulsory social security (Category O)
- Education (Category P)
- Human health and social work activities (Category Q)
- Arts, entertainment and recreation (Category R)
- Other service activities (Category S)

Details regarding the different businesses in the survey, which are classified into the above sectors are listed in Annex-2.

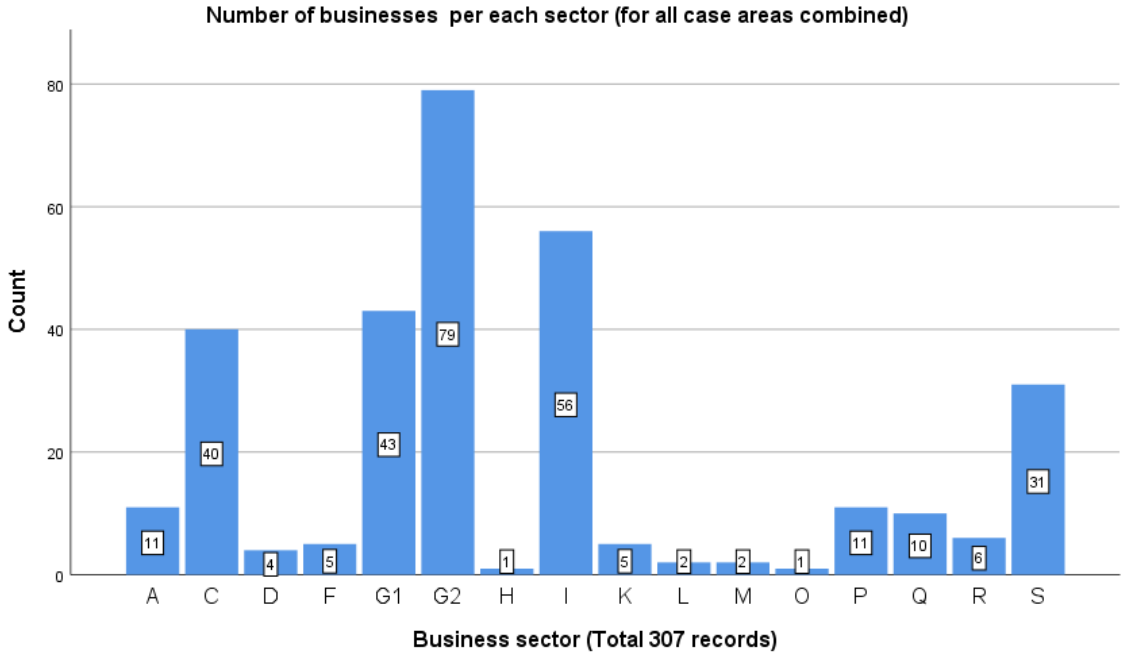

Figure 4.2: Number of businesses per each sector

From Figure 4.2, we can say that nearly 43% of all businesses belong to two sectors: trade of non-consumption goods (G2-25.7%) and accommodation & food service activities (I-18.3%). The next three sectors are the trade of consumption goods (G1-14%), manufacturing (C-13%), and other service activities (S-10%). Other service activities include businesses like cosmetic shops, saloons, laundry, furniture repair, among others. The rest 19% of businesses belong to the remaining 11 sectors.

Micro enterprises primarily comprise trade of non-consumption goods (26.3%), food service & accommodation activities (22.5%), trade of consumption goods (18.3%), and other activities (14.1%). Small enterprises primarily comprise trade of non-consumption goods and manufacturing with 25.6% each. The majority of the medium enterprises belong to manufacturing, with 60%.

The primary sector in all three study areas is the trade of non-consumption goods. There are certain sectors like security services, professional activities, real estate, logistics transportation, and construction businesses that are present only in Ntinda, clearly differentiating it from the informal settlements Bwaise and Natete as an affluent neighbourhood.

Status of business premises

Among the 311 businesses, 105 own their premises, and 199 are tenants, while 7 of them have missing data. Figure 4.3 clearly shows the percentage of businesses that own their premises are less compared to those who rent in informal settlements of Bwaise (31%) and Natete (30%), unlike Ntinda(51%). One of the possible reasons behind such observation can be attributed to the fact that Bwaise and Natete are primarily comprised of micro-enterprises (Figure 4.1), of which many are also informal. In terms of business size, from Figure 4.4, it is clear that the majority of the small (57%) and medium (66.7%) businesses own their premises, unlike micro-enterprises (25.7%).

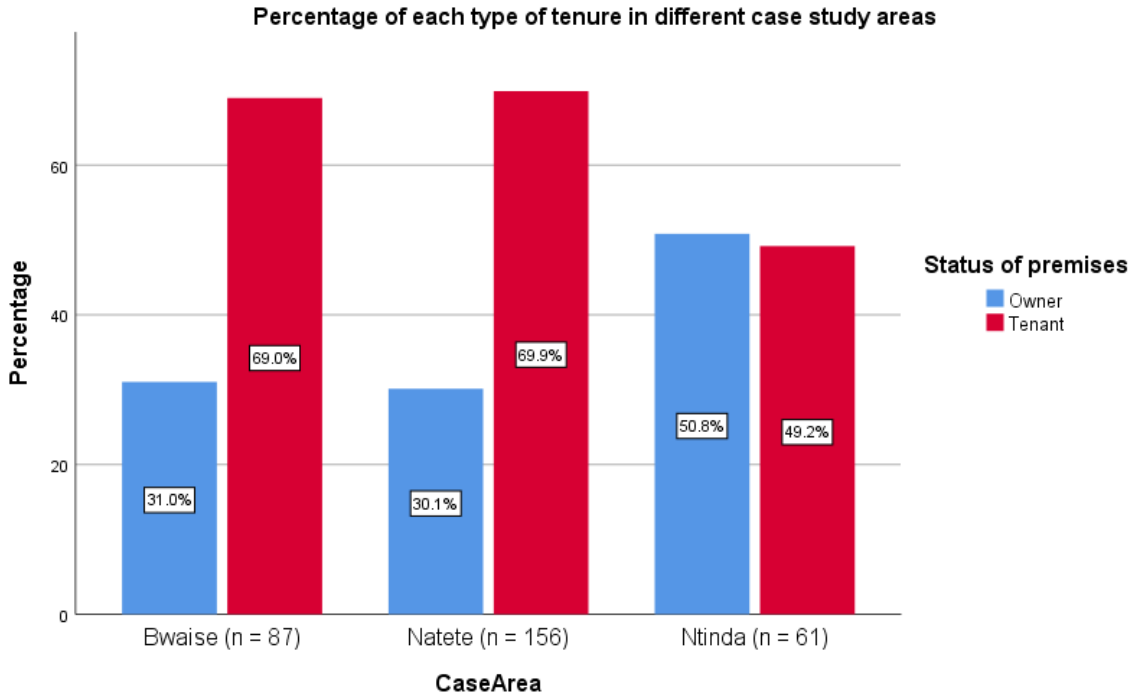

Figure 4.3: Percentage of each type of tenure in different case study areas

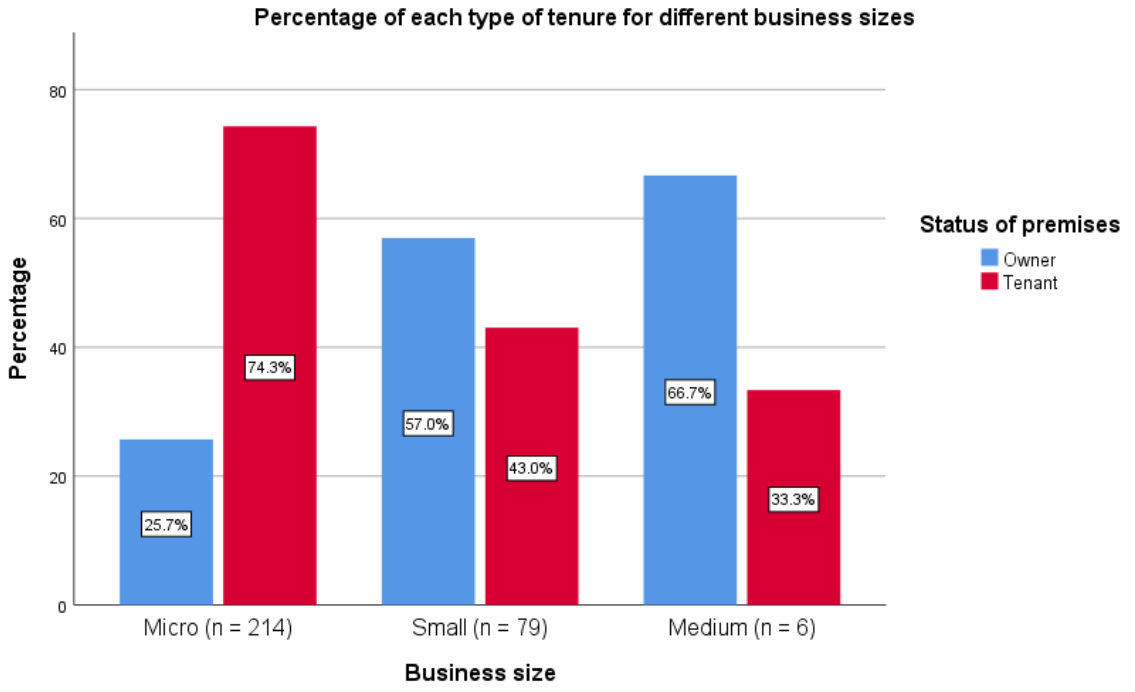

Figure 4.4: Percentage of each type of tenure for different business sizes

Age of business

The 311 business' age ranges from 1 to 62 years. Though the respondents were asked to provide answers for three years (2015, 2016 & 2017) for some variables, not all businesses were present from 2015. 44 businesses were established in 2016, and 30 businesses were established in 2017 while the remaining were present from or before 2015. Over 50% of businesses are relatively new with age less than five years (1 year[2]: 10%; 2 years: 14.7%; 3 years: 16.4%; 4 years: 9.4%).

In term of business size, micro-enterprises have the least mean age (M = 4.98, SD = 4.72) compared to small (M = 9.79, SD = 8.9) and medium (M = 15, SD = 5.37) businesses. These differences are statistically significant as determined by the one way ANOVA test ($F(2, 291) = 23.529$, $p<.01$). Post-hoc comparisons using the Scheffe test indicated that the mean age of micro businesses is significantly different from small and medium businesses, but the difference is not significant between small and medium enterprises. One of the possible reason for micro-enterprises being the youngest is almost 50% of them are newly established (1 year: 13.5%; 2 years: 16.9%; 3 years: 19.3%) compared to small businesses with 23% (1 year: 2.3%; 2 years: 10.3%; 3 years: 10.3%).

In terms of tenure status, tenants have the least mean age (M = 5.37, SD = 4.98) compared to those own their premises (M = 8.81, SD = 8.62) and the differences are significant as determined by the independent sample t-test ($t(136.2) = 3.7$, $p < .01$). The reason behind tenants being younger compared to owners can be attributed to the fact that the majority of the micro-enterprises are tenants (**Error! Reference source not found.**), of which many of them are newly established.

There was a statistically significant difference in the mean age of businesses in the three case study areas ($F(2,296) = 3.417$, $p =.034$): Bwaise (M = 6.01, SD = 7.02), Natete (M = 6.11, SD = 4.41) and Ntinda (M = 8.52, SD = 9.59). The businesses in the two informal settlements are slightly younger than those in the Ntinda.

4.2. Business characteristics influence on flood mitigation behavior

Out of 311 businesses, 131 businesses have implemented, and 97 have not implemented mitigation measures in 2017, while no information is given by 83 businesses. Among the 131 businesses which implemented mitigation measures, 100 of them used structural measures, and 28 of them used non-structural measures while 4 of them have no information. More than 50% of businesses implemented mitigation measures in all three case study areas (Bwaise: 56%; Natete: 60.5%; Ntinda: 51%) while structural measures are the most common type of mitigation measures implemented by them.

4.2.1. Influence of business size on flood mitigation behaviour

As the number of medium enterprises is very small(only 6), they are merged with small enterprises for further analysis. So, now the total number of micro-enterprises is 217 (71.1%), and small enterprises is 88 (28.9%), while 6 of them have missing information.

[2] Though the data is collected in August 2017 which is not a full year, businesses age is considered as 1 year for the analysis.

A total of 224 businesses respondent to the questions on business size and mitigation behaviour in 2017. Among 224 businesses, 57.6% of them implemented mitigation measures while 62.7% of micro and 45.5% of small businesses implemented measures (refer to Table 4.2). These differences were statistically significant with a small to moderate association between business size and mitigation behaviour ($\chi^2 = 4.959$, N = 224, p = .026, Phi = -.159). Therefore, we can infer that micro-enterprises are more likely to implement mitigation measures compared to small enterprises, which is the exact opposite of the proposed hypotheses.

Table 4.2: Cross-tabulation of business size and mitigation behaviour

			Business size		Total
			Micro	Small	
Mitigation behavior in 2017	Yes	Count	99	30	129
		% within Business size	62.7%	45.5%	57.6%
		% of Total	44.2%	13.4%	57.6%
	No	Count	59	36	95
		% within Business size	37.3%	54.5%	42.4%
		% of Total	26.3%	16.1%	42.4%
Total		Count	158	66	224
		% within Business size	100.0%	100.0%	100.0%
		% of Total	70.5%	29.5%	100.0%

One of the plausible explanation for such observation is 55.2% of small businesses already have previous mitigation measures in place, while the percentage is only 28.8% in micro-enterprises. Another explanation for this finding is that almost 50% of micro-enterprises are fairly young (less than four years) compared to 23% of small enterprises. Therefore, it is a possibility that these newly established businesses are implementing measures for the first time after establishing as it is important for them to withstand the impacts of floods to sustain their business operations in these three flood prone case study areas. This highlights the importance of time element for avoiding false conclusions in this kind of research.

Structural measures are the most common type implemented by both micro (79.2%) and small (73.3%) enterprises. There is no statistically significant association observed between type of mitigation measures and business size ($\chi^2 = 0.176$, N = 126, p = .675, Phi = .06). From Figure 4.5, it is clear that clearing/construction of drainage is the most common structural measure implemented in both micro (35.5%) and small enterprises (63.6%). One of the plausible reasons behind micro-enterprises implementing costly measures like rebuilding/raising premises more than small enterprises is that most small enterprises already have good mitigation measures in place, and most micro-enterprises are relatively new. From Figure 4.6, we can say raising goods/electric sockets is the most common non-structural measure implemented in both micro (31.6%) and small enterprises (62.5%). Relocation is observed only in micro-enterprises, which can be understood as they are easy to move compared to small enterprises and sometimes lack resources to implement measures leaving them with relocation as the best option to save themselves from floods.

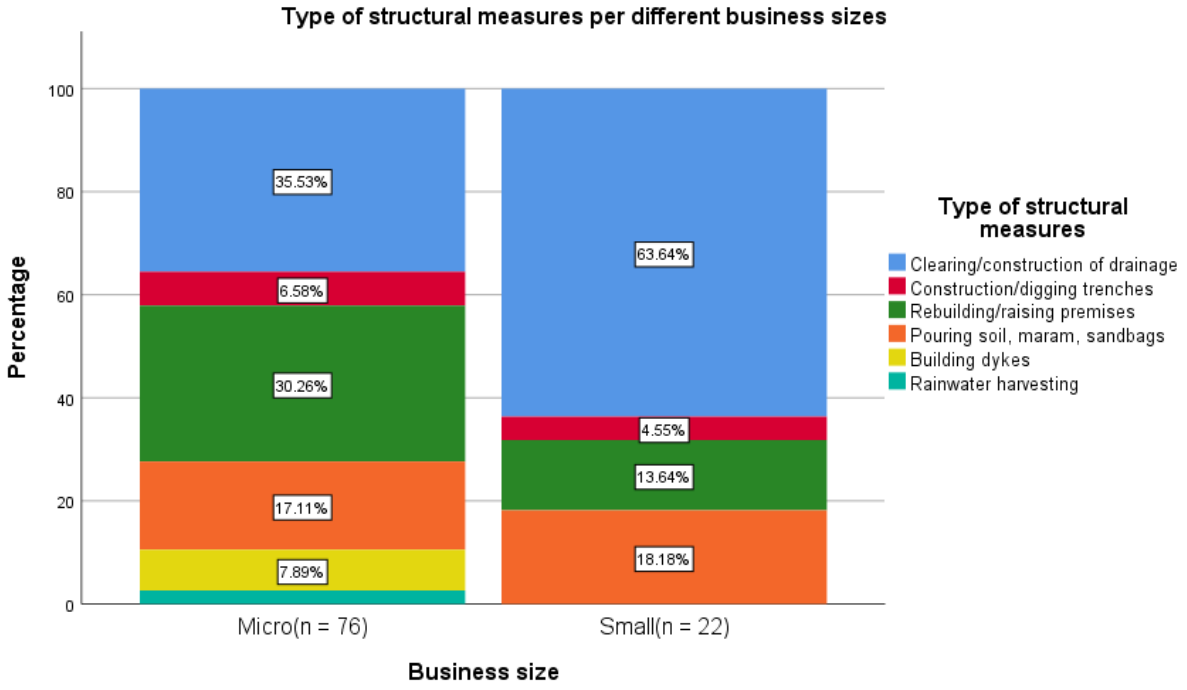

Figure 4.5: Percentage of each type of structural measures per business size

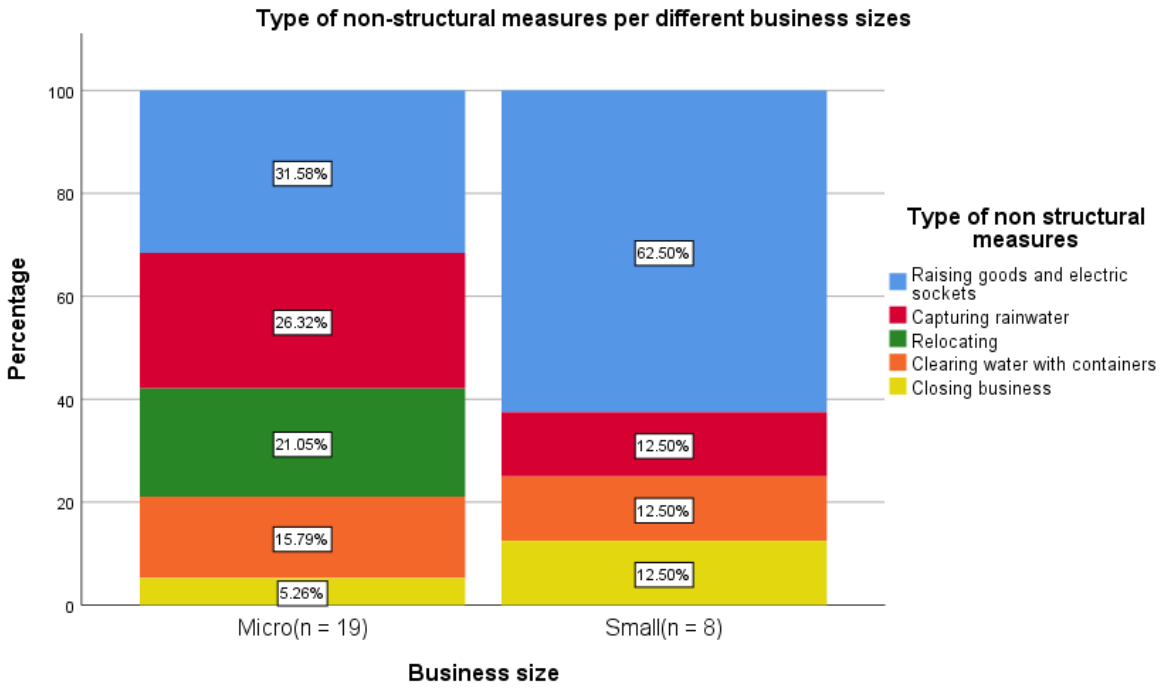

Figure 4.6: Percentage of each type of non-structural measures per business size

4.2.2. Influence of tenure status on flood mitigation behaviour

A total of 224 businesses respondent to questions on tenure status and mitigation behaviour in 2017. From Table 4.3, it evident that 57.1% of all businesses implemented mitigation measures, while 43.9% of owners and 64.8% of tenants implemented measures. These differences are statistically significant with a small to moderate association between status of premises and mitigation behaviour ($\chi^2 = 8.426$, N = 224, p = .004, Phi = .203). The tenants of the premises were more likely to implement mitigation measures than the owners of the premises. The observation is the exact opposite of the hypotheses proposed in this study.

Table 4.3: Cross-tabulation of status of premises and mitigation behaviour

			Status of premises		Total
			Owner	Tenant	
Mitigation behavior in 2017	Yes	Count	36	92	128
		% within Status of premises	43.9%	64.8%	57.1%
		% of Total	16.1%	41.1%	57.1%
	No	Count	46	50	96
		% within status of premises	56.1%	35.2%	42.9%
		% of Total	20.5%	22.3%	42.9%
Total		Count	82	142	224
		% within status of premises	100.0%	100.0%	100.0%
		% of Total	36.6%	63.4%	100.0%

Though owners have more resources and options available compared to tenants, the reason behind such observation can be attributed to the fact that the majority of the businesses that are tenants are micro-enterprises (74.3%) while the majority of the businesses that own their premises are small businesses (57.6%). As the majority of the small businesses already have mitigation measures in place, and most of the micro-enterprises are relatively new, we observe a relationship where tenants are more likely to implement measures compared to the owners.

Structural measures are the most common type implemented by businesses who both own (69.4%) and rent (82%) their premises. There is no statistically significant association observed between the type of mitigation measures and the status of premises ($\chi^2 = 1.709$, N = 125, p = .191). Clearing/construction of drainage (32%) and pouring soil/maram/sandbags (32%) are the two primary structural measures implemented by businesses who own their premises, while clearing/construction of drainage (45.2%) and rebuilding/raising premises (27.4%) are the major structural measures implemented by tenants (refer to Figure.1 of Annex-1). It is interesting to observe that rebuilding/raising premises were done more in tenants(27.4%) than owners(24%) as it is a big investment and benefits the owners when the tenants leave the place. But it is unclear whether or not the owners invested in rebuilding/raising the premises rather than the tenants. Raising goods/electric sockets is the major non-structural implemented by owners (60%), while raising goods/electric sockets, capturing rainwater, and relocating are three common measures implemented by tenants with each 25% (refer to Figure.2 of Annex-1). Relocation is only observed in tenants and is understandable since they are not bound to the place, unlike the businesses that own the premises.

4.2.3. Influence of business type on flood mitigation behaviour

A total of 224 businesses responded to the questions on business type and mitigation behaviour in 2017. The majority of the 16 sectors have more than 50% of businesses that implemented mitigation measures. 81% of the businesses belong to only five sectors, and the discussion of this sub-section will be focused on these top 5 sectors.

Table 4.4: Cross-tabulation of top five business sectors and mitigation behaviour

			Mitigation behavior		Total
			Yes	No	
Business sector	Manufacturing	Count	14	16	30
		% within Business sector	46.7%	53.3%	100.0%
		% of Total	6.3%	7.1%	13.4%
	Wholesale and retail trade of consumption goods	Count	21	15	36
		% within Business sector	58.3%	41.7%	100.0%
		% of Total	9.4%	6.7%	16.1%
	Wholesale and retail trade of non-consumption goods	Count	28	23	51
		% within Business sector	54.9%	45.1%	100.0%
		% of Total	12.5%	10.3%	22.8%
	Accommodation and food service activities	Count	20	19	39
		% within Business sector	51.3%	48.7%	100.0%
		% of Total	8.9%	8.5%	17.4%
	Other service activities	Count	18	4	22
		% within Business sector	81.8%	18.2%	100.0%
		% of Total	8.0%	1.8%	9.8%

From Table 4.4 it is evident that in the top five sectors, mitigation measures were implemented by more than half of the businesses in four sectors namely trade of consumption goods (58.3%), trade of non-consumption goods (54.9%), accommodation and food service activities (51.3%) and other service activities (81.8%). Manufacturing is the only top-five sector with less than 50% of its businesses implementing mitigation measures (46.7%). There was no statistically significant association observed between business type and mitigation behaviour ($\chi^2 = 18.320$, N = 224, p = .193).

Structural measures are the most common type implemented by businesses of all top five sectors. Clearing/construction of drainage is the most common type of structural measure implemented by businesses of all top five sectors except accommodation and food service activities where rebuilding/raising premises (30.7%) and pouring soil/maram/sandbags (30.7%) are the two primary structural measures (refer to Figure.3 of Annex-1). It is understandable as this sector has to make sure its customers come back to stay and dine at their places, which should be safe.

The type of non-structural measures vary per sector (refer to Figure.4 of Annex-1). The primary non-structural measure implemented by businesses in the trade of consumption (60%) and non-consumption (33.3%) goods is raising goods/electric sockets, which is understandable as they have to protect their goods from getting spoiled due to floods. The other primary non-structural measure of trade of non-consumption goods is capturing rainwater (33.3%). Raising goods/electric sockets (40%) and relocating (40%) are the two primary non-structural measures of the accommodation and food service sector. It can be explained by the fact that the accommodation sector has to make sure its customers do not face unforeseen circumstances like electric shocks and the food service businesses have to store their raw material without getting spoiled due to floods. Closing business is only observed in the accommodation and food service

sector and is understandable because people tend to go restaurants and lodges less often during flooding season. So, instead of spending resources and finances on other measures, closing business for some time till the floods subside may be the best option for a few businesses.

4.2.4. Influence of age of business on flood mitigation behaviour

A total of 222 businesses responded to the questions on age and mitigation behaviour in 2017. The mean age of businesses that implemented measures (M = 5.5, SD = 5.26) is less than those who did not implement measures (M = 8, SD = 8.02) and these differences are statistically significant as determined by the independent sample t-test (t(220) = 2.82, p = .005). The observed result is the exact opposite of the hypotheses proposed. One possible explanation for such a finding is the fact that the proportion of relatively new businesses (age less than four years) is higher in micro-enterprises (~50%) compared to small businesses (23%) and most small enterprises have measures already in place.

Structural measures are the most common type implemented by both micro (82.4%) and small (81.8%) enterprises that are relatively new. There is no statistically significant difference in the mean age between businesses who implemented structural (M = 5.44, SD = 5.12) and non-structural (M = 6, SD = 6; t(121) = -.488, p = .627) measures. It is interesting to see that relatively new micro-enterprises tried different structural and non-structural measures, while small businesses have limited themselves to a few choices (refer to Figure.5 and Figure.6 of Annex-1). Rebuilding/raising premises in relatively new micro-enterprises is the main structural measure, whereas clearing/construction of drainage is the majority in small businesses. Closing businesses is observed only in the micro-enterprises and is understandable as micro-businesses are more vulnerable to flood impacts compared to small businesses due to lack of resources and finances, particularly in the early years.

4.3. Flood experience and its impacts as factors for flood mitigation behaviour

In this thesis, the flood experience is calculated as the number of times businesses experienced floods in the years 2015, 2016, and 2017 (maximum of 3 and minimum of 0). Similar is the case with flood impacts. But among the 311 businesses, 225 of them were established before or in 2015, 44 in 2016 and 30 in 2017, while 12 of them have missing data for year of establishment. Therefore, for this sub-section, only businesses that existed from or before 2015 are considered.

4.3.1. Influence of flood experience on flood mitigation behaviour

Among 225 businesses, 102 (45.7%) of them faced floods in all three years, 47 (21.1%) faced two times, 19 (8.5%) faced one time, and 55 (24.7%) businesses did not face floods in the period 2015-2017 (refer to Figure 4.7).

Micro-enterprises contribute 66.3% among the businesses that experienced floods in all three years while the percentage of micro and small businesses are almost the same among businesses that experienced no floods in the period 2015-2017. In terms of the study area, the majority of the businesses that have not experienced floods in all three years belong to the affluent neighbourhood Ntinda (45.5%), while the majority of the businesses that have experienced floods in all three years belong the informal settlement Natete (73.5%).

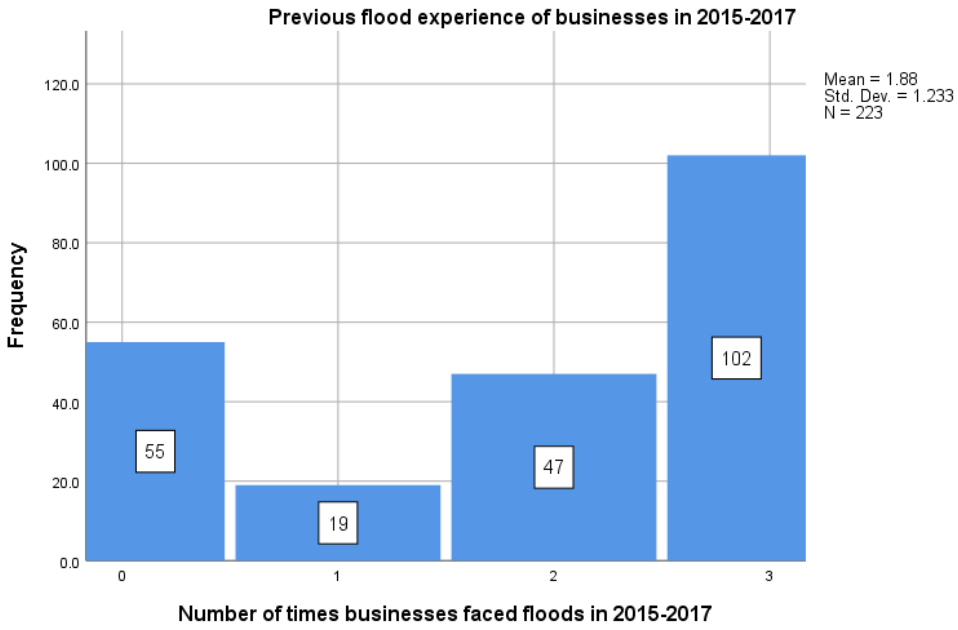

Figure 4.7: Businesses flood experience in the period 2015-2017

There was no statistically significant relationship between flood experience and mitigation behaviour, χ^2 (1, N = 166) = .038, p =.845. The results do not support the hypotheses that businesses with more experience are more likely to implement mitigation measures. Structural measures are the most common type implemented by businesses irrespective of the flood experience, and there is no statistically significant relationship between flood experience and type of mitigation measures, χ^2 (1, N = 84) = .252, p =.615. The only two types of structural measures observed among business that have not experienced floods in the three years are digging of trenches (50%) and rebuilding/raising premises (50%) while clearing/construction of drainage (55.6%) is the major structural measure among others implemented by businesses that have experienced floods in all three years. The most common type of non-structural measure observed among businesses that have experienced floods in all three years is raising goods/electric sockets (50%).

4.3.2. Previous flood impacts influence on flood mitigation behaviour

Financial problems are the most prevalent of the three impacts, and health problems are the least prevalent among businesses. 80 businesses (48%) reported that they experienced financial problems due to floods in all three years while the number is only 58 (34.5%) for health problems and even the number of businesses that experienced no health problems in all three years is 85 (51%) highest among the three impacts. The property damages include goods like grains, flour, animal feed, timber, and cement getting spoiled due to soaking and items like furniture, clothes, personal belongings, and assets getting damaged. The major health issues mentioned by the businesses include malaria, cholera, typhoid, diarrhoea, foot diseases, and skin infections. The majority of the financial problems mentioned by businesses include costs incurred due to hospital bills and property damage, aside from mitigation measures implementation costs.

Among the businesses that have not experienced property damage and health issues in all three years, micro-enterprises are the majority, but the proportion of small businesses (51.2%) is higher than micro-enterprises (48.8%) in case of businesses that have not experienced any financial damages due to floods. It is understandable as small businesses have resources and finances to withstand the financial losses compared to micro-enterprises.

The binary logistic regression model to assess the influence of flood impacts on mitigation behaviour showed statistically significant results, χ^2 (3, N = 144) = 12..172, p =.007. The model as a whole explained 10.8% of the variance in mitigation behaviour and correctly classified 62.5% of cases. Among the three impacts, only financial problems were significant (Table 4.5). For every one year increase in financial problems experience, businesses are over two times more likely to implement mitigation measures, which supports the hypotheses that the higher the flood impact on a business, the more likely it is to implement mitigation measures. It is important to note that though financial losses are the most significant among the three impacts, the majority of it includes costs incurred due to hospital bills and property damage.

Table 4.5: Binary logistic regression model summary of flood impacts against mitigation behaviour

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Property damage experience	-0.43	0.22	3.73	1	0.05	0.65	0.43	1.01
Health problems experience	-0.10	0.17	0.38	1	0.54	0.90	0.65	1.25
Financial problems experience	0.75	0.24	9.83	1	0.00	2.11	1.32	3.36
Constant	-0.55	0.32	2.91	1	0.09	0.58		

4.4. Summary

Among the 311 businesses surveyed, the majority of them are micro-enterprises (71.2%). In the informal settlements of Bwaise and Natete, micro-enterprises are predominant, while small businesses predominate in the affluent neighbourhood of Ntinda. 81% of businesses belong to only five sectors in which trade of non-consumption goods accounts for the largest proportion of businesses. Among the micro-businesses, a major proportion of businesses belong to the trade of consumption & non-consumption goods, accommodation & food service activities, and other service activities while in small businesses the majority of them belong to the trade of non-consumption goods and manufacturing. In terms of the case study area, trade of non-consumption goods accounts for the major proportion in all three of them.

Overall, the majority of the businesses do not own their premises. But most small businesses own their premises, while most of the micro-enterprises are tenants. As for the case study area, most businesses in informal settlements of Bwaise and Natete are tenants, unlike the affluent neighbourhood Ntinda where most of them are owners. Around 50% of businesses are relatively new with age less than five years, while micro-enterprises are relatively young compared to small businesses. Also, the businesses of the informal settlements Bwaise and Natete are relatively young compared to the businesses of affluent neighbourhood Ntinda.

The majority of the businesses implemented mitigation measures in 2017 in all three case study areas. Structural measures are the most common type of measures implemented by businesses irrespective of the size, location, type, tenure status, age, and flood experience.

Micro-enterprises are more likely to implement mitigation measures compared to small businesses. The possible explanations behind such observations are most small businesses have previously implemented mitigation measures in place, and most micro-enterprises are relatively new. In terms of tenure status, tenants are more likely to implement mitigation measures compared to owners. The reason behind such finding is most tenants are micro-enterprises which are relatively new, and most owners are small businesses that have previous mitigation measures in place. Clearing/construction of drainage is the major structural measure, and raising goods/electric sockets is the major non-structural measure among both categories of business size and tenure status. The non-structural measure relocation is observed only in micro-enterprises

and in tenants as they are relatively easy to move compared to small businesses and are not bound to the premises like the owners.

Among the top five sectors, the proportion of businesses that implemented mitigation measures is highest in other service activities. Clearing/construction of drainage is the major structural measure among four out of the top five sectors. In the accommodation & food service sector rebuilding/raising the floor and placing sandbags/soil/maram are the two major structural measures to ensure the safety of their customers and to safeguard the raw material from getting spoiled due to floods. The non-structural measure closing business is only observed in accommodation and food service activities as people come less often to hotels and restaurants during floods.

The businesses that implemented mitigation measures are relatively young, and rebuilding/raising premises is the major mitigation measure among relatively new micro-enterprises, whereas clearing/construction of drainage is the major mitigation measure among relatively new small businesses. The non-structural measure closing business is only observed in relatively new micro-businesses as they are more vulnerable to the floods impacts due to lack of resources and finances compared to small businesses.

Among the 311 businesses, 45.7% of them experienced floods in all three years while 24.7% businesses did not experience any floods in the period 2015-2017. Majority of the businesses that did not face floods in all three years belong to the affluent neighbourhood Ntinda while the majority of the businesses that faced floods in all three years belong to the informal settlement Natete. Among the three flood impacts analysed, financial impacts are the most prevalent while health problems are the least prevalent. Financial impacts made a significant contribution to the model predicting mitigation behaviour based on past flood impacts and businesses that experienced more financial problems are over two times more likely to implement mitigation measures.

5. RISK ATTITUDE AND FLOOD RISK PERCEPTION AS FACTORS FOR FLOOD MITIGATION BEHAVIOUR

This chapter discusses the relationship between risk attitude and flood risk perception with flood mitigation behaviour in all three case study areas. The two explanatory variables of risk attitude are willingness to spend on mitigation and insurance. The four explanatory variables of flood risk perception are future flood probability, response efficacy, self-efficacy and response costs. Sub-section 5.1 discusses how risk attitude influence flood mitigation behaviour and the sub-section 5.2 discusses the influence of flood risk perception on flood mitigation behaviour.

5.1. Risk attitude influence on flood mitigation behaviour

Willingness to spend on mitigation measures

Among the 299 businesses which responded to the question on willingness to spend on mitigation measures in 2017, 49.5% expressed as highly willing, 16.7% as willing, 7.4% as somewhat willing, and 26.4% of them as not willing. Some of the reasons given by businesses for not willing to invest on mitigation measures are feeling secure because of previously implemented measures, lack of funds, trust on the terrain, their assumption that it is the duty of the landlord and their perception of mitigation measures as not effective.

The percentage of businesses that are not willing is higher among micro-enterprises (27.8%) compared to small businesses (22.1%) while the percentage of highly willing businesses is higher among small enterprises (57%) compared to micro-enterprises (46.9%). In terms of case study areas, the percentage of businesses that are not willing is higher in Bwaise (41.7%) and least in Natete (19.2%) while the percentage of businesses that are highly willing is least in the informal settlement Bwaise (32.1%) and highest in the affluent neighbourhood Ntinda (61%).

Table 5.1: Cross-tabulation of mitigation behaviour vs willingness to spend on mitigation measures

			Willingness to spend on mitigation measures in 2017				Total
			Not willing	Somewhat willing	Willing	Highly willing	
Mitigation behavior in 2017	Yes	Count	24	9	30	63	126
		% within Willingness	41.4%	69.2%	81.1%	56.3%	57.3%
		% of Total	10.9%	4.1%	13.6%	28.6%	57.3%
	No	Count	34	4	7	49	94
		% within Willingness	58.6%	30.8%	18.9%	43.8%	42.7%
		% of Total	15.5%	1.8%	3.2%	22.3%	42.7%
Total		Count	58	13	37	112	220
		% within Willingness	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	26.4%	5.9%	16.8%	50.9%	100.0%

A total of 220 businesses responded to the questions on willingness and mitigation behaviour in 2017 among which 57.3% of them implemented mitigation measures. From Table 5.1 it is evident that the percentage of businesses that implemented mitigation measures is high in those who are willing (81.1%), highly willing (56.3%) and somewhat willing (69.2%) compared to those that are not willing (41.4%). These differences were statistically significant with a moderate to high relationship between willingness and mitigation

behaviour (χ^2 = 15.365, N = 220, p = .002, Cramer's V = .264). Therefore, the results confirm the hypotheses that businesses that are more willing to spend on mitigation measures are more likely to implement them compared to those who are not willing.

Structural measures are the most common type implemented by businesses regardless of their willingness, but it is interesting to note that non-structural measures are observed more in those businesses that are unwilling (34.8%) compared to the other three. The non-structural measure relocating, is only observed in businesses that are unwilling (40%) and somewhat willing (71.4%) which gives us an idea that these businesses prefer to relocate to other place instead of spending finances and resources on on-ground mitigation measures.

Insurance

A total of 282 businesses responded for the variable insurance, of which 91.8% (259) do not have insurance and only 8.2% (23) do have insurance. Among the 23 businesses that have insurance, 19 are small and 4 are micro businesses and 61% (14) of them are located in the affluent neighbourhood Ntinda. In terms of sectors, majority of them belong to manufacturing (30.4%), trade of non-consumption goods (17.4%) and construction (13%). As the number of insured businesses is pretty low, correlation or regression analysis is not performed for this variable.

5.2. Influence of flood risk perception on mitigation behaviour of businesses

To study the influence of flood risk perception on mitigation behaviour, the elements of PMT framework i.e., threat appraisal and coping appraisal are used. In this research, the threat appraisal is analysed using the variable 'future flood probability' which capture the respondents expectations about how the floods are going to be in the coming years. The coping appraisal elements response efficacy, self-efficacy and response costs are analysed for a total of nine measures of which five are structural and four are non-structural.

5.2.1. Threat appraisal as a factor of flood mitigation behaviour

Among the 248 businesses which respondent to the future flood probability question, more than 50% of them expressed their expectation that there will be fewer floods in the future, 19% expressed as about the same and 16.3% as much worse while 14.2% of them were not sure (refer to Figure 5.1).

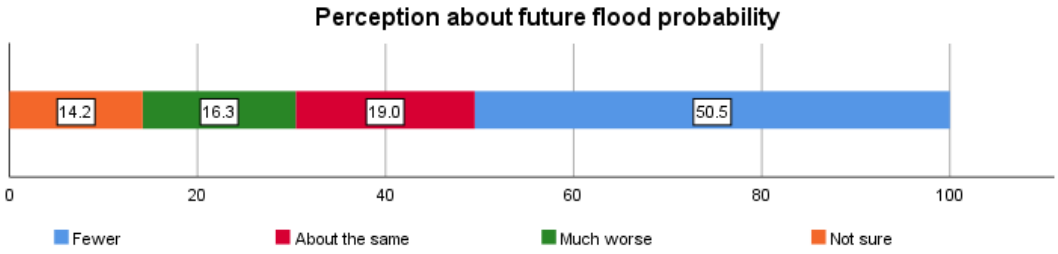

Figure 5.1: Perception about future flood probability (n = 248)

Almost 50% of both micro and small businesses expressed there will be fewer floods in the future while the businesses that expressed much worse is more in micro-enterprises (17.8%) compared to small businesses (12.3%). In terms of case study area, the percentage of businesses that expressed there will be fewer floods in the future is highest in Bwaise (79.3%) and least in Natete (28.3%) while the percentage of businesses that expressed as much worse is highest in Natete (29%) with Bwaise and Ntinda having 3.4%

and 3.5% respectively. Though Ntinda is an affluent neighbourhood, 63.2% of businesses expressed there will be fewer floods. The results show lack of awareness regarding floods across all businesses irrespective of their size or location.

It was interesting to observe a statistically significant difference in the mean distance from nearest drainage channel among the businesses that expressed as fewer floods (M = 163.42, SD = 131.62), about the same (M = 131.55, SD = 111.31) and much worse (M = 79.94, SD = 73.34) as determined by the one way ANOVA test ($F(2, 245) = 9.06$, $p<.001$). Post-hoc comparisons using the Scheffe test indicated the differences are significant only between those which expressed fewer and much worse. Hence, we can say businesses that are close to the drainage channel thought there would be much worse floods and those who are much away from the drainage channel thought there will be less floods in the future.

A total of 190 businesses[3] responded to the questions on future flood probability and mitigation behaviour in 2017 among which 55.8% of them implemented measures. As evident from Table 5.2, the proportion of businesses that have implemented mitigation measures is highest among those which have expressed that there will be much worse floods in the future (74.4%) and least in those which have expressed that there will be fewer floods in the future (43.9%).

Table 5.2: Cross-tabulation of mitigation measures vs future flood probability

			Future flood probability			Total
			Fewer	About the same	Much worse	
Mitigation behavior in 2017	Yes	Count	47	27	32	106
		% within Future flood probability	43.9%	67.5%	74.4%	55.8%
		% of Total	24.7%	14.2%	16.8%	55.8%
	No	Count	60	13	11	84
		% within Future flood probability	56.1%	32.5%	25.6%	44.2%
		% of Total	31.6%	6.8%	5.8%	44.2%
Total		Count	107	40	43	190
		% within Future flood probability	100.0%	100.0%	100.0%	100.0%
		% of Total	56.3%	21.1%	22.6%	100.0%

Businesses which expressed that there will be much worse floods in the future were over three times more likely and those which expressed there will be about the same floods were over two times more likely to implement mitigation measures compared to those which expressed that there will be fewer floods in the future as determined by the binary logistic regression model (χ^2 (2, N = 190) = 14.74, p = .001). The model explained as a whole explained 10% of variance in mitigation behaviour, and correctly classified 62.6% of cases (Refer to Table.1 of Annex-1 for full regression model summary).

The results support the hypotheses that businesses with high perceived future flood likelihood are more likely to implement mitigation measures. Therefore, it is clear that businesses that expect the same or even worse flooding in the future are more likely to implement mitigation measures. The finding highlights the importance of awareness building among businesses about floods which can contribute to the effective implementation of mitigation measures by more businesses.

[3] Excluding the responses of 'not sure' for the variable future flood probability.

5.2.2. Coping appraisal as a factor of flood mitigation behaviour

Among the nine mitigation measures selected to analyse the coping appraisal elements, the five structural measures are rebuilding/raising the floor, building small dykes, putting sandbags, planting grass & clearing the drainage while the four non-structural measures are raising electric sockets, capturing rainwater, moving from current premises (relocation) and raising goods.

a. Perceived response efficacy

As evident from Figure 5.2, a significant proportion of businesses expressed rebuilding/raising the floor (81.6%) and clearing drainage (77.1%) as very effective measures and planting grass as an ineffective measure (52.3%). Only about one-third of businesses expressed the non-structural measures as very effective and relocation (38.4%) has the highest percentage of businesses that expressed it as ineffective among the four.

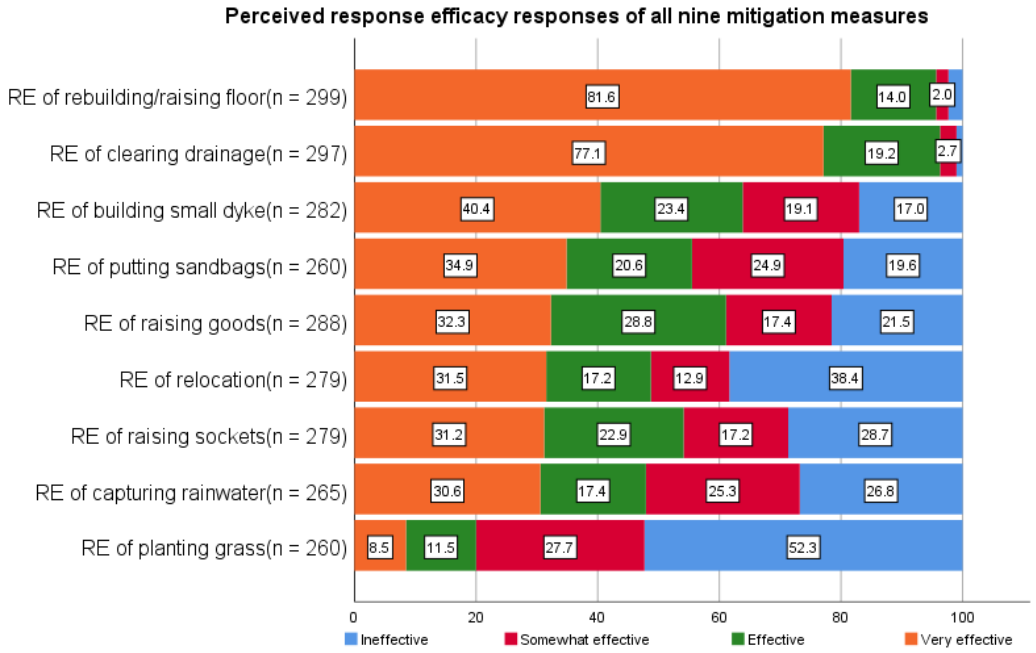

Figure 5.2: Perceived response efficacy responses of all nine mitigation measures

In terms of business size, one important finding was that though more than 50% of businesses expressed planting grass as ineffective, it is the major proportion of micro-enterprises that expressed it as ineffective with 59.1% while only 35.1% of small businesses expressed it as ineffective.

In Natete, the businesses were very positive about the structural measure rebuilding/raising the floor as no business expressed it as ineffective or somewhat effective measure. For the measure clearing drainage, the businesses of Bwaise are positive with no business expressing it as an ineffective measure. Though more than 50% of businesses expressed planting grass as an ineffective measure, it is the major proportion of Bwaise businesses which expressed it as ineffective with 76.3% while the percentage is only 43% and 38.5% in Natete and Ntinda respectively. For the non-structural measure relocation, Natete businesses were relatively positive with only 27.6% of them expressing it as an ineffective measure while more than 50% of Bwaise and Ntinda businesses expressed it as ineffective measure.

It was obvious to observe that tenants are relatively positive about the non-structural measure relocation compared to owners as they are not bound to the premises and have the flexibility of moving to a better location.

The binary regression model predicting the likelihood of whether or not businesses would implement mitigation measures based on perceived response efficacy was statistically significant (χ^2 (27, N = 134) = 59.09, $p < .001$). The model as a whole explained 47.7% of variance in mitigation behaviour, and correctly classified 76.1% of cases (Refer to Table.2 of Annex-1 for full regression model summary).

Among the nine mitigation measures, only two of them made significant contribution to the model predicting mitigation behaviour based on perceived effectiveness of the measures. Between the two, the strongest predictor of mitigation behaviour was perceived effectiveness of the structural measure placing sandbags. The results show that businesses that expressed placing sandbags as a very effective measure were over seven times more likely to implement the mitigation measures compared to those which expressed it as ineffective. Perceived effectiveness of raising sockets was the weakest predictor of mitigation behaviour where businesses that expressed it as effective were .15 times less likely to implement mitigation measures compared to those that expressed it as ineffective. Though rebuilding/raising the floor, clearing drainage are considered as very effective measures and planting grass as an ineffective measure by major proportion of businesses, they did not make significant contribution to the model.

The findings both support and contradict the hypotheses that businesses with high perceived response efficacy are more likely to implement mitigation measures as the hypotheses holds true for the structural measure 'placing sandbags' but do not hold true for the non-structural measure 'raising sockets'.

b. Perceived self-efficacy

Similar to the perceived response efficacy, a significant proportion of businesses expressed rebuilding/raising the floor (75.6%) and clearing drainage (64.5%) as easily self-implementable measures and planting grass as a non-implementable measure (58.2%) (Refer to Figure 5.3). Contrary to perceived response efficacy, though relocation has the highest proportion of businesses expressing it as ineffective (38.4% - Figure 5.2) among the four non-structural measures, it has the highest proportion of businesses expressing it as easily self-implementable (45.5%).

In terms of business size, similar to perceived response efficacy, it is the major proportion of micro-enterprises (62.9%) that expressed planting grass as non-implementable while the percentage is only 46.6% in small businesses. Another interesting finding was that though micro-enterprises are easy to move relative to small businesses, the larger proportion of small businesses (51.7%) expressed relocation as a easily implementable measure compared to micro-enterprises (43.1%).

In terms of study area, it is the major proportion of Natete businesses that expressed relocation as easily implementable (56%) while it is only 38% and 28.3% in Bwaise and Ntinda respectively. The findings show that the businesses of the informal settlement Natete are relatively positive about the non-structural measure relocation compared to the affluent neighborhood Ntinda. The responses for other measures were similar across all three study areas.

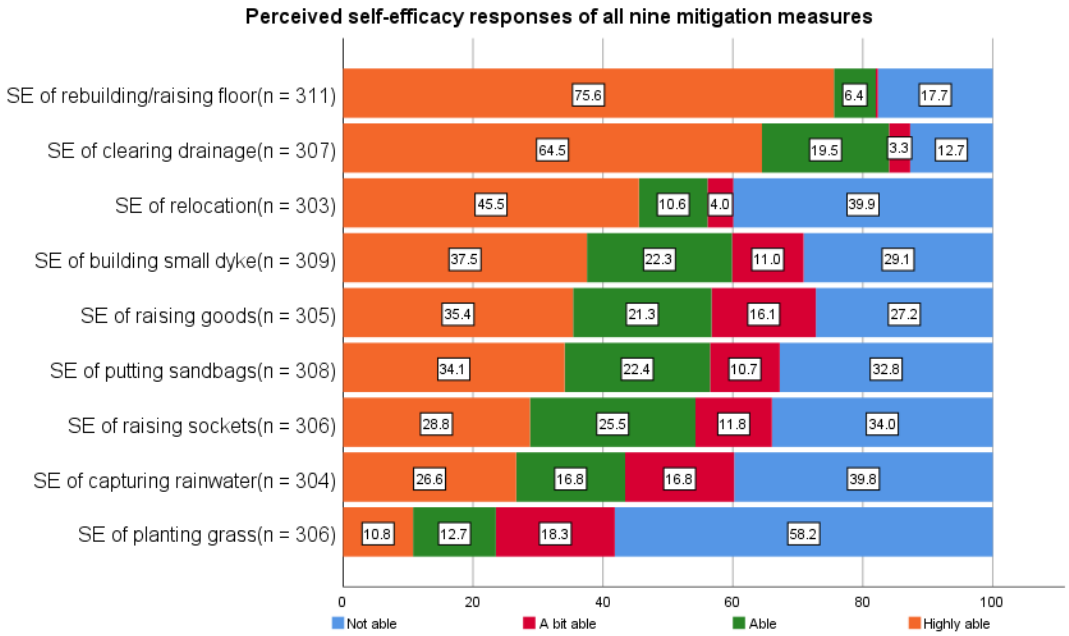

Figure 5.3: Perceived self-efficacy responses of all nine mitigation measures

The binary logistic regression model predicting the mitigation behaviour of businesses based on perceived self-efficacy of mitigation measures was statistically significant (χ^2 (26, N = 212) = 68.33, p < .001) by explaining 37% of variance in mitigation behaviour and classifying 72.2% of cases correctly (Refer to Table.3 of Annex-1 for full regression model summary).

Only three measures made significant contribution to the model. Among the three, the strongest predictor of mitigation behaviour was perceived self-efficacy of the structural measure placing sandbags indicating businesses that expressed it as a highly self-enforceable were over three times more likely to implement mitigation measures compared to those that expressed it as a non-enforceable measure. The weakest predictor was perceived self-efficacy of planting grass indicating business that expressed it as highly self-enforceable are .15 times less likely to implement mitigation measures compared to those that expressed it as non-enforceable. The third significant contributor is clearing drainage indicating businesses that expressed it as self-enforceable are .25 times less likely to implement mitigation measures compared to those that expressed it as non-enforceable.

Similar to perceived response efficacy, the findings both support and contradict the hypotheses that businesses with high perceived self-efficacy are more likely to implement mitigation measures as the hypotheses holds true for the measure 'placing sandbags' but do not hold true for the measures 'planting grass' and 'clearing drainage'.

c. Perceived response costs

It was obvious to observe the structural measure rebuilding/raising the floor as a very high cost measure as expressed by 75.7% of businesses because it requires a lot of resources and manpower (refer to Figure 5.4). Although the structural measure clearing drainage is considered by a significant proportion of businesses to be very effective (Figure 5.2) and easily self-implementable (Figure 5.3), 88.2% of businesses expressed it as a high to very high cost measure. While significant proportion of businesses expressed planting grass as an ineffective (Figure 5.2) and non-implementable (Figure 5.3) measure, 75.6% of businesses expressed it

as a low to very low cost measure. Among the four non-structural measures, relocation is expressed as a high to very high cost measure by 68.6% of businesses while capturing rainwater is expressed as a low to very low cost measure by 70% of businesses.

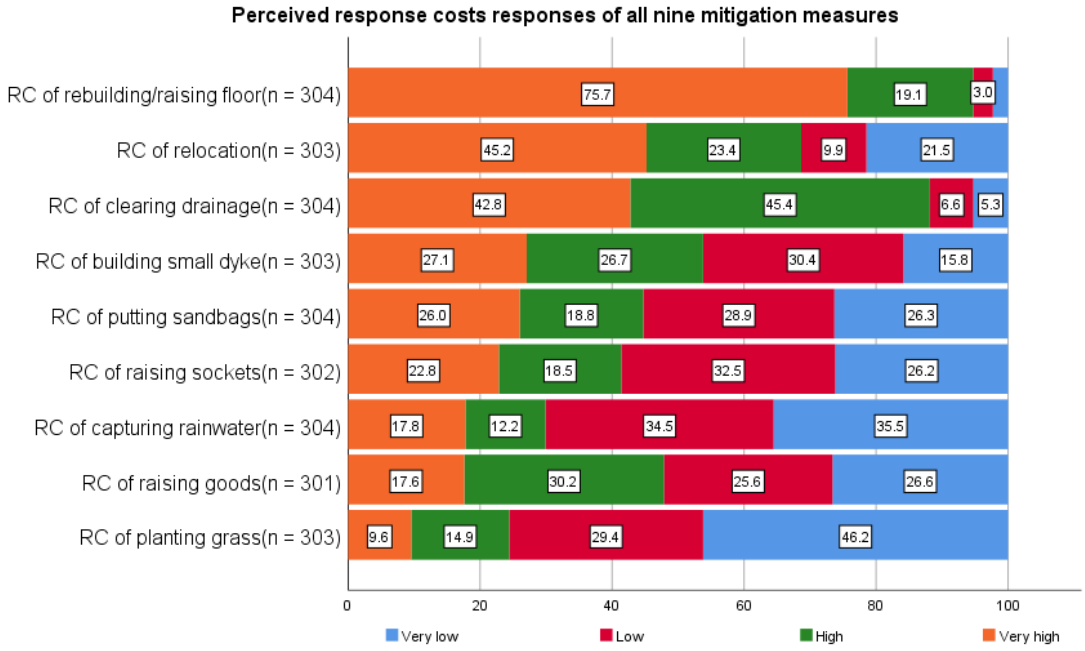

Figure 5.4: Perceived response costs responses of all nine mitigation measures

In terms of business size, it was apparent to note a significant proportion of small businesses expressing relocation as a very high cost measure (50.6%) compared to micro-enterprises (43.1%), as they are bigger in size and costs relatively more to relocate their business activities.

In terms of study area, though most of the businesses expressed planting grass as a low to very low cost measure, significant proportion of Bwaise businesses (59.5%) expressed it as a very low cost measure compared to Natete (39.9%) and Ntinda (44.3%).

Similar to perceived response efficacy and self-efficacy, the binary logistic regression model predicting the mitigation behaviour based on perceived response costs of all nine mitigation measures was statistically significant (χ^2 (27, N = 211) = 76.45, p < .001) explaining 40.9% variance in mitigation behaviour and correctly classifying 75.8% of cases (Refer to Table.4 of Annex-1 for full regression model summary).

Among the nine mitigation measures, five of them made significant contribution to the model. The strongest predictor being perceived response costs of rebuilding/raising the floor indicating businesses that expressed it as a very high cost measure were over 24 times more likely to implement mitigation measures compared to those that expressed it as a very low cost measure. The next strongest predictor was perceived response costs of placing sandbags indicating businesses that expressed it as a very high cost measure were over four times more likely to implement mitigation measures compared to those that expressed it as a very low cost measure. In case of the structural measure clearing drainage, businesses that expressed it as a low cost measure are .1 times less likely to implement mitigation measure compared to those that expressed it as a very low cost measure. For the measure raising sockets, businesses that expressed it as a very high cost measure were .25 times less likely and for the measure relocation, businesses that expressed it as a high cost

measure were .07 times less likely to implement mitigation measures compared to those that expressed them as a very low cost measures.

Similar to perceived response efficacy and self-efficacy, the findings both support and contradict the hypotheses that businesses with high perceived response costs are less likely to implement mitigation measures. In case of perceived response costs, the hypotheses holds true for the measures 'clearing drainage', 'raising sockets' and 'relocation' while it do not hold true for the measures 'rebuilding/raising the floor' and 'placing sandbags'.

The influence of distance from nearest drainage channel on coping appraisal elements was not uniform across all nine mitigation measures. The only measure where the differences in the mean distance is significant across all three elements of coping appraisal is building small dykes. The businesses which expressed the measure building small dykes as very effective, easily self-implementable and very high cost are relatively closer to the nearest channel compared to those which expressed it as ineffective, non-implementable and very low cost measure. In case of the non-structural measure raising goods, businesses which expressed it as very effective are relatively closer to the nearest channel compared to those which expressed it as ineffective. For the structural measure rebuilding/raising the floor, businesses which thought it is easily self- implementable are relatively close to the nearest channel compared to those which expressed it as a non-implementable measure.

5.3. Summary

Among the 311 businesses, almost half of the businesses expressed that they are highly willing to spend on mitigation measures, while 26.4% of them expressed they are not willing to spend on mitigation measures. The reasons behind businesses decision to not spend on mitigation measures is the existence of previous mitigation measures, trust in terrain, lack of funds, their belief that it's the landlord's responsibility, and their perception towards mitigation measures as ineffective. The proportion of businesses that are not willing to spend on mitigation measures is highest in micro-businesses while that are highly willing is highest in small businesses. As for the case study area, the proportion of businesses that are not willing to spend on mitigation measures is highest in the informal settlement Bwaise while that are highly willing is highest in affluent neighbourhood Ntinda. The businesses that are more willing to spend on mitigation measures are more likely to implement mitigation measures. The non-structural measure relocation is only observed in businesses with low willingness to spend on mitigation measures, which informs us that these businesses prefer to move from their location instead of investing their finances and resources on on-ground mitigation measures. Only 8.2% of businesses had insurance most of which are small businesses located in the affluent neighbourhood Ntinda.

With regard to the future flood likelihood, more than half of the businesses expressed that there would be fewer floods in the future, irrespective of the business size. As for the case study area, the proportion of businesses that expressed there will be fewer floods in the future is highest in Bwaise and lowest in Natete while the proportion of businesses that expressed much worse floods in the future is highest in Natete and lowest in Bwaise. Compared to the businesses that expressed there will be fewer floods in the future, the businesses that expressed even worse floods in the future are relatively close to the nearest drainage channel. Businesses with high perceived future flood likelihood are more likely to implement mitigation measures. Therefore, businesses that had expressed much worse floods (high amount of fear or worry regarding flood risk) are more likely to implement mitigation measures compared to that expressed there will be fewer floods in the future (low amount of fear or worry).

Among the nine mitigation measures analysed for the coping appraisal elements, most businesses expressed the two structural measures, rebuilding/raising the floor and clearing drainage as very effective, easily self-implementable and high cost measures while only about one-third of businesses expressed non-structural measures as very effective. These findings may be a potential explanation about why we observed structural measures as the most common type of measures that businesses implemented irrespective of their size, location, tenure status, flood experience and willingness to spend on mitigation measures. Out of the nine mitigation measures, most businesses expressed the structural measure planting grass as an ineffective, non-implementable and low cost measure. But, it is the major proportion of micro-enterprises and Bwaise businesses that expressed planting grass as an ineffective measure compared to small businesses and other two case study areas respectively. Among the four non-structural measures most businesses expressed relocation as an inefficient and easily self-implementable measure, which is fairly costly to implement. Compared to micro-enterprises, it is the largest proportion of small businesses that have expressed relocation as easily self-implementable and very high cost measure.

The businesses of Bwaise are positive about the measure clearing drainage and businesses of Natete are positive about the measure rebuilding/raising the floor with none of the businesses expressing them as ineffective. In terms of effectiveness and self-implementation, Natete businesses were relatively positive about the non-structural measure relocation compared to Bwaise and Ntinda.

In the regression analysis predicting the mitigation behaviour based on coping appraisal elements, not all measures made significant contribution to the models. For the regression model predicting mitigation behaviour based on perceived response efficacy, the measure placing sandbags made significant positive contribution supporting the hypotheses and raising sockets made significant negative contribution to the model rejecting the hypotheses. In case of the model predicting mitigation behaviour based on perceived self-efficacy, the measure placing sandbags made significant positive contribution supporting the hypotheses while the measures planting grass and clearing drainage made significant negative contribution to the model rejecting the hypotheses. For the model predicting mitigation behaviour based on perceived response costs, the measures clearing drainage, raising sockets and relocation made significant negative contribution supporting the hypotheses and the measures rebuilding/raising the floor and placing sandbags made significant positive contribution to the model rejecting the hypotheses.

Businesses that expressed building small dykes as very effective, easily self-implementable and very high cost are relatively close to the nearest drainage channel. Businesses that expressed raising goods as very effective and rebuilding/raising the floor as easily self-implementable are relatively close to the nearest drainage channel.

6. GOVERNMENT EFFORTS AS A FACTOR FOR FLOOD MITIGATION BEHAVIOUR

This chapter discusses the relationship between government efforts and flood mitigation behaviour in all three case study areas. The two explanatory variables of risk communication are whether or not businesses looked for information and whether or not businesses received flood information. The explanatory variable of local assistance is whether or not businesses received local flood assistance. Sub-section 6.1 discusses the information seeking behaviour of businesses and how it influences the flood mitigation behaviour while the sub-section 6.2 discusses the influence of local flood assistance on flood mitigation behaviour.

6.1. Influence of risk communication on flood mitigation behaviour

Among the 311 businesses, only 63 (20.3%) looked for flood information while 6 of them have missing data. Most businesses (242, 79.3%) did not look for information irrespective of the size, location and tenure status. Therefore we can say that businesses information seeking behaviour is not proactive.

While very few businesses proactively looked for information, the requisite information was passed on to a large proportion of businesses (169, 56.9%) through various sources. These include radio, television, community leaders, newspaper, friends, internet, local people and eye witness.

6.1.1. Looking for flood information as a factor for flood mitigation behaviour

A total of 223 businesses respondent to the questions on whether or not they looked for flood information and mitigation behaviour in 2017. Major proportion of businesses implemented mitigation measures irrespective of whether or not they looked for flood information but the percentage is higher in those that looked (64.2%) compared to those that did not look (54.1%) for flood information (refer to Table 6.1). These differences were not statistically significant ($\chi^2 = 1.655$, N = 223, p = .198).

Table 6.1: Cross-tabulation of mitigation behaviour vs looked for flood information

			Looked for flood info		Total
			Yes	No	
Mitigation behavior in 2017	Yes	Count	34	92	126
		% within Looked for flood info	64.2%	54.1%	56.5%
		% of Total	15.2%	41.3%	56.5%
	No	Count	19	78	97
		% within Looked for flood info	35.8%	45.9%	43.5%
		% of Total	8.5%	35.0%	43.5%
Total		Count	53	170	223
		% within Looked for flood info	100.0%	100.0%	100.0%
		% of Total	23.8%	76.2%	100.0%

The results do not support the hypotheses that businesses that looked for flood information are more likely to implement mitigation measures compared to those that did not looked for it.

However, there was a statistically significant relationship with a small to moderate association between type of mitigation measures and whether or not they looked for flood information ($\chi^2 = 6.397$, N = 123, p =

.011, Phi = -.228). Although the majority of the businesses implemented structural measures irrespective of whether or not they looked for flood information, major proportion of businesses that implemented non-structural measures were observed in those that looked for flood information (38.2%) while major proportion of businesses that implemented structural measures were observed in those that did not look for flood information (83.1%) and these differences are significant (refer to Table 6.2).

Table 6.2: Cross-tabulation of type of mitigation measures vs looked for flood information

			Looked for flood info		Total
			Yes	No	
Type of mitigation measures 2017	Structural	Count	21	74	95
		% within Looked for flood info	61.8%	83.1%	77.2%
		% of Total	17.1%	60.2%	77.2%
	Non-structural	Count	13	15	28
		% within Looked for flood info	38.2%	16.9%	22.8%
		% of Total	10.6%	12.2%	22.8%
Total		Count	34	89	123
		% within Looked for flood info	100.0%	100.0%	100.0%
		% of Total	27.6%	72.4%	100.0%

6.1.2. Receiving flood information as a factor for flood mitigation behaviour

A total of 216 businesses respondent to the questions on whether or not they received flood related information and mitigation behaviour of which 57.9% of them implemented mitigation measures. Similar to the results of 'looked for flood information' variable, major proportion of businesses implemented mitigation measures irrespective of whether or not they received flood related information but the percentage is high in those that received (60.5%) compared to those that did not receive (54.6%) flood related information. These differences were not statistically significant ($\chi^2 = .754$, N = 216, p = .385).

Table 6.3: Cross-tabulation of mitigation behaviour vs receiving flood information

			Received flood info		Total
			Yes	No	
Mitigation behavior in 2017	Yes	Count	72	53	125
		% within Received flood info	60.5%	54.6%	57.9%
		% of Total	33.3%	24.5%	57.9%
	No	Count	47	44	91
		% within Received flood info	39.5%	45.4%	42.1%
		% of Total	21.8%	20.4%	42.1%
Total		Count	119	97	216
		% within Received flood info	100.0%	100.0%	100.0%
		% of Total	55.1%	44.9%	100.0%

The results do not support the hypotheses that businesses that receive flood related information are more likely to implement mitigation measures compared to those that did not receive it.

A statistically significant relationship with small to moderate association was observed between type of mitigation measures and whether or not they received flood related information ($\chi^2 = 7.393$, N = 122, p =

.007, Phi = -.246). Although the majority of the businesses implemented structural measures irrespective of whether or not they received flood related information, major proportion of businesses that implemented non-structural measures were observed in those that received flood related information (30%) while major proportion of businesses that implemented structural measures were observed in those that did not receive flood related information (90.4%) and these differences are significant (refer to Table 6.4).

Table 6.4: Cross-tabulation of type of mitigation measures vs receiving flood information

			Received flood info		Total
			Yes	No	
Type of mitigation measures 2017	Structural	Count	49	47	96
		% within Received flood info	70.0%	90.4%	78.7%
		% of Total	40.2%	38.5%	78.7%
	Non-structural	Count	21	5	26
		% within Received flood info	30.0%	9.6%	21.3%
		% of Total	17.2%	4.1%	21.3%
Total		Count	70	52	122
		% within Received flood info	100.0%	100.0%	100.0%
		% of Total	57.4%	42.6%	100.0%

6.2. Influence of local flood assistance on mitigation behaviour of businesses

Among the 311 businesses, 25 (9.2%) of them got flood assistance and 248 (90.8%) did not receive any local flood assistance while 38 of them have missing data. Nearly 90% of businesses receiving local flood assistance listed it as the support provided by KCCA in clearing drainage, and a few businesses reported that they received funds from government and outside missionaries to construct drainage system.

A major proportion of the businesses that received local flood assistance belong to small enterprises (52.2%). In terms of case study area, major proportion of the businesses that received local flood assistance belong to Natete region (64%) with Ntinda and Bwaise having 24% and 12% respectively. It was also interesting to observe that a major proportion of businesses that received flood assistance are tenants (68%) compared to owners (32%). As the number of businesses that received local flood assistance is very low, correlation and regression analysis are not performed.

6.3. Summary

While very few businesses proactively looked for flood-related information, most businesses received it through multiple sources such as radio, television, community leaders, newspaper and internet. There was no relation observed between mitigation behaviour and risk communication variables. But, there was a significant relationship between type of mitigation measures and risk communication. Businesses that looked and received flood information are more likely to implement non-structural measures while that did not look nor received flood information are more likely to implement structural measures. Therefore, we can say that businesses that have proactive information seeking behaviour are better prepared by exploring different mitigation options and trying non-structural measures rather than the traditional structural measures. Very few businesses received local flood assistance among which most of them are small businesses and are located in the informal settlement Natete. Most of the local assistance mentioned by the respondents is the assistance that KCCA provided in clearing the drainage system.

7. SUMMARY, DISCUSSION AND RECOMMENDATIONS

This chapter summarises and discusses the findings of the research. The chapter also draws recommendations and concludes with the limitations of the study and areas of further research.

7.1. Summary

The original PMT framework uses the elements of threat appraisal and coping appraisal to predict mitigation behaviour. An extended version of the PMT framework is proposed in this research relevant to businesses based on the existing literature. To know whether or not this proposed extended version of the PMT framework is a better predictor of mitigation behaviour compared to the original PMT framework, regression models are performed. In these regression models, the mitigation behaviour in 2017 is the dependent variable while the variables that are found to be statistically significant in chapters 4-6 are the independent variables for the respective frameworks. The original PMT framework could explain 73.3% variance in the mitigation behaviour correctly classifying 85% of cases while the extended version could explain 90.5% variance in the mitigation behaviour correctly classifying 96.3% cases. Though the number seems small (17.2%) it is still a substantial increase in the percentage of variance the extended version's model could explain.

Table 7.1 shows a summary of all the important findings in this research across the three study areas. The findings such as small businesses being predominant, majority of them owning their premises, 45.5% of businesses not experiencing floods in all three years and 61% of insured businesses being located at this region clearly differentiates Ntinda as an affluent neighbourhood from the informal settlements of Bwaise and Natete. The other noticeable differences observed between affluent neighbourhood and informal settlements is the businesses of Ntinda are relatively old and most of the businesses were highly willing to spend on mitigation measures. The findings that are common across both affluent neighbourhood and informal settlements are the primary sectors being the trade of non-consumption goods, structural measures being predominant and low proactive information seeking behaviour but most of the businesses receiving flood-related information.

Table 7.1: Summary of findings across three case study areas

	Bwaise	**Natete**	**Ntinda**
Business size	Micro enterprises are predominant	Micro enterprises are predominant	Small enterprises are predominant
Business type	Primary sector: Trade of non-consumption goods	Primary sector: Trade of non-consumption goods	Primary sector: Trade of non-consumption goods
Tenure status	Majority are tenants	Majority are tenants	Majority are owners
Age of business	Mean age: 6 years	Mean age: 6.1 years	Mean age: 8.5 years
Mitigation behavior	56% implemented mitigation measures	60.5% implemented mitigation measures	51% implemented mitigation measures
Type of mitigation measures	Structural measures are predominant	Structural measures are predominant	Structural measures are predominant
Flood experience		73.5% of businesses experienced floods in all three years	45.5% of businesses have not experienced floods in all three years
Willingness	41.7% of businesses were not willing		61% of businesses were highly willing
Insurance	26% of insured businesses are located here	13% of insured businesses are located here	61% of insured businesses are located here
Future flood likelihood	79.3% expressed fewer floods in future	29% expressed much worse floods in future	
Perceived effectiveness	Very positive about clearing drainage; Majority of them expressed planting grass as ineffective	Very positive about rebuilding/raising the floor; Relatively positive about relocation	
Perceived self-efficacy		Majority of them expressed relocation as easily self-implementable measure	
Perceived response costs	Majority of them expressed planting grass as a very low cost measure		
Looked for flood information	Majority did not look for flood information	Majority did not look for flood information	Majority did not look for flood information
Receiving flood information	Majority received flood related information	Majority received flood related information	Majority received flood-related information
Local flood assistance		Major proportion of businesses that received flood assistance are located here	

The table shows the findings of each variable that are unique or common among the three case study areas.

7.2. Discussion

The results of this research indicate that the findings of existing literature based on formal businesses in a developed world context cannot be completely transferred to a developing world context such as Kampala with high levels of informality. Among the different variables analysed, the results of threat appraisal, flood induced financial impact, and willingness to spend on mitigation measures support the findings of existing literature while the results of tenure status, business age, and flood experience contradict the findings of existing literature. The results of the variable business size both support and contradict the findings of existing literature. The way the influence of coping appraisal on mitigation behaviour is analysed in the existing literature is different from how it is done in this research.

In terms of business size, micro-enterprises were more likely to implement mitigation measures compared to small enterprises contradicting the studies of Crichton, (2006) in the United Kingdom and Dahlhamer & D'Souza, (1995) in two states of USA but supporting the studies of Kreibich et al., (2007) in Germany. A possible reason identified behind such relation is the fact that more than half of the small businesses have mitigation measures already in place, which highlights the importance of time element in such studies and the possible reason why there are mixed results in the literature. The businesses that rent their premises were more likely to implement mitigation measures compared to those that own contradicting the studies of Dahlhamer & D'Souza, (1995) in two states of the USA.

The mean age of businesses that implemented mitigation measures is less than those of businesses that did not implement contradicting the studies of Dahlhamer & D'Souza, (1995). One plausible reason for such observation is almost 50% of micro-enterprises are relatively new (age less than four years) compared to small businesses (23%). As small businesses already have mitigation measures in place and many of the micro-enterprises might be implementing mitigation measures for the first time, the mean age of businesses was observed less in those that implemented mitigation measures compared to those that did not.

Flood experience is not significantly correlated to the mitigation behaviour contradicting the studies of Bubeck et al., (2012) and Dahlhamer & D'Souza, (1995). Among the three variables analysed to study the influence of flood impacts on mitigation behaviour, only flood induced financial impact results support the hypotheses and studies of Alesch et al., (2001) in the United States. The financial impacts were significant enough to show a change in mitigation behaviour unlike property damage and health issues, but it is important to note that most of the financial impacts include costs incurred due to hospital bills and property/goods damages.

The businesses that are more willing to spend on mitigation measures are more likely to actually implement mitigation measures supporting the hypotheses and the studies of Crichton, (2006) in the UK. Businesses with high threat appraisal (future flood likelihood) are more likely to implement mitigation measure supporting the studies of Bubeck et al., (2012) and Dahlhamer & D'Souza, (1995). The results of coping appraisal both support and contradict the hypotheses and studies of Bubeck et al., (2012) and Bubeck et al., (2013). The influence of coping appraisal elements was not consistent across all mitigation measures, and not all were significant contributors to the models predicting the mitigation behaviour. Analysing all the nine mitigation measures separately showed that the influence of each measure was different by bringing much deeper analysis compared to the existing literature where all the responses of coping appraisal elements are aggregated to form an index.

Reflection on the proposed conceptual framework

As discussed in section 3.3, two sets of elements that are relevant to businesses are added as an extension to the original PMT framework based on the existing literature (businesses element & governance element). Among the businesses element, the variables that had a significant influence on flood mitigation behaviour are business size, tenure status, business age, willingness, and flood induced financial impacts. Among the governance element, no variables had a significant influence on flood mitigation behaviour, but risk communication had a significant influence on the type of mitigation measures implemented by businesses.

Though the influence of business type on mitigation behaviour is not significant, the results where majority of the accommodation and food service businesses implementing mitigation measures is in line with the studies of Dahlhamer & D'Souza, (1995). Though flood experience had a significant influence on flood mitigation behaviour in the existing literature (Bubeck et al., 2012; Dahlhamer & D'Souza, 1995), the results of this research showed it is not always true and particularly not in the selected three neighbourhoods of

Kampala. The influence of flood experience on mitigation behaviour can also differ when we consider more or less than three years to calculate businesses flood experience, unlike this study.

The two variables of flood impacts that are used in this research without any literature support are flood induced property damage and health problems These two variables did not have any significant influence on mitigation behaviour, but they helped in identifying the type of property damages faced by businesses of different types and the wide range of health issues businesses faced due to floods.

Though the literature suggested a significant influence of insurance on mitigation behaviour (Crichton, 2006), it could not be tested in this research as very few businesses had insurance and the information regarding whether or not they cover flood-related losses, their availability across different business sizes and case study areas and their cost is not available.

Though the variables of risk communication are not observed in literature and did not had a significant influence on mitigation behaviour, they highlighted the low information-seeking behaviour among businesses and the different sources of information dissemination among them. The influence of local flood assistance (Terpstra, 2011) cannot be tested in this research as very few businesses received it.

Therefore, it can be concluded most of the extended version's elements made a significant contribution in understanding the flood mitigation behaviour of businesses with a few exceptions like insurance, risk communication, and local assistance. So, if the proposed conceptual framework has to be revised based on the findings, the extended version variables I would consider would be as follows:

- Business characteristics:
    - Business size
    - Tenure status
    - Age of business
- Flood experience and impacts:
    - Past flood experience
    - Past flood impacts
- Risk attitude:
    - Willingness to spend on mitigation measures

Reflection on the survey data collection

The idea behind collecting data for three years for a few variables (section 3.4.) was to study the change in perception and other variables among businesses and to know how it influenced the mitigation behaviour. But, the issues that I observed in the data that prevented such analysis are most variables like business size, tenure status, insurance, flood assistance, future flood likelihood etc. are collected only for one year, i.e., for 2017 as the data is collected in that year. There was no information if these variables changed over the period 2015-2017 as it is a possibility that cannot be ruled out. The responses of coping appraisal variables for all nine mitigation measures were almost similar. The three possible explanations for such observation could be collecting data for three years at once i.e. in 2017 introduced bias in the data, the time frame is too small to see a difference, and the coping appraisal of all nine mitigation measures did not change in all three years. So, the analysis is geared towards analysing the information that is relevant for the year 2017 and made more sense to consider the information collected, particularly for the year 2017, to have uniformity in the data and to avoid possible bias.

Therefore, I believe the data collection method where the respondents are asked to give information for the previous year's for the questions that capture information regarding perceptions, risk attitudes, and

characteristics is not appropriate. Collecting information separately for individual years could benefit more for the research that focuses on understanding the change in perception or mitigation behaviour over the years though it requires more resources and manpower.

7.3. Recommendations

Awareness and information dissemination

Local authorities, including community leaders, NGO's and CBO's should play an active role in awareness building educating businesses about the risk of future floods and the impact it could cause to their businesses. It may be lead to more companies adopting mitigation measures as it has been observed that businesses that think there is a high potential for flood risk in the future are more likely to implement mitigation measures.

Local community members, NGO's and CBO's should also be more involved in disseminating the flood-related information before and during a flood event since there are still more than 40% of businesses that have not received flood-related information in 2017 in the three case study areas of Kampala. Especially the region-specific (e.g., Bwaise) leaders and authorities should find more efficient ways to communicate flood-related information throughout their region and make every effort to ensure that the information reaches everyone.

Knowledge of the relatively low cost non-structural measures should be enhanced among businesses as only 21% of businesses have adopted non-structural measures, and only one-third of businesses have expressed them as very effective. Given their financial constraints, it could benefit micro-enterprises more than small enterprises.

Local assistance and financial aid

The KCCA's local flood assistance where they help businesses in cleaning the drainage system should be provided more in the Bwaise and Natete informal settlements, as most of them are micro-enterprises, unlike Ntinda and generally lack resources and finances to withstand flood impacts.

The local government should take the necessary steps to provide a range of insurance options for all types of businesses that cover flood-related losses, as we see that there are only 8.2% of businesses that have insurance in the selected three case study areas of Kampala.

The government should introduce schemes targeting the relatively new businesses where it provides local flood assistance, information regarding various structural and non-structural measures, and financial aid for the first four or five years to help them in overcoming flood impacts and preventing them from permanently shutting down.

Businesses should be made aware of the health problems that floodwater might cause, such as malaria, cholera, typhoid, foot infections, skin diseases, and the government should provide free to low-cost medicine and health care for those suffering from flood induced health problems.

7.4. Limitations of the study

The results of this research are specific to the businesses in the selected three neighbourhoods of Kampala, Uganda, where the floods are frequent but not life threatening. Therefore, it is a possibility that the determinants of flood mitigation behaviour can be different in places where floods are life threatening and should be cautious while adapting the conclusions and results of this research. It is also important to note that the results of this research are based on the data collected in 2017 and should be aware that all the findings of this research might not hold true in 2020.

7.5. Areas for further research

The extended version of the PMT framework, which is proposed in this research, can be used as a reference framework to guide studies focused on analysing flood mitigation behaviour among businesses, particularly in a developing world context. However, it should be tested in a broader context covering both informal settlements and affluent neighbourhoods as well as more global south countries to test its applicability.

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ANNEX - 1

Supplementary material

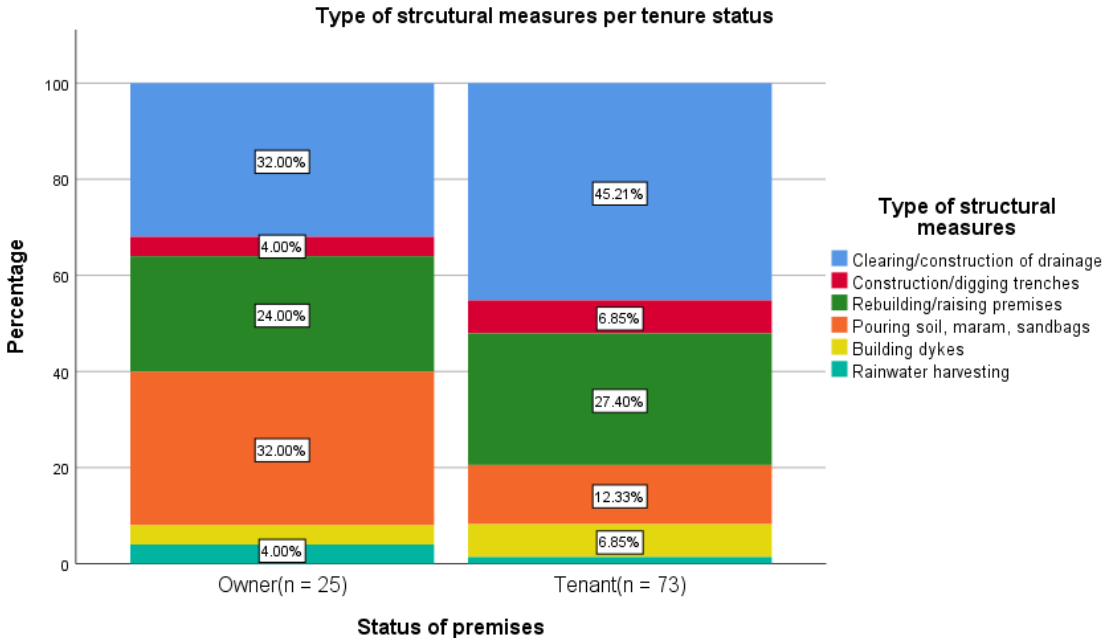

Figure.1: Percentage of each type of structural measures per tenure status

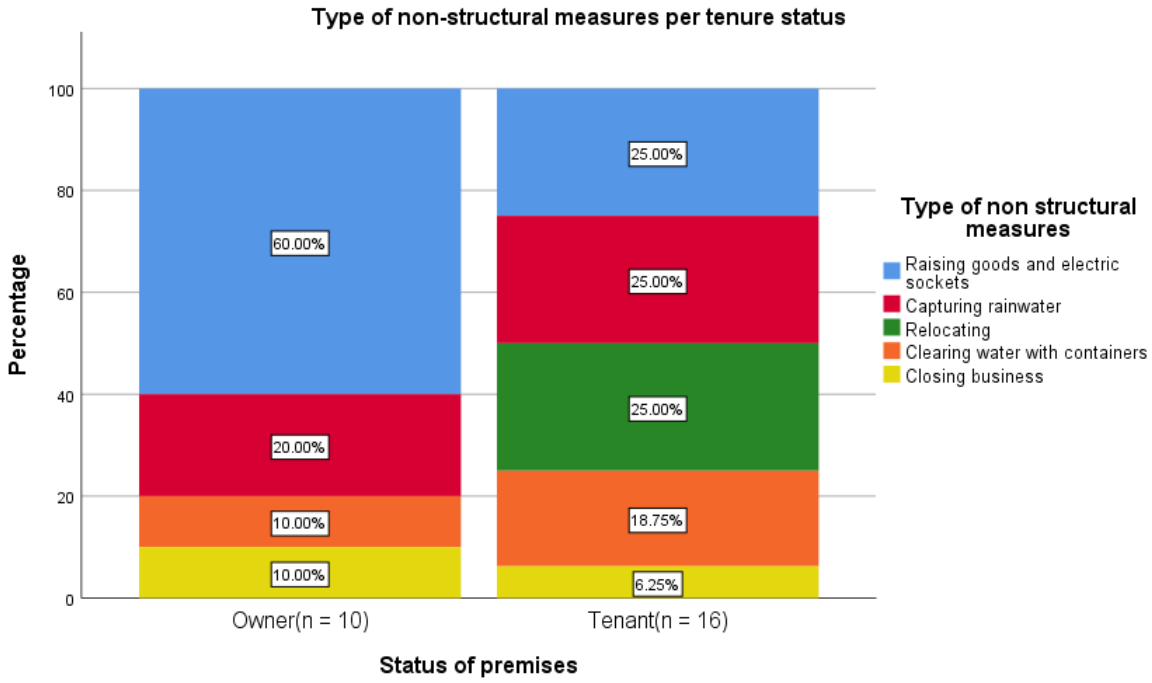

Figure.2: Percentage of each type of non-structural measures per tenure status

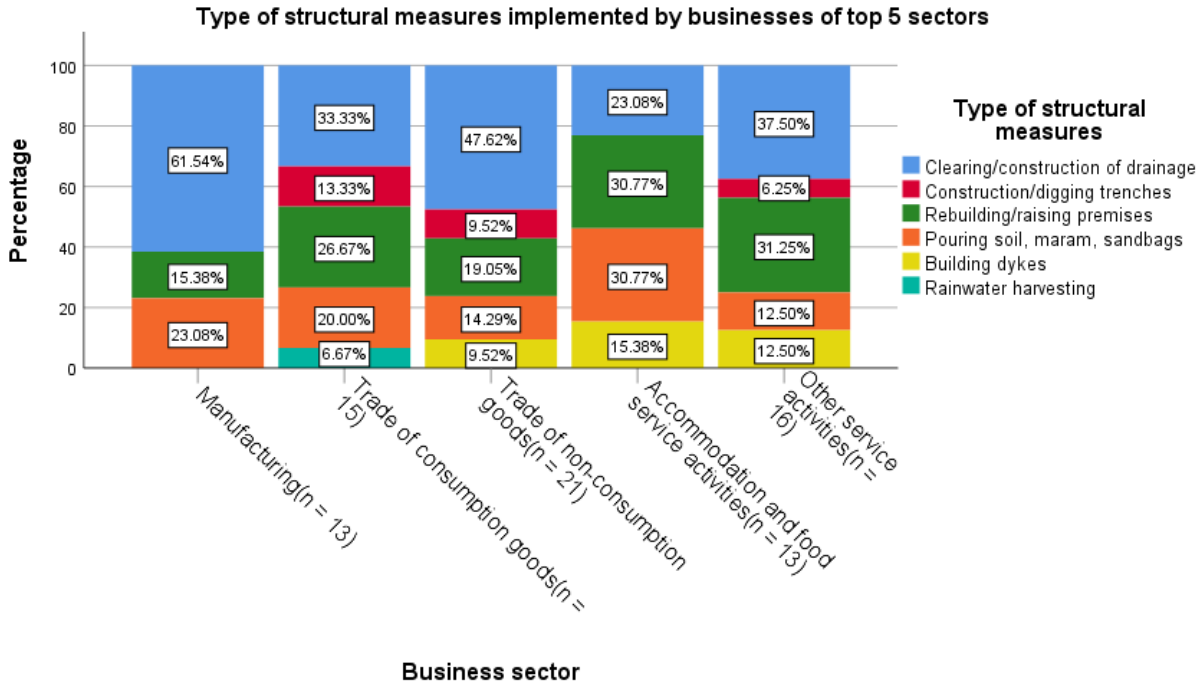

Figure.3: Percentage of each type of structural measures per top five sectors

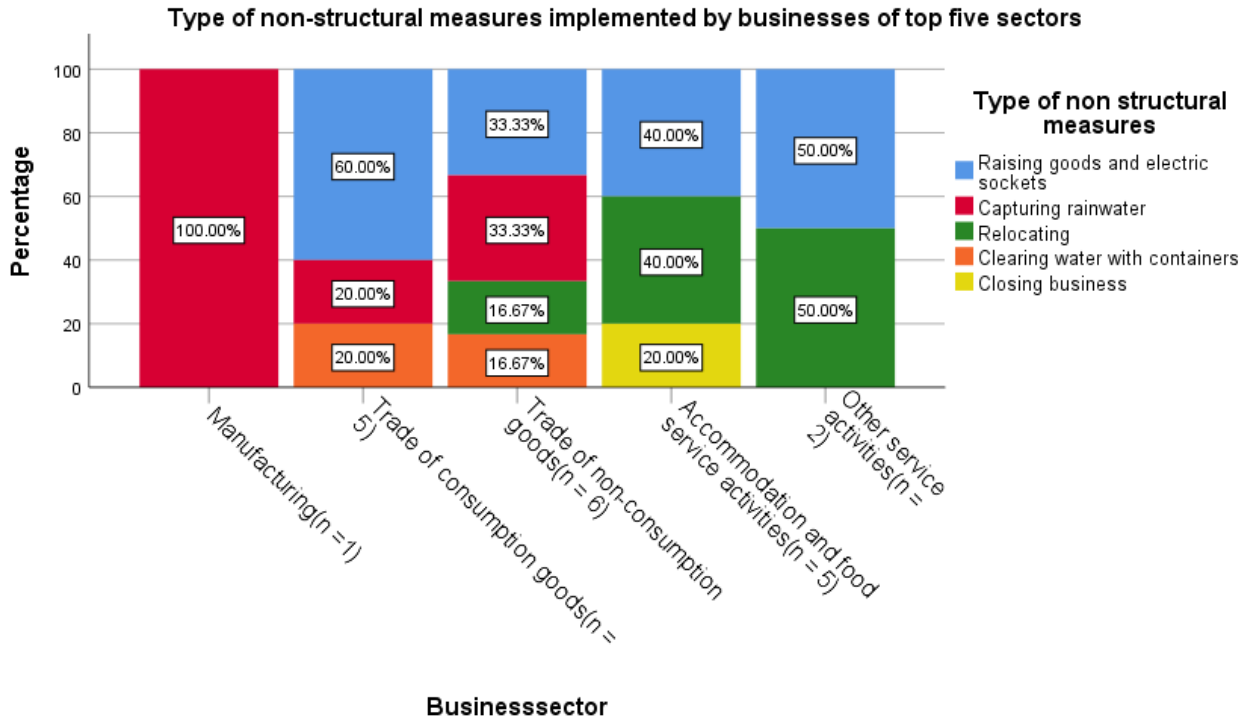

Figure.4: Percentage of each type of non-structural measure per top five sectors

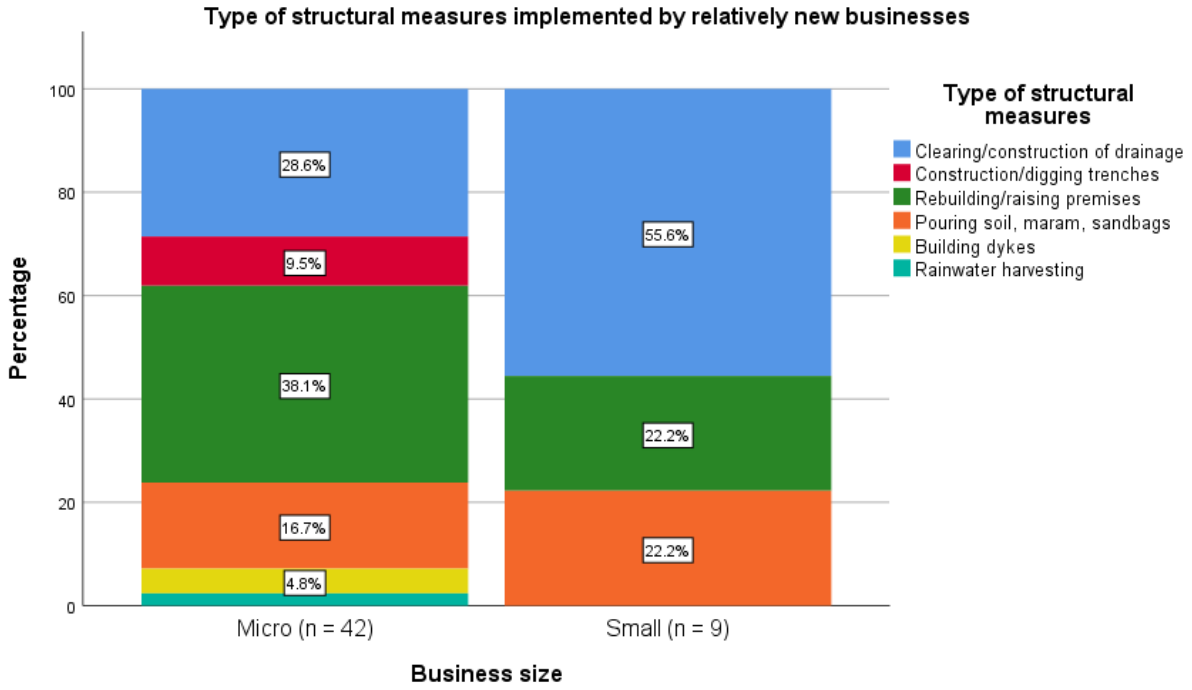

Figure.5: Percentage of structural measures implemented by relatively new businesses

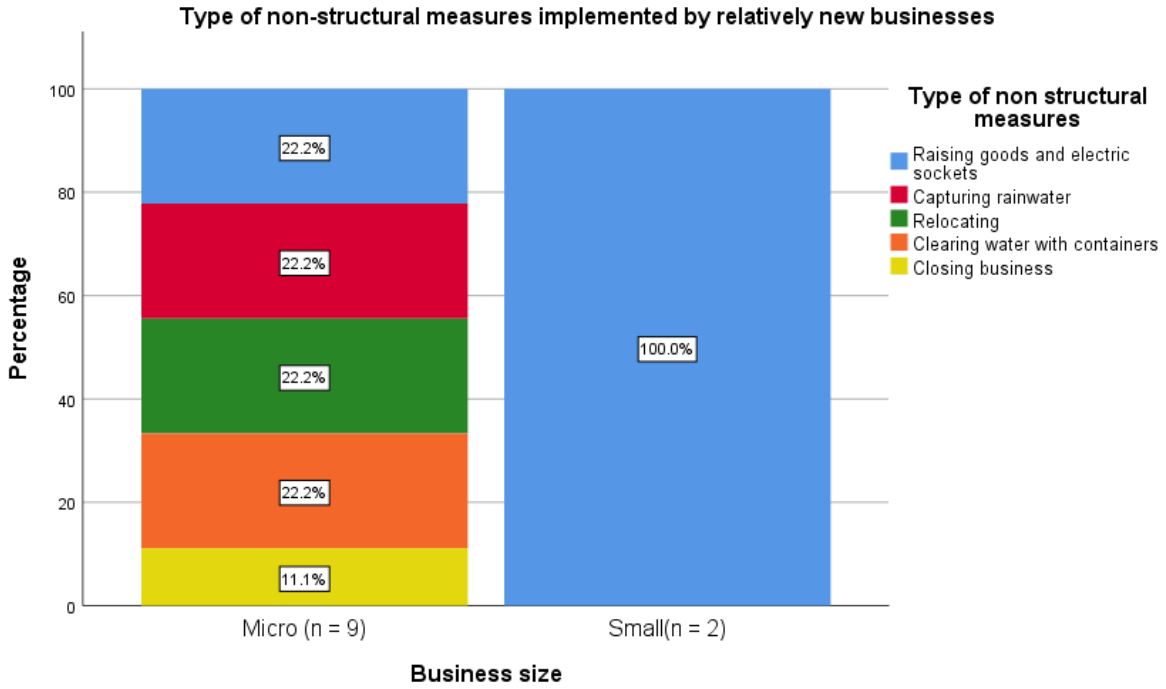

Figure.6: Percentage of non-structural measures implemented by relatively new businesses

Table.1: Binary logistic regression model summary of future flood probability against mitigation behaviour

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Future flood perception			13.84	2	0.00			
Future flood perception(1)	0.98	0.39	6.26	1	0.01	2.65	1.24	5.69
Future flood perception(2)	1.31	0.40	10.75	1	0.00	3.71	1.70	8.14
Constant	-0.24	0.20	1.57	1	0.21	0.78		

The coding of the categories is as follows: Reference: Fewer ; 1: About the same; 2: Much worse

Table.2: Binary logistic regression model summary of perceived response efficacy against mitigation behaviour

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
RE of raising sockets			6.69	3	0.08			
RE of raising sockets(1)	-0.06	1.05	0.00	1	0.95	0.94	0.12	7.30
RE of raising sockets(2)	-1.89	0.84	5.06	1	0.02	0.15	0.03	0.78
RE of raising sockets(3)	-1.45	0.83	3.06	1	0.08	0.23	0.05	1.19
RE of capturing rainwater			4.52	3	0.21			
RE of capturing rainwater(1)	0.52	0.75	0.50	1	0.48	1.69	0.39	7.27
RE of capturing rainwater(2)	-1.35	0.86	2.46	1	0.12	0.26	0.05	1.40
RE of capturing rainwater(3)	-0.29	0.82	0.13	1	0.72	0.75	0.15	3.74
RE of relocation			1.97	3	0.58			
RE of relocation(1)	-1.14	0.94	1.48	1	0.22	0.32	0.05	2.01
RE of relocation(2)	0.02	0.88	0.00	1	0.98	1.02	0.18	5.73
RE of relocation(3)	-0.04	0.74	0.00	1	0.96	0.97	0.23	4.15
RE of raising goods			4.36	3	0.23			
RE of raising goods(1)	-2.16	1.43	2.27	1	0.13	0.12	0.01	1.91
RE of raising goods(2)	-0.12	0.98	0.02	1	0.90	0.89	0.13	6.06
RE of raising goods(3)	-0.70	0.85	0.67	1	0.41	0.50	0.09	2.65
RE of rebuilding/raising floor			1.16	3	0.76			
RE of rebuilding/raising floor(1)	1.40	2.12	0.43	1	0.51	4.05	0.06	260.10
RE of rebuilding/raising floor(2)	1.81	1.70	1.13	1	0.29	6.12	0.22	171.58
RE of rebuilding/raising floor(3)	1.24	1.50	0.69	1	0.41	3.46	0.18	65.15
RE of building small dyke			2.59	3	0.46			
RE of building small dyke(1)	-1.12	0.89	1.59	1	0.21	0.33	0.06	1.87
RE of building small dyke(2)	-1.04	1.01	1.05	1	0.31	0.36	0.05	2.59
RE of building small dyke(3)	-0.13	1.03	0.02	1	0.90	0.88	0.12	6.61
RE of putting sandbags			8.90	3	0.03			
RE of putting sandbags(1)	0.15	0.75	0.04	1	0.84	1.17	0.27	5.11
RE of putting sandbags(2)	-0.03	0.92	0.00	1	0.97	0.97	0.16	5.90
RE of putting sandbags(3)	2.02	0.78	6.67	1	0.01	7.51	1.63	34.70
RE of putting grass			0.09	3	0.99			
RE of putting grass(1)	0.17	0.76	0.05	1	0.82	1.19	0.27	5.25
RE of putting grass(2)	-0.10	0.82	0.01	1	0.91	0.91	0.18	4.50
RE of putting grass(3)	-0.02	0.96	0.00	1	0.98	0.98	0.15	6.36
RE of clearing drainage			0.29	3	0.96			
RE of clearing drainage(1)	-20.83	40192.86	0.00	1	1	0	0	.
RE of clearing drainage(2)	-20.19	40192.86	0.00	1	1	0	0	.
RE of clearing drainage(3)	-20.55	40192.86	0.00	1	1	0	0	.
Constant	20.95	40192.86	0.00	1	1	1.25E+09		

The coding of the categories is as follows: Reference: ineffective; 1: somewhat effective; 2: effective; 3: very effective

Table.3: Binary logistic regression model summary of perceived self-efficacy against mitigation behaviour

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
SE of raising sockets			2.84	3	0.42			
SE of raising sockets(1)	-1.34	0.81	2.76	1	0.10	0.26	0.05	1.27
SE of raising sockets(2)	-0.55	0.63	0.76	1	0.38	0.58	0.17	1.98
SE of raising sockets(3)	-0.24	0.53	0.21	1	0.65	0.78	0.28	2.23
SE of capturing rainwater			2.38	3	0.50			
SE of capturing rainwater(1)	0.61	0.66	0.84	1	0.36	1.84	0.50	6.72
SE of capturing rainwater(2)	-0.54	0.64	0.71	1	0.40	0.58	0.17	2.05
SE of capturing rainwater(3)	0.02	0.48	0.00	1	0.96	1.02	0.40	2.64
SE of relocation			2.18	3	0.54			
SE of relocation(1)	0.41	0.93	0.19	1	0.66	1.51	0.24	9.33
SE of relocation(2)	0.35	0.66	0.28	1	0.60	1.42	0.39	5.18
SE of relocation(3)	0.80	0.55	2.10	1	0.15	2.22	0.76	6.50
SE of raising goods			0.76	3	0.86			
SE of raising goods(1)	-0.08	0.85	0.01	1	0.92	0.92	0.17	4.89
SE of raising goods(2)	-0.39	0.62	0.40	1	0.53	0.68	0.20	2.27
SE of raising goods(3)	-0.40	0.54	0.55	1	0.46	0.67	0.24	1.93
SE of rebuilding/raising floor			2.94	2	0.23			
SE of rebuilding/raising floor(1)	1.59	0.93	2.93	1	0.09	4.92	0.79	30.48
SE of rebuilding/raising floor(2)	0.44	0.60	0.55	1	0.46	1.55	0.48	4.99
SE of building small dyke			1.23	3	0.75			
SE of building small dyke(1)	-0.24	0.79	0.09	1	0.76	0.79	0.17	3.70
SE of building small dyke(2)	-0.45	0.66	0.46	1	0.50	0.64	0.18	2.31
SE of building small dyke(3)	0.18	0.56	0.10	1	0.75	1.19	0.40	3.56
SE of putting sandbags			12.51	3	0.01			
SE of putting sandbags(1)	-0.20	0.78	0.07	1	0.80	0.82	0.18	3.73
SE of putting sandbags(2)	-0.42	0.56	0.56	1	0.45	0.66	0.22	1.98
SE of putting sandbags(3)	1.36	0.51	7.14	1	0.01	3.88	1.44	10.50
SE of putting grass			15.41	3	0.00			
SE of putting grass(1)	1.04	0.79	1.71	1	0.19	2.82	0.60	13.32
SE of putting grass(2)	-2.13	0.69	9.46	1	0.00	0.12	0.03	0.46
SE of putting grass(3)	-1.90	0.72	6.97	1	0.01	0.15	0.04	0.61
SE of clearing drainage			12.33	3	0.01			
SE of clearing drainage(1)	0.86	1.33	0.42	1	0.52	2.35	0.18	31.58
SE of clearing drainage(2)	-1.39	0.66	4.36	1	0.04	0.25	0.07	0.92
SE of clearing drainage(3)	0.39	0.53	0.54	1	0.46	1.48	0.52	4.20
Constant	0.16	0.52	0.09	1	0.76	1.17		

The coding of the categories is as follows: Reference: not able; 1: a bit able; 2: able; 3: highly able

Table.4: Binary logistic regression model summary of perceived response costs against mitigation behaviour

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
RC of raising sockets			4.67	3	0.20			
RC of raising sockets(1)	-0.89	0.69	1.70	1	0.19	0.41	0.11	1.57
RC of raising sockets(2)	-0.71	0.71	1.02	1	0.31	0.49	0.12	1.96
RC of raising sockets(3)	-1.41	0.67	4.43	1	0.04	0.25	0.07	0.91
RC of capturing rainwater			3.10	3	0.38			
RC of capturing rainwater(1)	0.35	0.48	0.53	1	0.47	1.42	0.55	3.64
RC of capturing rainwater(2)	-0.08	0.66	0.01	1	0.91	0.93	0.26	3.37
RC of capturing rainwater(3)	-0.83	0.65	1.65	1	0.20	0.44	0.12	1.55
RC of relocation			16.73	3	0.00			
RC of relocation(1)	-1.08	0.84	1.67	1	0.20	0.34	0.07	1.75
RC of relocation(2)	-2.60	0.83	9.84	1	0.00	0.07	0.02	0.38
RC of relocation(3)	-0.37	0.67	0.30	1	0.58	0.69	0.19	2.58
RC of raising goods			7.07	3	0.07			
RC of raising goods(1)	-0.88	0.71	1.53	1	0.22	0.41	0.10	1.68
RC of raising goods(2)	0.46	0.67	0.47	1	0.49	1.58	0.43	5.84
RC of raising goods(3)	-0.52	0.60	0.75	1	0.39	0.59	0.18	1.93
RC of rebuilding/raising floor			6.56	3	0.09			
RC of rebuilding/raising floor(1)	4.54	1.82	6.23	1	0.01	93.47	2.65	3301.81
RC of rebuilding/raising floor(2)	3.31	1.47	5.10	1	0.02	27.50	1.55	488.84
RC of rebuilding/raising floor(3)	3.19	1.40	5.16	1	0.02	24.20	1.55	378.10
RC of building small dyke			3.42	3	0.33			
RC of building small dyke(1)	-0.82	0.71	1.32	1	0.25	0.44	0.11	1.79
RC of building small dyke(2)	-0.96	0.73	1.73	1	0.19	0.38	0.09	1.60
RC of building small dyke(3)	-0.03	0.71	0.00	1	0.96	0.97	0.24	3.89
RC of putting sandbags			7.94	3	0.05			
RC of putting sandbags(1)	0.24	0.54	0.20	1	0.65	1.27	0.45	3.64
RC of putting sandbags(2)	0.84	0.63	1.75	1	0.19	2.31	0.67	7.99
RC of putting sandbags(3)	1.54	0.59	6.83	1	0.01	4.68	1.47	14.86
RC of putting grass			4.49	3	0.21			
RC of putting grass(1)	0.23	0.49	0.22	1	0.64	1.26	0.49	3.25
RC of putting grass(2)	-0.20	0.55	0.13	1	0.72	0.82	0.28	2.42
RC of putting grass(3)	-1.22	0.66	3.45	1	0.06	0.30	0.08	1.07
RC of clearing drainage			4.52	3	0.21			
RC of clearing drainage(1)	-2.27	1.11	4.20	1	0.04	0.10	0.01	0.91
RC of clearing drainage(2)	-1.69	0.91	3.42	1	0.07	0.19	0.03	1.11
RC of clearing drainage(3)	-1.40	0.89	2.49	1	0.12	0.25	0.04	1.41
Constant	0.57	1.53	0.14	1	0.71	1.78		

The coding of the categories is as follows: Reference: very low; 1: low; 2: high; 3: very high

ANNEX - 2

As per the ISIC Rev.4, the businesses which are classified into 15 categories are as follows:

Major categories	Different businesses
Agriculture, forestry, and fishing	Animal feeds
	Chicken farming
	Farmer
	Poultry
Manufacturing	Mattress industry
	Sayona business
	UNEB printery
	Lake bounty
	Steel cutting
	Plastic industry
	Industry, SWT Tanner
	Tailoring
	Kawacom Coffee manufacturing
	City Tires
	Chips making
	Grain millers
	Box making industry
	Carpentry
	Pot making
	Maize miller
	Still and tube industry
	Furniture shop
	Making of rafcasting machines
	Welding shop
	Shoemaking
	MK Hides and skins company
Electricity, gas, steam and air conditioning supply	Filling station
	Solar lights
	Petrol station
	Juli International gas production
Construction	Construction business
	Medallion company
	Concrete designing
Wholesale and retail trade of consumption goods	Wholesale
	Vendor
	Supermarket
	Grocery
	Pork business
	Produce shop
	Tomato vendor
	Potato selling
	Retail
Wholesale and retail trade of non-consumption goods	Shop
	Garage
	Mechanics
	Chata motors
	Shumik group of companies
	Hardware

	Clothing shop
	Charcoal selling
	Merchandise
	Stationery shop
	Mattress seller
	Motor spare parts
	Stockist
	Sand seller
	Timber business
	Electronics
Transportation and storage	DHL Global forwarding
Accommodation and food service activities	Samosa vendor
	Hostel
	Food selling
	Kiosk
	Apartments
	Chapati
	Restaurant
	Bar
	Pancake & Cassava takeaway
	Banana selling
	Informal restaurant
	Bakery
	Lodge
	Drinks
	Popcorn shop
	Guesthouse
	Local beer
	Secret Inn lodge
Financial and insurance activities	Mobile money
	Financing institution
Real estate activities	Dealers, brokers, and management
	Housing and Estates company
Professional, scientific and technical activities	Engineering company
	Consultants
Public administration and defence, compulsory social security	Security services
Education	School
	Day care
	College
	St James school
Human health and social work activities	Health centre
	Clinic
	Vet drug shop
	Pharmacy
	Herbalist
Arts, entertainment and recreation	Talking films production
	Church
	Video library
Other service activities	Cosmetics
	Saloon
	Hairdressing
	Furniture repair
	Laundry company
	Shoe repair

	Boutique
	Driving school

ANNEX – 3 (SAMPLE QUESTIONNAIRE)

QUESTIONNAIRE

Section A – Profile of Businesses

Location of business: _____X_____Y Type of business _____ Value of stock _____

1. Gender: ☐ Male ☐ Female

2. When was your company established: ☐ Years Position _____

3. Staff establishment: ☐ People

4. a. For how long has your business been using these premises? ☐ Years b. Size of premises _____

5. What is/was the yearly net income for your business during the years indicated in the table?

1 = 0 – 40,000 UGX **2** = 40,001 – 80,000 UGX **3** = 80,001 – 120,000 UGX **4** = 120,001 – 160,000UGX
5 = 160,001 – 200,000 UGX **6** = 200,001 – 240,000 UGX **7** = 240,001 – 280,000 UGX
8 = 280,001 – 320,000 UGX **9** = 320,001 – 360,000 UGX **10** = 360,001 and above

	2015	2016	2017
Income level	1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○

6. a. What is your profit margin? ……..…b. Value of movable stock (eg. Assets and goods for sale) ……

7. How much do you expect to earn next year? Please tick in the appropriate box below

More ☐ Less ☐

8. What is the status of your premises?

☐ Owner
☐ Tenant
☐ Usufruct

If you are not renting your house, please skip question 11.

10. How much is your rent per month? ☐

11. What is the status of your land?

☐ Mailo (if you pay fees or taxes please indicate how much per year) ☐
☐ Leasehold (if leasehold, how much is rent price in UGX/year?) ☐
☐ Freehold (if you pay any fees or taxes please indicate how much per year) ☐

12. How many employees for your company stay in the following areas?

Bwaise III ……..
Other areas of Kawempe division …….
Ntinda ……
Other areas of Nakawa division ……
Natete ……..
Other areas of Rubaga ……..
Other, please specify ……

13. How are your operations affected by the flooding:
a) on your premises
……
b) of your employees
……

Section B – Impact of floods on the businesses

14. a. Did you experience flooding on these premises or away from your property during the following years?

2015	2016	2017
Yes ○ No ○	Yes ○ No ○	Yes ○ No ○

b. Were you surprised? Yes ○ No ○

If you did not experience flooding please go to question 19

15. Please explain the extent (per year) of the flooding in the space provided below (Nature, level & duration)
2015
……
2016
……
2017
……

16. Did your business suffer the following because of flooding, in the indicated years?

	2015	2016	2017
Property damage	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
Health problems	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
Financial costs	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○

If you did not suffer any of the above please skip the explanation part.

Explanation
Property damage
……..
Health problems
……..
Financial costs
……..

Section C – Flood assistance and future flood perception

17. Do you think that floods in the future will be: Fewer ☐ About the same ☐ Much worse ☐

18. a. Did you get any assistance to help you cope with flooding? Yes ☐ No ☐

If you did not get any assistance related to flooding, please go to question 19

b. Please fill in the indicated information about the assistance

……

Type of assistance	Year received	Source	Benefits
a			
b			
c			

Section D – Mitigation measures & coping appraisal elements (perceived efficacy, self-efficacy & response costs)

19. Mention any specific flood damage mitigation measure that you implemented.

Mitigation measure	Year

If you did not do anything, why not? Please indicate your answer in the space below:

……

20. Which other damage mitigation measures, if any, does your company intend to implement?

…….....

21. How do you rate your situation relating to financial resources required to implement the following measures during the indicated years against your overall view of cost of mitigation measures? Please indicate your answer by ticking in the appropriate circle, where 1 represents None, 2 represents very less, 3 represents little, 4 represents more.

Mitigation measure	Year/rating 2015	2016	2017
Rebuilding/ Raising floor of the premises	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Building small dykes	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Putting sand bags to protect the yard	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Putting grass on your yard	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Putting electric sockets higher	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Capture rainwater to reduce runoff	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○

Clearing the drainage	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Moving your business from these premises	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Putting goods On higher places	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○

22. Do you consider the following measures to be effective ways to reduce flood impact? Please indicate your answer in the appropriate circles where 1 indicates ineffective and 4 indicates very effective. 5 represents 'do not know'

Mitigation measure	Year/rating 2015	2016	2017
Rebuilding/ Raising floor of the premises	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
Building small dykes	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
Putting sand bags to protect the yard	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
Putting grass on your yard	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
Putting electric sockets higher	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
Capture rainwater to reduce runoff	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
Clearing the drainage	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○

Moving your business from these premises	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○
Putting goods On higher places	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○	1 ○ 2 ○ 3 ○ 4 ○ 5 ○

23. How do you perceive the time requirements for implementing these measures? Please fill in the appropriate circles where 1 represents very low and 4 represents very high.

Mitigation measure	Year/rating 2015	2016	2017
Rebuilding/ Raising floor of the premises	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Building small dykes	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Putting sand bags to protect the yard	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Putting grass on your yard	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Putting electric sockets higher	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Capture rainwater to reduce runoff	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Clearing the drainage	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Moving your business from these premises	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○
Putting goods On higher places	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○

Section E – Willingness

24. How willing was your company / business to spend resources in order to protect these premises against flooding during the following years? Please indicate your answer in the appropriate circles where 1 represents unwilling and 4 represents highly willing.

Year	2015	2016	2017
Willingness to spend on mitigation	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○	1 ○ 2 ○ 3 ○ 4 ○

Section F – Organizations help and flood information

25. Please state the organizations with which your company / business associates with, type of association and when the association began?

Organization	Type of association	Year association began

26. What kind of help, if any, do these organisations provide to your company / business

a. Before flooding?

……

b. During flooding?

……

c. after flooding?

……

27. Did your company / business do any of the following in the respective years?

	2015	2016	2017
Looked for flood related information	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
Received flood related information	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○
Received an incentive to implement flood damage mitigation measures	Yes ○ No ○	Yes ○ No ○	Yes ○ No ○

If you did not receive any incentive please skip the next question.

28. Please explain the type of incentive you got in the space provided below:

Type?

……

From whom?

……

How useful?

……

Question about mitigation and social networks

29. From which sources do you obtain information about flooding?

……

30. If your employees are affected by flooding, does that affect your business?

……

31. Do you give the following benefits for your employees:

a. Emergency loan

……

b. Housing

……

c. Others (please specify)

……

32. Do you have insurance for your business against flooding?

……

33. Do you know any business which stopped because of flooding? If yes please list below:

……

END