Barriers to flood risk adaptation: A case study of cross-scale collaboration in the informal settlement of Graveyard Pond, Philippi

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Plagiarism Statement

"I know the meaning of plagiarism and declare that all of the work in the document, save for that which is properly acknowledged, is my own."

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Abstract

There is a growing concern over the increase in extreme events expected as part of climate change. Good governance is a critical component of managing current climate risk that can help to adapt to future impacts of climate change. Understanding current governance is critical in urban areas where local government plays a key role in providing infrastructure to reduce the vulnerability of low-income populations. However, there is a gap in the literature regarding how cross-scale collaboration, particularly the relationship between non-governmental and governmental actors, affects adaptation.

In Cape Town, South Africa the vulnerability of informal settlements to flooding is a growing concern due to their location in low-lying areas and wetlands. Using a single case study approach, the barriers to adaptation to flooding were examined and identified, with a focus on cross-scale collaboration, in an informal settlement in a detention pond. In order to understand cross-scale collaboration in this context, a nodal governance framework is used to analyze how actors at the community, intermediary, and government level interact and respond to flooding in informal settlements. The analysis shows that the community level is lacking the resources and technologies to adapt to flooding and there is a disconnect between the community level and the local government level, despite the existence of ward councillors. The nodal governance and barriers framework showed that the challenges actors face in adapting to flooding in Graveyard Pond relate to the different mentalities of the actors around flooding and in turn this affects how flooding is responded to. Additionally, the current flood management plan of the City of Cape Town leaves Graveyard Pond in an endless loop of disaster response and coping mechanisms that have not reduced the vulnerability of residents in the long-term. It is apparent from the data that there is a lack of cross-scale collaboration around responses to flooding in informal settlements. Though cross-scale collaboration comes with challenges, it is clear that this disconnect is acting as a barrier to adaptation to flooding in Graveyard Pond and needs to be explored further. This study provides insight into the barriers of adapting to urban flooding as well as how flooding is responded to in informal settlements in order to increase adaptive capacity to future climate change.

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Acronyms:

ACC	African Centre for Cities
CCT	City of Cape Town
DRM	Disaster Risk Management
FLiCCR	Flooding in the Context of Climate Risk
FTT	Flood Task Team
GP	Graveyard Pond
IPCC	Intergovernmental Panel on Climate Change
IS	Informal Settlements
NEG	New Environmental Governance
NGO	Nongovernmental Organization
SA	South Africa
UCT	University of Cape Town
UNDP	United Nations Development Programme

Chapter 1: Introduction

1.1 Background of the Study

There is a growing body of literature surrounding the severity of climate change and the need for action (McCarthy, 2001). According to the Intergovernmental Panel on Climate Change, temperature increases and regional climate changes have already begun to affect physical and biological systems (McCarthy, 2001). Adaptation efforts are therefore becoming important to protecting livelihoods (O'Brien et al., 2006). Within the growing literature on the theory of adaptation, there has been a shift to understanding what adaptation entails and how to plan for adaptation (McGray et al., 2007; Tompkins et al., 2010). McGray et al. (2007) summarized the literature on adaptation by framing adaptation into a continuum of approaches ranging from those that address drivers of vulnerability, to those that build response capacity, those that manage climate risk, and lastly those that directly confront climate change. This case study will focus on adaptation in the context of managing current climate risk in order to build capacity to manage long term climate risks (McGray et al., 2007).

Adaptation in informal settlements is vital because of the increased vulnerability of these areas to extreme weather events such as flooding (Douglas et al., 2008). Vulnerability, for the purpose of this dissertation, can be defined as "how susceptible a system is to adverse effects of climate change and the lack of ability to cope or adapt" (McCarthy, 2001: 6). Vulnerability and levels of risk in urban areas are often associated with low-income populations due to greater exposure to risk and limited capacity to adapt (Satterthwaite, 2011). Informal settlements in South Africa are particularly vulnerable because of lack of resources, high unemployment, poverty, and hazardous living environments (Douglas et al., 2008). Moreover, a large proportion of people are living in these types of settlements, specifically in Cape Town. As of 2007, there were approximately 109,000 families living in informal settlements in the city. (City of Cape Town, 2008).

An important component of adaptation research relevant to this thesis involves understanding the limits and barriers to adaptation. This evolving body of literature centers on what prevents or slows adaptation progress, as well as what frameworks can be used to identify barriers (Moser and Ekstrom, 2010; Adger, 2008). Though there is a growing body of literature regarding why certain barriers exists and ways to identify barriers in specific contexts, there is a lack of literature regarding how informal and formal structures that exist in society affect adaptation (Inderberg and Eikeland, 2009). These structures include regulatory factors, values, norms and cognitive limits that influence choice and behavior (Inderberg and Eikeland, 2009). These structures are important because in many urban areas with vulnerable populations, such as Cape Town, there is a complex relationship between institutions such as local government and leaders at the local level. This relationship needs to be addressed in order for a preventative adaptation plan to be implemented. In addition, the vulnerability of low-income populations is often linked to local governance because basic infrastructure and services dramatically reduce risk to environmental hazards (Satterthwaite, 2011). The collaboration between these different levels of City and local actors can present both an opportunity and a barrier.

Cross-scale collaboration is an important concept of governance especially in informal settlements because of the role local government plays in upgrading and maintaining these settlements. Cross-scale collaboration, according to Berkes (2001) refers to linking institutions across levels and space (described further in section 2.2.3). Strengthening cross-scale collaboration in informal settlements could allow for different voices to be heard in order to develop responses that are appropriate at the local level. Cape Town's high proportion of informal settlement residents coupled with the lack of infrastructure and service provision provides a suitable case study for addressing how cross-scale collaboration affects adaptation.

1.2 Statement of the Problem

In Cape Town particularly, flooding has had an extreme effect on informal settlements. The City of Cape Town conducted a study in three informal settlements that found that 83% of the residents had been affected by flooding (City of Cape Town, 2005). According to the City of Cape Town Framework for Adaptation to Climate Change (2006: 44), "Response strategies need to be broadened to include adaptation strategies, which reduce the need for emergency response and anticipate projected climatic change". Though disaster response and flood management are part of the activities of the City of Cape Town, many informal settlements are still vulnerable to flooding. The City of Cape Town has attempted to reduce flooding in informal settlements but has been unsuccessful as a result of challenging biophysical conditions, of people living in low lying areas and limited housing options, accompanied by institutional and governance constraints within the City (Ziervogel and Smit, 2009). More specifically, the current institutional focus is on narrow technical solutions and disaster relief, which have not been sufficient to reduce flood risk (Ziervogel and Smit, 2009). Therefore, in order to plan for the future, it is important to assess what prevents or slows adaptation to flooding in informal settlements as well as the role governance plays in creating opportunities and barriers to adapting to flooding.

Managing service delivery and safety in informal settlements is a challenge in Cape Town and throughout the country (Huchzermeyer and Karam, 2006). The Constitution of South Africa (1996), specifically section 27(2), contains the right to free basic services for all citizens and places the responsibility for delivering these services in the hands of local municipalities. Therefore, informal settlements receive attention from local government regarding water and sanitation, health care, and disaster relief. Because of the lack of infrastructure to withstand weather events and the low lying areas where informal settlements are found, flooding devastates informal settlements every winter. Flood response is therefore a growing concern within the local municipalities. One way in which the City of Cape Town has tried to address flooding is through the formation of the Winter Readiness Program, which is managed by the Flood Task Team. The Flood Task Team is a collaboration of different local government departments such as Disaster

Risk Management, Informal Settlements, Anti-Land Invasion, Roads and Stormwater, Environmental Health, and Water and Sanitation. These departments come together to prioritize and respond to high-risk areas affected by flooding.

Although there is a growing body of literature that addresses barriers to adaptation, there has been minimal research on areas with informal settlements. Government intervention is particularly difficult in informal settlements because they are unplanned and often illegal (Huchzermeyer and Karam, 2006). Though the City of Cape Town does have a Flood Task Team and is involved in assisting with daily adaptation activities, a proactive adaptation plan that reduces these occurrences long term has not been integrated. This research focuses on cross-scale collaboration, as one aspect of flood risk governance that can create barriers and opportunities for adapting to flooding in Graveyard Pond. Therefore, this research intends to provide insight into current cross-scale collaboration, or lack thereof, from different actors' perspectives including informal settlement leaders, ward councillors, and government representatives in order to understand the role cross-scale collaboration plays in adaptation to flooding.

1.3 Aim and Objectives of the Study

This case study seeks to understand the current flood risk management approach in the informal settlement Graveyard Pond, Phillippi and identify how actors collaborate to address flooding in these high-risk areas.

The aim of this research is to identify the barriers to adaptation to flooding and investigate the potential for strengthening cross-scale collaboration to better adapt to flooding in Graveyard Pond, an informal settlement in a detention pond in Philippi.

The specific objectives of the study are to:

- Examine the different actors that have responded to an informal settlement being located in a detention pond using a nodal governance framework
- Explore the responses to flooding at various scales and the implications of these responses, with a focus on the community level

- Identify the barriers to adaptation to flood risk in Graveyard Pond, Philippi
- Assess the potential for how an understanding of cross-scale collaboration can contribute to strengthening adaptation to flood risk

1.4 Context of the Study Within a Larger Project

This study is associated with a larger project being undertaken by the African Centre for Cities at the University of Cape Town and the Stockholm Environmental Institute entitled "*The power of collaborative governance: Managing the risks associated with flooding and sea-level rise in the City of Cape Town*". The aim of the project is to increase climate risk preparedness within the City of Cape Town through strengthening partnerships between civil society and government.

1.5 Organization of the Thesis

This research is organized into seven chapters. The second chapter assesses the literature on important concepts of the study including adaptive capacity, vulnerability, urban adaptation, adaptation to flooding, and flood risk management. Nodal governance and the barriers to adaptation framework are explained in detail in this chapter.

The third chapter explains the methods used and describes the single in-depth case study. It expands on the context of the case study, flood management in informal settlements, and also addresses the ethics of the study.

The fourth chapter presents the first set of results. The actors and their role in flooding are described using nodal governance. Following this, the chapter addresses how flooding is viewed and responded to by various actors within the study as well as how these actors collaborate.

The fifth chapter uses the barriers to adaptation framework and concepts of governance to define and examine the barriers that arose from the given data. These barriers and how they affect flood management planning in informal settlements are analyzed.

The conclusions are presented in the final chapter, which summarizes the findings and the relevance of these findings within the field of adaptation and flood risk management. Future research topics that would enhance the findings of this case study are also suggested.

Chapter 2: Literature Review and Theoretical Framework

2.1 Definitions and Concepts

Before describing the theoretical framework, it is important to define various terms and concepts found throughout the adaptation and governance literature.

2.1.1 Adaptation, Vulnerability, and Adaptive Capacity

Adaptation can be defined in a variety of ways, therefore it is important to clarify which definitions are more appropriate to this research that is situated in the climate change field. Originally, the term adaptation was associated with the Darwinian theory of evolution and natural selection (Schipper and Burton, 2008). The concept of studying human responses to change was practiced under the term 'human adjustment' coined by Gilbert White (1945). The United Nations Framework Convention on Climate Change coined the term adaptation in 1992 to be associated with how humans will need to adjust to future changes in climate (Schipper and Burton, 2008). Smit and Wandel (2006: 282) specifically describe adaptation in this social context of climate change stating that it is "a process, action or outcome in a system (household, community, group, sector, region, country) in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard, risk or opportunity". This definition is most relevant to the theoretical framework of this thesis because it looks at adaptation holistically.

When discussing adaptation, other concepts such as vulnerability, resilience, and adaptive capacity arise throughout the literature. Vulnerability does not have one definitive explanation, but rather refers to different concepts in varying systems. However, the bulk of the literature in environmental change, defines vulnerability as how susceptible a system is to adverse effects of environmental change and the lack of ability to cope or adapt (McCarthy, 2001; Adger, 2006). According to Wisner et al. (2004), the root causes of vulnerability are limited access to power, structures and resources combined with ideologies of the political and economic system. However, vulnerability increases due to pressures such as lack of local institutions, rapid population change, and urbanization.

Living in dangerous locations as well as unprotected buildings and infrastructure exacerbates vulnerability (Wisner et alet al., 2004). When combined with a hazard, such as flooding, these unsafe conditions could lead to a disaster. In this context, the concept of adaptation is best described by McGray et al. (2007) who frame adaptation as a continuum of approaches including addressing drivers of vulnerability, building response capacity, managing climate risk, and confronting climate change. Managing climate risk, according to McGray et al. (2007) involves focusing on hazards and impacts, and includes many disaster-response planning activities such as building institutions, launching planning processes, raising awareness, promoting technology change, establishing early warning systems, empowering people, promoting policy change, and improving infrastructure.

Ekstrom (2011) presented a model based on a review of the literature regarding short-term versus long-term strategies when adapting to climate change.

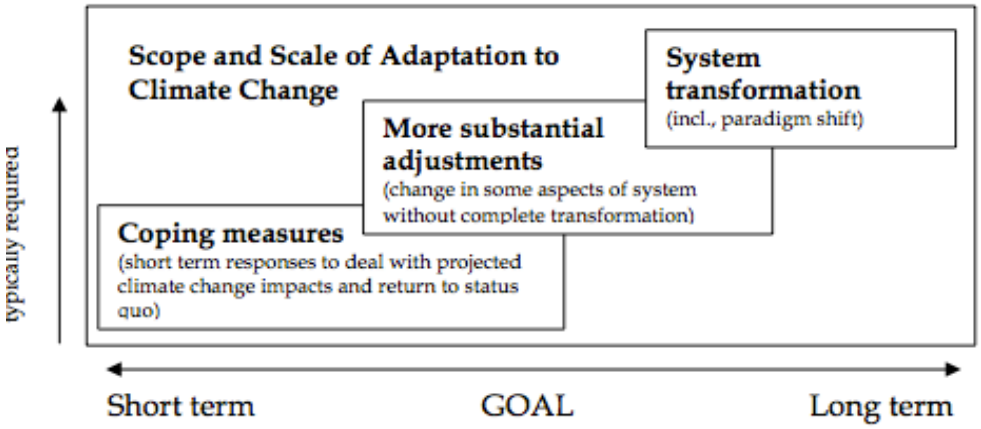

Figure 2.1: Scope and Scale of Adaptation to Climate Change [Source: Ekstrom (2011: 9). Barriers Framework Report.]

This figure explains short term coping measures compared to the long-term transformation needed to reduce vulnerability, which this thesis will investigate in an informal settlement in Cape Town.

The notion of social vulnerability also arises in the literature. Adger et al. (2003) explain that vulnerability not only depends on the ecological system (available resources) but also

on the human system. This concept of social vulnerability helps to provide context to the framework of this dissertation. Brooks et al. (2005) examine how developmental factors such as poverty, economic disparity, and governance form the basis for plans to reduce vulnerability. Brooks et al. (2005) stress the importance of governance, civil and political rights and literacy as indicators of adaptive capacity. These concepts provide the backbone of this thesis by identifying the importance of governance and rights as well as how these influence adaptive capacity.

Adaptive capacity, a key parameter of vulnerability, refers to the ability of a system to adjust to changes in climate (McCarthy et al., 2001; Adger, 2006; Leary et al., 2008). Satterthwaite et al. (2007) describe the elements of adaptive capacity as knowledge, institutional capacity, and financial and technological resources. When looking at the adaptive capacity of communities, it is expected that low-income populations generally have lower adaptive capacity compared to high-income populations (Satterthwaite et al., 2007). Though income can often be associated with lower adaptive capacity, income is not the only determinant of adaptive capacity. Governments also have a range in their adaptive capacities because of resources, information, infrastructure, and governance systems (Satterthwaite et al., 2007).

According to Inderberg and Eikeland (2007), when assessing institutional restraints, limited capacity to learn and capacity to act are the main constraints of adaptive capacity. In addition, the changes in institutional management of natural resources affect adaptive capacity (Brockhaus and Kambiré, 2009). All of these constraints relate directly to the indicators of vulnerability previously mentioned. These concepts are important to understanding the issue of flooding holistically. By assessing adaptive capacity, the limits and barriers of adaptation can be identified, which as a result could benefit adaptation planning in the future.

2.1.2 Urban Adaptation

The vulnerability of urban populations has not been given adequate consideration in adaptation to climate change (Satterthwaite et al., 2007; Birkmann et al., 2010). Focusing

on adaptation planning in urban areas is important because of the high population of these areas, lack of infrastructure, rapid growth and expansion, which add to their vulnerability and instability (Birkmann et al., 2010). Most of the focus of the National Adaptation Programs for Actions (NAPAs) is on rural area initiatives and do not consider how urban planning and governance must be modified (Birkmann et al., 2010). Most of the urban areas that face highest risk are small contributors to the anthropogenic causes of climate change, yet they have constraints on the ability to adapt (Satterthwaite et al., 2007).

Low and middle-income nations have an advantage in that they have not fully urbanized and can therefore plan for anticipated risks caused by climate change (Satterthwaite et al., 2007). According to Satterthwaite et al. (2007: 2) "when problems concerning urban areas' adaptation to climate change are considered, independent of current conditions and government structures, it is easy to conceive of a long-term process of support and funding for adaptation". This quote parallels the previously mentioned literature on adaptation by Inderberg and Eikeland (2009) regarding institutional factors as the ultimate constraint. Implementation of adaptation is a challenge due to the lack of capacity of urban governments and the antagonistic relationship between urban governments and most low-income groups (Satterthwaite et al., 2007). Satterthwaite et al. (2007) suggest that government can reduce risk by providing infrastructure, influencing development, regulating construction and hazardous activities, influencing land availability, and encouraging community action. These are a few suggestions for how governments can improve adaptive capacity and become more involved in adaptation. Therefore, both federal and local government play a large role in influencing adaptation in urban areas. However, government is not the sole actor managing risk in urban areas. As a result, the concept of governance has arisen because of the recognition of the roles of nonstate actors as well as state actors and how they interact in the governing process (Betsill and Bulkeley, 2006). This case study will speak to the literature on urban adaptation and governance since the focus of the research is on urban flooding.

2.1.3 Flood Risk Management

Since flooding is the environmental issue being addressed in this study, flood risk management is a relevant and significant concept that needs to be defined. Flooding, flood risk, and flood risk management are all important concepts to understand when addressing adaptation to flooding. Flooding can be defined as "a temporary covering of land by water outside its normal confines" (Schanze, 2006: 2). This dissertation will focus on how actors themselves, as well as relevant policies, define flooding. The "probability of the occurrence of potentially damaging flood events" is called flood hazard (Schanze, 2006: 2). Flood hazard depends on vulnerability that Schanze (2006) distinguishes in three basic areas including social and cultural, economic, and ecological. This research will focus mainly on the social drivers of vulnerability to flooding.

Flood risk refers to "the probability of negative consequences due to floods and depends on the exposure of elements at risk to a flood hazard" (Schanze, 2006: 3). The focus of this research will be on flood risk management. Flood risk management refers to a holistic approach aimed at reducing flood risk (Schanze, 2006: 4). According to Schanze (2006), three modes are defined within the management process: pre-flood mode, event management mode, and post-flood mode. Pre-flood mode aims for the reduction of flood risks long term. Event management is "influenced by the nature of the flood event" whereas the post-flood mode is "dedicated to recovery and avoidance of further negative consequences" (Schanze, 2006: 5). The process of flood risk management includes decision-making and development by actors in various fields (Schanze, 2006). Flood management is an important concept to understand when exploring how the City of Cape Town responds to flooding.

2.1.3.1 Flood Risk Management in Cape Town

The need for climate change adaptation planning and strengthened governance for populations in informal settlements has been highlighted in the literature (Ziervogel and Smit, 2009; Satterthwaite, 2011). Populations living in settlements that lack infrastructure as well as those living in poor-quality housing are particularly vulnerable to climate shocks (Satterthwaite et al., 2007). According to the 2001 Census figures, the

total population living in informal settlements in South Africa was approximately 3,560,383 out of 44,819,776 in 2001. (United Nations, 2004). In 2007, there were over 250 informal settlements in Cape Town (City of Cape Town, 2007). This high percentage of the population living in informal settlements indicates the need for better service delivery and informal settlement upgrading (Wekesa et al., 2010). Better service delivery and upgrading requires collaboration between local government and community leaders (Wekesa et al., 2010). Service delivery and settlement upgrading helps decrease the vulnerability of populations to flooding by securing structures, making sure existing drainage is sufficient, and keeping the drains unclogged. Therefore, adaptation planning and collaborative governance is needed to address the vulnerability of these populations to flooding in the context of climate change.

Ziervogel and Smit (2009) examine how governance affects flooding responses in informal settlements in Cape Town. In this case, informal settlements are experiencing high levels of flooding and will continue to do so as extremes from climate change become more frequent alongside people settling on flood-prone land linked to increasing in-migration. Therefore, there is pressure on the government to reduce the impacts of flooding. Lack of resources, institutional limitations, and governance constraints were identified as key factors limiting effective action from being taken. The paper by Ziervogel and Smit (2009) points to the importance of building capacity of actors within the context of climate change which this dissertation will seek to contribute to. While adaptation responses in these areas have been researched, not enough focus has been given to what prevents long term solutions in the areas where adaptation is needed the most.

2.2 Theoretical Framework

Since this case study seeks to understand how different actors collaborate to alleviate flooding and identify the barriers to flooding, the theoretical framework of this thesis includes the concepts of governance and cross-scale collaboration, nodal governance theory and Moser and Ekstrom's (2010) framework for identifying barriers to adaptation.

2.2.1 Governance and Cross-Scale Collaboration

Governance can broadly be defined as the "intentional shaping of the flow of events so as to realize desired public goods" (Holley et al., 2012: 6). According to Betsill and Bulkeley (2006: 144), governance involves "processes through which collective goals are defined and pursued in which the state (or government) is not necessarily the only or most important actor." Governance is a concept that has been around since Thomas Hobbes, in 1651, who defined 'good governance' as "rule by a single sovereign who represents the people" (Holley et al., 2012: 1). However, more recently there has been a shift to understanding governance as collaboration between actors including private, public and non-governmental actors. One application of the concept of governance is 'New Environmental Governance' (NEG), which explores the effectiveness of this type of governance in relation to managing environmental resources (Holley et al., 2012). NEG stems from the concept of collaborative governance. Collaborative governance can be defined as "a governing arrangement where one or more public agencies directly engages stakeholders in a collective decision-making process that is formal, consensus oriented, and deliberative and that aims to make or implement public policy, or manage public programs or assets" (Ansell and Gash, 2007: 544). These concepts are important to this research because the aim of the case study is to understand how different actors interact to respond to flooding in Graveyard Pond.

The concept of what 'good' governance consists of is debated in the literature. However, many theorists agree that the attributes of 'good' governance are participation, collaboration, representation, deliberation, accountability, empowerment, social justice, and organizational features such as being multilayered and polycentric (Lebel et al., 2006; Holley et al., 2012). The fundamental question in the literature on NEG is "whether, when, and how effective collaboration can be achieved" (Holley et al., 2012: 10). This thesis will explore if collaboration occurs when managing flooding, and how that affects adaptation.

One of the key characteristics of collaborative governance, and of most relevance to this dissertation, is cross-scale collaboration. For the purpose of this research, cross-scale

collaboration refers to "linking institutions both horizontally (across space) and vertically (across levels of organization)" (Berkes, 2002: 293). Betsill and Bulkeley (2006) highlight that governance involves recognizing the complex interactions between state and non-state actors. The issue of cross-scale collaboration is complex because of the interdependency of agents, institutions, and resources (Adger, 2003). Satterthwaite (2011) explains that accountable and capable governments that understand how to incorporate adaptation measures into aspects of their work are the key to adaptation. In addition, the development role of local government is to support households and enhance their capabilities, especially in areas with informal settlements (Satterthwaite, 2011). Though cross-scale collaboration is not addressed directly in the article, Satterthwaite (2011) emphasizes the importance of local government, and the interaction of government with other non-state actors, in adaptation planning.

Of significant importance to this case study is the urban context. In order for adaptive urban governance to be successful, Birkmann et al. (2010) propose that more flexible governance structures must be promoted, multiple time scales must be considered, and various scales integrated. Though these suggestions would help improve adaptation planning, they are easier said than done in areas where government is divided or lacks resources. Therefore, more information on the specific complexities preventing government from implementing adaptation is needed. In order to understand how flooding is governed, a theory such as nodal governance that allows for the inclusion of all actors, even nongovernmental actors, is imperative.

2.2.2 Nodal Governance Theory

Nodal governance theory involves a shift away from the 'state centered' governance concept (Burris et al., 2004). Instead, nodal governance considers how to govern a complex system by explaining how "actors operating within a social system interact along networks to govern the systems they inhabit" (Burris et al., 2004: 5). Nodal governance provides a way to analyze the various actors, their mentalities around flooding, the resources they have access to and how they interact with other actors. This

theory was chosen for this research because managing flooding in informal settlements is complex and involves a variety of actors in order to respond to flooding.

According to Burris et al. (2004), 'mentalities' in this context refer to the ways of thinking about the issues that need to be governed. Technologies are methods for exerting influence over the course of events of the issue. Resources support the operation and exertion of influence of the node (Burris et al., 2004; Shearing and Johnston, 2010). Resources are important because they affect the influence a node has. A node also needs a structure or institutional form. These institutional arrangements can be loosely structured and do not have to be formally recognized. Institutional forms are the structures that "enable the directed mobilization of resources, mentalities, and technologies over time" (Burris et al., 2004). Looking at these nodes and characteristics of each node allows for empirical 'mapping' of the system being examined. Though nodal governance has mostly been used for police systems (Shearing, 2005; Shearing and Johnston, 2010), it will provide a framework for examining how actors in this case study interact and collaborate around flooding, in order to provide insight into the current collaboration of actors including non-governmental actors. The theory of nodal governance takes into account the complexity of the situation, which in the case of flooding in Graveyard Pond, will allow for a more holistic analysis of flood management.

Though the main focus of analysis will be on identifying barriers to adaptation, the concept of nodal governance provides a framework for looking at different actors and how they interact around the issue of flooding. The concept of nodal governance will be used to describe the nodes, how they connect to other nodes, and the resources utilized by each node. Additionally, concepts of 'good governance' will be analyzed to look at whether these characteristics are present within the current governance structure of flood management in Graveyard Pond.

2.2.3 Defining Limits and Barriers to Adaptation

According to the IPCC (2007), limits are conditions that cause adaptation to be ineffective. Limits, in this context then, tend to be absolute (Moser and Ekstrom, 2010). Obstacles that can be overcome with effort, prioritizing, resource shifts, and creative management are referred to as barriers (Moser and Ekstrom, 2010). These definitions are most relevant to the way in which these terms will be used in this report. However, "many seeming limits, especially social ones, are in fact malleable barriers; they can be overcome with sufficient political will, social support, resources, and effort" (Moser and Ekstrom, 2010: 10). In the proposed case study, the barriers to adaptation are explained in the context of informal settlements in Cape Town. The focus of this research is on barriers to adaptation rather than limits, because it is not previously defined whether the obstacles to adapting to flooding in the case study site can be overcome with concerted effort.

After defining the concepts of limits and barriers to adaptation, it is also important to understand how these concepts are referred to in the literature. Inderberg and Eikeland (2009) argue that even with technological, financial, and human resources, climate change adaptation could still be hindered by institutional factors. Therefore, much of the recent focus of the literature is on social and organizational constraints and will also form the focus on this dissertation.

2.2.4 Framework for Identifying Barriers

This case study uses a framework developed by Moser and Ekstrom (2010) to diagnose barriers to climate change adaptation. This framework was designed to be "(i) socially focused but ecologically constrained; (ii) actor-centric but context-aware; (iii) process-focused but action/outcome-oriented; and (iv) iterative and messy but linear for convenience" (Moser and Ekstrom, 2010: 2). This framework was chosen because it provides an approach to identifying and organizing barriers at various stages in the adaptation process. Additionally, it recognizes the complexity of adaptation and the adaptability required throughout the planning process. The framework considers "the actors, the larger context in which they act (not a static but often wide-ranging and

dynamic set over time), and the object upon which they act" (Moser and Ekstrom, 2010: 2).

2.2.4.1 Phases of Planning

The diagram below shows the phases and sub-processes throughout the adaptation process.

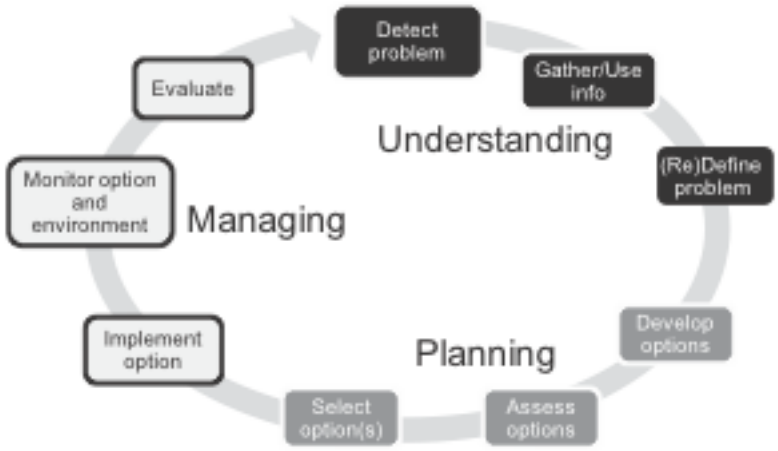

Figure 2.2: Adaptation Planning Cycle [Source: Moser and Ekstrom (2010: 2).]

The phases of planning outlined by Moser and Ekstrom (2010) include understanding, planning, and managing. Within each of these phases, there are several stages where barriers often can be found (Esktrom et al., 2011). These sub phases include problem detection and awareness raising, information gathering, problem definition, development of adaptation options, assessment of options, selection of options, implementation, monitoring, and evaluation (Moser and Ekstrom, 2010; Ekstrom et al., 2011). Planned adaptation can be a messy process but should have distinguishable phases (Ekstrom et al., 2011). According to Ekstrom et al. (2011: 14) this process allows for "systematic identification of potential barriers that may arise in different moments of the process". These phases are used to analyze the barriers of adaptation to flooding in this case study and are presented in section 5.2.

2.2.4.2 Scale

The framework identifies the scale of influence on the barrier as proximate/remote and contemporary/legacy. A proximate barrier, or "barrier within reach of the actor's sphere of influence", is easier to overcome than remote barriers, outside of the actor's control (Ekstrom et al., 2011: 54). Legacy barriers occur due to a decision made in the past while contemporary barriers arise and often interfere with the current process (Ekstrom et al., 2011).

2.2.4.3 Crosscutting Issues

Additionally, Moser and Ekstrom (2010) highlight the following common barriers: leadership, resources, communication and information, and values and beliefs. These barriers are "of repeated and cross-cutting importance" throughout the process (Moser and Ekstrom, 2010: 4). These crosscutting issues are further described and explained in section 5.3.

Though frameworks for adaptation to climate change have been developed for many cities, research is still needed on how these frameworks can be used to successfully address barriers of adaptation in urban areas. In a study on adaptation strategies, Birkmann et al. (2010) point out the need for additional studies on tipping points and limits to adaptation in urban adaptation plans. Governance structures and planning systems must change in addition to adjusting physical structures (Birkmann et al., 2010).

2.3 Conclusion

Adaptation, adaptive capacity, vulnerability, nodal governance, cross-scale collaboration and barriers to adaptation are all important concepts that are referred to throughout this thesis. The complexity of implementing adaptation plans in highly vulnerable areas is apparent through this review of the literature. The theoretical framework is based on Moster and Ekstrom's (2010) framework for diagnosing barriers to adaptation, since there are few cases in the literature where this framework has been applied. The second framework used for analysis in this research is the nodal governance theory that traditionally has been used in the criminology field. The gap in the literature that this

dissertation will seek to fill involves gathering more information regarding cross-scale collaboration in order to try and identify elements of effective and ineffective governance that are supporting or undermining adaptation in developing countries.

Chapter 3: Context and Methods

3.1 Context: Informal Settlements and Flooding

Informal settlements are historically and politically complex areas in South Africa. Informal settlements in the context of this case study refer to the unauthorized occupation of land by the urban poor. These settlements are usually overcrowded and often lack basic services, which contributes to the unhealthy living conditions of residents. According to Huchzermeyer and Karam (2006), there is a lack of understanding in policies and programs of the reality of informal settlements.

As mentioned previously in Chapter 1, the number of people living in informal settlements in Cape Town has increased. About 22% of households live in informal dwellings, and 58.2% of those households reside in informal settlements while the remaining portion are found in backyards (City of Cape Town, 2010). Due to these increasing informal areas, there is a backlog in infrastructure and free basic services. Additionally, the majority of townships are found in flood prone areas. According to Douglas et al. (2008: 191), human settlements can be affected by "localized flooding due to inadequate drainage, flooding from small streams whose catchment areas lie almost entirely within built-up areas, flooding from major rivers, and coastal flooding from the sea". Urbanization increases the magnitude of floods by creating impermeable surfaces (i.e. roads and roofs), increasing the speed of flood caused by networks of surface drains and sewers that deliver water more rapidly to the channel, and insufficient stormwater draining on the onset of development (Smith, 2001; Douglas et al., 2008). Flooding is an issue in informal settlements affecting not only structures but also the lifestyles of residents, specifically health. Therefore, managing flood risk has become a growing concern for the City of Cape Town.

In order to address flooding in informal settlements in Cape Town, the Flood Task Team was created in 2008 to encourage collaboration regarding flood management from various departments including Disaster Risk Management, Environmental Health,

Housing and Informal Settlements, Development Services, Roads and Stormwater, and Water and Sanitation (previously described in section 1.2). The Flood Task Team forms a list of priority areas and feasible interventions to reduce the vulnerability of these areas, in order to prevent flooding in these sensitive areas. Since the formation of the Flood Task Team, there has been a decrease in affected structures, however there are still areas where proactive measures are needed.

3.2 Case Study Site: Graveyard Pond

Graveyard Pond is an informal settlement located in a detention pond in Philippi, a township in the outskirts of Cape Town (see figure 3.1). A detention pond is a structure for catching stormwater. According to the Roads and Stormwater Department informant the primary purpose of a detention pond is to *"limit flooding of downstream properties"*. Detention ponds are used as a "*temporary storage for stormwater so that you don't need huge pipes low down the network because you're accommodating some of that flow on a temporary basis in that pond*". Since a detention pond is used to drain stormwater, it is not a suitable place for people to live. However, because of the continuous migration of people from rural areas, many of these public lands have been settled on. If the stormwater drains fill up due to a large amount of rainfall, extreme flooding will occur in the area. In 2009, an extreme amount of rainfall caused the stormwater drain to overflow, which affected the shacks on the bottom of the pond. Because people settled in the detention pond, they often experience various types of flooding (Drivdal, 2011; Msungu, 2012). The City of Cape Town also continues to manage this area because the land belongs to the city and they are responsible for maintaining the drains. Since the problem of flooding had already been established through previous research, this research could focus on how the government departments are responding to flooding in this area and identify the barriers preventing long-term adaptation.

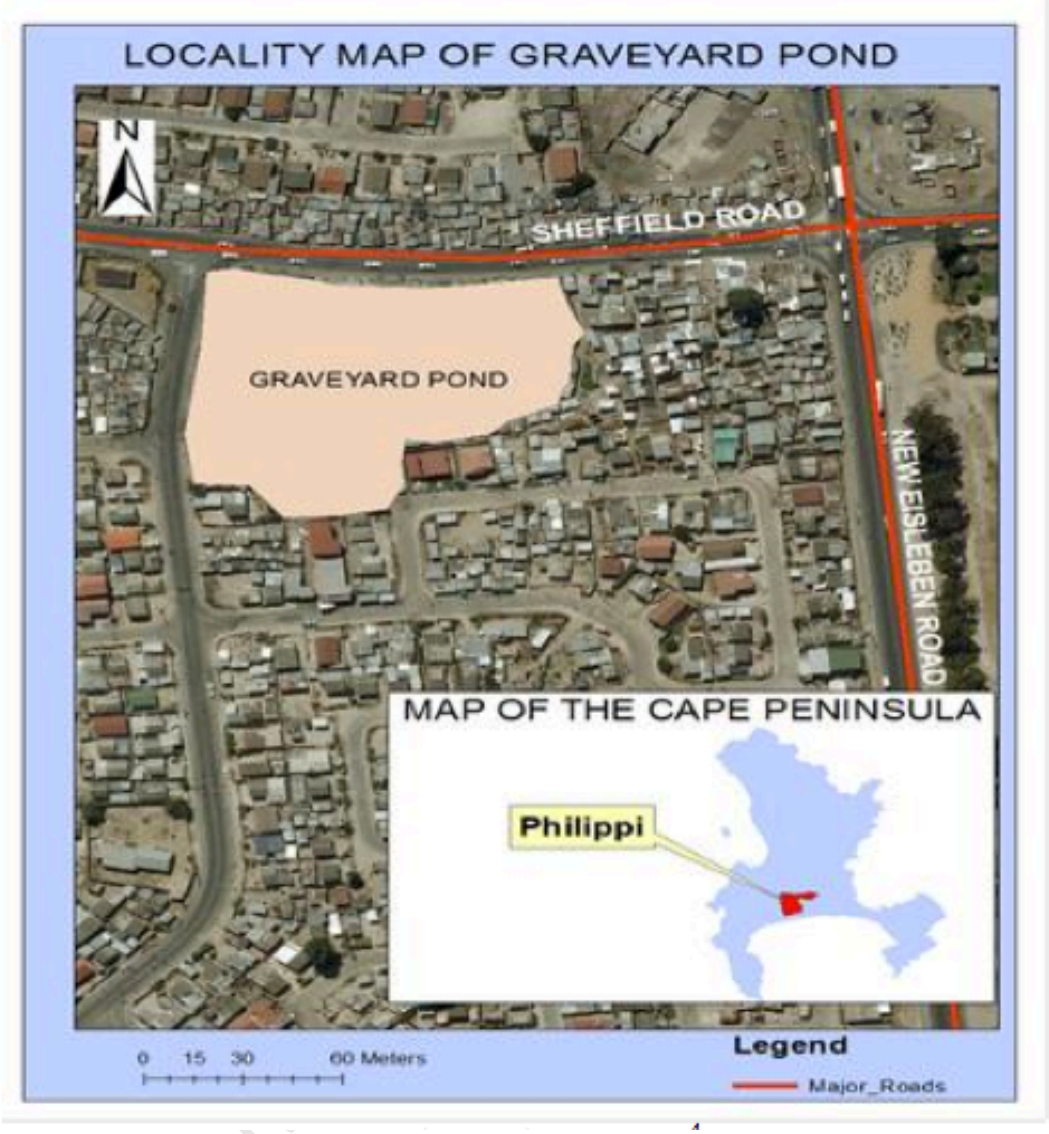

Figure 3.1 Map of Graveyard Pond. [Source: Drivdal, L. 2011. Unpublished Report.]

3.3 Single Case Study Design

This research used a single case study method in order to collect qualitative data that helped to answer the questions posed in the objectives. Case studies are used to understand and explain complex problems. A single case study method was chosen because it allows for an in-depth, qualitative understanding of the particular issue while maintaining the characteristics of real-life events (Yin, 2009). Therefore, this design was chosen in order to focus in-depth on the issue of flooding in an area that experiences flooding, but is not prioritized by the government.

3.4 Data Collection

Most of the data used to inform the research question came from primary data sources using qualitative methods. Because the primary focus of the research was on cross-scale collaboration, qualitative methods were the best way to gain an in-depth understanding. These methods include in-depth as well as casual interviews, document analysis, and participant observation.

Secondary data was used to understand the extent of flooding in the area. Secondary data was collected from reports done by the City of Cape Town as well as previous studies done in relation to the FLiCCR (Flooding in the Context of Climate Risk in Cape Town) project. The project provided data on the extent of flooding in Graveyard Pond as well as GIS maps of the case study site. Secondary data such as a map of informal settlements and stormwater infrastructure was collected from the Roads and Stormwater Department. The City of Cape Town and the Flood Task Team provided reports in order to inform the research. The data provided information such as the type of flooding experienced by residents in different parts of the detention pond.

3.4.1 Interviews

Because the aim was to understand how the different departments collaborate with local leaders, two community leaders and the ward councillor were interviewed. The community leaders were interviewed in order to understand their responsibilities, relationship with the ward councillors and government departments, and their knowledge of the detention pond. Information regarding the extent of flooding, how it is handled locally and what the government departments have told the leaders to do in case of emergencies was also collected during these interviews. This provided insight into how community leaders and residents respond to flooding in Graveyard Pond. Additionally, the ward councillor and government officials were interviewed regarding their mentalities around flooding, their interactions with each other, and how they respond to flooding in informal settlements and Graveyard Pond in particularly. Government departments that agreed to interviews include Disaster Risk Management, Environmental Health, and

Roads and Stormwater. The Sub-Council manager of Sub-Council 13 was interviewed to understand how wards and ward councillors are managed. For each of these departments, the administrator in charge of Ward 34, the area in which Graveyard Pond is located, participated in the interviews. Many of the interviews were relaxed and conversational, allowing respondents to communicate about the issues they feel are relevant in Graveyard Pond. Though they were guided by questions (which can be found in Appendix A), many of the respondents added information beyond the questions.

Interviews took place from November 2011 to February 2012. Interviews with the community leaders were held in their shacks in Phillippi, while interviews with the ward councillor and government departments were held in their respective offices. Interviews were conducted in English, however one of the community leaders only spoke Xhosa. In this case, a translator attended the interview in order to translate the questions and answers from Xhosa to English. Most of the interviews were recorded, however due to regulations one department was unable to agree to being recorded. In this case extensive notes were taken.

3.4.2 Observation

In addition to interviews, the ward councillor was observed in order to gain insight into their role within informal settlements. Observing the ward councillor involved sitting in her office for a morning while she addressed issues with people in the community. During this time she also answered questions and raised her concerns about flooding in Ward 34. To better understand how ward councillors are tasked with communicating with the City of Cape Town, a sub –council meeting was attended that included all ward councillors for Sub Councils 13 and 14. For this meeting notes were taken about the issues raised and the flow of communication between the ward councillors and the sub council manager. Following this the initial Flood Task Team Meeting was attended on March 27, 2012 in order to gain an understanding of how the municipal departments interact in this forum. This meeting had members from all of the departments previously mentioned as well as Housing, Informal Settlements, and Development Services. The meeting provided an understanding of what the departments report on before choosing

the priority list, which is described previously in this chapter. Observations were made regarding how the meetings are run, how the departments communicate in the meetings, and what departments are normally represented at the meetings. All of this information provided insight into how these departments interact, communicate, and plan for flood response.

3.5 Data Consolidation and Analysis

After completing the interviews, the interviews were transcribed and a case study database was compiled. The interviews were then analyzed by highlighting key themes that arose from the data. Two different frameworks were used to further analyze the data. Firstly, the nodal governance framework was used to evaluate the mentalities, resources, institutional structure and technologies of actors to understand how they interact and communicate around flooding in informal settlements, particularly Graveyard Pond. Secondly, a framework for identifying barriers to adaptation was used to assess the barriers to adaptation in the case study site. The data were then used to create a map of the actors and the barriers preventing the actors from addressing the issue of flooding in Graveyard Pond. Additionally, the adaptation strategies were identified and placed into a chart to show the strategies employed by each of the actors.

3.6 Validity and Constraints of the Study

3.6.1 Internal, External, and Construct Validity

According to Yin (2009), validity is an important component of case studies. There are different types of validity that need to be considered including construct validity, internal validity, and external validity. Construct validity refers to identifying correct measures for concepts being studied. This was done by using multiple sources of evidence such as interviews, documents, and previous case studies. Internal validity refers to establishing a causal relationship, which was done using the framework to addressing barriers to adaptation and the nodal governance framework. External validity is the domain in which findings can be generalized. Though the external validity will never be high because only a single case was used, the internal validity increases because of the single case study design allows for an in-depth analysis.

3.6.2 Study Constraints and Limitations

A few constraints arose during the research such as government officials not being able to participate in interviews. In this case, the department would send another representative within the same department to answer interview questions. Many officials were slow to respond or hard to obtain meetings with. However, most of the relevant actors involved in flood management in Graveyard Pond were interviewed and the researcher was able to get sufficient data necessary to meet the objectives. Another constraint is that many government representatives were careful with what they said when answering questions since they represent the City of Cape Town. Additionally, there were a few limitations to the study. Since it is only one single case study, the results do not apply to all scenarios of adaptation but can give indications for key variables. The findings of this study may occur in similar scenarios, but conclusions should not be made based on this study alone.

3.7 Ethical Considerations

The department and university policies were followed which required the completion of ethics forms. These forms require the researcher to obtain permission from each of the interview respondents and to show that these respondents were properly informed about the research. In order to comply with this procedure, each interview respondent of this case study signed a form, which included a description of the research (form provided in Appendix B). Additionally, out of respect for the informal settlement residents, permission to research in Graveyard Pond was gained by approaching the community leader before scheduling interviews. This was done to show respect for the people there as well as the leaders that agreed to be interviewed. Due to advice from previous students, the role of the researcher was made clear to the community leaders and residents. Before each interview permission was received from the respondent and both the researcher and the interview respondent signed the consent form. Before recording an interview, permission from the interview respondent was received and all respondents were kept anonymous.

Chapter 4: The Contested Nature of Flooding

4.1 Introduction

This chapter addresses the conflicting mentalities and responses to flooding in order to understand how the actors interact around flooding in Graveyard Pond, Philippi. From the interviews with various local representatives and City of Cape Town department representatives, it is apparent that the mentalities of these actors differ from one another. In order to describe these contestations to meet the first two objectives of the case study, a nodal governance framework is used first to characterize the nodes that manage and respond to flooding in Graveyard Pond. Following this, the differences between these nodes and how this affects flood response is explored.

As previously described in section 2.2.4, nodes refer to sites of governance (Burris et al., 2005). Nodal governance looks at the various actors, not just government, that play a role in governing a certain issue. These actors are not always formally recognized but still contribute to managing the issue, in this case flooding (Burris et al., 2005). Through this framework, the mentalities, resources, technologies and the institutional arrangement of each node will be described.

4.2 Description of Nodes

The first node addressed in the study is that of the two community leaders who are activists and residents of Graveyard Pond. Here both of the community leaders are grouped together into one node yet it is important to note that there are differences between the individual leaders. Community leaders are elected by the residents of the settlement, and are responsible for reporting to and communicating with the ward councillor of the area. There are generally several community leaders for each settlement in a ward, which the ward councillor oversees. This institutional structure often results in challenges for both the community leaders and ward councillors because the local government does not formally recognize community leaders. Though they are not officially recognized like the ward councillors are, community leaders play an important

role as leaders of the settlements. The resources of this node include communication with the ward councillor who is there to connect the settlement with the City of Cape Town, and to non-governmental organizations (NGOs) that provide aid during extreme events. Community leaders have access to resources of the Flood Task Team node when there is a disaster in the community such as a flood or fire. Another resource that community leaders have is the ability to organize residents to toi toi (protest) against the local government. Technologies that community leaders have used to cope with flooding include stones, sand bags, and trenches. The mentalities of this node come from the experience of living in this informal settlement and the direct impact of flooding on their livelihoods. The mentalities of all of the nodes will be described and compared in detail in section 4.3.

The second node consists of the ward councillors. Ward councillors are elected leaders of their wards, which are geographic areas divided by the City of Cape Town to effectively manage service delivery (City of Cape Town, 2012). Ward councillors often belong to a political party, though they can be independent and are elected by residents of the ward. The way the institutional structure of this node is organized, ward councillors are responsible for communicating with the City of Cape Town regarding the needs of the residents in the ward. Resources of the ward councillor include mechanisms for communicating with the community leaders, local government departments, and NGOs. Community leaders are a resource to ward councillors because they connect the ward councillors to the residents. Sub-council meetings are a resource to communicate with sub-council managers and discuss challenges that arise in each ward. Additionally, financial resources through the sub-council are available. Technologies available to the ward councillor in terms of flood response are similar to those of the community leaders. However, the ward councillor has other technologies such as the formal ability to communicate with the City of Cape Town during disasters or to report issues in the area. The mentalities of this node are shaped by experiences from living in Philippi but are also shaped by being part of the sub council with the local government.

The Flood Task Team makes up the third node of the nodal governance framework. As described in section 1.2, the Flood Task Team consists of a number of different departments. Representatives of each of these departments come together under the auspices of the Disaster Risk Management department head to prioritize high-risk areas. This institutional structure allows for the attendance and participation of ward councillors but not community leaders. The Flood Task Team uses resources such as the Flood Task Team meetings that enable communication between the various departments. Therefore, resources available to this third node include resources available to the individual departments that make up the Flood Task Team such as information regarding the stormwater infrastructure, the relocation list, and the priority lists created each winter. The Flood Task Team also receives financial resources for flood response and management. Other resources of the Flood Task Team include communication with the ward councillors through sub-council meetings, which connect the departments to the settlements. Technologies employed by this node are stormwater drains, winter readiness intervention strategies, in-situ upgrading, and awareness, which are expanded upon in section 4.4. The Flood Task Team node plays an important role in mobilizing these resources and technologies to address flooding in informal settlements. The mentalities of this node stem from the expertise of each of the departments and the policies that govern the departments.

4.3 Mentalities Surrounding Flooding

It is important to compare the mentalities of flooding held by each node involved in the case study, because these mentalities influence flood response and management. Broadly speaking, the node that governs flooding at the community level identifies flooding as a serious issue in Graveyard Pond as does the ward councillor. In contrast, the representatives who work at the administrative level of government do not consider the area to have significant flooding. These two opposing mentalities have come out of the data. This chapter will seek to probe deeper beyond this polarity.

From the local perspective, two types of flooding occur and cause problems for residents. Graveyard Pond, from the residents' perspective experiences two types of flooding. The first type of flooding is water seepage from the ground while the other is caused by

rainwater flowing from the top to the bottom of the detention pond. When speaking with two of the community leaders, these two types of flooding were described in more detail.

When asked about the flooding in Graveyard Pond, one of the community leaders replied, "*It's not the water that you can remove. The water comes from underneath"*. This refers to the first type of flooding mentioned where water collects under shacks and seeps in from the ground. This type of flooding occurs without heavy rainfall. During an interview with the ward councillor for Ward 34, which includes Graveyard Pond, she immediately identified this particular informal settlement as one of the problems in her ward. She describes the area as "*very bad, whether it's raining or not"*. She explained that managing the flooding there is a challenge because "*even if there is rain or not rain the situation there is very bad. The water is flowing there, the grey water is flowing there"*. This quote parallels the views of the community leader by highlighting that flooding occurs even without rain. Another community leader describes a different type of flooding, *"[I] get the real flooding, to [me] it is real flooding that is happening"*. This type of flooding, "real flooding", refers to water flowing through the shack down to the bottom of the pond. These descriptions are how community leaders and residents have distinguished between the two types of flooding, namely water that 'comes from underneath' and 'real flooding'. All of the community leaders, whether informal or formal, identify Graveyard Pond as having a problem with flooding.

When speaking to the Sub Council Manager of Sub Council 13 where Graveyard Pond is located in Cape Town, his perspective on flooding was different. According to him,

> *There [have] been a lot of definitions used even by the city to say what do you mean when you say that you are flooded. A lot of people seem not to understand. Our understanding given by Disaster Management is that when the water is above your knees then you can regard that as flooding but you can't say you are flooding just because water is protruding from below and doesn't even reach your ankle.*

The Sub Council Manager, referring to the Disaster Management definition, explains that water must come to above a resident's knees before it is flooding. He specifically refers to water rising from below as not being a flooding incident. This quote shows that the

definition used by City of Cape Town officials does not account for the type of flooding in Graveyard Pond. The Roads and Stormwater Department gave another example of how the government defines flooding in relation to Graveyard Pond. The representative explained

> *We don't actually get a lot of major flooding which indicates to us that the existing line is probably sufficiently sized. But if you were to get a major storm like we had in 2009, it could definitely flood.*

The existing line refers to the physical drainage structure present in Graveyard Pond. For the Roads and Stormwater Department, flooding in this case would be when water quantity exceeds the existing drainage infrastructure. Paralleling this perception of flooding, the Environmental Health Department representative stated that flooding has not been an issue in Graveyard Pond since 2009 when the stormwater drain overflowed. Therefore, flooding in Graveyard Pond, from the point of view of government officials is not a problem until the stormwater drain overflows.

Another mentality of the local government node that arises regarding flooding is that people are living illegally in a pond, and therefore there will be water. The sub council manager explained, *"You see you are saying it's a pond. So what do you expect? If people are living in ponds obviously the water will go there, because that place is not for people to reside it is a pond."* This quotes shows the mentality often held by various City of Cape Town officials that these areas are 'informal' and illegal settlements. Therefore, people residing in stormwater drains and ponds will obviously experience flooding. This highlights how the context of informal settlements often affects the mentalities of the nodes.

These various ways of understanding flooding show the different interpretations of flooding at the community level compared to the government department level. These different mentalities therefore have an affect on how flooding in Graveyard Pond is responded to at different levels. This separation between the "on the ground" understanding and the government administrative understanding results in a division of response.

4.4 Flood Response

Flood response refers to the various options that different nodes use to manage flooding in informal settlements. These responses stem from the available resources and technologies of each of the governing nodes. In order to compare how these resources are employed, the responses are organized by theme rather than focusing on each node individually.

There are several different types of coping strategies and adaptation measures that are employed in these areas such as structural adaptation, preparedness, government interventions, disaster response, in-situ upgrading and community awareness. Structural adaptation refers to the minor adjustments that can be made to infrastructure in order to withstand extreme weather events. Preparedness describes the action government departments take prior to the winter season in order to increase the adaptive capacity of informal settlements that are identified as vulnerable. Disaster Response and government interventions are actions that the government departments help to decrease vulnerability of informal settlements either through providing disaster relief or improving infrastructure such as stormwater drains. In-situ upgrading involves upgrading the area by adding services such as electricity, water taps, and toilets. Community awareness activities are undertaken at a local level to educate residents about important topics to prepare for disaster response or disease prevention. Additionally, disaster response such as providing blankets, temporary housing, and other emergency assistance occurs when necessary. This section provides a description of each of these coping and adaptation strategies and the effect they have on Graveyard Pond.

4.4.1 Community Level Response (structural adaptation)

In order to manage flooding at the informal settlement level a variety of technologies are utilized both by community members and by the city. The residents in the community try to manage flooding by implementing structural techniques to reduce the impact of flooding on their shacks using the available resources. For example, according to a community leader, techniques such as digging trenches and sand bags are used to reduce structural damage of shacks due to flooding. "*We only dig trenches or sometimes fetch*

the sand to put in our houses or fill in the path, that's where we put things like rock or sometimes sand." Residents often put sand in their shacks to prevent flooding or place rocks to change the path of the flood to prevent damage to their shacks. Another community leader in the community described how "*they put that stones because of the water*". Stones are used to create a new path for the but often times these paths just lead the water to a different shack or the flood is too strong to be moved by the rocks. Though there are community level responses, such as the structural adaptation measures previously mentioned, flooding cannot be controlled with the available technologies and resources of this node. The community leader describes another technique, building trenches, that is not successful in reducing vulnerability to flooding in Graveyard Pond

> *Even if you build a trench here, if you make a trench for instance it is too low. If you remember there were houses there, I took a picture of the houses, I mean shacks, there when you saw that there was water underneath. The people tried to raise their shacks, I mean floor, but still the water doesn't run through. The water stays there and becomes green and you hear there are frogs ya know and all that stuff underneath there.*

This quote describes another technique of building trenches to catch the water so it does not flow into the house, however is not successful because the land the informal settlements are built on is too low. Additionally, many residents raise their shacks in order to avoid flooding. However, as the community leader described, the flooding still seeps in from the bottom. When the sub-council manager was asked about adaptation to flooding, the response was that

> *It happens sometimes that the water bursts from underneath because some of them their houses are not even, ya know, they don't have cement on the ground so it is just pure soil and sand. They just put their carpets and that's all. So when the water comes from below, it just floods their whole area. But the interventions from NGOs and local government departments' people have been advised to put their structures in higher grounds.*

The quote above suggests that often times the water coming in through shacks is due to the materials used to build the shacks, rather than the extent of water from the flood. Therefore, one of the government solutions is to increase structural adaptation techniques to prevent water from coming through shacks. The Roads and Stormwater representative pointed out that flooding in areas could be due to *"how the community has erected their structures. They cut off water or [do] their own thing."* This quote signifies that in the

perspective of government departments, flooding is exacerbated by how the residents choose to use their resources. Therefore, according to the officials, the residents need to take more responsibility for managing flooding. However, the proposed solutions such as raising shacks work in low lying areas but if a storm fills the stormwater drain, then the water will fill the pond and the shacks will flood. These structural adaptation measures provide short-term relief rather than resilience to extreme flooding. Therefore, structural adaptation techniques alone cannot solve the flooding problem in Graveyard Pond.

4.4.2 Disaster Response and Government Interventions

Local government plays an important role in disaster response. In order to cater to these informal settlements, disaster response mechanisms are put in place through a disaster operation call center. A representative from the Disaster Risk Management Department describes the protocol for reporting disasters such as flooding and fires.

> *What the community will do is they will inform the community leader on the ground. The community leader will inform the ward councillor, so it would be either the community leader or the ward councillor or anyone in the community can phone the toll free number which is the 107 number or the disaster operations center. Anyone can phone. On that question we would contact the community leader or the ward councillor when an official goes out to deal with the right person to coordinate everything. I'll give you now the reason for that is because the ward councillor needs to know everything that goes on in the ward and so on. There would be plans in place, what would we do, why do we do the assessment. After the assessment is done there would be relief provided for these people. The question would be whether they will be temporarily removed from their location where there will be a supply of basic needs because all of your goodies are wet, the normal things like blankets, food parcels, clothing, ya know.*

This protocol was developed in order to provide a line of communication from the residents of informal settlements to local government departments particularly in times of crisis. However, in many cases there are communication issues between community leaders and ward councillors and many people therefore do not get assistance. This year in Graveyard Pond the community leader stated that they did not receive any aid in the form of blankets or food:

> *For instance this year one of my community leaders when she saw that there was blankets that was given to another area she phoned the ward councillor but the ward councillor was not here she was at Eastern Cape. And she asked her why didn't we get the blankets this time around? Because the blankets were given to*

> *the people who were staying there in those developed houses in those RDP houses. Not us the people who were having the problem, uh the flooding problem.*

The quote above describes that sometimes relief is not given to places in need. This lack of relief materials could be due to a lack of communication or a lack of resources. These reactive measures depend on resources of local NGOs since they provide the blankets, access to technology for communication, and a collaborative relationship with ward councillors. Therefore the connection the local community leader node has to institutions is important to their ability to manage flooding.

In order to be more proactive about reducing flood risk in informal settlements, the City of Cape Town created the Flood Task Team, comprised of different departments to address areas with the highest risk and collaborate around flood disaster response (as mentioned in section 3.1). The representative for the Disaster Risk Management Department describes that:

> *In this Flood Task Team meeting we would have all the line departments. Most of the departments would assist us in mitigation and risk reduction when it comes to flooding. Believe me even the Anti-land invasion, there are a lot of departments involved here and it cannot be done alone. So on an annual basis we would look at how can we plan ahead for whatever lies ahead. We would start during and shortly after the[beginning] of the season, how are we going to plan preparation for the 2012 winter or rain season again. This is just what we have done in the past in the beginning of last year and the beginning of last year we are looking at what has happened before. We are looking at our stats and so on. We are taking out our draft and all of our old reports and we see what changes, what interventions, what reactive/proactive measures were put in place, how effective it was and so on.*

This Flood Task Team therefore assesses the needs of informal settlements and addresses emergency situations by coordinating collaboration between departments. These departments work in partnership to create a priority list of twenty high-risk areas (previously mentioned in section 3.1). According to the Disaster Risk Management representative the priority list refers to areas *"where interventions or mitigations such as reactive and proactive measures are put in place to reduce these risks."* These 20 high-risk areas are where immediate measures need to take place. The role of the Flood Task Team is to then come up with proactive measures for the top twenty priority areas to

mitigate the effects of flood disasters on these informal areas. An example of the role other departments play arose from an interview with a representative from the Roads and Stormwater Department. He explains that

> *As part of the winter readiness program, we identify what we call interventions. It's basically improvements that can be made to the area so that we can limit or mitigate the risk of flooding. It could be for example reshaping of the site to make sure that the water drains away from the settlement. It could be installing a pipe with a drain so that certain areas are able to drain and not become a trapped sort of area with flooding. As I said as Roads and Stormwater we are responsible for the roads and stormwater network. We would be responsible for any improvements to the stormwater network, which will reduce or mitigate the risk of flooding.*

Graveyard Pond was removed from this list of proactive and reactive measures because it is on the relocation list. The Disaster Risk Management representative explained

> *Graveyard Pond was taken off from reactive and proactive measures. Reason I'm going to tell you now because of the detention pond they are actually on the list for relocation. Why I say this is, in terms of relocation, when we look at relocation it's not that we are not doing anything at all, we are looking at reactive measures that are put into place.*

The priority list, according to Disaster Risk Management, is "*where Roads and Stormwater or other departments can actually do something about it to prevent [flooding]"*. However, in the case of Graveyard Pond there are no proactive measures that can prevent flooding, and so they have been added to the relocation list but removed from the Winter Readiness priority list. Thus, proactive measures are taking place in some high-risk areas but the support from the government often does not reach those like Graveyard Pond that experience year-round flooding.

4.4.3 In-situ Upgrading and Relocation

In addition to responding to disasters, the City of Cape Town has devised other approaches to meeting the needs of informal settlements. According to a representative with the Roads and Stormwater Department, *"The approach the city is taking now is to do in-situ upgrading as opposed to moving people"*. In-situ upgrading is where informal settlements obtain services such as toilets, electricity, and upgrades to their shacks. Insitu upgrading in the form of shack upgrades is the most relevant to increasing adaptive

capacity to flooding. Because of the lack of land for relocation, this is the second best option for residents. However, in the case of Graveyard Pond, no in-situ upgrading can take place because the residents are staying in a detention pond. A community leader explains that

> *Even if you talk to for instance [to] the city, these people from the city council mostly they tell us no, this place we can't get all the services because it is supposed to be relocated. But when will it be relocated, we don't hear stories like that.*

The ward councillor for Ward 34 expanded on this by saying, *"Up to now there is no answer from the city. They refuse to electrify that place and there is no land identified for them. That is a problem that we are facing here."* This quote describes the challenges that the community leaders and ward councillors face regarding insitu upgrading and relocation.

All of the aforementioned adaptation techniques and strategies point to the need for relocation for areas such as Graveyard Pond, where short-term adaptation techniques are not successful in reducing the impacts of flooding. Relocation is a controversial subject in South Africa because of the history of politics in these sensitive areas. The Department of Housing Five Year Plan (2009) accounts for the development of 4,500 housing opportunities each year but there is still a large housing deficit. This is due to continued migration from rural areas as well as financial constraints (Department of Housing, 2009). According to the Department of Housing (2009: 8), "the nature of the housing provision process is in itself slow, requiring intergovernmental cooperation, lengthy environmental and approval processes, and careful planning". The slow process of relocation therefore adds to the complexity of responding to flooding because in many cases relocation is the only answer. However, relocation is a slow process and must be accompanied with other forms of interventions and support.

4.4.4 Awareness and Community Involvement

Awareness programs are used by various departments within the local government to reduce risk exposure from environmental and health disasters. Disaster Risk Management and the Environmental Health Department both hold workshops and

trainings in informal areas to educate residents on important topics that could reduce their vulnerability.

The Environmental Health Department educates people about how to properly dispose of greywater rather than pouring it into stormwater drains, which reduces flooding because it prevents the drains from being clogged. Disaster Risk Management has "*a section for awareness and preparedness and training to increase capacity for communities",* according to the respondent, where they collaborate with the Jungle Theatre that puts on plays in Xhosa for residents to understand how to protect themselves from fires and floods. Additionally, there are pamphlets handed out on responding to disasters and how to handle flooding (Appendix C).

These departments work in collaboration with the community leaders and residents. One community leader from Graveyard Pond explains,

> *They even sometimes have some workshops where they teach people about what must they do when there is flooding, because in this winter for instance we had a workshop here. Sometimes I do organize people to come to the workshops so they can listen to them. Though we know that that does not help. That is what I told them also. Sometimes it is helpful here and there but it can't help that much because this water is here to stay. It is not the water that you can remove.*

This shows that the government departments do try and reach out to the residents of informal areas, however this cannot be the only type of prevention. As the community leader communicated in the quote, it is only helpful if those techniques are applicable and they are only applicable with certain types of flooding. The mentalities of the Flood Task Team node affect what resources the other nodes receive. Because the residents of Graveyard Pond already employ structural adaptation techniques, these awareness exercises are not as successful because these methods are not reducing their vulnerability in the long term.

4.5 Conclusion

From the interviews conducted in Graveyard Pond it is apparent that the understanding of the extent of flooding is not consistent across actors, especially between the local level and the City of Cape Town. Rather, actors have different views regarding the type of flooding that occurs in the case study site. Moreover, these perceptions of flooding affect how flooding is managed. If flooding is not perceived as a major problem, then the area will not be prioritized. Additionally, the mentalities affect the type of response used to manage flooding. The data suggests that the way flood risk is currently governed in Graveyard Pond is not providing the residents with a long-term solution that reduces their vulnerability to flooding. They are still at risk of major flood incidents, despite the available response options in place. Though there is a government department responsible for coordinating relief and preparedness against impacts of flooding, the technologies and resources available are not reaching Graveyard Pond. The barriers that prevent action from taking place in Graveyard Pond are diagnosed in the following chapter.

Chapter 5: Barriers to Adaptation to Flooding in Graveyard Pond

5.1 Components of the Barriers to Adaptation Framework

This chapter will diagnose the barriers to adaptation to flooding in Graveyard Pond using the Moser and Ekstrom (2010) framework. Barriers were found throughout the three phases of planning, namely understanding, planning, and managing, as described in the framework in section 2.2.2.1. Moser and Ekstrom (2010) also highlight several crosscutting issues, which will be included in this chapter.

Moser and Ekstrom's framework describes three components that need to be analyzed when identifying barriers including the actors, the governance context and the object upon which they act (explained previously in section 2.2). For the purpose of this research, the main actors are the residents, leaders and ward councillors. The residents and community leaders are considered the main actors because they are on the ground experiencing the flooding. Ward councillors are residents in the area that liaise with the City of Cape Town through the sub council and related local government departments on issues including flooding. Therefore ward councillors play a key role as actors in flooding in informal settlements.

The City of Cape Town departments, through the Flood Task Team, form the peripheral actors of this study. From the perspective of this research the departments that make up the Flood Task Team are peripheral actors because in order to manage flooding and adapt to flooding, the 'core actors' rely on the services of departments such as Disaster Risk Management, Roads and Stormwater, Environmental Health, Water and Sanitation, and Informal Housing.

The governance context within which the peripheral actors act in this case includes the arrangement of the Flood Task Team, and the policies of the winter preparedness program. Additionally the governance context includes the nature of informal settlements and the norms that govern operation within these areas. According to Graham (2006: 232) "inadequate consideration is paid to the institutional structures, capacity constraints, financing mechanisms, international relations and social dynamics within which local government has to operate". In other words, there are a wide variety of

external factors that affect the context that influences the behavior and decisions of the actors in relation to flood management and contribute to barriers to adaptation.

The detention pond where Graveyard Pond is located is the object upon which the core actors are operating. Since the detention pond is government land, the residents live there illegally. However, due to the complex history of these settlements, the City of Cape Town municipal government still responds to flooding in this area. The detention pond plays an important role in contributing to barriers because of how the stormwater drains affect flooding. Additionally, it is unclear whether the residents living in the detention pond are beyond the threshold to adapt to flooding, which would mean that relocation is the only adaptation option. From this research, no clear ways to adapt within the detention pond are evident. The detention pond adds to the complexity of managing flooding, and therefore an important component to discuss when identifying barriers to adapting to flooding.

5.2 Barriers throughout planning phases

5.2.1 Understanding Phase: Mentalities and Perception of the Signal

The major barrier in the first phase of planning is that the actors have different understandings of the extent of flooding in Graveyard Pond and so perception of the signal differs between nodes. According to Ekstrom et al. (2011: 19), "the adaptation process begins with the existence of a signal indicating some type of change and/or potential problem". This section will describe how the perception of the signal acts as a barrier. Chapter 4 shows there is a clear disconnect between how community leaders and residents view flooding compared to various departments within local government. Several factors add to this barrier that will be expanded upon below.

Government officials have defined a narrow explanation of flooding that does not include the type experienced by residents and leaders in Graveyard Pond. This is contributing to how these actors peripheral to the core actors understand flooding in Graveyard Pond. If the government prioritizes areas that experience flooding as defined as water up to a certain level, then areas that experience other types of flooding get overlooked. Therefore the way the government views and defines flooding often excludes the types of

flooding experienced by residents and creates a barrier to adapting to flooding. This barrier is a remote barrier because how the government perceives flooding is beyond the control of the core actors, in this case the residents, community leaders and ward councillors. Whether this barrier is contemporary or a legacy barrier is not as straightforward. The barrier is due to the different mentalities that the local government department representatives possess due to their own beliefs, practices, and also the policies put in place. Therefore it is hard to identify whether their different understandings come from the mandates that the departments follow (contemporary) or whether they stem from the complex historical context of informal settlements (legacy).

Another factor contributing to the barrier of understanding flooding is communication between the ward councillor and the government officials. The ward councillor is a community member elected to communicate and collaborate with the City of Cape Town. It is her role to be involved with Disaster Risk Management when it comes to flood and fire response. She needs to know what is happening in the informal settlement at all times. When I interviewed the ward councillor for Ward 34, she was not aware of who she was supposed to communicate with in the City of Cape Town. Because the line of communication is not clear, the signal (flooding in Graveyard Pond) may not be getting communicated to the correct government departments. This could be contributing to how the government understands flooding in Graveyard Pond. If government officials are not receiving the signal, then it is likely that the area will not be prioritized. This barrier is a proximate barrier, because it can be overcome by creating new lines of communication between the community level and various City of Cape Town government departments.

The way the signal of flooding in the detention pond is interpreted varies for different actors. Peripheral actors, such as the Flood Task Team departments, see the detention pond as a technology that detains excess water so they expect it to flood. Residents see it as their home so they want to avoid flooding as a normal occurrence. Therefore, a signal is being sent i.e. flooding is occurring in the detention pond however it may not be above the threshold of concern for the City of Cape Town. As a result of these various mentalities, different signals are received and are only a concern for the core actors compared to the peripheral actors.

5.2.2 Planning Phase: Short Term vs. Long Term Options

The next set of barriers, found in the planning phase, involves the lack of feasible long-term adaptation options. Chapter 4 described the various options employed by residents and local government officials including structural adaptation, disaster response, government interventions, in-situ upgrading, and awareness. As explained in the previous chapter, the residents of Graveyard Pond employ structural adaptation techniques such as using stones to change the paths of flowing water, and sand bags to prevent leakage into shacks. However, many of the shacks experience seepage of water from the ground into their shacks, and the current techniques do not prevent this from occurring. Additionally, the stones usually only defer the water from certain shacks, causing it to flow towards other shacks. Therefore these options only provide short-term alleviation for select residents and are not providing long-term adaptation to flooding.

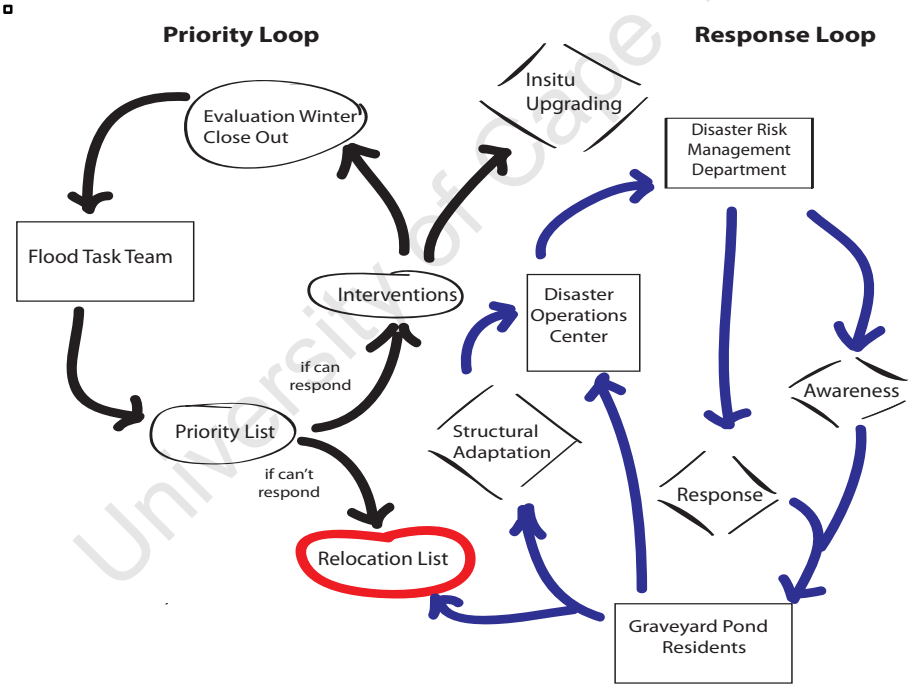

Figure 5.1: The flood response options of key actors in regards to flood management in informal settlements in Cape Town [Source: based on insights from empirical work]

Key: The rectangles signify actors; the circles represent decisions made; the diamonds represent the feasible response options; The black arrows refer to the decisions and options involved in the Winter Readiness Program; The blue arrows refer to options and decisions made in settlements

that are not prioritized in the winter readiness program. The red circle is the relocation list, which connects the two cycles together.

Figure 5.1 shows the cycles of flood management in Graveyard Pond. The black arrows symbolize the areas that are prioritized and/or upgraded in order to build resilience to flooding. If a community is placed on the priority list, then interventions occur where necessary. These priority areas will then be checked on throughout the winter. At the end of the season, these areas will be evaluated to determine if they are still high priorities. The Flood Task Team often identifies priority areas where interventions are unlikely to reduce the vulnerability of the area resulting in the residents of that particular area needing to be relocated. However, as explained in section 4.4.3, the relocation list often results in a waiting period. The blue arrows are those actions taking place in Graveyard Pond, an area that has not been prioritized for intervention because relocation is needed. The Disaster Risk Management Department tends to address the areas that have not been prioritized for intervention with awareness and disaster response. As previously described, structural coping mechanisms are put in place but they do not limit the vulnerability long term of all residents, and therefore can still result in the need for disaster response. If an area is not on the priority list, they may be placed on the relocation list because in-situ upgrading is not a feasible option. Relocation takes time, and often results in a continuous loop of disaster response without a sustainable form of relief.

The barrier of planning previously described is a remote barrier because the community leaders and ward councillors have exhausted the resources available to their nodes to reduce flooding. The residents of Graveyard Pond need a long term solution that is outside the control of the immediate actors, and more dependent on the governance context such as resources like land availability and city planning. The lack of feasible options is linked to the housing backlog and the legacy left by apartheid. Therefore, this is a legacy barrier rather than a contemporary barrier.

5.2.3 Managing Phase

Though the Flood Task Team includes all departments, the way it is organized is creating a barrier to managing flooding. Power distribution within the Flood Task Team often prevents or delays disaster response. The Flood Task Team is set up so that all of the disasters are referred to the Disaster Risk Management Department (DRM). They are then tasked with responding to these disasters, and coordinating other departments where necessary. However, a DRM representative explained that the department *"needs more powers because our powers are limited. At the local level we need more power where we can actually sit in the mayor's office. Because when there is a situation that you need to deal with you need immediate action at times."* This quote refers to where DRM is located in the organizational structure of the City of Cape Town. DRM often has to go through a variety of departments before they can take action. Therefore, this lack of power and inability to make prompt key decisions due to the organizational structure of departments prevents DRM from responding the way they feel they need to. Giving DRM more decision-making power could help in supporting more proactive flood management. If the process of taking action is shortened, then DRM could be more effective in preventing and responding to flooding.

Additionally, the Flood Task Team is organized in such a way that many of the departments such as DRM and Environmental Health that work on the ground with community leaders and residents are only coordinating positions. This means that they help coordinate solutions, but often do not respond directly. They facilitate the solution to problems, however this seems to add to the amount of time it takes to solve problems. Most of the departments mentioned coordinate with DRM when there is a problem. For example, the Environmental Health Department's role is to check the area after heavy flooding, fill in the structural damage on a template for flood reports and report it to DRM. The Roads and Stormwater Department explains, "*Disaster Risk Management are the ones that normally respond first. They will then get the Road and Stormwater people in and the Housing people in to provide assistance* " In most cases, DRM is the first to respond and the department that other departments refer to for help. As a result, DRM

becomes less effective because they are overloaded with responsibility. The DRM representative describes the challenges that this cycle brings:

> *"From disaster management the [biggest] challenge that we have is they might say no, no more can be done in that area but our job is we still need to deal with it, we can't say no nothing can be done. We need to deal with consequences also. Other departments they only do that, they say ok the job is done. We have to go back, it's a whole continuum the whole thing can happen over and over and over. People might say years. The same thing happened last year, we say yes, then we need to look at our plans, how effective [they are], if not we need to look at other measures also. But no one can say no, the buck stops there."*

The quote describes the heavy responsibilities placed on DRM to continuously cope with a variety of complex issues regarding disaster management. The DRM representative explains that even if other departments say they cannot do anything more in an area, DRM still have to continue dealing with the problems facing the area in the form of relief or disaster response. This parallels Figure 5.1 where Graveyard Pond is in an endless loop of disaster response but not prioritized for long-term adaptation. In these cases, DRM still has to respond to on the ground disasters and challenges yet the department has minimal control over making more effective long-term adaptation plans. More collaboration and reassessment of responsibilities could help to address this and strengthen flood management in informal settlements. This current structure of organization within local government is causing a barrier to flooding in the managing phase.

When discussing the 'scale' of the managing phase, the actors in this context are not the community leaders and ward councillors, instead the actors here are the representatives of DRM. For the aforementioned barriers in the managing phase, the scale is remote because rearranging the local government organizational structure is not in the control of the DRM representatives working on the ground. This barrier is contemporary since it originates from the creation of the Flood Task Team, which has only been in existence since 2008.

5.3. Crosscutting Issues and Governance

Moser and Ekstrom (2010) define several crosscutting issues that can be identified from analysis of the case study data including resources, communication, and participation. Each of these crosscutting issues acts as a separate barrier or contributes to existing barriers. Additionally, many of these crosscutting issues relate to characteristics of governance. Lebel et al. (2006) identifies several characteristics that need to be integrated in order to create "good" governance such as participation, deliberation, accountability, representation, empowerment, social justice, and a multilayered and polycentric organizational structure. Many of these characteristics such as the organizational structure, participation, and representation are key barriers preventing action in Graveyard Pond.

Resources

At the community level, residents are employing structural adaptation as described in section 4.4.1. However, the resources available to the community are not decreasing the impact of flooding. Other resources are then needed such as the resources of the other nodes. For example, land for relocation, or even services such as electricity and more toilets are resources that would enhance the ability of residents to adapt. In order to gain these, the community leaders need more of a connection to the aforementioned institutions. In this sense, communicating with institutions is a resource creating a barrier to adaptation. Although it is clear that better communication could be established, this alone is unlikely to result in addressing the deficit in resources.

Communication

Another crosscutting issue is communication. There is a major disconnect between the departments and the informal settlement leaders. This disconnect mostly occurs with the ward councillors who are elected to be the connection between informal areas and government officials. The ward councillor for Ward 34, the area in which Graveyard Pond is located, explained how communicating with the City of Cape Town presented a major challenge for her. When asked how it is to communicate with the City, the ward councillor responded by saying "*it is difficult sometimes really it is difficult, more*

especially in our areas when there are challenging things." She continued by explaining that her motions to get electricity in dark areas with crime are often not responded to. Additionally, she could not mention any specific departments that she speaks to, saying that *"I work with all of the departments"*. When asked how she usually communicates with these departments, she explained, *"in fact we are using the sub council."* This is a sign that either the structure of who the ward councillor is supposed to be in contact with in the City of Cape Town is unclear or that it is currently not working.

Participation

Participation is a crosscutting issue contributing to various barriers and is a component of "good" governance. Lebel et al. (2006: 2) defines participation as "the amount of public participation by non-state actors in decision-exploring processes through to implementation, monitoring, and sanctioning". For example, Ward Councillors have been invited to the Flood Task Team Meetings to represent the residents in their areas. However in the meeting attended, no ward councillors were present. Since the head of the Flood Task Team did not allow recorders in the meeting, there is not an official quote regarding the lack of participation of ward councillors in meetings. However, ward councillors not attending meetings was a repeated problem mentioned in conversations with government officials. Additionally, during the interview, the ward councillor for Ward 34 did not seem to be aware of the Flood Task Team. This lack of participation could be due to the lack of education surrounding the meeting, and what the role of ward councillors would be. This lack of participation could also be an extreme case pointing to this particular ward councillor not fulfilling her responsibilities. As a result, there is no one to represent the community leaders and residents of informal settlements in the Flood Task Team process. This lack of participation is contributing to the aforementioned barriers in the understanding and planning phases and also to the lack of collaborative governance in managing flooding.

Deliberation

According to Lebel et al. (2006: 4) deliberation is "a process of open communication, discussion and reflection among actors who have alternative political viewpoints and

understandings". Though the Flood Task Team has a variety of various departmental representatives, deliberation is still not occurring between all the necessary actors. From the meetings attended, it was apparent that there is a process of communication and discussion where concerns are raised regarding the Winter Readiness plan. However, without representatives from the communities such as ward councillors and community leaders or residents, an important viewpoint is missing. Therefore, when open communication occurs it only includes local government departments and very few representatives from the areas being managed.

Accountability

Accountability of actors is important and can increase trust that actors have in each other to improve management. From conversations with core actors it is clear that sometimes accountability is lacking. The community leaders felt that the ward councillor was not always accountable to them, however the ward councillor felt that the City of Cape Town was not being accountable. When asked about working with the City, she described her experience of collaboration by saying,

> *People they come blaming at the ward councillor. Even they put our lives in danger. Because when they toi toi the people outside, they didn't get an answer, they decided to go straight to your house as a ward councillor. You also you are not safe.*

This quote shows that this ward councillor is held accountable for the decisions made by the City of Cape Town, which creates other challenges for her. This shows that the existing structure, particularly the role of ward councillors, creates challenges for managing flooding and other important challenges in Graveyard Pond.

5.4 Scales of Influence over Barriers

It is important to identify the scales of influence acting on the identified barriers in order to know where to intervene. The barriers to adaptation framework discusses two main categories where scales of influence fall: proximate/remote and contemporary/legacy (Ekstrom et al., 2011). Many of the barriers are legacy barriers from apartheid government. For example, many of the peripheral actors claim that the constitution adds

to the problem of flood management by making it difficult to prevent people from living on unsuitable land, often in flood prone areas. For example, the Roads and Stormwater representative explained, *"Unfortunately legislation probably favors the people who erect structures there. So really if they are not moved in [when they first erect structures] it is quite a long process to then get them to."* This quote refers to the fact that housing and free basic services are a constitutional right, as described in section 1.2, making it difficult to remove people from the land without an alternative location for them to relocate to. The sub council manager also mentioned this by claiming *"It is difficult for any department to say people must vacate because the constitution doesn't allow that"*. In this case, the legacy of apartheid and the resulting constitutional right to free basic services complicates the way departments manage informal areas.

According to the framework by Ekstrom et al. (2011: 55), remoteness can result from "an actor not participating in a multi-level social network, or could be the result of multiple levels of governance between the actor and origin of the barrier". In this case, the ward councillors are not effectively representing the community level and connecting the core actors to the peripheral actors. Consequently, the community leaders then do not have the technologies, or resources to participate in the social network. Remote barriers can be overcome, as in many cases the technologies, institutions, and resources of the Flood Task Team and ward councillor could be engaged in order to overcome them. If the ward councillors were more effective in linking the community leaders to the Flood Task team, or if the community leaders had more of a role in collaborating and communicating with the government, then some of the aforementioned barriers might be more within the control of the community leaders. Therefore, the current lack of collaboration between the nodes results in the scale of many of the barriers of adaption to flooding being remote rather than proximate.

Many of the crosscutting issues are characteristics identified in the literature that need to be present in order to create 'good' governance such as accountability, participation and deliberation. Many of these attributes of 'good governance' were identified as crosscutting issues and contribute to barriers to flood management and adaptation

planning. One way to alleviate cross-scale collaboration as a barrier would be to integrate the community leaders and ward councillors into the adaptation plan. In order to do this, communication between the different actors needs to be strengthened. If modes of communication could be improved, there would be more of an opportunity for all of the actors to have a clearer understanding of how problems are experienced at different levels. Though communication would come with another set of complex issues and challenges, the current lack of communication contributes to how the actors understand, plan, and respond to flooding differently. In the case of Graveyard Pond, collaborative governance could allow for the community's needs to be integrated into flood management and give more responsibility to the community level in regards to managing flooding. Though challenges would arise with collaboration and more responsibility on the local community level, it is clear that the separation between these two levels creates a barrier to adapting to flooding.

5.5 Conclusion

The key barriers that came out of the Moser and Ekstrom (2010) framework parallel the findings from the nodal governance analysis in Chapter 4. The main barriers identified are: how the government defines flooding compared to the types of flooding present in Graveyard Pond, the gap between the community level and the local government level, and the lack of a long-term adaptation plan in the case study site. Resources, communication, participation, deliberation and accountability were found to be important crosscutting barriers. The framework for identifying barriers to adaptation was effective in looking at adaptation planning holistically, which allowed for barriers to be diagnosed throughout the process while taking into account multiple actors. However, the framework does not provide suggestions for overcoming these barriers. Rather, the framework is a starting point to help understand where the main barriers are and how actors contribute to them.

Chapter 6: Conclusions and Implications of Research

The overall aim of this thesis was to identify the barriers to adaptation to flooding and investigate the potential for strengthening cross-scale collaboration to better adapt to flooding in Graveyard Pond. This was accomplished using two different frameworks including the nodal governance framework and the framework for identifying barriers to adaptation (Moser and Ekstrom, 2010). This chapter will summarize the main conclusions drawn from the frameworks, provide suggestions for future adaptation planning and research, and explain the implications of this case study.

6.1 Key findings

Available resources are not reducing vulnerability of the Graveyard Pond residents.

Using the nodal governance framework it was clear that the resources available to the community leaders and ward councillors do not allow for the reduction of vulnerability to flooding in the case of Graveyard Pond. Instead, they depend on the resources and technologies of the level above them; that of the Flood Task Team. This implies that the residents, community leaders, and ward councillors are dependent on the Flood Task Team to respond to flooding. Therefore, either different resources and technologies need to become available to the community leaders, or the Flood Task Team needs to involve these nodes more effectively in planning. The mentalities of each of these nodes also significantly affected how resources were used. Because the Flood Task Team departments had a different mentality around flooding to those on the ground, Graveyard Pond was not prioritized and the resources and technologies of the Task Team were focused in other geographical areas.

More than one type of flooding is experienced at the local level but not recognised by local government.

It became evident through assessing the different mentalities of each node that the community leaders and ward councillor experience more than one type of flooding. The departments that make up the Flood Task Team prioritize only one type of flooding. For example the Roads and Stormwater Department defined flooding based on the size of the

existing stormwater drain pipe in the informal settlement. The Sub council manager defined flooding based on DRM's definition of water above the knees. Therefore, the Flood Task Team does not see flooding as an issue in Graveyard Pond because of the existing mentalities of this node. This is important to how flooding is then managed and responded to. It also shows that the mentalities of departments in the Flood Task Team act as a barrier to adapting to flooding in Graveyard Pond. In order to reconcile this, these different types of flooding need to be recognized and prioritized by the Flood Task Team.

Long term adaptation planning is needed for Graveyard Pond.

The case study found that planning that focuses on reducing vulnerability long term is needed for flood management and adaptation for areas such as Graveyard Pond. The current flood response options are leaving Graveyard Pond in a continuous loop of disaster response rather than decreasing the vulnerability of residents. There is also a lack of service delivery in this area, which is contributing to their high vulnerability. Therefore, more sustainable adaptation options need to be developed for Graveyard Pond.

There is a gap between the community level and government departments.

The barriers to adaptation analysis made it clear that there is a gap between the community level and government departments in terms of understanding, planning, and crosscutting issues such as communication and participation. Resources are also a crosscutting issue that came out of the barriers to adaptation chapter. This paralleled the nodal governance analysis, which showed that the resources of the community leaders do not decrease the vulnerability of residents. The resources available to the ward councillor, such as a forum to communicate with the City, are also not successful in drawing attention to the issues of flooding in Graveyard Pond. The resources available to the Flood Task Team are being used in other areas. These interconnected issues of cross-scale collaboration contribute to the lack of long-term adaptation options available to Graveyard Pond. By understanding what is slowing or preventing adaptation to flooding in informal settlements, and the role that local government and community leaders play in this, adaptation planning can then be adjusted to account for these barriers.

Additionally, the ward councillor struggled to communicate with the City of Cape Town and does not play a role in the Flood Task Team. This is significant because ward councillors were created in order to serve as an intermediary between the residents in wards and the City of Cape Town. Therefore, either this system is not working or the ward councillor in Graveyard Pond is not fulfilling her duties. This issue should be investigated further and other ways to communicate with the City of Cape Town should be explored to improve cross-scale collaboration in general.

Though there is a gap between the community level and the local government level, DRM plays an important role in trying to fill this gap. DRM appears to function as a boundary organization. DRM works closely with the community leaders in Graveyard Pond compared to the other departments on the Flood Task Team by coordinating response and awareness activities. As seen in Figure 4.1, DRM provides Graveyard Pond residents with disaster response and awareness as they wait to be relocated. Therefore, DRM connects these two levels by working at the community level with residents and community leaders. DRM could be utilized to help decrease the gap and promote more community involvement in flood management decisions.

More information is needed regarding thresholds for adaptation in these areas.
Graveyard Pond, and other areas in detention ponds could be beyond their threshold to adapt and therefore require long term planning to accommodate residents. More information is needed on settlements in detention ponds to understand what their thresholds are. The government may need to come up with creative solutions due to the lack of resources that proved to be a crosscutting issue in managing flooding in Graveyard Pond.

6.2 Implications of Findings

The findings of this case study parallel the findings of other case studies on urban flooding in vulnerable areas throughout Africa. In a study done by Douglas et al. (2008), a participatory vulnerability analysis was performed in five cities in Africa surrounding

perceptions of flooding, flood response, and what the community can do to prevent flooding. From the results of the study, it was clear that many urban settlements in different African countries also struggle to gain government and community collaboration in coping and adapting to flooding. For example, after a flood incidence in Kampala, Uganda there was no significant intervention by the local government and the community did not make a collective effort to cope. Though the City of Cape Town does coordinate disaster response in many areas, the results of the case study of Graveyard Pond parallel many of the cases in the study done by Douglas et al. (2008) where more government intervention is needed because local coping mechanisms often do not reduce the long-term vulnerability of these areas. The study by Douglas et al. (2008) shows that there is a need to explore this relationship between informal settlements and local government around flood adaptation, a gap in the literature that this case study can contribute to.

This case study in Graveyard Pond has contributed to the gap in the literature regarding how flood risk management in informal settlements and barriers to adaptation to flooding can help to reduce the vulnerability of at risk areas in the future. This identification of barriers is an important starting point upon which to build future adaptation options (Ekstrom et al., 2011). With the recent shift in literature to the practical application of adaptation and a focus on governance, this case study can speak to the intersection of the body of literature surrounding barriers to adaptation and the need for strengthening adaptive governance (Holley et al., 2012). By focusing on nodal governance, this case study provides an exploration of how cross-scale collaboration in flood risk management might be enlisted to reduce urban vulnerability in Cape Town, South Africa. It is evident from the results of this research that current governance around flooding excludes the community level. Though collaborative governance could cause other challenges, it is clear that there is a lack of collaboration contributing to the absence of long-term adaptation to flooding in Graveyard Pond.

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Appendix A: Interview Questions

Many of the interviews also included discussion and often covered more than these questions. Additionally, questions were adapted as necessary to match the language proficiency of the respondent.

Community Leader Interview Questions

1. What is your role in this community?
2. What role do you think ward councillors do and should play in Graveyard pond?
3. How do you communicate with the ward councillors?
4. Have you had communication with ward councillors about flooding?
5. When was original communication with the ward councillors established?
6. Was the detention pond addressed in any original communication? (if needed, will rephrase to ask if anyone had mentioned that the place was "meant for water" as this is what they know about the detention pond)
7. Explain the purpose, use, and maintenance of the two drains? When were they placed there and who is responsible for them?
8. How often have you reported flooding to the ward councillors in the last 5 years? Describe.
9. How have the ward councillors responded to flood complaints?
10. What government departments do you have contact with?

Ward Councillor Interview Questions

1. What is your role in this community?
2. Could you describe the nature of flood events and the response to these events by different actors?
3. How often is there talk of flooding from community leaders?
4. What is the role of community leaders in these situations?
5. What is your role in response to flooding in this community?
6. What is done about flooding in the townships, and specifically in Graveyard Pond? (including actors seen as responsible and actions to respond to flood events and reduce future flood events)
7. Are you aware of the use of GP as a detention pond?
8. Has there been instruction from the government regarding the detention pond?
9. What is the role of the local government in flooding and matters concerning the townships?
10. What other departments do you speak with on a regular basis?

Government Department Interview Questions

1. What are your specific responsibilities within the department?
2. What is your role in terms of reducing flood risk in informal settlements?
3. What is your role in terms of flood response in informal settlements?
4. What has communication with other governmental sectors regarding the pond been?
5. Has there been any communication with GP ward councillors directly regarding the detention pond?
6. Does flooding play a role in city planning? How so?

7. Whose jurisdiction does the detention pond fall under?
8. Whose responsibility is it to inform you of issues, such as flooding in Graveyard Pond?
9. How do you handle flooding in Graveyard Pond?

Roads and Stormwater Specific Questions

10. How many detention ponds are in Cape Town? What are the roles of these ponds?
11. How many of these detention ponds have settlements on them?
12. What are the future plans for these detention ponds? GP specifically?
13. What is the protocol for settlements formed on detention ponds?

Appendix B: Consent Form

Title of Research Project:

Cross-scale collaboration and adaptation planning in informal settlements: a case study of Graveyard Pond, Philippi

Names of principal researchers:

Christina Orangio

Department/ Research Group Address:

Shell Environmental and Geographic Sciences Building, South Lane, Upper Campus University of Cape Town, Private Bag X3, Rondebosch 7701

Telephone:

Provided on actual form

Email:

Provided on actual form

Name of participant:

Nature of the research:

Interviews regarding cross-scale collaboration between local government and township community leaders surrounding the informal settlement being located in a detention pond.

Participants Involvement:

What's involved: An in-depth interview regarding personal experience with your particular role and /or relationship in Graveyard Pond.

- I agree to participate in this research project
- I have read this consent form and the information it contains and had the opportunity to ask questions about them
- I agree to my responses being used for education and research on the condition my privacy is respected, subject to the following:
  - I understand that my title may be included in the research, but I will not be personally identifiable
- I understand that I am under no obligation to take part in this project
- I understand I have the right to withdraw from this project at any stage

Signature of Participant:

_____

Name of Participant:

_____

Signature of person who sought consent:

_____

Name of person who sought consent:

_____

Signatures of principal researchers:

a) _____

b)_____

Date:_____

Appendix C: Disaster Risk Management Awareness Pamphlets

Plan ahead...

Cape Town has a wet and cold winter season.

Areas that are dry in summer can become flooded in winter.

Build on higher ground - building on floodplains and in stormwater dams is dangerous.

If your home gets flooded ...

You do not have to stay in a community hall to qualify for help. You can stay with friends and family. If you have nowhere to stay, you may be housed in a community hall.

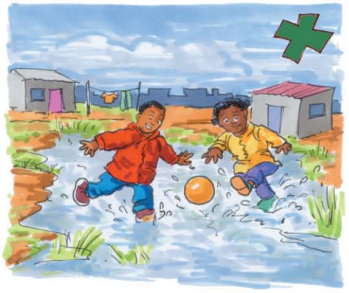
If you do have to leave home, make sure your valuables are safe.

Warn other people not to build in areas that are prone to flooding.

Help friends and family – provide them with shelter if your site is not flooded.

Protect your health

Floodwater is dirty and can make your family sick.



Tell children not to play in floodwater. Beware of sharp objects in the water.

Wash your hands with soap and clean water before working with food.

Protect your home

Raise your floor above ground level.
Make furrows to channel water around your site, and keep stormwater drains clear.