Disaster risk reduction strategies for informal settlements: A case of Hlophekane in Giyani, Limpopo Province, South Africa

By

Vhahangwele Charlene Ramunenyiwa

A Master's dissertation submitted to the Department of Urban and Regional Planning in the School of Environmental Sciences, in Fulfilment of the Requirements for the Award of Master of Urban and Regional Planning (MURP) Degree.

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DECLARATION

I Ramunenyiwa Vhahangwele Charlene, student number **11616950,** hereby declare that this masters research titled "**Disaster risk reduction strategies for informal settlements: A case of Hlophekane in Giyani, Limpopo Province, South Africa**" has not been submitted previously for a degree at this or any other university, it is my own work in design and in execution, and that all reference material contained therein has been dully acknowledged.

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DEDICATION

I dedicate this work to the following three special people in my life: My late Grandmother Kutame Nyadzani this is to say I have become the woman that you wanted me to be. My daughters Omphatshilidzi and Omphathutshedza Ndhukwani who keep motivating me to do more. My mother Azwihangwisi Joyce Ramunenyiwa, this is to say you have played your part in our lives and you are our world, no words can explain the sacrifices you have made for us and I thank you with this research.

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Ndo livhuwa

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ABBREVIATIONS

ADPC	Asian Disaster Preparedness Centre.
CCOHS	Canadian Centre for Occupational Health and Safety
CSERGE	Centre for Social and Economic Research on Global Environment
DFED	Department of Finance and Economic Development.
DMC	Disaster Management Centre
DMIS	Disaster Management Information Systems
DRR	Disaster Risk Reduction
EIP	Environmental Implementation Plan
EMHSAP	Emergency Management Homeland Security Academic Programme
EPM	Environmental Planning Management
ESCAP	Economic and Social Commission for Asia and the Pacific
EWN	Eye Witness News
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographical Information System
HDA	Housing Development Agency
HFA	Hyogo Framework of Action
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster reduction
KII	Key Informative Interviews
LEDET	Limpopo Economic Development, Environment and Tourism
MCCR	Mwanza City Council Report

NARRI	National Alliance for Risk Reduction and Responses Initiatives
NDMC	National Disaster Management Centre
NDMF	National Disaster Management Framework
NEMA	National Environment Management Act
NOAA	National Oceanic and Atmospheric Administration
ODPM	Office of Disaster Preparedness and Management
OSHA	Occupational Safety and Health Administration
PAHO	Pan American Health Organisation
SADC	Southern African Development Community
SADMA	South Africa Disaster Management Act
SAHO	South African History Online
SALG	South African Local Government
SDG	Sustainable Development Goal
SERI	Socio-Economic Rights Institute of South Africa
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Program
UNDRR	United Nations office of Disaster Risk Reduction.
UNISDR	United Nations International Strategy for Disaster Reduction
UNOCHA	United Nation Office for the Coordination of Humanitarian Affairs
USAID	United States Agency International Development
WCDR	World Conference on Disaster Risk Reduction
WMO	World Meteorological Organization

ABSTRACT

The frequency of natural disasters in informal settlements has been on the increase globally, Yet approximately 1 billion people still live in informal settlements world-wide. In South Africa, about 1.2 million people live in informal settlements characterised by inadequate infrastructure, lack of effective land use and spatial planning, high densities and are highly exposed to the risk of disasters. In general, there is a close link between informal settlements as spaces of habitation and exposure to disaster risks. Reflecting on disaster risk reduction strategies for informal settlements is therefore imperative particularly from an urban and regional planning perspective. Therefore, this work uses a case study of Hlophekane an informal settlement located in Greater Giyani Local Municipality under the Limpopo Province's Mopani District in South Africa to illustrate these concerns. The main purpose of this study is to develop disaster risk reduction strategies for Hlophekane Informal Settlement. The study sought to identify and characterize the nature of disasters in Hlophekane Informal Settlement. Data was collected from 90 households that live in Hlophekane Informal Settlement through a questionnaire survey and 3 key informant interviews were conducted. Furthermore, the study mapped disaster risk zones in Hlophekane Informal Settlement using GIS. Collected data was analysed using Statistical Package for Social Sciences (SPSS) making use of a thematic analysis and descriptive statistics. Microsoft computer software packages and Geographical Information System (GIS) were used to map disaster hotspots zones. Data was presented through the use of tables, graphs, and maps. Qualitative data was analysed making use of a range of processes and procedures to generate explanations, understanding or interpretation of the experiences of people and situations in the disaster context. The study findings in disaster risk reduction strategies are expected to provide lessons for reducing disasters in the area from an urban and regional planning perspective. Disaster Risk Reduction strategies suitable for informal settlements such as Hlophekane must be sustainable, cost effective and involve the community. A combination of the multi-sectoral and multi-displinary approaches is one of the disaster risk reduction strategies that can be implemented. This strategy integrates different sectors, government departments, NGO's and the affected communities. Out of this strategy, several projects were identified such as in situ upgrading, roll over upgrading and complete relocation. From those projects, in situ upgrading is the most suitable, convenient and cost-effective strategy that can be implemented.

***Key words**: Informal Settlements, Disaster Risks, Disaster, Vulnerability, Exposure and Hazards, Disaster Risk Reduction*

CHAPTER 1: INTRODUCTION AND BACKGROUND OF THE STUDY

1.1. Introduction.

The prevalence of natural disasters in informal settlements has been on the increase globally. Reflecting on Disaster Risk Reduction (DRR) strategies for informal settlements in urban areas is therefore imperative particularly from an urban and regional planning perspective. This research seeks to highlight these research concerns using a case study of Hlophekane, an informal settlement situated in Greater Giyani Local Municipality under Mopane District of the Limpopo Province in South Africa.

Approximately 1 billion people live in informal settlements worldwide (Hermanson, 2017). According to Engleson (2010), informal settlements are residential areas where a group of housing units are constructed on land whose occupants have no legal claim, they occupy the spaces illegally, and the areas are unplanned where housing is not in compliance with planning and building regulations (UN-Habitat, 2010; Engleson, 2010; United Nations, 1997). Informal settlements are characterized by inadequate infrastructure, lack of effective spatial planning functions, unsuitable environment for human habitation, and high population densities (UN-HABITAT, 2010; Mugisha, 2006; Payne and Majale, 2004; Anan, 2003). Often, informal settlements are characterised by squalid living conditions and are vulnerable to disaster risks such as floods, diseases, fire, and crime (Mugisha, 2006; Anan, 2003). As such, DRR strategies remain important in order to make informal settlements more habitable.

According to Kelman (2017), a disaster is an adverse event that occurs as a result of changes in the natural systems of the earth. A disaster can also be defined as severe disturbance of society that involves widespread loss of human lives, livelihoods, material and environmental assets (and Helvetas Swiss Interco operation, 2014; United Nations International Strategy for Disaster Reduction (UNISDR), 2009). Disasters can be severe or moderate (Datar *et al.*, 2013). In most cases, these disasters are natural, although some are a result of human activities. Globally, the disaster setting emphasis has been largely positioned on the initial humanitarian and emergency response (Alexander, 2005). Today, more than 226 million people are affected by disasters every year (UNISDR, 2013). This requires more proactive interventions such as DRR strategies.

Disaster Risk Reduction strategies entail effort and scaling priority towards reducing deplorable living conditions that arise from disaster situations (ISDR, 2009). These DRR strategies include strengthening institutional capacities of local authorities through risk assessment, creating early warning systems, and community education among others (Ministry of Social Solidarity, 2008; Matsimbe, 2003). The International Strategy for Disaster Reduction (ISDR) in the Hyogo Framework of Action (HFA) identified early warning, improved governance, building up community and household resilience, and reducing the underlying risk factors while strengthening disaster preparedness as important elements of reducing disaster risks (UNISDR, 2015; United Nations, 2015). Clearly, there are many ways of reducing disaster risks. These vary in space and time. As such, governments around the world cannot ignore the risks of disasters on people's lives (White, 2013).

In many cases, people who live in precarious spaces such as informal settlements are vulnerable to disaster risks. Residents of informal settlements are prone to disasters of many kinds because they reside in spaces with uncontrolled planning (Mugisha, 2006; Anan, 2003). Informal settlements lack adequate infrastructure and basic housing services. This exposes the residents to risks of disasters (Mugisha, 2006; Anan, 2003). According to ISDR (2009), disaster risks are a function of exposure and vulnerability to situations that trigger disasters at any moment. Strategies for DRR in informal settlements therefore require deeper exploration (ISDR, 2009). Disaster risk reduction strategies in informal settlements decrease the risk of disasters and improves the living conditions of residents. Reflecting on disaster risks and strategies that reduce risks of disasters therefore require urgent attention (USAID, 2011). Recently, there has been a growing acknowledgement of the significance and value of DRR strategies in the context of the communities affected by disasters (Twigg, 2015; Dickson *et al.*, 2012). This research seeks to develop DRR strategies for informal settlements from an urban and regional planning's perspective.

In Africa and the global arena at large, emphasis has been on the need for functional disaster risk reduction strategies (UNDP, 2009). Existing strategies rather focus on unsustainable application of the disaster management cycle. Yet, disasters require context specific interventions responsive to local conditions.

In South Africa, rapid migration of people from deep rural areas and neighbouring countries has become a huge problem for towns or provinces located near the national borders. This issue has become complex for spatial planning because most of these migrants end up settling in informal settlements exposing themselves to different kinds of disasters (Marutlulle, 2017; Mahlakoana, 2010). These informal settlements are characterized by dwellings with inadequate infrastructure and lack of basic services such as water, sanitation, roads, and electricity which pose serious threats to health, safety, and security (Marutlulle, 2017; Ziblim, 2013; Mahlakoana, 2010). In South Africa, most informal settlements lack effective governance, and thus are unsuitable for human habitation (Housing Development Agency (HDA), 2012). In some cases, these informal settlements have high population densities.

About 1.2 million people in South Africa live in informal settlements (Ziblim, 2013). There is a close link between informal settlements as spaces for habitation and exposure to the risk of disasters. This means that people who live in informal settlements are likely to be affected by disasters in their lifetime. However, informal settlements remain alternatives to housing for the urban poor in the absence of efficient housing markets (Socio-Economic Rights Institute of South Africa (SERI), 2018). Regrettably, most informal settlements continue to experience negative impacts of disasters. This research therefore explores possible DRR strategies for an informal settlement called Hlophekane located in Mopani District of South Africa.

Hlophekane is an informal settlement situated in Greater Giyani Local Municipality, approximately 5km from Giyani Central Business District (Google maps, 2018). The informal settlement comprises migrants from different parts of Africa, and Asia mostly asylum seekers that are unable to find better places to stay. Hlophekane is situated on a floodline area. The settlement pattern of Hlophekane is dispersed with no visible subdivision layout of land uses. In case of emergency, it is therefore difficult for ambulances or fire fighters to get access to the settlement. Clearly, disaster risk reduction strategies from a planning perspective requires urgent attention.

1.2. Rationale

A lot of research, declarations, policies and strategies, plans and programs have been developed globally on disaster management including the Hyogo Framework for Action 2005-2015, and the Sendai Framework for Disaster Risk Reduction 2015-2030 for example. In South Africa, a study on disaster risk management in local government by Foreman and Kennedy on informal

settlements of eThekwini Municipality in KwaZulu-Natal recommends that eThekwini Municipality should recognize recovery period mitigation and incorporate this objective into recovery planning (Ngcamu, 2011). In addition, much has been written about informal settlements in urban areas on disaster management, for example, Mahlakoana (2010) highlights vulnerability to brown environmental problems in the Seshego Informal Settlement in Limpopo Province. However, little research has been conducted on DRR strategies for informal settlements generally since informal settlements are regarded as unplanned. In South Africa, particularly in Limpopo Province, very little has been researched on disaster risk reduction. Yet, informal settlements are on the increase in the peripheries of small rural towns where land is unsuitable for human habitation (Ogra *et al.*, 2013). In any case, there are no existing studies on Hlophekane Informal Settlement that relate to disaster risk reduction. Yet, this settlement is prone to disaster risks. My interest is to develop DRR strategies for informal settlements. My experience in urban and regional planning, and water sector are important in developing functional debates and adaptable planning options based on the findings of this study. My knowledge of informal settlements is also crucial. I am familiar with what is happening in Hlophekane because I visited the place a number of times.

1.3. Statement of the problem

Hlophekane Informal Settlement in Greater Giyani Town under Mopani District of South Africa is a disaster-prone neighborhood because it lies on a floodline of a nearby river called Klein Letaba. This situation exposes residents of this informal settlement to vulnerability and risks of flooding and other allied disasters. Developing DRR strategies from an urban and regional planning perspective is therefore critical in order to improve the living conditions of people, as well as making the space more habitable.

1.4. Aim of the study

The aim of this study is to develop DRR strategies for Hlophekane Informal Settlement in Greater Giyani Local Municipality under Mopani District of the Limpopo Province in South Africa – from an urban and regional planning perspective.

1.5. Objectives and Research Questions

1) To characterize the nature of disasters in Hlophekane Informal Settlement.
2) To map disaster risk zones in Hlophekane Informal Settlement using GIS.

3) To develop disaster risk reduction strategies for informal settlements in rural towns of South Africa such as Giyani – for recommendation to the local municipality.

1.6. Significance of the study

This study is part of a larger joint research project between the University of Venda School of Environmental Science and the Disaster Management Center in Mopani District, Limpopo Province of South Africa. This research is also a critical component in urban and regional planning particularly debates on sustainable human settlements. As such, the study seeks to contribute to the body of knowledge on disaster risk reduction, as well as urban and regional planning. Furthermore, the study seeks to generate political will on prioritization of DRR strategies for informal settlement even through these spaces are largely unplanned.

1.7. Scope and the delimitation of the study

This section introduces the scope of the study in terms of physical scope which covers the geographical aspects of the study, temporal scope which sets the time lines for the study, whereas the conceptual and theoretical scope delineate the relevant concepts and theories on DRR and informal settlements.

1.7.1 Physical scope

This study is restricted to the Hlophekane Informal Settlement situated in Greater Giyani Local Municipality under Mopane District of the Limpopo Province in South Africa. This informal settlement covers a total area of 1.50 km² and with coordinates 23.3228S, 30.7374E (Google Maps, 2018). On the northern side, the boundary of the informal settlement area is separated from Giyani A neighbourhood by Shimati Road. There are no physical boundaries on the west and south of the settlement (Google maps, 2018).

1.7.2. Temporal scope

The temporal scope of the study stretches from 2008 when the settlement was initiated to 2019. Datasets on planning, as well as disaster events will be informed by experiences during this period. Temporal scope is intended to provide an understanding of the dynamics of disaster events since the establishment of the informal settlement in 2008.

1.7.3. Conceptual scope

The conceptual scope of this research focuses on disaster risk reduction in the realm of informal settlements. Concepts will be discussed from an urban and regional planning perspective. The concepts include exposure, vulnerability, hazards, disaster risks and disasters.

1.7.4. Theoretical scope

In order to understand why 'things' happen the way they do in Hlophekane Informal Settlement, the study adopted Lefebvre's theory on production of space. The theoretical framework focused on right to the city concept and Disaster Crunch Model.

1.8. Description of the study area

Hlophekane is located in the Greater Giyani Municipality of Limpopo Province of South Africa. Limpopo is one of South Africa's poorest provinces with 63.8 per cent of the population living below the poverty line (Limpopo Economic Development, Environment and Tourism (LEDET), 2015; Municipalities of South Africa, 2018). Limpopo Province is susceptible to disasters because it lies in a zone affected by both tropical and subtropical weather systems where rainfall can be highly vulnerable and unreliable (Hart *et al.*, 2013). Below is a map of South Africa showing the location of Limpopo Province in the northern part of the country bordering Botswana, Zimbabwe, Mozambique and Swaziland. Figure 1.1 also illustrates the map of Limpopo Province and the location of Mopani District. In addition, the map shows the location of Greater Giyani Municipality where Hlophekane Informal Settlement is located. Lastly, Figure 1 illustrates a google map of Hlophekane Informal Settlement. Limpopo Province is made up of 5 districts namely Mopani, Vhembe, Capricorn, Waterberg and Sekhukhune (South Africa Auditor General, 2012). Hlophekane Informal Settlement is located in the northern part of the Mopani District. The proximity of Mopani District to the south of the Indian Ocean makes it vulnerable to tropical cyclones. As such, this district is prone to natural disasters due to its location. Mopani District is made up of Greater Letaba, Greater Tzaneen, Greater Maruleng, Ba-Phalaborwa and Greater Giyani municipalities (see Figure 1.1). Hlophekane Informal Settlement fall under the Greater Giyani Local Municipality. Hlophekane Informal Settlement is located approximately 5 km from Giyani Town. Giyani Town is the largest center of population concentration, employment opportunities, shopping and recreational facilities in this municipality. Figure 1.1 below illustrates the location of Hlophekane Informal Settlement from a national context to a local context.

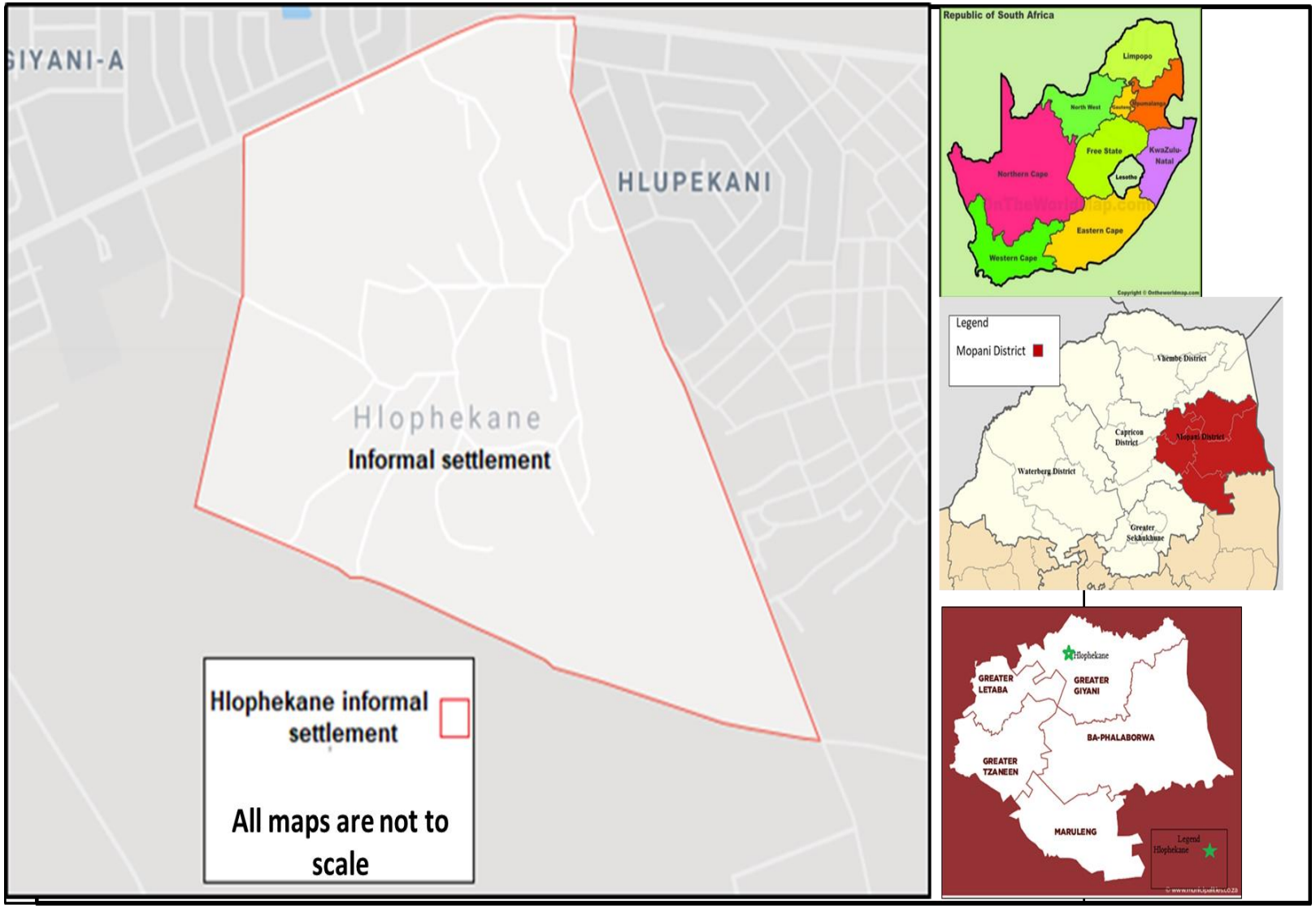

Figure 1.1. Showing South Africa, Limpopo Province, Mopani district, Greater Giyani municipality and Hlophekane informal settlement

Source: Google maps, 2018.

According to the South African Census Report (2011), the total population of Hlophekane Informal Settlement is constitutive of 574 people of which 54,2% are male and 45,8% female. This informal settlement has a population density of 377 persons/km² from 199 households (SA Stats, 2011). However, the number of households in the informal settlement is always changing as newcomers settle, and some people leave to stay elsewhere.

Hlophekane Informal Settlement is situated on a floodplain on a gentle slope. Its location makes it susceptible to flooding each time it rains. Hlophekane Informal Settlement is characterized by a flat topography and the vegetation comprises of lowveld and Mopani bushveld vegetation of the savannah biome (Limpopo Department of Finance and Economic Development (LDFED), 2004). The surrounding land use is evidently residential and recreational. The rainfall average is 600mm, the driest month being June with an average of 4mm of rainfall and the greatest month of precipitation occurs in February with an average of 140mm (LDFED, 2004). The warmest month of the year is January with an average temperature of 26.0°C and the lowest temperature is in July with an average temperature of around 16°C. (LDFED, 2004).

1.9. Definition of key terms

Coping capacity is the capability of individuals, organisations and systems, using available skills and resources, to face and manage adverse conditions such as hazards, emergencies or disasters (UNISDR, 2009).

Disaster is a severe disturbance of the operational the public or a society that involves the widespread human, material, or environmental losses and impacts which exceeds the ability of the affected community to cope using only its own resources (UNISDR, 2009).

Disaster risk is considered a combination of the rigorous and rate of recurrence of a hazard, the numbers of individuals and the resources exposed to the hazard, and their vulnerability to the damage (UNISDR, 2015).

Disaster risk reduction is a concept and practice of reducing disaster risks through orderly determinations to scrutinize and manage the underlying factors of a disasters, that include reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, as well as improved vigilance for adverse effects (USAID, 2011).

Disaster risk reduction strategies define goals and objectives across different timescales and with concrete targets, indicators and time frame.

Exposure refers to the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas (UNISDR, 2007).

Hazard is a physical state that has the capability of injuring humans, damaging property, damaging the environment or a combination of both however it has the potential of becoming a disastrous event when it occurs in populated areas where it can cause deaths or major economic losses (Allen, 1992).

Informal settlements are unplanned settlements or areas where housing is not incompliance with present planning bylaws and building regulations (United nations, 1997).

Livelihood is a means of people making a living. It includes people's abilities, assets, revenue and activities essential to secure the necessities of life (Chambers *et al.*, 1991).

Migration is the geographic movement of individuals and people across a definite boundary for the aim of developing a new permanent or semi-permanent home (Quinterno, 2014).

Resilience is the ability of an organisation, community or society exposed to hazards to fight, absorb, provide accommodations to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2009).

Risk is the probability of harmful consequences or expected losses (deaths, injuries, property, livelihoods, disrupted economic activity or environmental damage) resulting from interactions between natural or human-induced hazards and vulnerable conditions (UNISDR, 2009).

Rural area means sparsely populated areas in which people farm or depend on natural resources, including villages and small towns that are dispersed through these areas (Dent *et al*, 2003).

Rural town: According to the South African Rural Development Framework (1997), these are sparsely populated areas where people farm or rely on natural resources, including villages and small towns scattered throughout these areas.

Small towns these are small centers in the context of their respective national urban and economic systems, most of which are defined by population size and function (Van Niekerk and Marais, 2008).

Sustainable settlements are ecological settlements that are designed to have little impact on the environment as possible (Riley, 2019).

The disaster cycle consists of the steps that emergency managers take in planning for and responding to disasters (Rosenberg, 2007).

Vulnerability is the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt (Adger, 2006).

1.10. Chapters layout.

This dissertation is divided into eight distinct chapters structured as follows:

Chapter 1: This chapter provides a summary of the research, a brief description and context of the study field, problem statement, study scope and significance. The chapter sets the tone and argument for the research.

Chapter 2: This is the first chapter on literature review. The chapter unpacks the important concepts covered by the research, as well as the theoretical underpinnings used to interpret the research findings.

Chapter 3: This chapter contextualizes important legislations and policies linked to DRR and informal settlements, as well as spatial planning more generally.

Chapter 4: This chapter highlights the research methodology used to achieve each of the research objectives.

Chapter 5: This chapter is the first analysis chapter that characterizes Hlophekane Informal Settlement.

Chapter 6: This chapter is the second analysis chapter that focuses on disaster risks in Hlophekane Informal Settlement.

Chapter 7: This chapter provides the findings on possible DRR strategies for Hlophekane Informal Settlement.

Chapter 8: This is the last chapter of this research that provides a summary of conclusions and recommendations based on the research findings from the analysis chapters.

1.11. Chapter summary

This chapter introduces the topic being studied and the intentions of the research. The chapter outlines the background of the study and introduces the concepts of disaster risk reduction strategies and informal settlements from an international and local perspective. This chapter demonstrates the importance of studying DRR strategies for informal settlements. The next chapter is on Literature Review.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter reviews literature on disaster risk reduction (DRR) strategies, and on informal settlements. A literature review is a critical evaluation of what has been published on a topic by accredited scholars and researchers (Taylor *et al.,* 2008). Therefore, the aim of the review is to summarize, evaluate, and compare original research in that specific area, and it is a secondary source (Taylor *et al.,* 2008). The first section discusses the basic concepts related to the topic such as informal settlements, disasters, and disaster risk reduction. Secondly, the literature covers the relationship between disasters and disaster risk reduction. The last sections provides the theoretical framework used as the mode of analysis in this study. These modes of analyses are Lefebvre`s theory on production of space with a focus on right to the city concept (1968); and the Disaster Crunch Model (Minh Hai and Smyth, 2012).

2.2. The concept of informal settlements

Informal settlements are defined as residential areas where a group of housing units has been constructed on land to which the occupants have no legal claim, or which they occupy illegally (UN Habitat, 2010). Generally, informal settlements in most regions of the world are characterised by high densities, moderate or non-basic infrastructure services such as poor housing, lack of portable water, poor sanitation, lack of electricity, and secure tenure. In most cases, informal settlements suffer from degraded environmental and health conditions (Mugisha, 2006; Kilian *et al*., 2005; Anan, 2003).

More than a billion people live in marginalised and informal settlements without access to basic services and very frequently in high risk areas, they simply just get any piece of land and settle in it, without considering the environmental factors (Hermanson, 2017). Their vulnerability to disaster events is often compounded by a lack of infrastructure, for example, not having a functional drainage system, and lack of proper housing (Emergency Management Homeland Security Program (EMHSAP), 2018). If the material used to build houses is not strong enough to withstand disasters, it exposes the occupants to disaster risks (EMHSAP, 2018). The characteristics of informal settlements worldwide are similar, and they range from lack of adequate of social services and basic infrastructure. Many cities have building standards that set minimum

requirements for residential buildings, however informal settlements are associated with a high number of substandard housing structures, often built with non-permanent materials unsuitable for housing (Nassar, 2017; George *et al.*, 2006). Overcrowding, high occupancy rates, cohabitation by different families, high numbers of single-room units, and high population densities are some of the features used to describe informal settlements (UN-Habitat, 2010). In addition, Nassar (2017), states that unhealthy living conditions and hazardous locations, lack of basic services, visible and open sewers, lack of pathways, uncontrolled dumping of waste, and polluted environments also typify conditions found in informal settlements. Some of the definitions of informal settlements consider lack of security of tenure as a central characteristic of informal settlements, and regard lack of any formal document entitling the occupants to occupy the land or structures as prima facie evidence of illegality and informal occupation of space (; UN-habitat, 2010; George *et al.*, 2006). For example, Diepsloot is an informal settlement in South Africa that has all the above characteristics and more (Marutlulle, 2017). Although the government of South Africa keeps providing state social housing to the residents of Diepsloot, informality keeps growing annually, and during the rainy season people who stay on floodlines are swept away by floods (Marutlulle, 2017). This clearly shows the risks associated with staying in informal settlements as people are exposed to a myriad of disasters.

Exposure to disasters refers to situation whereby people, infrastructure, housing, production capacities and other tangible human assets are located on areas that are prone to hazards that lead to disasters (UNISDR, 2007). People and economic assets become concentrated in areas exposed to hazards through processes such as population growth, migration, urbanization and economic development (UNISDR, 2009). Previous disasters are also a factor that can force people to increasingly settle on unsafe areas. Consequently, exposure changes over time and from place to place (Hunter, 2005). Many people in developing countries are pushed to stay in informal settlements as they seek for work in cities. These areas are often the only available free spaces (Arias *et al.*, 2017; Leopold *et al.*, 1964). Clearly, people and their assets are exposed to disaster risks due to various circumstances.

2.3. Vulnerabilities associated with informal settlements

Over the years there have been different definitions of vulnerability. In this study, vulnerability refers to the extent to which individuals or households living in an informal settlement may be susceptible to hazards that reduce their ability to prepare, withstand or respond to particular disasters (USAID, 2011; UNISDR, 2009; Republic of South Africa, 2003). Birkmann (2006) defines vulnerability as the capacity of a community to anticipate, confront, resist and recover from the impacts of natural disasters. Vulnerability to disasters comprises a variety of factors which determine the degree of exposure of both people and material goods to risks.

There are four types of vulnerability which are physical; economic; social and attitudinal vulnerability. Physical vulnerability of a community is determined and influenced by the geographic proximity to the main source and origin of disaster (; Rovshan, 2017; Wisner *et al.*, 2003; ADPC, 2001). Economic vulnerability of a community is measured by determining how different its sources of income are, how easy one can access and control the means of production (Rovshan, 2017; Adger, 1998). Social vulnerability of a community is influenced by weak and dysfunctional family structures, lack of leadership for decision making and conflict resolution, unequal and biased participation in decision making, both weak or no community organizations, and the one in which people are discriminated on racial, ethnic, linguistic or religious basis (Rovshan, 2017; M and E Studies, 2016; Burt *et al.*, 2012). Attitudinal vulnerability is one that is determined by the communities' negative and destructive attitude towards change and they lack initiative in life and that makes them become more and more dependent on external support because they cannot act independently and build their community (Bigael, 2018). This study therefore highlights the nature of vulnerabilities that characterize Hlophekane Informal Settlement.

2.4. Hazards that characterize informal settlements

A hazard can be defined as the probability of a potentially damaging natural phenomenon occurring in a specific place and in a specific period of time (Tominaga *et al*., 2009: 151). Hazards can be single, sequential or combined in their origin and effects. A hazard is a rare or an extreme event in a natural or man-made environment that harmfully effects human life, property or livelihoods; it reflects a potential threat to human and the impacts of such an event to the society and the environment (Hansford, 2011; UN/ISDR, 2002). For example, disaster risks that can occur in informal settlements are a result of impacts of hazards on society. These could be man-made

(anthropogenic) or natural. It should be noted that the effect of a hazard of a particular magnitude would affect communities differently (Von Kotze *et al.*, 1995: 35). For example, poorer communities such as those living in informal settlements are more prone to disaster hazards because of their limited capacity to cope with adverse situations.

2.5. Disaster risks in informal settlements

According to UNISDR (2009), a disaster risk is a combination of the probability of an occurrence of an event and its negative consequences. The term risk is therefore multidisciplinary, and it is used in a variety of contexts. According to the Asian Development Bank (2014), a disaster risk can be characterized as a function of the probability of occurrence of hazards of varying severity in a particular location. The concept of disaster risks is a combination of processes and conditions which result from physical, social, economic and environmental factors that increase the susceptibility of a community to exposure to risks and to the impact of dangers (Tominaga *et al*., 2009: 151). Therefore, the three critical elements that determine disaster risks include a hazard, vulnerability to the hazard, and coping capacity of the communities (USAID, 2011). Residents of informal settlements are exposed to disaster risks as a result of their location, and inability to pool together available resources to make themselves and their assets safe in case of any form of eventuality be it man made or natural.

2.6. The concept of disasters

Disasters are a global phenomenon that occur as a result of natural changes in weather patterns, as well as human activities. According to Brigitte *et al.*, 2003, disasters are "a sudden event, such as an accident or natural catastrophe that causes great damage or loss of life". The United Nation International Strategy for Disaster Reduction (UNISDR) (2009) states that disasters are a result of hazard that impacts on vulnerable communities that cause damage to life, assets, or livelihoods in ways which exceed the people's capacity to cope. Disasters can also be defined as a progressive or sudden; widespread or localised; natural or manmade occurrences which cause death, injury, and disease; as well as damage to property or disruption of the life of a community with a magnitude exceeding the ability of those affected to cope with the consequences (Disaster Management Act No. 57 of 2002; Bethke *et al.*, 1997; Reed, 1997; Stephenson, 1994). Clearly, disasters result in destruction and uncomfortable situations on spaces. They undertake different forms and kinds. For example, the Tsunami floods of South East Asia in 2004; the bomb-blast of

the World Trade centre in 2001; the Hurricane Andrew that smashed Louisiana and its environ in 2005 (Sigma, 2018). In Africa, typical examples include cyclones Idai and Kenneth that ravaged communities in Mozambique, South Africa, Zimbabwe, Malawi and Zambia (Yuhas, 2019). A number of informal settlements in South Africa were affected by cyclones Idai and Kenneth. Both the natural and man-made disasters occur as a result of the failure of the built environment to structurally, functionally, environmentally and socially resist the physical forces of natural forces to provide the functional support necessary for recovery (Adeleye *et al.*, 2006).

2.6.1 Categories of disasters

There are two distinct categories of disasters. These are natural disasters and manmade disasters. According to Wisner and Adams (2002), disasters can take many different forms, and the duration can range from an hourly disruption to days or weeks of ongoing destruction. Natural disasters are extreme, catastrophic or sudden events caused by nature or the natural processes of the earth that injure people and damage property (Kelman, 2017; Basic planet, 2013). These natural disasters continue to strike persistently and without notice and are perceived to be on the increase in their magnitude, complexity, frequency and economic impact globally (Lindell, and Prater, 2003). Examples of natural disasters range from agricultural diseases and pests; damaging winds; drought and water shortage; earthquakes; emergency diseases (pandemic influenza); extreme heat; floods and flash floods; hail; hurricanes and tropical storms; landslides and debris flow; thunderstorms and lighting; tornadoes; tsunamis; wildfire; winter and ice storms and sinkholes (www.restoreyoureconomy.org, 2018; Natural disaster, 2016; Dotto *et al.*, 2010; Prevention web, 1989).

Hurricanes and tropical storms are amongst the most powerful natural disasters because of their size and destructive potential. Tornadoes are quite short-lived but violent, possibly causing winds in excess of 200 mph. Both earthquakes and tornadoes strike suddenly without warning (RestoreYourEconomy.org, 2018; National Oceanic and Atmospheric Administration (NOAA), 2018). Disasters can also be caused by humans. A man-made disaster is one in which many deaths and destruction are caused by error or negligence on the part of human beings (Ragheo, 2017). Man-made disasters include chemical spills, groundwater contamination, cyber-terrorism, hazardous materials, power service disruption, nuclear blast, radiological emergencies, and veld fires (Duggal and Chowdhury, ND; Pedikaris, 2014). Informal settlements are more prone to

common disasters that cause property damage and loss of life. Figure 2.1. Below illustrates the disaster cycle constitutive of exposure, vulnerability context, hazards, disaster risks that ultimately lead to disasters. It is therefore important to understand these dynamics in order to come up with functional DRR strategies for informal settlements.

Figure 2.1 Disaster Cycle
Source: www.restoreyoureconomy.org (2018).

2.7. The concept of risk reduction

Disaster risk reduction is a concept and practice of reducing the probability of an occurrence of negative events on people or communities through well planned and systematic effort to analyse and understanding the causal factors (UNISDR World Meteorological Organization (WMO), 2012; USAID, 2011). Disaster risk reduction is made up of different activities that support each other to reduce vulnerabilities, risks and hazards. Reducing exposure to hazards, lessening vulnerability in contexts where people live, improving preparedness through institutionalized early warning systems for adverse events are all examples of DRR strategies (UNISDR, 2009). Clearly, disaster risk reduction results from complex interaction between development process that generates conditions that reduce exposure, vulnerability and hazards in communities (UNISDR, 2015).

2.8. The notion of disaster risk reduction strategies

Disaster risk reduction strategies entail effort and scaling priority towards reducing deplorable living conditions that arise from disaster situations (The International Strategy for Disaster Reduction (ISDR), 2009). According to the ISDR Report (2006), disaster risk reduction strategies include strengthening institutional capacity of local authorities through equipping them with

knowledge on risk assessment. This will enable communities to be able to assess the nature and extent of risks (ISDR Report, 2006). The practice of analysing potential risks is done through evaluating existing conditions of vulnerability that together could potentially expose people, property, services, livelihoods and the environment to disasters (ISDR Report, 2006). Community education is one of the most important DRR strategies that enables communities to react when a disaster hits (ISDR, 2009; Arya *et al.*, 2005; ISDR, 2004).

2.8.1. The disaster management cycle as a disaster risk reduction tool

The disaster management cycle illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred (Nishan, 2015) This tool is widely used to reduce or avoid losses from hazards; and with the aim to ensure prompt assistance to victims (Nishan, 2015; Rosenberg, 2007). However, in most cases, disaster management occurs after a disastrous event. It is therefore important to put more emphasis on DRR strategies than to wait until disasters struck. Figure 2.2 illustrates the components of a disaster management cycle.

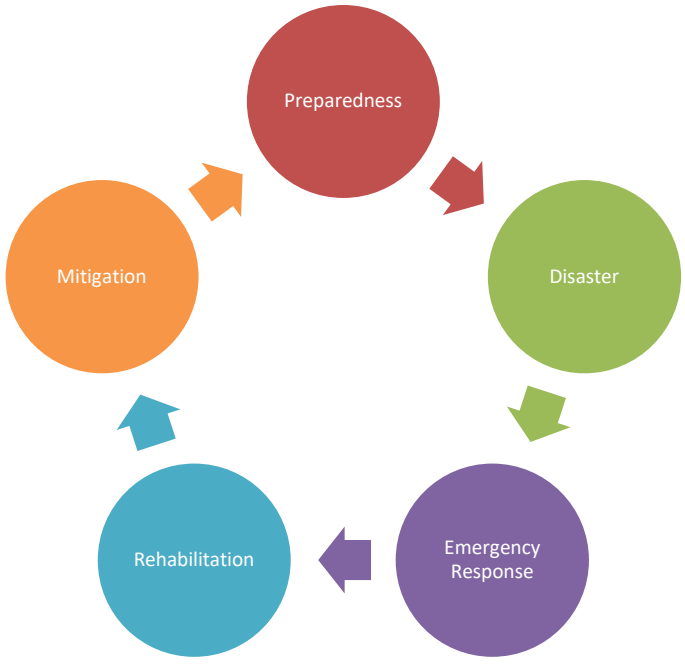

Figure 2.2. Disaster Risk reduction cycle
Source: Nishan (2015).

Two important aspects of the disaster risk management cycle are mitigation and preparedness. Mitigation involves pre-impact actions that involve directly preventing future disasters and reducing their destructive effects (Lindell and Perry, 2000). Whereas preparedness includes plans or preparations made in advance in order to help individuals and communities get ready for the hazard (Lindsay, 2012). These two elements form part of DRR strategies communities can adopt before disasters strike. On the other hand, emergency response puts attention as soon as disaster strikes through swift response (Hindle, 2017; Hansford, 2011). Rehabilitation also known as disaster recovery occurs after the damages have been evaluated, and it includes rehabilitation of the community to its original state or better –with the aim to make it less vulnerable to future risks (Hansford, 2011; Nasim and Comfort, 2003). An overview of the disaster management cycle demonstrates that in some instances the components do not flow in a linear pattern but are iterative. This means that contexts such as experiences of residents in informal settlements require DRR strategies that are adaptable to local circumstances.

2.8.2. Early Warnings

Early warnings systems are methods by which people receive important and timely information in a systematic way prior to a disaster in order to take informed decisions and take actions to reduce harm or loss (UNISDR, 2009). There are four basic elements of early warning systems which are risk knowledge, monitoring, response capability and warning communication (United Nations, 2015). All these elements must function efficiently for a system to be successful. Early Warning Systems play an important role in enhancing disaster risk reduction because they assist in minimizing disaster risks and save lives (Gautum and Phaiju 2013; Lassa and Sagala 2013; Perez *et al.*, 2007).

2.8.3. Capacity building

Capacity building is an ongoing process that equips experts and communities to perform their functions in a better manner during a disaster (National Disaster Management Authority, 2018). The concept of capacity building for managing and reducing disaster risks is highlighted extensively in the Hyogo Framework for Action 2005-2015. The framework calls for accelerated efforts to build community and national-level capacities to manage and reduce risk (UNISDR, 2013).

2.8.4. Community Education

Education is a process that must be integrated at different levels of management and practice of disaster risk reduction and has a positive effect on community knowledge and attitudes for risk reduction (Aghaei and Nesami, 2013; Song *et al.*, 2004). Community education enlightens communities on how to react and behave when faced with disasters (ISDR, 2009; Arya *et al.*, 2005; ISDR, 2004). As such, the UNISDR is promoting a global culture of safety and resilience through the integration of disaster risk reduction in school curriculums and the continuous involvement of children and youth in the decision-making process for disaster risk reduction. This facilitates the organization of thematic discussions on disaster risk reduction education in key international forums (United Nations Office of Disaster Risk Reduction (UNDRR), 2019).

2.8.5. The eco-system resilient approach

The eco-system resilient approach is an approach that aims at integrating a management of land, water, and living resources to promote their conservation and sustainable use in an equitable way (Adams *et al.,* 2004). There are several conditions that should be considered when integrating an ecosystem based disaster risk reduction such include the nonlinearity of disaster events, meaning that not all types and magnitudes of disaster risks can be reduced solely by ecosystem-based approaches and it should also be noted that natural variability and the presence of previous interventions must also be taken into account when implementing an eco-system resilient approach (Koch *et al.,* 2009).

2.8.6. Multi-disciplinary approach

This approach is based on integrated multi-disciplinary and sectorial approach. It intends to have a diverse participation of professional disciplines, from different departments, private investors, the community and it also requires political commitments, this is based on different ideas, different approaches and support system Green and Johnson, 2015).

As part of this approach there is a need to have a supportive social task team from the community that can incorporate equity and social justice considerations in preparedness planning and response. It aims to strengthen the ways that people living in fragile environment can cope with natural environment by building a sound evidence base of the role that healthy environment play in reducing risks and other critical drivers of disaster risks (Green and Johnson, 2015).

2.9. Theories and approaches to understanding disaster risk reduction

Under this section the study, theories and models that provide meaningful insights into understanding DRR strategies are reviewed.

2.9.1 The community-based risk reduction approach

The overarching aim of the approach is to reduce vulnerabilities and strengthen people's capacity to cope with hazards (Yodmani, 2002). In essence, the community-based risk reduction approach aims to increase resilience and strengthening the state mechanism for disaster preparedness through community rural preparedness (Yodmani, 2002). A thorough assessment of a community's exposure to hazards and an analysis of their specific vulnerabilities and capacities form the basis for all activities, projects and programmes directed towards disaster risk reduction (Yodmani, 2002; ISDR, 2002). The community based risk reduction model recognises community risk assessment as an essential tool to a bottom up decision making approach for the development of policies, strategies and plans towards effective disaster risk reduction (ISDR, 2007; ISDR, 2007a). The community-based risk reduction model unpacks the importance of the community and the role it plays in DRR. This means that involving informal settlement community resident's assists in assessing the type of disaster risks they are exposed to and understanding how vulnerable they are to disaster risks.

2.9.2 Disaster resistance planning approach

The disaster resistance planning approach is used to minimize the damage and distribution of disasters (Adeleye *et al.*, 2006. This approach embraces a clear understanding of how we manage growth and how we plan and develop our communities. This approach also explains how people relate with the natural environment, as well as the capacity of an environment to resist and minimize the results of a disaster (Adeleye *et al.*, 2006). The disaster resistance planning approach explains why it is important to observe what residents apply as their disaster resistance mechanism, for example, in informal settlements such as Hlophekane.

2.9.3 The Disaster Crunch Model

The Disaster Crunch Model was originally developed by Blaikie, Cannon, Davis and Wisner in the mid 1990's. The model offers a basic analysis of vulnerability in relation to hazards. Socio-economic and political processes are the most important links within the Disaster Crunch Model as these are largely dependent on governance for their effectiveness. According to Minh Hai and

Smyth (2012), the Disaster Crunch Model is a framework for understanding and explaining the causes of disaster and it adopts a cause effect perspective. The Disaster Crunch Model in general states that disasters happen only when hazards affect vulnerable people or communities (Blaikie *et al.*, 1994). The Disaster Crunch Model has two main dimensions which are hazard and vulnerability both of which influence disaster risks (Blaikie *et al.*, 1994). The level of disaster risks therefore depends on the magnitude of the hazard and degree of vulnerability of the people (Wisner *et al.*, 2004). The model's vulnerability is rooted in socio-economic, political, environmental and ecological processes (Minh Hai and Smyth, 2012; Wisner *et al.*, 2004). Figure 2.3 shows how hazard and vulnerability combine to squeeze or 'crunch' a population, causing a disaster. The Disaster Crunch Model (pressure and release) states that disasters occur when two opposing forces that is vulnerability and hazards interact (Blaikie *et al.*, 1994).

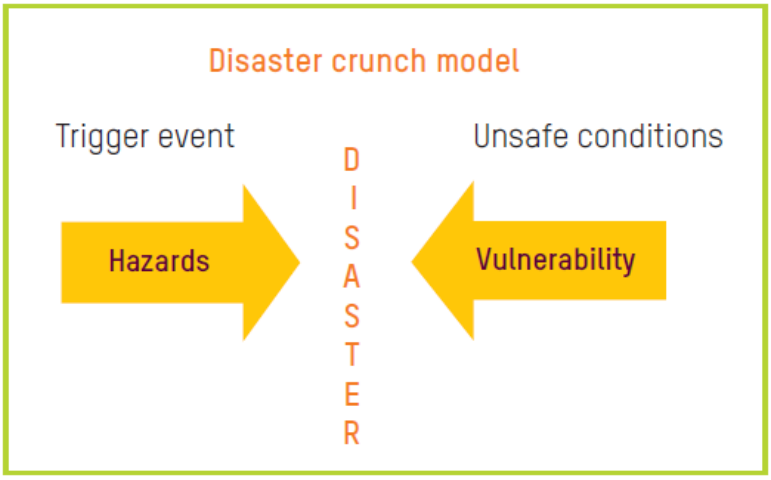

Figure 2.3. Disaster Crunch Model
Source: (Minh Hai and Smyth, 2012).

This model assists to understand and uncover the factors that leads to DRR by reviewing the types of vulnerabilities and pressure rooted processes, as well as identifying the trigger events and unsafe conditions in Hlophekane Informal Settlement. The vulnerabilities that characterise Hlophekane Informal Settlement create pressure that is rooted in socio-economic and political processes. The built-up pressure has to be addressed or released in order to reduce the risk of a disaster (Nirupama, 2012). This model thus informs debates on how residents of Hlophekane are crunched by disasters as a result of underlying political, social, economic, environmental and spatial processes.

2.9.4 Lefebvre's theory on space production and Right to the City

Lefebvre's theory on social production is used to explain how residents of informal settlements create spaces, and in the process make themselves vulnerable to disasters of many kind. According to Lefebvre (1991), social space is distributed based on social class, and social planning reproduces the class structure. Hence, this is either on the basis of too much space for the rich and too little for the poor, or because of uneven development in the quality of places, or indeed both. Like all economies, the political economy of space is based on the idea of scarcity (Kidder 2009; Gieryn 2002). Hence there is marginalisation of the poor in the city. This is linked to the emergence of divergent centres and informal settlements in the outskirts of cities and towns in the 21st century (Kerr, 1994).

The right of the city is about the rights of all urban dwellers, regardless of citizenship, ethnicity, ability, gender to participate in shaping the city (Purcell, 2013; Lefebvre 1991). This theory talks about the rights of the excluded and marginalised to be part of the production of the city, for their needs and aspirations, rather than exclusively those of capital as occurs in most urban development, to be met in the process (Purcell, 2013). The right to the city thus fundamentally challenges existing power relations and the deep roots of the capitalist system that drive urban development and the production of urban space, including social, political and economic relations (Lamarca, 2009; Harvey, 2008; Purcell,2002).

The theories of space production therefore explain how the community residents of Hlophekane Informal Settlement expropriated land to their advantage, and how the land they expropriated is exposed to disasters. In the process, the community residents made themselves vulnerable to disasters.

2.10. Impacts of disasters on informal settlements

According to Seneviratne *et al.*, (2010), the impacts of disasters in human settlements are categorised into physical, economic, social and psychological. Physical factors include injuries, death, physical disability, burns and epidemics such as Covid19. The economic factors include unemployment, loss of livelihood and loss of property land. The social factors include Isolation, migration and change in individual roles. Lastly, the psychological factors include distress, flash backs and intrusion. The impacts of disasters on communities that are already vulnerable such as

informal settlements require deeper interrogation. This research therefore proposes DRR strategies for informal settlements so that the impacts are avoided or reduced.

2.11. Chapter summary

Reviewing empirical literature on DRR strategies for informal settlements is important in making informal settlements safer places for habitation by the urban poor. This requires collaborative efforts by the community residents, city planners and the state. The next chapter elaborates the policy and legislative frameworks related to DRR, and disasters.

CHAPTER 3 RELATED POLICY AND LEGISLATIVE FRAMEWORKS

3.1. Introduction

This chapter focuses on the relevant legislative and policy frameworks related to Disaster Risk Reduction (DRR) in informal settlements. The contents are organized to capture the global frameworks on DRR and precedes to highlight the South African policy and legislative perspectives. Lastly, the chapter closes by reviewing related case studies from global, regional and local spheres.

3.2. Global frameworks on disaster risk reduction

This section reviews international frameworks related to disaster risk reduction in informal settlements. The section discusses the Sustainable Development Goals and the Sendai Framework (2015-2030).

3.2.1. The Sustainable Development Goals

Disaster risk reduction cuts across different aspects and sectors of the Sustainable Development Goals. In total there are 17 Sustainable Development Goals, with 69 targets. These goals are set to take over from the unfinished business of the Millennium Development Goals (Sustainable Development, 2017). In 2015, South Africa committed to align its development programmes with Agenda 2030 linked to the achievement of the Sustainable Development Goals. This means that the country agreed on this development plan for the next 15 years. The Sustainable Development Goals relate to disaster risk reduction in different ways.

Sustainable Development Goal 11 targets to create sustainable cities and communities. This goal aims to make cities and human settlements inclusive, safe, resilient and sustainable (Sustainable development, 2017). One of the targets of this goal is to ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums. Inadequate housing impacts negatively on urban equity and inclusion, urban safety and livelihood opportunities, and causes negative health conditions (Sustainable development, 2017). Clearly, the role of DRR is a core to development strategies in developing countries as Sustainable Development Goals aim to reduce the impacts of disaster on urban and other population and strengthen the resilience of the community (ESCAP, 2017; Sustainable Development, 2017). Informal settlements can be regarded as human settlements targeted by Goal 11.

3.2.2. The Sendai Framework 2015-2030

The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015 on building the resilience of nations and communities to disasters. The Sendai Framework is built on elements which ensure continuity with the work done by States and other stakeholders (HFA UNISDR, 2015). South Africa and other African countries have agreed on a strategic plan to align disaster risk reduction with the priorities and targets of the global plan to reduce disaster losses (Sendai Framework for Disaster Risk Reduction; Tralac, 2016).

The Sendai Framework also articulates the need for improved understanding of disaster risk in all its dimensions of exposure, vulnerability and hazard characteristics; the strengthening of disaster risk governance, including national platforms; accountability for disaster risk management, preparedness to "Build Back Better", recognition of stakeholders and their roles, mobilization of risk-sensitive investment to avoid the creation of new risk, resilience of health infrastructure, cultural heritage and work-places, strengthening of international cooperation and global partnership, and risk-informed donor policies and programs, including financial support and loans from international financial institutions (UNISDR, 2015).

3.3. Legislative and policy frameworks on disasters risk reduction: A South African perspective

In terms of South African legislative and policy framework(s) on disaster risk reduction, the researcher reviewed the Constitution of South Africa Act 108 of 1996, the National Development Plan-Agenda 2030, the Spatial Planning and Land use Management Act 16 of 2013, Municipal systems Act 16 0f 2000, the Disaster Management Act 57 of 2002; the National Disaster Management Framework (NDMF) 2005, the Greater Giyani Municipality Spatial Development Framework and lastly, the role of the National Disaster Management Centre (NDMC) in South Africa.

3.3.1. The Constitution of the Republic of South Africa Act 108 of 1996

The Constitution of the Republic of South Africa, 1996 (Chapter 7) requires local government as a sphere of government to provide democratic and accountable government to local communities. It also requires that local government should ensure the provision of services to communities in a sustainable manner, promote social and economic development, promote a safe and healthy environment; and encourage communities and community organisations in matters of local

government. Everyone has the right to an environment that is not harmful to their health or well-being; and Government accountability to all citizens translates to improving the lives of the poor and the vulnerable (South African History Online (SAHO), 2016). This means that it is the duty of the national government to ensure that all the citizens of the Republic of South Africa reside on spaces that are free from disaster risks.

3.3.2. The National Development Plan of South Africa – Agenda 2030

Chapter 8 of the National Development Plan focuses on transforming human settlements (South African Government, 2017). The National Development Plan states that there are different types of rural settlements which are villages, towns and informal settlements. This means that the National Development Plan recognizes the spatial disparities on human settlements, and that they require different approaches and policies to address challenges they face. Allowing for sensitive and differentiated interventions responsive to social, economic and demographic conditions and anticipated population shifts is important for sustainable DRR strategies for informal settlements (see Alexander, 2017; South African Government, 2017).

3.3.3. Spatial Planning and Land Use Management Act 16 of 2013

Spatial Planning and Land Use Management Act 16 of 2013 of South Africa is a single piece of legislature that seeks to provide a uniform, effective and comprehensive system of spatial planning and land use management for the Republic. It is based on five principles which are: the principle of spatial resilience, spatial justice, good administration, spatial sustainability and the principle of efficiency. Effort on DRR is closely related the principle of resilience which is the capacity and ability of a community to withstand stress, survive, adapt, bounce back from a crisis or disaster and rapidly move on and the principle of spatial justice which advocates for greater control over how spaces are produced (Ajayi, 2013; Soja, 2010).

Spatial Sustainability states that spatial planning and land use management systems must promote the principles of socio-economic and environmental sustainability through; encouraging the protection of prime and unique agricultural land; promoting land development in locations that are sustainable and limit urban sprawl; consider all current and future costs to all parties involved in the provision of infrastructure and social services so as to ensure for the creation of viable communities (Department of Rural Development and Land Reforms (DRDLR), 2014). Application of SPLUMA 16 of 2013 principles ensures that informal settlements are fully

integrated into the spatial plans of urban centres. This reduces disaster risks of such human settlements.

3.3.4. Municipal Systems Act 16 of 2000

Municipal Systems Act 16 of 2000 is part of a series of legislations which aim to empower local governments to fulfil their constitutional objectives on basic service provision (Republic of South Africa, 2000).This Act complements the Demarcation and Structure Act by regulating key municipal organisational planning, participatory and service delivery (Republic of South Africa, 2000). The provisions of the Municipal Systems Act 16 of 2000 provides for ways of alleviating some of the challenges that that are experienced in informal settlements as one of the key responsibilities of the municipal authorities is to avail sound and formal spatial and land use planning functions which amongst other things translate to effective and efficient service delivery. It is therefore the responsibility of the local municipalities to provide safe and a healthy living environment to the communities of informal settlements such as Hlophekane in order to reduce disaster risks.

3.3.5. National Environment Management Act 107 of 1998

The National Environment Management Act 107 of 1998 quotes Section 24 of the Constitution that provides the right to every person for a non-harmful environment and simultaneously mandates the government to protect the environment. National Environmental Management Act 107 of 1998 seeks to enforce Section 24 of the Constitution (Gondwana environmental solutions, 2016). The National Environmental Management Act 107 of 1998 is thus a forward-thinking environmental management legislation in South Africa (Gondwana Environmental Solutions, 2016). The Act has provided the framework for decision-making for individuals, institutions, and government. National Environmental Management Act 107 of 1998's principles are aimed at promoting co-operative governance and ensuring that the rights of people are upheld, while at the same time recognising the importance of economic development (Department of Transport, 2019). The principles indicate that environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably and also development must be socially, environmentally and economically sustainable (University of Pretoria, 2014).

3.3.6. Disaster Management Act 57 of 2002

The Disaster Management Act 57 of 2002 is an integrated and co-ordinated disaster risk management policy that focuses on preventing or reducing the risk of disasters, mitigating the severity of disasters, preparedness, rapid and effective response to disasters, and post-disaster recovery. The Act recognises the wide-ranging opportunities in South Africa to avoid and reduce disaster losses through the concerted energies and efforts of all spheres of government, civil society and the private sector. However, it also acknowledges the crucial need for uniformity in the approach taken by such a diversity of role players and partners (South African National Disaster Management Framework (NDMF), 2005)

3.3.7. National Disaster Management Framework (NDMF), 2005

The National Disaster Management Framework (NDMF) is the legal instrument specified by the Disaster Management Act 57 of 2002 that was published in 2005 to address disaster management issues which need consistency across multiple interest groups by providing a coherent, transparent and inclusive policy on disaster management appropriate for the republic as a whole (NDMF, 2005). The NDMF of 2005 comprises of four key performance areas and three supportive enablers. The key performance areas are; integrated institutional capacity for disaster risk management that emphasises forming the essential institutional measures for implementing disaster risk management within the national, provincial and municipal spheres of government, disaster risk assessment and monitoring; the necessities of employing disaster risk assessment and monitoring by organs of state within all spheres of government, disaster risk management planning and implementation; introducing disaster risk management planning and implementation to enlighten developmentally-oriented approaches, plans, programmes and projects that reduce disaster risks; and disaster response, recovery and rehabilitation planning: that defines procedures to confirm effective disaster response, recovery and rehabilitation planning (NDMC, 2009; NDMF, 2005).

3.3.8. The role of the National Disaster Management Centre (NDMC) in South Africa

According to the NDMF (2005:9), the National Disaster Management Centre (NDMC) has been constituted with the objective to promote an integrated and coordinated system of disaster management (Hiles, 2004). This institution is in essence responsible for guiding and developing frameworks for government's disaster risk management policy and legislation, facilitating and monitoring their implementation, and facilitating and guiding cross-functional and

multidisciplinary disaster risk management activities among the various organs of state with a special emphasis on presentation and mitigation by, national, provincial and municipal organs of the state statutory functionaries, other role players and the community (NDMF, 2005). The NDMC goals are to improve disaster preparedness and response, to promote a culture of risk avoidance among stakeholders by capacitating all role players, training and public awareness, and to prevent, reduce and analyse impacts of disasters and to reduce community and property vulnerabilities to hazards and disasters (NDMF, 2005).

3.3.9. The Greater Giyani Municipality Spatial Development Framework

A Spatial Development Framework is a tool to achieve the desired spatial form of the municipality. One of the main aims of the SDF is to improve the physical environment of the community as a setting for human activities to make it more functional, beautiful, decent, healthful, interesting and efficient. According to the SDF for the Greater Municipality, Hlophekane Informal Settlement is located on a space earmarked for residential purposes. However, this space is being used informally and illegally as a residential area. The area has not been planned or subdivided. The SDF also states the general guidelines that should be applied to developing the adjacent areas as an extension of the existing settlements (BC Gildenhuy and Associates, 2013).

3.3.10. Greater Giyani Land Use Scheme of 2009

The Greater Giyani Land Use Scheme is linked to Section 18 of the SPLUMA bylaw. This policy framework aims to promote harmonious and compatible land use patterns which are aesthetically considerations. It also aims to promote sustainable development and densification and most importantly the scheme aims to promote accommodation of cultural customs and practices of traditional in land use management (Greater Giyani, 2017).

3.4. Related case studies

This section provides three case studies on disaster risk reduction in the context of informal settlements. The case studies were isolated from the global, African and local scales.

3.4.1. A global example from Thailand in Bang Bua

In the last few decades, Thailand has faced a number of major natural disasters, including the 2004 Indian Ocean Tsunami, the 2011 floods, the 2015-16 droughts, irregular rainfall, decreased agricultural and fishery yields and rising sea-level (Nakasu, 2017). The impact of disasters and extreme natural hazard resulted in not only loss of human lives, but also damage to infrastructure,

disruption of livelihoods and loss of economic activities (Nakasu, 2017). For example, the Bang Bua squatter community in northern Bangkok of Thailand experienced some of these disasters (ADPC, 2013). The settlement was characterized by unstable housing built over polluted canal waters with poor basic public services and sanitation and exposed to flooding (ADPC, 2013).

3.4.2. An African experience from Mozambique

Mozambique is one of the Southern African Development Community (SADC) countries that often faces severe cyclones and floods. In most cases, the disasters leave behind devastating impacts. Apart from the immediate threat to human life, such natural disasters seriously impede economic growth (Christie and Hanlon, 2001). In 2000, Cyclone Eline caused great floods in Mozambique which claimed about 700 lives and caused over $400 million of damage in this poor Southern African country. One of the areas that was affected the most was Gaza Province. The government was committed on using and sharing early warning information, there was a good collaboration with local radio stations, word of mouth of Red Cross volunteers, all of these combined resulted in people moving before their lives were in danger (Christie and Hanlon, 2001).

In March 2019, Cyclone Idai caused the worst tropical cyclone recorded to affect Africa and the southern hemisphere. It caused severe damages within Madagascar, Zimbabwe, Malawi and Mozambique leaving the aftermath of more than 1000 deaths and more than thousands missing people; more than US1$ billion damages in property; cholera outbreak; and an increase in malaria incidence (BBC News, 2019; Borges, 2019; Meteo France, 2019; The Independent News, 2019; Thompson, 2019; UNOCHA, 2019; Yuhas, 2019; ZBC News). On the 25th of April 2019; cyclone Kenneth caused deaths of 38 people in Mozambique and left more than 160 000 affected with almost 30 000 homes destroyed (News 24, 2019a; EWN, 2019).

3.4.3. Experiences from South Africa

Flood risk has been a growing concern in the city of Cape Town mainly due to rapid urbanization which has intensified as poor people tend to settle on flood plains (Ziervogel and Smit 2009; City of Cape Town, 2009). Out of the city's 3.4 million residents, 22.4% are estimated to live in informal settlements and most of these settlements are found in low lying flat areas (City of Cape Town, 2009; Ziervogel and Smit, 2009). Between 2004 and 2009, five to seven per cent of informal settlements residents were moved each year from Kosovo, Graveyard pond, Cape Flats and Egoli, mostly between July and August periods. The most horrible flooding event to be recorded moved

an estimated 44 000 informal settlements households in 2001, which is approximately 13% of the total number of households in the area (Wood, 2009 in Smit and Ziervogel, 2009). And yet still, there has been an influx of people with the number of informal dwellings in Cape Town increasing from just over 23 000 families in 1993 to an estimated 109 000 by 2007 (City of Cape Town, 2009) despite the advocacy against settling in flood prone areas.

KwaZulu Natal was declared as a disaster area by Premier on the 23 April 2019 after a "mega-storm" caused devastation in parts of the province, wherein approximately 70 people died while 2 went missing and an estimation of R1.1 billion in damaged infrastructure and property (Dlami ni,2019). A total number of 1469 of people were displaced and housed temporarily (Dlamini, 2019; SABC News, 2019).

3.5. Chapter summary

This chapter reviewed legislative and policy framework(s) critical to development of DRR strategies for informal settlements as well as experiences from other countries and in South Africa. Through literature review different perspectives regarding disaster risk reduction in informal settlements were established. The next chapter provides the research methodology.

CHAPTER 4: METHODOLOGY

4.1. Introduction

The purpose of this chapter is to present and discuss the methods that were used to carry out this research. Research methodology is a systematic way to solve a problem, and a science of studying how research is to be carried out (Chinnathambi *et al.*, 2013). Research methodology is also defined as the study of methods by which knowledge is gained. This chapter outlines the research methods with regards to the adopted research approach, data collection procedures, sample selection, and data analysis procedures. Thus, in order to achieve the research objectives of the study, a research methodology needs to be developed to address the research problems.

4.2. Research Design

A research design is a blueprint for conducting the study that maximises control over factors that could interfere with the validity of the findings of the research (Burns and Grove, 2001). A research design assists in creating conditions for collection and analysis of data, thus increasing the chances of obtaining information that could be associated with the real situation (Peersman, 2014). In fact, the research design is the conceptual structure within which research is conducted that constitutes the blueprint for the collection, measurement and analysis of data (Burns and Grove, 2001). This study adopted an explorative research design. An explorative research design entails determining the nature of the problem and getting a better understanding of the problem. Since little is known about Disaster Risk Reduction strategies applied in Hlophekane Informal Settlements an explorative case study research design was adopted.

Yin (1984) defines a case study as empirical inquiry that investigate a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used. Through a case study, I was able to examine data on disaster risk reduction within a specific context of an informal settlement. A case study approach explores and investigates a contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions and their relationship (Zainal, 2007). Issues such as disaster risk reduction in an informal settlement called Hlophekane were examined, analysed and reported.

4.3. Research approach

A research approach is defined as a plan and procedure that is made up of steps of broad assumptions to detailed method of data collection, analysis interpretation (Chetty, 2016). There are two basic approaches to research. These are the qualitative and the qualitative approaches. The qualitative approach involves collecting of variety of materials which may include personal experience, case study, interview and observational, international and visual text (Denzin and Lincolin, 2008; Thomas, 2003). The qualitative data was also used to crosscut different knowledge areas, fields and subjects and it further produces contextual analysis and cognitive interpretation of information provided from sampling process. Furthermore, the qualitative approach allows the researcher to get close to an individual perspective in contextual; details and data specific to the research subject (Kayrooz and Trevitt, 2005). Within this research context, qualitative data provided detailed information pertaining disaster risks in an informal settlement. This data was drawn from both reviewed secondary and primary data sources linked to the aim of the research. Data pertaining disaster risk was closely scrutinized and how vulnerable the community is, was analysed contextually. Qualitative data is important in this research because it has assisted in providing details about human behaviour. Examples of such information entails how people have moved within Hlophekane due to disaster risk, what feeling they get every time they experience disasters, and how different people use the same space differently.

On the other hand, the quantitative approach engages an inquiry into an identified problem, supported by testing a theory composed of variables, measured with numbers, and analysed using statistical techniques; the goal being to determine whether the predictive generalizations of a theory holds true (Creswell, 2009; Johnson and Christensen, 2008). The quantitative research approach assisted to derive important facts from research data including differences between groups or individuals, demographics and trends of certain activities. Quantitative data was mainly based on the number of households who are exposed to disaster, the years of disaster recurrence and the number of affected households resulting from naturally induced hazards and vulnerable conditions for example, rating scale; measuring the intensity of disaster.

This research however adopted a mixed method approach. This approach was regarded as best suited for the case study because the research combined both qualitative and quantitative research approaches. The mixed method research approach recognises that every method has its limitation

and that different approaches can be complementary (Anguera *et al.*, 2018). This mixed research approach is important because it provides a better wide understanding of the research problem than either approach alone; it identifies that each approach has weaknesses (Anguera *et al.*, 2018.

4.4. The study population

Polit and Hungler (1999) refer to a study population as an aggregate or the totality of all objects, subjects or members that conform to a set of specification. The population of this study encompasses all households in Hlophekane Informal Settlement which according to SA Stats (2011) were 199 households constitutive of 574 people. However, by the time the research was conducted there were approximately 90 households. These form the unit of study. These households were made of people who reside in Hlophekane Informal Settlement on a 'permanent basis'. The study population also included two town planners from Greater Giyani Local Municipality. The ward Councillor, a community leader and a disasters risk management department officer in the local municipality also participated in this research. These groups of people were very familiar with the disaster risks in Hlophekane Informal Settlement. Therefore, the total study population was made of 94 elements.

4.5. Sampling procedures

Sampling is the process of selecting a portion of the population to present the entire population (Wood and Haber, 1998). Obtaining data could have been impossible to accomplish within the time constrains and with limited financial resources hence there is always need for sampling procedures (Maree and Pieterson, 2007). In this research, purposive sampling technique was used to select the study elements. Purposive sampling is a non-probability sampling technique in which the researcher relies on the characteristics of a population and the objective of the study, and this method is subjective and judgmental (Palys, 2008). This was important for the researcher as it helped in collecting structured data from relevant people. Thus, all the 94 elements, as well as the study area were purposively selected on account of their richness in data critical to addressing the research objectives.

4.5.1. The study sample

A sample is a subset of a population selected to participate in the study, and a fraction of the whole selected to participate in the research project (Polit and Hungler 1999; Wood and Haber, 1998). The study sample was composed of people staying in Hlophekane. The study focused on

households as the unit of study rather than individuals. Within these households, the heads of households were selected to represent their household members in this study. According to Hungwe, (2014), a household is a unit of interaction made up of people sharing the same dwelling unit and common provisions. Whereas, household heads are the economic providers and chief decision makers on behalf of their members (Hungwe, 2014). In this research, household heads of each 'shack' in the informal settlement of Hlophekane were targeted. The study sample was also made of municipal officers who had knowledge of the disaster risks in Hlophekane Informal Settlement and most probably the tools that are in place to reduce disasters. Table 4.1 below shows the distribution of the study sample. But one town planner and one disaster management officer did not respond to the questionnaire and only 72 households' heads responded leaving behind approximately 18 household questionnaires being null and void.

Table 4.1. Sample distribution table

Unit description	Frequency	% frequency
Household heads	72	97%
Officers from the Department of Disaster Management	1	1%
Town planners from local municipality	1	1%
Ward Councillor	1	1%
Total	74	100%

Source: Fieldwork, 2019.

4.6. Data collection procedures

According to Polit and Hungler (1999), data is information obtained in a course of a study. This research adopted both primary and secondary data collection procedures. Both secondary and primary data instruments were used.

Primary data was collected from first-hand experience or sources using methods including survey, questionnaire, interviews mapping and observations. This type of data assisted to define the problem, aims, objectives and the types of data needed which do not exist in any storage form (Vosloo, 2014).

Secondary data involved the use of readily available information, and it forms an important part of the research process (Ajayi, 2017). The secondary sources of data that were used are library

books, journal articles, newspapers, magazines, published government policies on disaster risk reduction and informal settlements, and internet websites (Antwi and Kasim, 2015). These sources were reviewed to regain essential information linked to the informal settlement associated with disasters (Sangonet, 2010).

4.6.1 Primary data collection instruments

This section reviews the primary data collection instruments that were employed. These include a household questionnaire, key informant interviews, observation, and mapping.

4.6.1.1. The household questionnaires

This study employed the interviewer-administered questionnaire method to collect data from heads of households. The questionnaires were both structured (quantitative) and unstructured (qualitative). The interviewer-administered questionnaire method is the oldest and frequently most effective method of social survey inquiry. This method was convenient and saved time for both the researcher and the respondents. Household questionnaires were important because they assisted in understanding the general and specific characteristics of individual households with regards to disaster risk reduction in Hlophekane Informal Settlement. The questionnaires included both open ended and close-ended questions (Chaleunvong, 2009). Household questionnaires were administered to the selected household heads.

4.6.1.2. Key Informant Interviews (KII)

Main informant interviews provide comprehensive, qualitative information for the research on observations, perceptions and opinions. Interviews were conducted either in person or by telephone. Within this research, KII were conducted with the disaster management officer, the community leader, the town planners and the Ward Councillor. These interviews aided in understanding in detail the challenges, experiences and other DRR tools that have been adopted in Hlophekane Informal Settlement. These interviews were more formally structured, and each portfolio got a different set of questions.

4.6.1. 3. Observations

Observations are a data collection method under which data from the field is collected by personally going to the field (Demunck and Sobo, 1998). Observations can also be defined as a systematic viewing coupled with consideration of seen phenomenon (Antwi and Kasim, 2015).

Within this research observations were done by the researcher in order to identify spaces that are vulnerable and exposed to disasters in Hlophekane. Through observations, I was able to acquire primary evidence on the different types of disasters that are experienced in the neighbourhood, and the general settlement form of the informal settlement with regards to vulnerability and exposure to disasters. Observations were done during field surveys and reconnaissance. Observations assisted in triangulating evidence collected through other data collection instruments. Observations thus emerged as a critical component of ground truthing. This assisted to eliminate subjectivity and bias.

4.6.1.4. Mapping

According to Choudhury (2013), mapping is defined as the creation of maps, graphic symbolic representation of important structures of a part of surface on earth. The role of mapping in this research was firstly to map out areas that were directly exposed to disaster risks and the kinds of disasters they were exposed to. Mapping was done with aid of GIS (Arc Map).

Below is Figure 4.1. which provides a summary of data collection procedures used to collect data on Disaster Risk Reduction strategies in Hlophekane Informal Settlement.

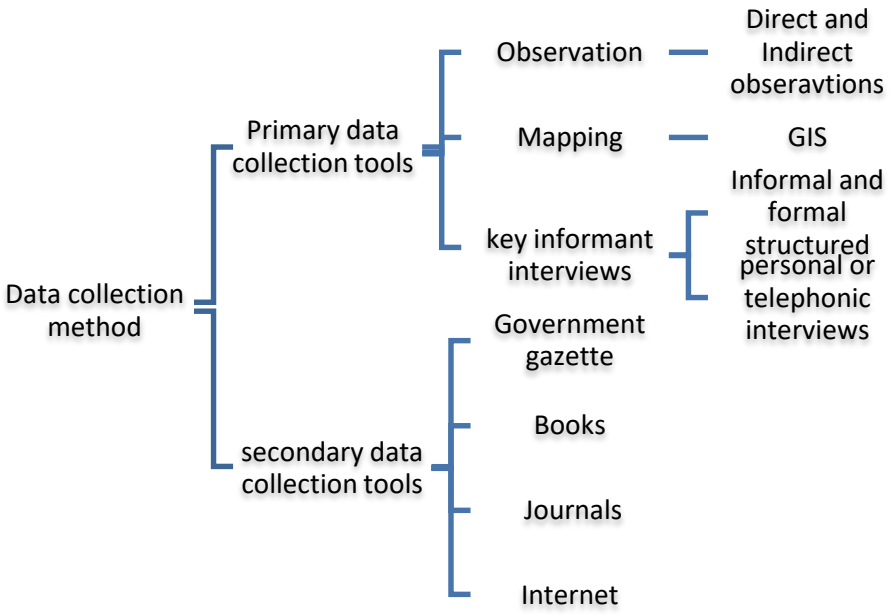

Figure 4.1. Data Collection methods
Source: Fieldwork, (2019).

4.7. Data analysis procedures

Marshall and Rossman (1999) describe data analysis as the process of bringing order, structure and meaning to the mass of collected data. Data analysis is often described as time-consuming, but also as a creative and fascinating process of processing research findings. The following variables were critical in data analysis: exposure, vulnerability, hazards, disaster, and disaster risks.

Quantitative data gathered through the household questionnaires was carefully developed and structured to provide numerical data that was explored statistically and yielded results generalizable to the larger population. Quantitative data produced results that were generalized to other elements of the wider population. The quantitative techniques were used to generate descriptive statistics. This was done to provide simple summaries about the variables. Data was analysed and represented using graphs, figures and charts. Computer software packages including Statistical Package for Social Sciences (SPSS) and Excel were used in quantifying data.

On the other hand, the analysis of qualitative data focused on determining the nature of the impact of a disaster risks upon the households of Hlophekane Informal Settlement. Cohen *et al.,* (2005) states that qualitative data analysis involves organising, accounting for and explaining the data to make sense of participants definition of situations, noticing patterns, themes, categories and regularities. Qualitative data analysis employed a range of processes and procedures to generate explanations, understanding or interpretation of the people and situations in the disaster context. This was informed by a thematic analysis of data guided by the research objectives.

Thematic analysis is defined as the method of identifying patterns or themes within qualitative data, within this research thematic analysis were generated by research objectives. Braun and Clarke (2006) suggest that it is the first qualitative method that should be learned as ‘it provides core skills that will be useful for conducting many other kinds of analysis’ (Braun and Clarke, 2013; 2006). This therefore means that, unlike other qualitative methodologies, it is not tied to a specific theoretical perspective meaning it is not rigid making it a very flexible method of analysing qualitative data (Maguire and Delahunt, 2017). Data analysis was supported by arguments from Lefebvre’s theory on space production and the Right to the City concept. In addition, the Disaster Crunch Model explain the behaviour of people experiencing disaster risks in informal settlements.

4.8. Summary of Achievement of the Research objectives

OBJECTIVES	QUESTIONS	VARIABLES	DATA COLLECTION TECHNIQUE		DATA ANALYSIS
			Primary data	Secondary data	
1. To characterize the nature of disasters in Hlophekane Informal Settlement.	• What are the kinds of disasters that are experienced in Hlophekane Informal Settlement? • How far is the water flood line from each house? • How often do you experience disasters? • What are the impacts of households on disasters?	• Occurrence/ Vulnerability • Distance • Disaster trend • Livelihoods or assets	observation, surveys, questionnaires	journals, books and internet	Quantitative data (Statistical Package for the Social Sciences (SPSS) and (EXCEL) using percentage, frequency and average etc statistics: Graphs, tables). ArcGIS and qualitative data (Thematic data analysis)
2. To map disaster risk zones in Hlophekane using GIS.	• Where are the disaster hotspots? • Who are the most affected by those disasters?	• Spatial patterns or spatial configuration of hotspot	Observation, Key informant interviews (KII) and land audit	GIS and Municipal documents	Quantitative data analysis (Descriptive analysis) ArcGIS Thematic Maps, Land use maps and graphs and Qualitative data (thematic data analysis)
3. To develop disaster risk reduction strategies for informal settlements in rural towns of South Africa such as Giyani – for recommendation to the local municipality	• What are the sustainable risk reduction strategies that we can employ?	• Disaster risk reduction strategies (Participatory Disaster Risk Mapping)	Observation, Key informant interviews (KII)and land audit	GIS and Municipal documents journals, books and internet	Qualitative data analysis: Thematic data analysis

Table 4.2: *Summary of achievements of the research objectives*

Source: Author, 2020

4.9. Ethical consideration

According to Babbie (2008), the fundamental rule of social research is that it must bring no harm to research subjects. As such, this fundamental rule was adhered to in this study. Participation was based on a voluntary decision by the participants. Additionally, the importance of privacy, anonymity, and confidentially in interviews and questioners was highly considered. For the purposes of maintaining of confidentiality, I used pseudonyms to preserve the anonymity of participants.

4.10. Limitations of the study

Part of the study limitation was the language barrier since most of the respondents spoke Tsonga and the researcher was not fluent in speaking Tsonga. Therefore, an interpreter had to be appointed. The researcher was involved in an accident while collecting data from the municipal official, which led to all municipal official interviews being conducted by telephone and e-mails. Financial limitations were a major obstacle because no research funds were distributed from the Research and Publication Committee at the University of Venda. As a result, all data collection activities were self-funded.

4.11. Chapter Summary

This chapter presented and summarized the research approach, research design, sampling procedures, sample design, data collection procedures and data analysis procedures. The next chapter is my first analysis chapter.

CHAPTER 5: CHARACTERIZING HLOPHEKANE INFORMAL SETTLEMENT

5.1. Introduction

This chapter presents and analyses data collected from the field and ascertain patterns of disaster risks for informal settlements. The analysis was carried out after the data collection process had been completed and all information related to the study obtained from the relevant information sources. The data collection is classified according to the responses provided by the heads of households or their members as well as the responses given by the Ward Councillor, one community planner and one emergency management officer.

This chapter responds to all the research objectives provided in Chapter 1 of this research. A total of 72 household questionnaires were distributed. Interviews were done with the Ward Councillor and the Town Planner. A GIS mapping application for collecting, presenting and sharing geographic information and a Ground Positioning System (GPS) tool was used to assist with establishing the actual location of components of the study area using geographical coordinates. This tool was used to map the location of disaster hotspots and all shacks within the informal settlement.

5.2. Bio-demographic data

From the data collected, it was possible to obtain socio-demographics of the sampled respondents. This includes household headship, age, gender, nationality, employment status, and total monthly income. The Ward Councillor indicated that he is aware of the informal settlement and it dates back to the 1980's, however most of the parts of the squatter settlement were demolished and residents were moved to Homu (14c), where they were provided with Reconstruction Development Programme (RDP) houses. The remaining (approximately 90) households did not have legal documents and were being assisted to obtain identification documents since they stayed there for a long time.

5.2.1. Gender of residents

A total of 72 residents of Hlophekane Informal Settlement participated in this research. Out of these residents, 57% were male and the rest were female. This means that males dominate most of the households in this informal settlement. Since some of the heads of household were absent during the questionnaire survey, the respondents were the most senior members of the households. As such, reference is made to sampled residents rather than heads of household. Refer to Figure 5.1.

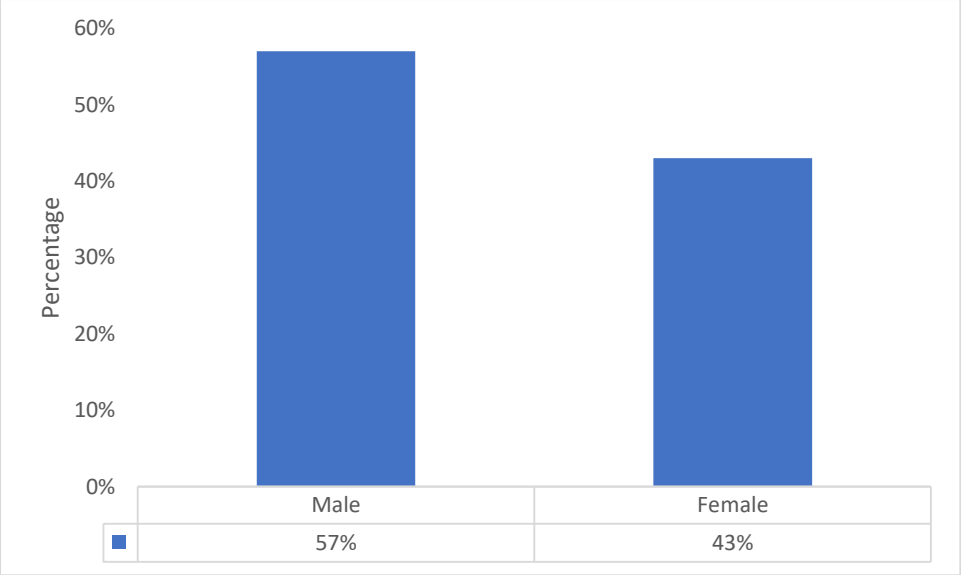

Figure 5.1. Gender of sampled residents
Source: Fieldwork, (2019).

5.2.2. Age of the sampled residents

In terms of age of the residents of Hlophekane, 32(44%) were 51 years and above; 16 (22%) were aged between 41-50 years; 13 (18%) were aged between 31-40 years; 9 (13%) were aged between 21-30 years; and lastly only 3% indicated they were aged 20 years and below. The average years of the people staying in Hlophekane is between 41-50 years. This means that the majority of the residents are 51 years and above and they make up approximately half of the overall population of Hlophekane Informal Settlement. Such individuals are likely to provide historical data on activities and events such as disasters that happened in the informal settlement over time. In any case, most of the older residents moved to Hlophekane in the early 1980s and have been staying there since then. Most of the younger generations in the youths' age groups from 31 years downwards could have inherited their parents' shelter in the informal settlement. Figure 5.2 shows the age categories of the sampled residents.

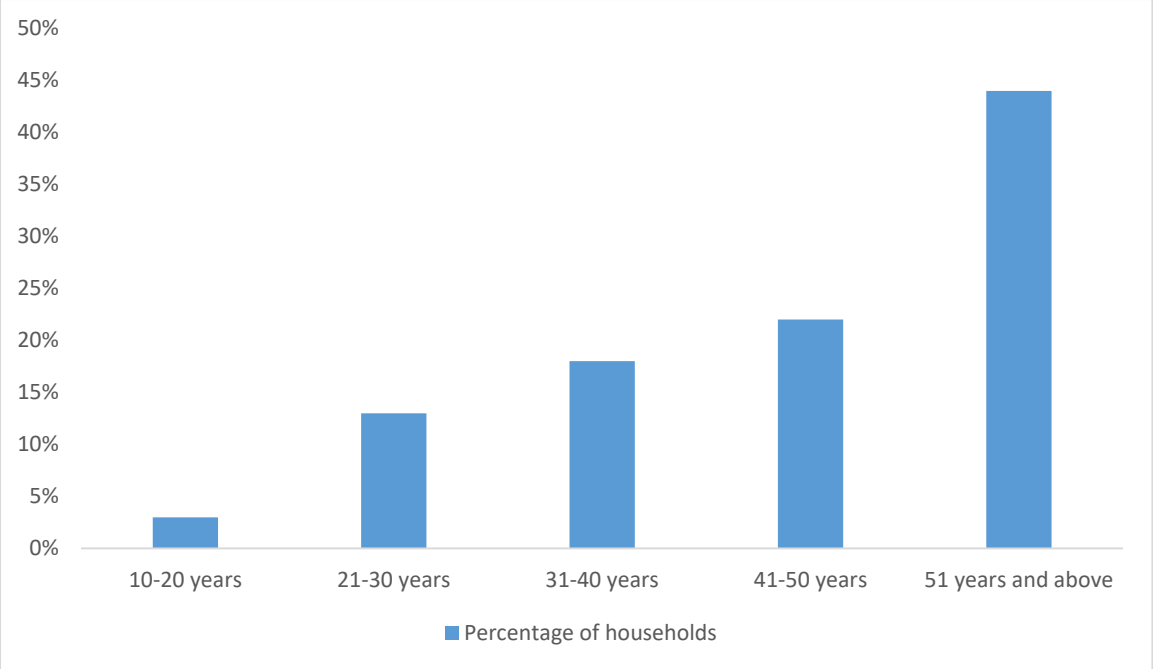

Figure 5.2. Age group of the household heads
Source: Fieldwork, (2019).

5.2.3. Duration of stay at Hlophekane

In terms of the duration of stay in Hlophekane Informal Settlement, 89% (64) of the sampled residents indicated that they have been staying there for 8 years and more; 5% (4) indicated that they have been staying for 4-7 years; 6 %(4) indicated that they have been staying for 0-3 years. The majority of Hlophekane Informal Settlement residents settled there during the 1980s as asylum seekers. This is because they invaded an open space which the current government is claiming to be state land. Figure 5.3 shows the length of stay of these residents.

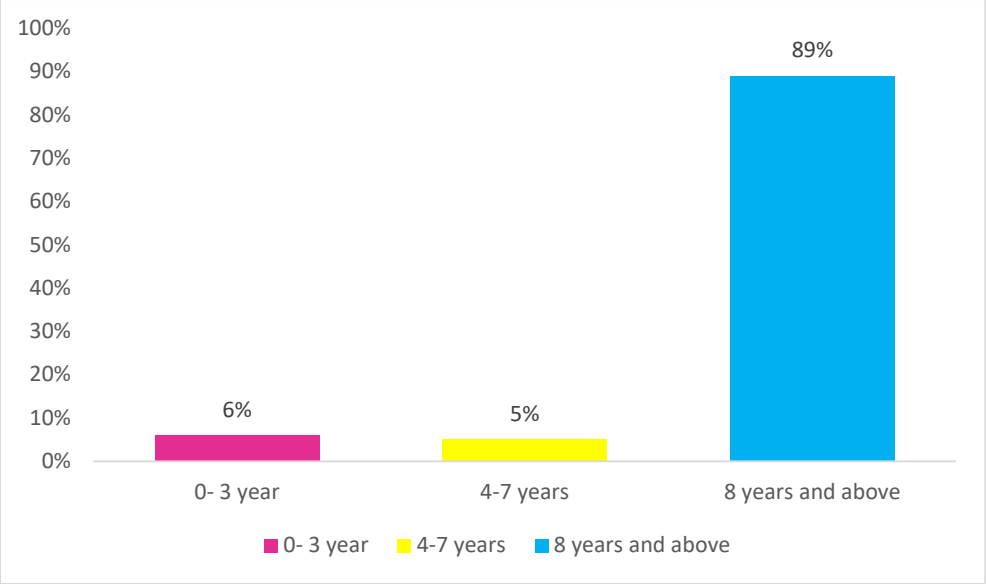

Figure 5.3. Duration of stay in Hlophekane Informal Settlement
Source: Fieldwork, (2019).

5.2.4. Place of origin of the sampled residents

Within Hlophekane Informal Settlement, there is diversity of residents in terms of their place of origin, nationality and culture. In terms of the nationality, the majority of the residents who stay in Hlophekane Informal Settlement 85 %(61) were from Mozambique, 13% (9) were South African citizens, and 3% (2) were from Zimbabwe. This is due to the geographical proximity of Giyani in relation to Mozambique and Zimbabwe. These two countries share borders with South Africa. In the 1980s, the wars in Mozambique sent people looking for refugee in neighbouring countries. From the data collected, these refugees were desperately seeking jobs, education and health (Fieldwork, 2019). As such, Hlophekane Informal Settlement emerged as a safe haven located closer to health facilities, schools and other government facilities in Giyani in South Africa. Figure 5.4 shows the places of origin of the sampled residents.

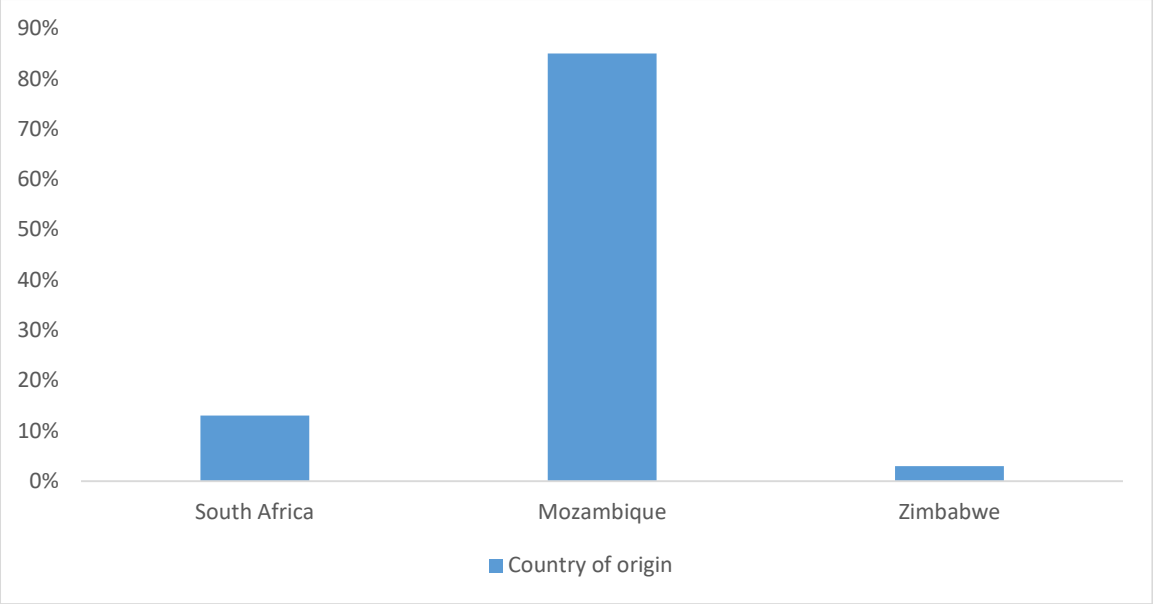

Figure 5.4. Place of origin the sampled residents
Source: Fieldwork, (2019).

People often migrate from their countries mainly in search of opportunities (Piesse, 2014). As such, unfavourable conditions in South Africa's neighbouring countries such as Mozambique, Zimbabwe and Lesotho are a push factor for migration of people that end up settling in any available piece of land that they come across, whether prone to disaster or not (Tati, 2008). From the data collected in terms of why respondents are staying in Hlophekane Informal Settlement, 33% (24) of the respondents indicated that they were following a family member. The people within this category either came as infants or were born in Hlophekane Informal Settlement. About 29% (21) of the household heads indicated they came as asylum seekers during the Mozambican war between the years 1977-1992.

The Civil war in Mozambique was a 15-year conflict that occurred between May 30, 1977 and October 4, 1992 and it was estimated that one million people died during this war (Momodu, 2018). Twenty four percent (17) of the residents that participated in this research indicated that they came to Hlophekane Informal Settlement seeking employment. The informal settlement is located within a walking distance to the Central Business District of Giyani Town largely comprising of retail outlets and commercial activities. On the other hand, 10% (7) of the residents indicated that they stay in Hlophekane Informal Settlement for affordability reasons. In their minds, the informal settlement emerged as the only place they could stay in because it is cheaper to stay there. For example, they do not pay levies to the local municipality. Only 4% (3) came to stay in Hlophekane Informal Settlement for other reasons such as marriage. Clearly, there are many reasons why people move to stay in informal settlements. These reasons are

varied and are influenced by the homogeneity of individual needs and interests. Non-registered migrants and refugees often face additional difficulty in terms of their legal right to remain, or to reside in a location of their choice, and they frequently lack personal documentation needed to access support and services. From the Right to the City's perspective everyone regardless of citizenship has the right to the city and basic services (International Rescue Committee, 2017). Figure 5.5 shows the dynamics on the reasons on why the residents chose to stay in Hlophekane Informal Settlement.

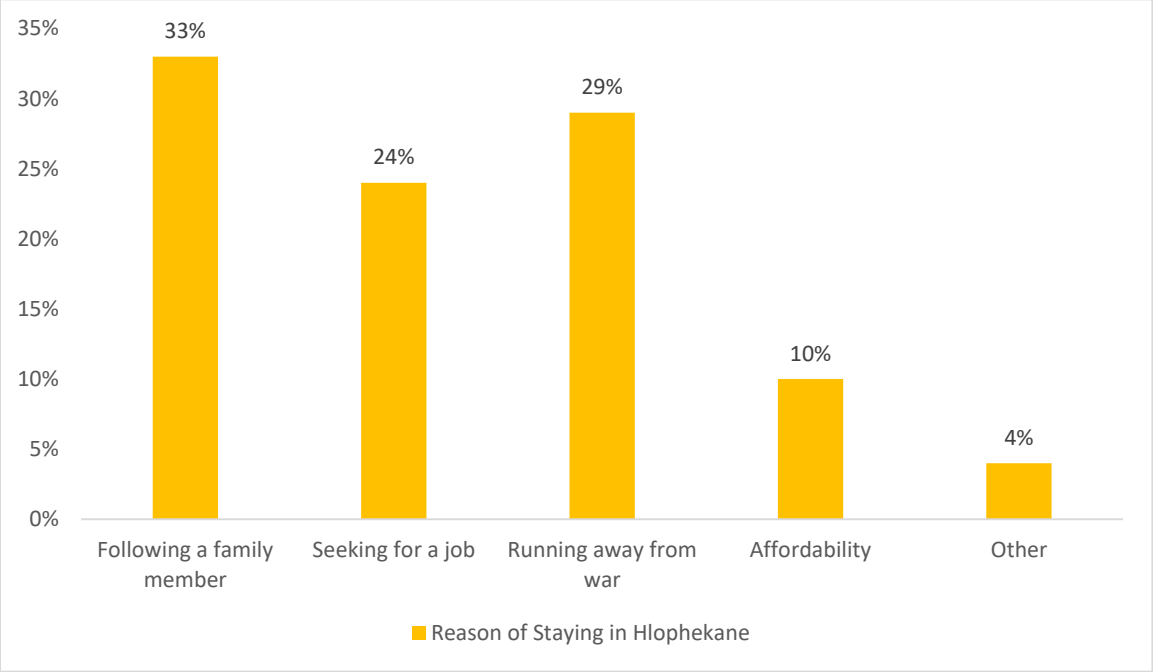

Figure 5.5. Reasons for choosing to stay in Hlophekane Informal Settlement
Source: Fieldwork, (2019).

5.2.5. Employment status of residents of Hlophekane Informal Settlement

Employment levels or opportunities are critical socio-economic elements deep rooted in creating and maintaining extreme levels of vulnerability particularly in informal settlements (USAID, 2011). In this research, 56% (40) of the residents were unemployed; 36% (26) were self-employed. The self-employed residents worked as painters, plumbers, or carpenters. Only 4% were formally employed. For example, the employed residents worked in taverns within Hlophekane Informal Settlement, and as gardeners or housekeepers in Giyani Town. Whereas, the rest of the residents got income from other sources (2%). The employment status demonstrates the diversity of the residents of Hlophekane Informal Settlement in terms of class. According to Lefebvre (Lamarca, 2009; Harvey, 2008 and Purcell, 2002), cities are regarded as spaces that should be accessible by all people regardless of their class or social status. The

different kinds of employment dynamics determine the residents' class and status in society (Purcell, 2002).

Figure 5.6 illustrates the different categories of employment of the heads of households from Hlophekane Informal Settlement that participated in this research.

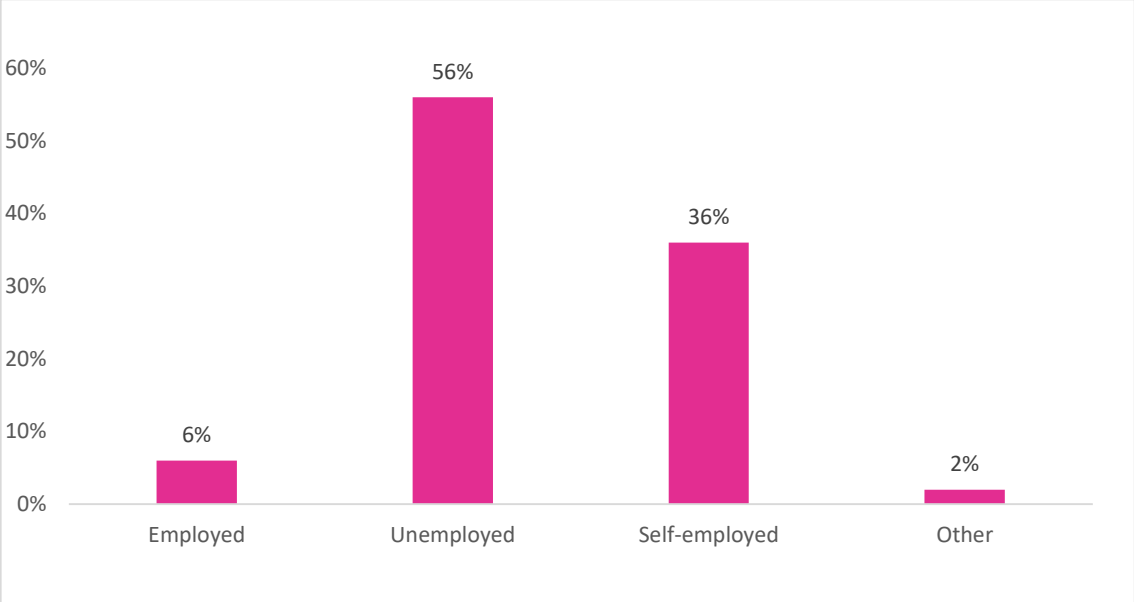

Figure 5.6. Employment categories of heads of households

Source: Fieldwork, 2019

5.2.6. Monthly income

In terms of income, 54% (39) of the households survived on a monthly income of R0-R500; 17 % (12) had a monthly income between R501-R1000; 21%(15) had a monthly income is between R1001-R1500; and only 8%(6) had a monthly income between R1501-R3000. Affordability levels as indicated by the household income are a key pointer to the ability of households to pay for services including housing, water, electricity, food and health. For example, with the above monthly income figures, most of the residents of Hlophekane Informal Settlements may not be able to pay for water and electricity accessed through the local municipality even if they were to receive Reconstruction and Development Programme (RDP) houses because the majority are living below the poverty line. In South Africa, the extreme poverty line is pegged at R561 per month (Stats SA, 2019). Figure 5.7 illustrates these dynamics. Poverty is deemed as both a driver and a consequence of disasters, hence this research revealed that it is generally the poor who suffer the worst from disasters (DFID, 2004, Twigg, 2004 and Wisner *et al.*, 2004a).

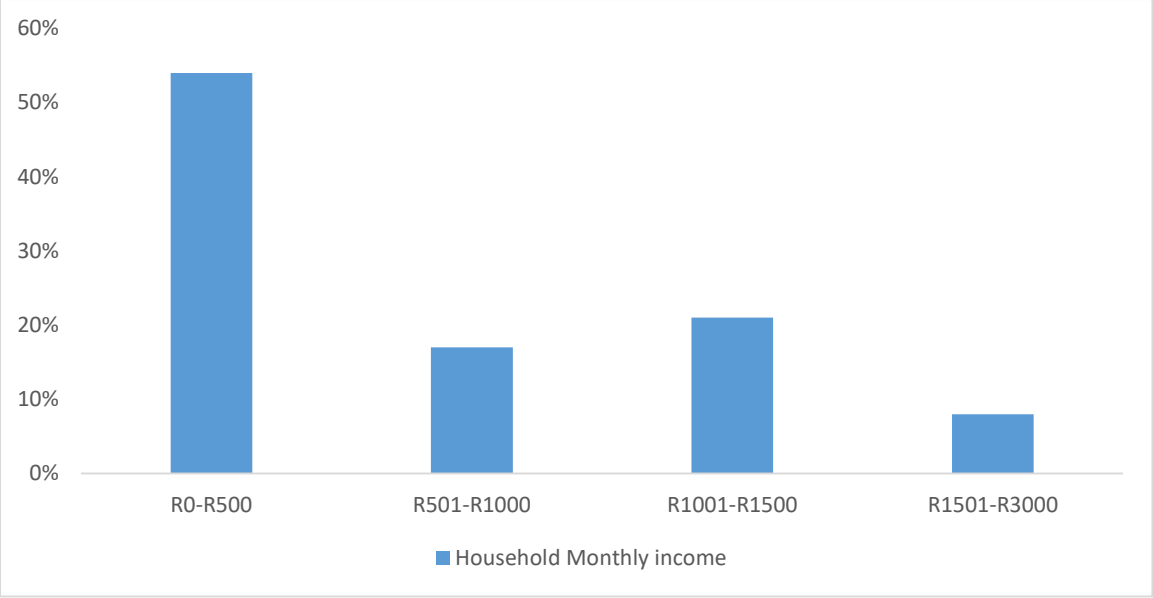

Figure 5.7: Household monthly income
Source: Fieldwork, (2019).

5.2.7. Size of households

About 49% (35) of the households in Hlophekane Informal Settlement had 1 - 3 members; 31% (22) had 4 - 6 members; 15% (11) had 7 - 9 members; and only 6% (4) more than 10 members. This shows that the household sizes in this informal settlement vary. Figure 4.8 shows these dynamics. According to Meyer *et al.*, (2016), literature on the impacts of household size and its relationship with poverty over the last few decades yielded interesting research results. The literature on impacts of household size on level of poverty is still divided but leaning towards a positive correlation between size of household and poverty but with a negative impact of household size on levels of poverty (Schiller, 1995). Figure 5.8 shows these dynamics.

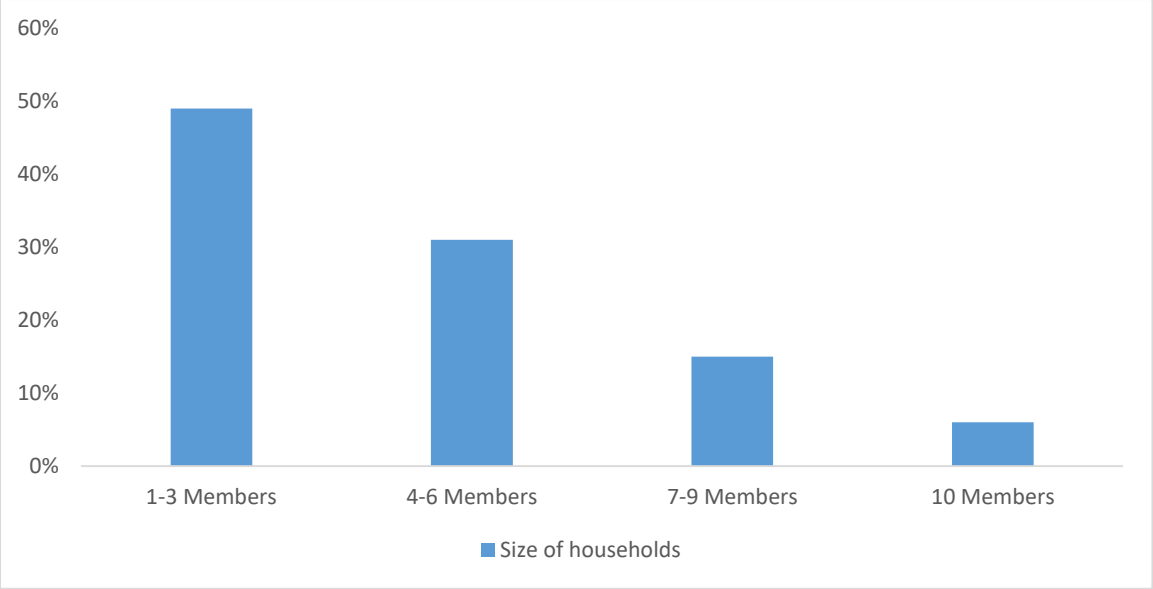

Figure 5.8. Size of households
Source: Fieldwork, (2019).

5.3. Characterizing the nature of disaster risks in Hlophekane Informal Settlement.

This section seeks to address the first objective on characterizing the nature of disasters in Hlophekane Informal Settlement. In order to address this objective, consideration was made on characterizing the activities and dwellings of Hlophekane Informal Settlement. The assumption was that the forms of dwellings can contribute to disaster risks of many kinds. Hlophekane is an informal settlement made up of approximately 90 shacks. This settlement is largely regarded by the municipal by-laws as illegal because the residents or occupants have no legal claim to the land on which the dwelling are logged. The dwelling units were built on land not proclaimed for housing. As such, the dwelling units were not incompliance with the current planning and building regulations of Giyani Local Municipality. According to the Greater Giyani IDP, 2019, informal settlements have a negative impact on planning, provision of services and attraction on investment.

5.3.1. Size of the shack

According to SAMSET (Supporting Sub-Saharan African Municipalities with Sustainable Energy Transitions, 2014), the average size of an ideal shack is between 6m² and 20m². Often, in most instances more than one family lives in one shack. This therefore increases the risk of residents being exposed to disaster risks. Dwelling units in Hlophekane Informal Settlement like other South African informal settlements are shacks. In terms of the sizes of shacks, 47 % (34) of the households live in shacks of between 16 m^2 – 20m^2; 25% (18) in 11m^2 -15m^2; 22% (16) in 6m^2 -10m^2, and only 6% (4) in 21m^2 or more. In most informal settlements, shacks are

erected very close to each other and therefore shack fires often spread easily. A distance of 3.5m between shacks is considered as a safe (Wu *et al.*, 2019). Within Hlophekane most shacks have that safe distance. Figure 5.9 shows these dynamics.

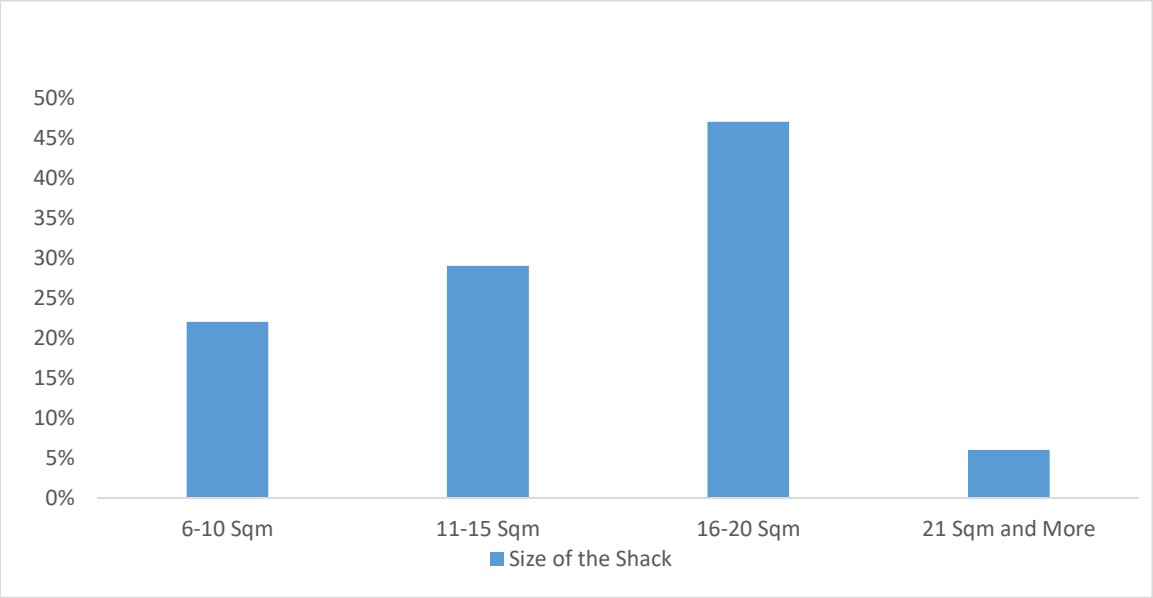

Figure 5.9. Size of shacks in Hlophekane Informal Settlement
Source: Fieldwork, (2019).

The different sizes of shacks clearly demonstrate that most people in Hlophekane Informal Settlement live in shacks of between $16m^2$ – $20m^2$. The average shack size is between 6 and $20m^2$. This therefore means that Hlophekane Informal Settlement is like any other typical informal settlement around the country.

5.3.2. Material used to build the shacks

In many African countries, unplanned informal settlements are poorly sited, and the housing structures are built with improvised materials which are flimsy, highly flammable and have a weak or no foundation (USAID, 2011). The type of material used to build any dwelling unit have an implication to resilience of the structure against disaster risks (USAID, 2011; ISDR, 2007). Hlophekane is not different from the many informal settlements in the country. In terms of material used by households of Hlophekane to build their shacks, 75% (54) were built from corrugated iron sheets, 14% (10) were built from mud and clay, 7% (5) were built from plastic and mud, 3% (3) were made of other material as shown in Figure 5.10.

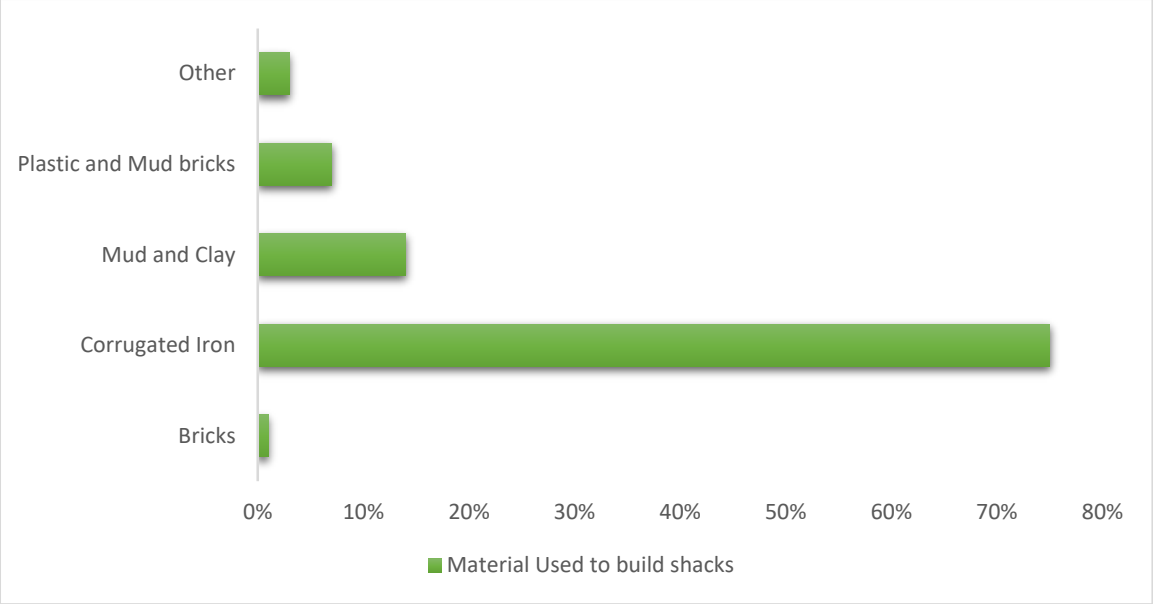

Figure 5.10. Materials used to build the shacks
Source: Fieldwork, (2019).

According to Malagoda *et al.*, (2014), for a city, town or community to be functional and operational at a time of disaster, the built environment plays an important role since it is expected to provide protection to people and other facilities. However, recent disasters have highlighted the vulnerability of the built assets to natural disasters and therefore it is very much important to focus on creating a disaster resilient built environment within communities. The process of making a disaster resilient built environment is a complex process particularly in communities clouded by poverty where people rather define their access to opportunities as more important than where they stay or the material used to build the residences. Photograph 5.1 shows different types of material used to build shacks in Hlophekane Informal Settlement.

Photograph 5.1.Building materials used
Source: Fieldwork, (2019)

5.3.3. Control of space in Hlophekane Informal Settlement.

While these shacks are distinctly vulnerable to disaster risks, residents of Hlophekane continue to identify themselves with the informal settlement. Discussions with these resident indicate that 65% (47) believe that there is no leader or anyone who controls activities and space, 14% (10) indicated that the community leader as a distinct unit is in control, 10%(7) indicated that the chief controls the informal settlement; 6% (4) indicated that other people control them, 4% (3) indicated that the municipality control the space and only 1% indicated that the Ward Councillor controls activities and space in the informal settlement. Figure 4.11 illustrates these findings.

These findings clearly demonstrate the variability of opinion as well as lack of knowledge on leadership and control of the space and activities in the informal settlement. In addition, the general impression is that there is no direct individual or institution in control of Hlophekane Informal Settlement. This is uncommon because many informal settlements are controlled and ruled by mafias that collect 'land levies' (Rashid, 2009). Since residents are not aware of who controls space and activities in Hlophekane Informal Settlement, they are exposed to disaster risks that emanate from lack of structural arrangements on how the settlement is administered including a functional reporting system. As such, this leaves residents frustrated and desperate because of the absence of a community representative during Ward or municipal meetings.

According to the Ward Councillor, in the event of any kind of a disaster in this informal settlement there is no clearly pronounced channel for reporting the event. However, the Ward Councillor indicated that he often visits the settlement since it is located within his Ward to conduct Ward meetings. The mucky system of administration for Hlophekane emanates from the history of the informal settlement since at times it is regarded to be administered by an Induna. Figure 4.11 shows a mixed reaction on how the residents view the administration of the informal settlement.

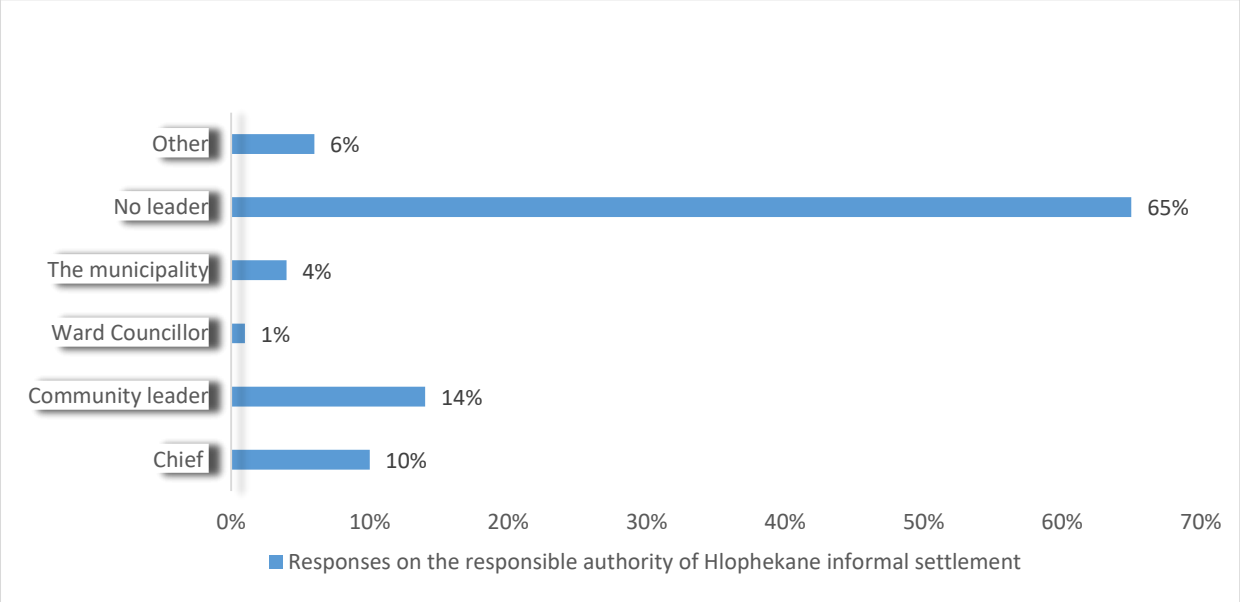

Figure 5.11. Administration of Hlophekane Informal Settlement
Source: Fieldwork, (2019).

From Figure 5.11, the research results demonstrate multiple structures of the system of administration in the informal settlement. Under these circumstances, there is always a blame game when disasters happen as none of the identified structures want to be held accountable. This reporting structures also demonstrates how spaces are produced through direct or indirect control.

5.4. Dynamics of service provision in Hlophekane Informal Settlement

According to the Sustainable Development Goal 11; access to adequate services is key to creating sustainable cities and communities (High-Level Political Forum, 2018). Inadequate water and sanitation impact negatively on urban equity and urban safety (Anderson *et al.*, 2016).

5.4.1. Sanitation issues

According to SERI (Socio-Economic Rights Institute) (2018), sanitation is a big concern in informal settlements which lack infrastructure for waste disposal. In the absence of toilets, residents resort to the nearest bush, posing a health challenge (Ibid). Findings from Hlophekane Informal Settlement indicate that 60% (43) of the households use bush toilets; 38% (28) use pit latrines; 1 % (1) uses flash toilets; and the other 1% uses offsite toilets. This shows that the majority of households do not have access to proper toilets. Figure 5.12 shows these dynamics.

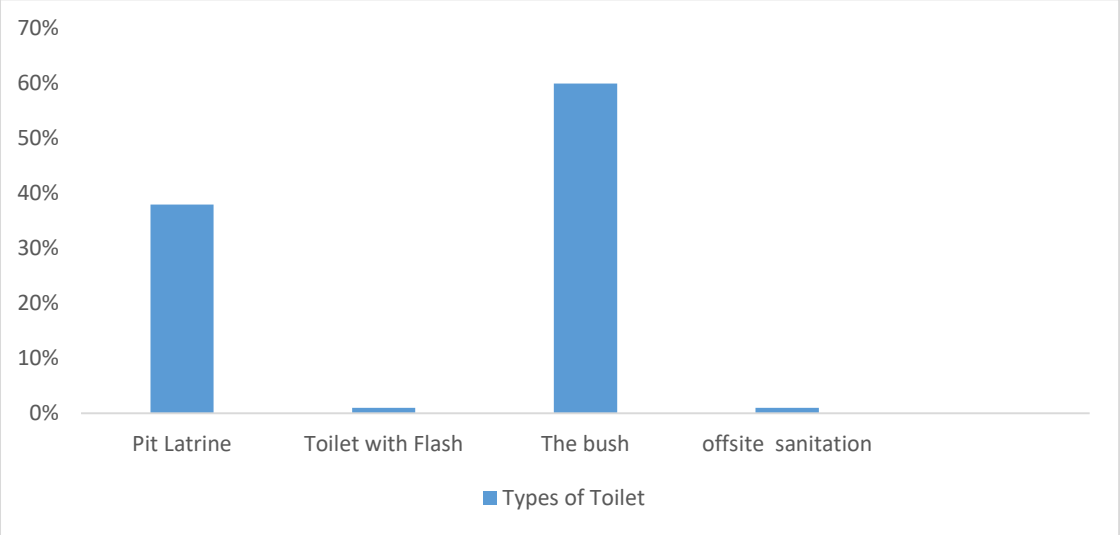

Figure 5.12. Type of Toilets
Source: Fieldwork, (2019).

Most of the toilets are built from corrugated iron, wood and plastic and they do not have a roof. According to Tissington (2011), some municipalities resort to using short term measures in trying to provide long term solutions to sanitation provisioning. However, with the case of Hlophekane Informal Settlement the local municipality is not even providing the bare minimum of toilets such as chemical toilets. Below is Photograph 5.2 that shows the different kinds of toilets in the informal settlement.

Photograph 5.2. Types of toilets in Hlophekane Informal Settlement
Source: Fieldwork, (2019).

These toilets point to self-provisioning of sanitation (particularly toilets) in the informal settlement. When requested for comment with regards to provision of toilets in the informal settlement, the Ward Councillor stated that this settlement is only recognised as illegal hence they cannot provide such services as it would seems as they are promoting illegal settlements. From a Right to the City perspective, lack of proper sanitation does not only deny city residents of their rights to access services, but also exposes them to disaster risks such as diseases. Below is Photograph 5.3 that shows the inside of one of one of the pit latrines in the informal settlement.

Photograph 5.3. Inside a pit latrine in Hlophekane Informal Settlement

Source: Fieldwork, (2019.

The squat holes of the pit latrines are often too wide for people to squat when relieving themselves. This exposes people to risk falling into these latrines. For example, in 2014, a grade R pupil from Mahlodumela Primary School in Limpopo Province died when the toilet collapsed and he fell in (Mabuza, 2019). However, none of the residents of Hlophekane Informal Settlement interviewed stated that a child fell into a pit toilet because children mostly use the bush toilets, and also there are not many pit latrines in the informal settlement.

5.4.2. Sources of water for domestic use

According to Chapter 2 of the Constitution of South Africa, everyone has the right to access to clean water. However, in Hlophekane Informal Settlement that is not the case. Residents do not have adequate sources of clean water for domestic use. As a result, the residents illegally connect water pipes from the municipal main water line in order to meet their domestic water needs. The local municipality has the mandate as a water services authority to provide access to water to all people living within that municipal area (Smith, 2009). According to the Red Book on Guidelines for Human Settlement Planning and Design Volume 2, the collective standpipes are planned at positions within residential areas to satisfy the minimum service levels, and should be informed by community needs within a walking distance of 250m to a pipe at most. Photograph 5.4 shows water sources such as the neglected borehole which is no longer used and illegal communal pipes.

Photograph 5.4. Water sources, the neglected borehole which is no longer used and illegal communal pipes

Source: Fieldwork, (2019).

Findings on water sources in Hlophekane Informal Settlement indicate that 67 (93%) of the total households get water from a street pipe that is illegally connected to the municipal water pipeline. Such connections are done by some residents who are knowledgeable about illegal water connections for a fee. This main pipe runs to the adjacent Homu 14C residential neighbourhood in Giyani. About 3 (4%) of households get water from the illegal connections of the household pipes. Whereas, 2 (3%) buy water from other residents within the informal settlement (spaza shops) or from the residential neighbourhood located across the road. The dynamics of accessing water in Hlophekane Informal Settlement clearly demonstrate that different households use different ways to access water for household use – mainly cooking, bathing and for watering small vegetable gardens. Figure 5.13 shows these dynamics.

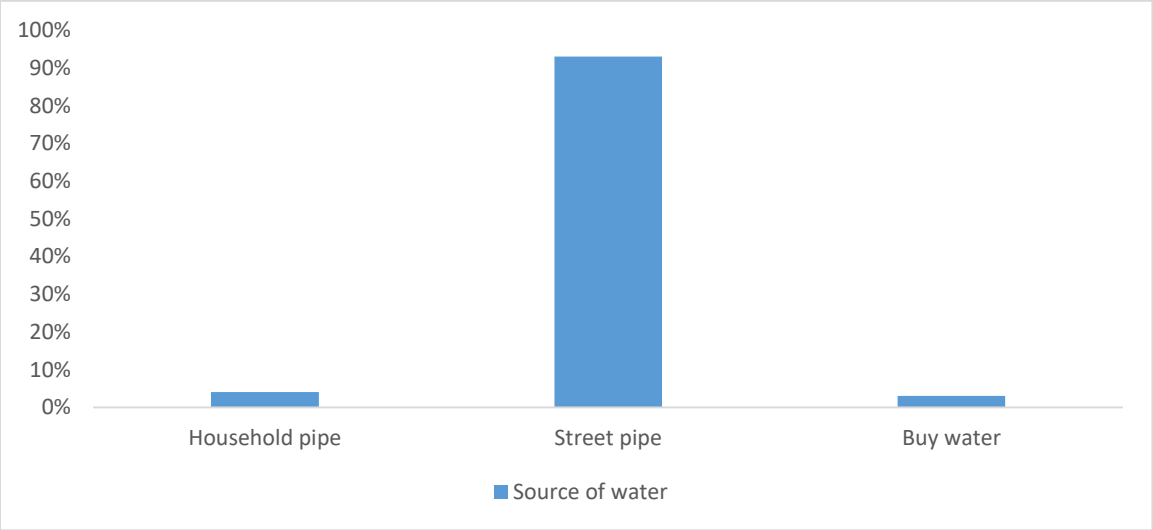

Figure 5.13. Source of water
Source: Fieldwork, (2019).

Given the circumstances of accessing water, the Ward Councillor indicated that some of the hazards that occur in the informal settlement are a result of people sharing water with animals particularly with the case of the borehole or the communal water tank. Hence now people have stopped using them. The two sources are exposed and lack covers. Yet, the local municipality is obligated by section 27 (1) (b) of the Constitution of the Republic of South Africa Chapter 108 of 1996 to provide water to all citizens of the Republic. Clearly, the local municipality failed to provide the basic communal standpipes leaving residents to illegally connect water or to rely on sources that expose them to disease disaster risks. As a result, women and girls emerge as the bearers of the negative impacts of poor municipal water service provision because they carry water from the different sources to their households using containers risking violence and sexual assault while doing so. This could be the reason why most residents use

makeshift water connections to get the water to their residential spaces in the informal settlement. Photograph 5.4 shows the malfunctioning borehole and street pipes.

5.4.3. Sources of energy used in Hlophekane Informal Settlement

Sources of energy are important for cooking, heating and lighting in the informal settlement. From the data collected, 71 (99%) use firewood for cooking whereas the rest use paraffin. This shows that most household use wood fuel which they get from the bush or buy from supermarkets and informal traders for approximately R10 per portion. Figure 5.14 shows these dynamics.

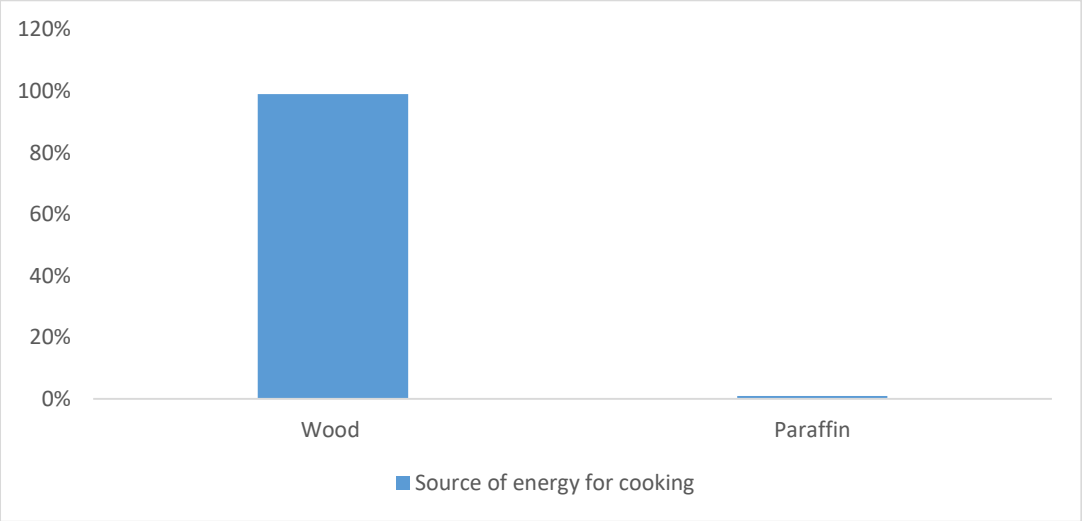

Figure 5.14. Source of energy for cooking
Source: Fieldwork, (2019).

In terms of source of energy for lighting 69 (96%) households indicated that they use candles for lighting whereas 3(4%) of the households use paraffin for lighting. Clearly, none of the household use clean energy such as solar, electricity or gas thereby exposing themselves to disaster risks such as fire. Figure 5.15 shows these dynamics.

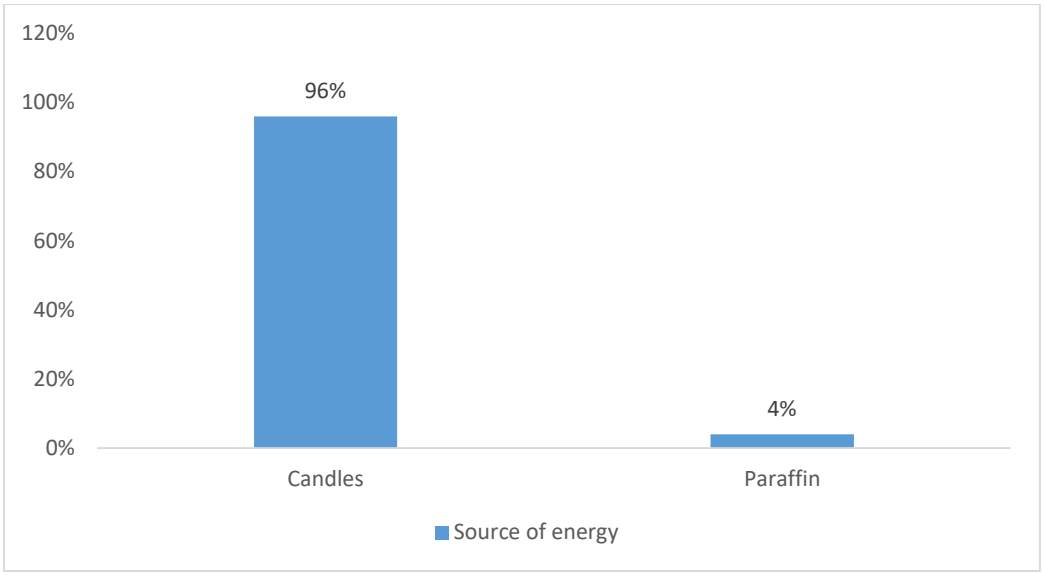

Figure 5.15. Source of energy for lighting
Source: Fieldwork, 2019.

In terms of energy for heating 71 (99%), households indicated that they use wood whereas 1 (1%) use paraffin. It was observed that some residents use solar batteries for charging their phones and charging their radios but not for cooking, heating and lighting. This could be because purchasing equipment to install solar energy for heating, cooking and lighting is regarded as expensive by many residents of informal settlements. In addition, such connections require dwelling units built from stronger materials. Figure 5.16 illustrates the sources of energy for heating.

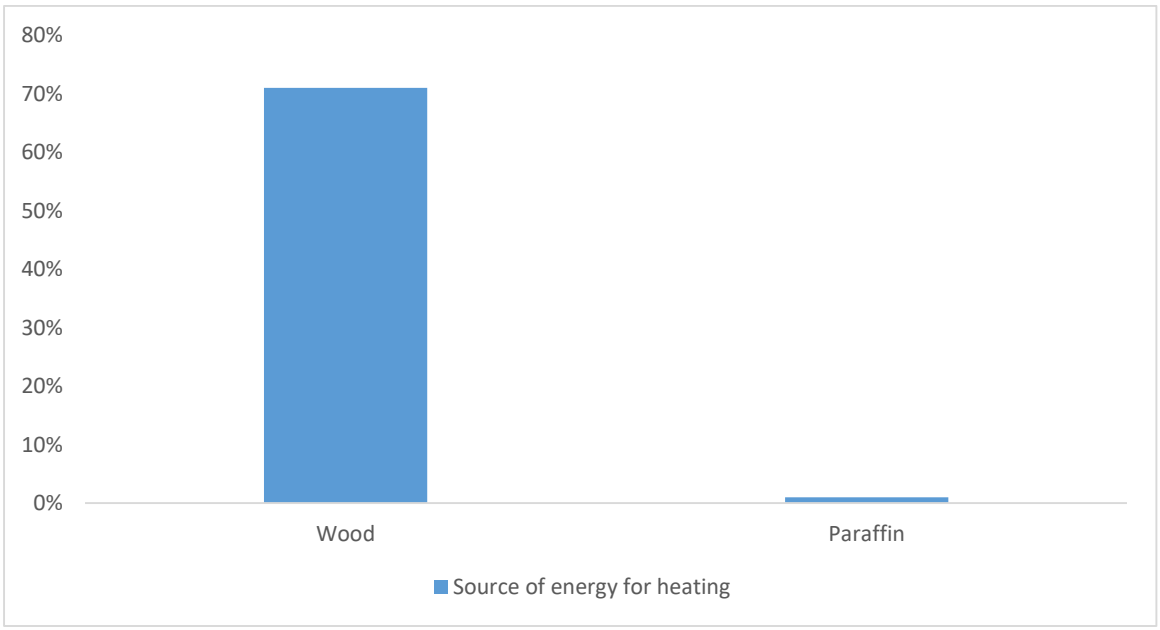

Figure 5.16. Source of energy for heating
Source: Fieldwork, (2019).

Some of the residents also pointed out that there are no high mast lighting installed within Hlophekane Informal Settlement. As a result, the residents depend on the natural lighting systems including the moon and stars at night and the sun for day heating. Moonlight and the stars create shadows thereby risking residents through mugging during the night.

In Hlophekane Informal Settlement most of the dwelling units are made of plastic. As such, using candles and paraffin for lighting is a hazard that can lead to fire disasters. Many residents indicated that their shacks were previously burnt down and destroyed out rightly by fire due to unattended candles, paraffin stoves and lamps and cinders from the firewood. In some cases, residents use a combination of the energy sources.

5.5. Connectivity

Connectivity refers to the directness of links and the density of connections. A highly permeable network has many short links, numerous intersections, and minimal dead-ends. Good connectivity provides easy access to key destinations for pedestrians. (TDM Encyclopedia, 2009). Within Hlophekane Informal Settlement there are no formal roads, the roads are desire lines or simply paths. These desire lines have dead ends. However, the residents are very conversant on how to navigate through and within the settlement and beyond to other settlements. These paths are not tarred. The roads get muddy when it rains and dusty when it is dry and windy thereby exposing the residents to disease risks of airborne and waterborne diseases. Below is Figure 5.17. that shows the access points into Hlophekane Informal Settlement as well as a connectivity network of paths.

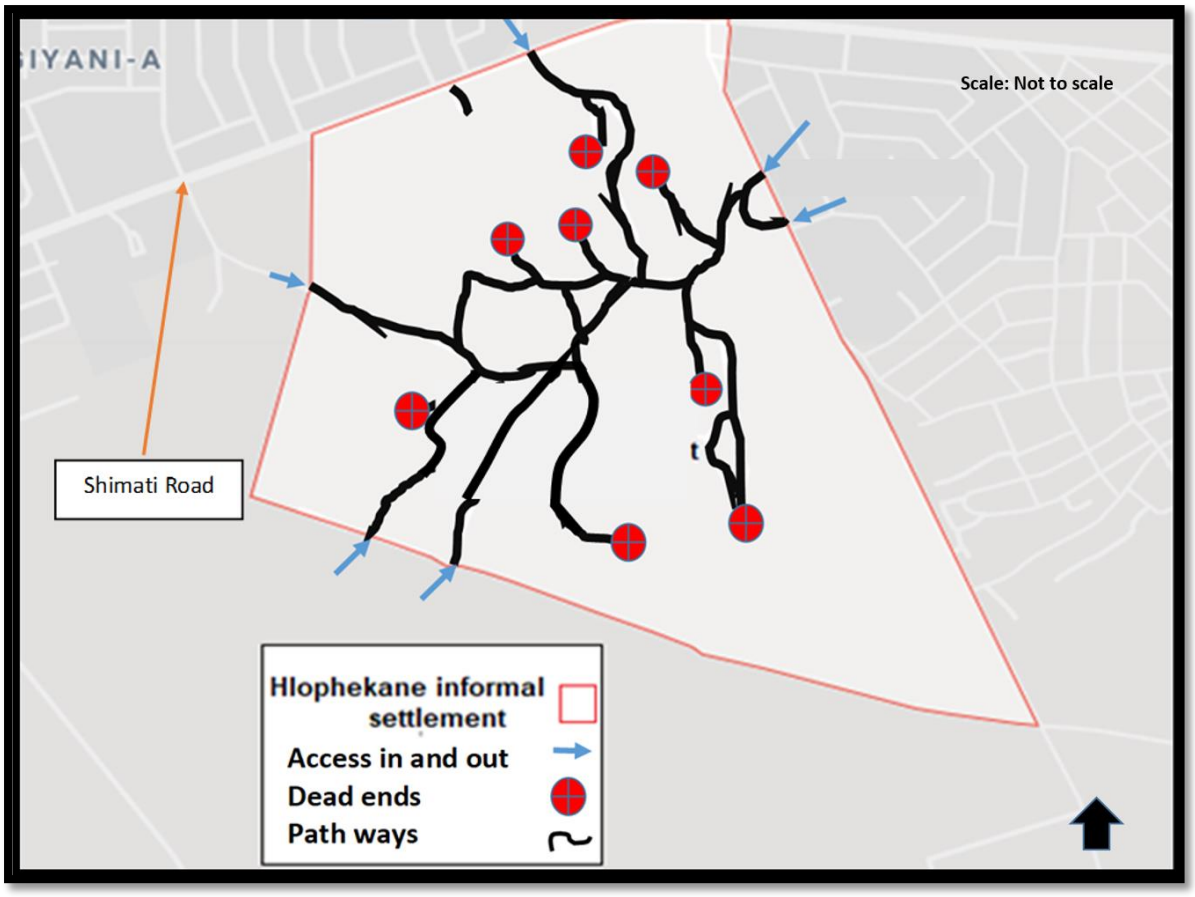

Figure 5.17. Connectivity Map within Hlophekane Informal Settlement
Source: Author, 2020

Findings from the residents of Hlophekane show that the principle of connectivity goes beyond networking within the informal settlement as residents also travel to other places outside the informal settlement. This shows that paths within the informal settlement link the residents both within and outside the area, the unproclaimed dusty road branch from the Shimati road which is a local collector, which connects the Giyani main road that is connected to the R81. As such, the residents use different types of transport such as taxis, bicycles and buses. For example, when residents travel to town or visit their relatives elsewhere they prefer to use taxis. It costs R10 from the informal settlement to Giyani CBD by taxi – a distance of about 5.5km. From the findings, about 71% of the residents use taxis to connect the informal settlement to other places 24% prefer walking, 3% cycle and the rest use other means of transport such as company vehicles or simply 'lifts'. This clearly shows that residents of Hlophekane Informal Settlement have a variety of choices from the available means of transport. Their choices are often limited by their ability to pay; hence they walk to town. Figure 5.18 illustrates these dynamics.

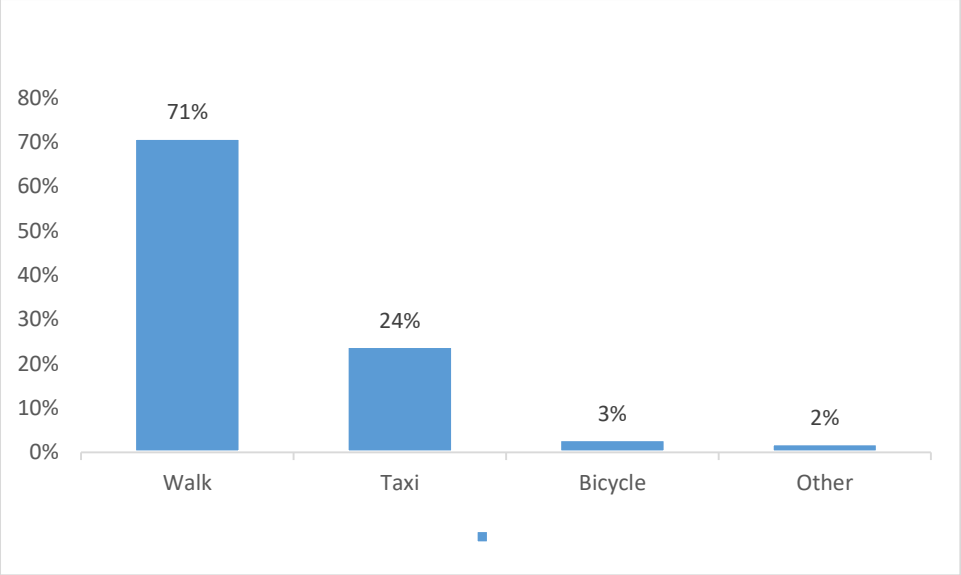

Figure 5.18. Transport systems used to connect with the town and other areas.
Source: Fieldwork, (2019).

Connectivity in informal settlements is an important element that determines the ability of local stakeholders' ability to assist residents during disasters. The connectivity within Hlophekane is not adequate enough to disaster management since there are no obvious visible road patterns or layout and stand numbers. For example, with good connectivity fire fighters and water cannons can easily move within an informal settlement to douse fires. Emergency vehicles together with some fire prevention need to be provided to an informal settlement to ensure that the health and safety of the community meet basic minimum criteria (Western Cape Government, 2005).

5.5. Chapter summary

Hlophekane Informal Settlement lacks adequate service provision including electricity, sanitation, water supply and proper access roads. This exposes residents to disaster risks of many kinds for instances floods, damaging winds, fire and diseases. From the Right to the City perspective, the right to the city is more than just improving people's neighbourhoods and housing or improving the city and its surroundings. It is about democratic control over the city, with the right to access, occupy and use urban space.

CHAPTER 6: DISASTER RISKS IN HLOPHEKANE INFORMAL SETTLEMENT

6.1 Introduction

This chapter seeks to address objective number two which is to characterize the nature of disaster risks in Hlophekane Informal Settlement. In order to achieve this objective, I used data from the residents, municipal planners and the Ward Councillor. Analysis of data was conducted using SPSS and Excel software and using frequency and percentage as a statistical method. The Disaster Crunch Model and Right of the city theory were used in analysing data in this chapter. The Disaster Crunch Model describes that vulnerability (pressure), which is rooted in socio-economic and political processes to be addressed (released) to reduce the risk of disasters. The model further states that disasters happen only when a hazard affects vulnerable people, hence Hlophekane Informal Settlement is a vulnerable settlement. The chapter covers issues on vulnerability, kinds of disaster risk, disaster trends, where they report to once a disaster has occurred, how residents feel once a disaster has occurred, losses caused by a disaster, and disaster hotspot mapping. In terms of identifying the nature of disasters in Hlophekane Informal Settlements, the findings reflect on the nature of disasters in the informal settlement; as well as identifying both the direct and indirect nature of disasters; kinds of disasters faced by the community and individual households; and how they deal with vulnerabilities in the informal settlement.

6.2. Characterizing the vulnerability context of Hlophekane Informal Settlement.

From a spatial planning perspective, Hlophekane Informal Settlement is viewed as a temporary space that can be used by the residents while they await formal housing provision by the local municipality. These residents have been occupying this space for more than 30-35 years. As a result, the residents are marginalized by the community of Giyani. Hlophekane Informal Settlement residents also suffer from endless prejudices by living in a settlement that is largely regarded as informal with inadequate services and housing dwellings that are built from plastics. Such perceptions are simply denying the residents their right to the city.

6.2.1 Population densities

As a result of twin forces of migration and urbanization, a lot of people are settling at Hlophekane Informal Settlement while they access opportunities from Giyani Town.

6.2.2 The location of the informal settlement

Hlophekane Informal Settlement is a low-lying area located near a river (Klein Letaba) approximately 1, 37 km away. The settlement is located on a brownfield where storm water

runoff from the neighbourhood passes through the informal settlement before it gets to the river. This location creates precarious conditions including threats from natural disasters such as flooding, fires and diseases. From the Disaster Crunch Model's perspective, there is need to uncover the pressure rooted processes and to identify both trigger events and unsafe conditions that characterise disasters in this human settlement (Minh Hai and Smyth, 2012; Nirupama, 2012; Blaikie et al., 1994). As such, trigger events can be winds, rain, unsafe sources of energy such as candles and paraffin as well as unsafe conditions that define spaces where people live in. This means that conditions and location of Hlophekane can be regarded as trigger events for disaster risks in this informal settlement because most disasters are caused by a ripple effect wherein one disaster leads to another. For these disasters to be reduced, elimination and prevention of disaster risks is at the core of the strategies.

6.2.3 The socio-economic context of the residents of Hlophekane Informal Settlement

From the Disaster Crunch Model's perspective, a natural phenomenon by itself is not a disaster but requires a trigger event to become a disaster (USAID, 2011). This therefore defines the vulnerability context of people. For example, the vulnerability context of residents of Hlophekane Informal Settlement can be described as rooted in undesirable socio-economic and political process that deprive them of opportunities enjoyed by residents from other municipal areas. As such, strategies are required to release the built-up pressure from this socio-economic context in order to reduce disasters. For example, the living conditions and service delivery challenges that households face in this settlement. The Ward Councillor also indicated that there are multiple categories of social ills experienced by the residents ranging from housing, children dropping out from schools because of lack of identity documents, children engaging in sexual practices often "unprotected sex" to generate money to support their families, and alcohol consumption by children. As for adults, lack of legal identity documents reduces their chances of obtaining formal employment or requesting for better services from the local municipality. As a result, these adults resort to low paying blue-collar jobs.

In general, the level of vulnerability of residents of informal settlements is linked to social factors including household poverty (Simiyu *et al.*, 2019; Weimann *et al.*, 2019; Meth, 2016). This is directly linked to the location of the human settlement, design structure of the shacks, the design considerations and the ability of the dwelling structures to withstand hazards as well as lack of access to services, infrastructure and information on disasters.

Reflecting on the case of Hlophekane Informal Settlement, 51% of the residents indicated that they are vulnerable due to the material used in building their shacks, 26% due to inconvenient location, 10% because of location on a flood line and the rest had other reasons including inability to build proper buildings due to poverty. Figure 6.1. Illustrates these findings.

Figure 6.1. Reasons for vulnerability.
Source: Fieldwork, (2019).

Clearly, both the location and material used to construct shacks in the informal settlement are major factors that define the vulnerability context of Hlophekane. Yet, the residents prefer to settle in this informal settlement because it is located in proximity to schools, public health facilities such as Evaxakeni Psychiatric Hospital, and other public services such as Thandabantu Lower Primary School, and Giyani High School. Above all, the residents believe that the land is free although their safety and security from disaster risks is compromised.

6.3. The nature of disasters in Hlophekane Informal Settlement

It was possible to collect data that relates to identifying the nature of disaster in Hlophekane Informal Settlements. This section presents both the direct and indirect nature of disasters, kinds of disaster faced by the community and individual households, how vulnerable they are to such disasters and who they report to once a disaster has occurred.

6.3.1. Kinds of Disasters in Hlophekane Informal Settlement.

Hlophekane Informal Settlement is viewed as a temporary space that results in residents being marginalized and they suffer from endless prejudices, yet the location is made of precarious

conditions including the threats of both natural disasters and man-made disasters. For one to understand and uncover the kinds of disasters, there is need to uncover the factors that leads to disasters. From the perspective of the Disaster Crunch Model, one needs to uncover the pressure rooted process and identify both trigger events and unsafe conditions. In this case, trigger events include winds; rain; candles and unsafe conditions is the space people live in. Most of the disasters such as damaging winds, flooding, fires and diseases (such as malaria) are caused by ripple effect wherein one disaster leads to another, and for one to reduce a disaster action, one needs to eliminate or prevent the main or the core of that effect.

In terms of disaster risk experienced in Hlophekane Informal Settlement, 36% (26) of the household heads indicated that they experience floods within the settlement, 46% (33) only experience damaging winds, 5% (4) experience diseases, 5%(4) experience fire, 4% experience drought, and the remaining 4% experience other risks. From the overall kinds of disasters in Hlophekane Informal Settlement, there seems to be an indication of health risk associated with each disaster and this implies a lower life expectancy as compared to proper planned areas.

The area is mosquito infested since it is located close to a river. During summer, people suffer from malaria. The Ward Councillor pointed out that just in 2017, a total of 989 cases of malaria were reported with 80 deaths throughout Giyani Local Municipality. These disaster risks did not occur at the same time, but over time in each household that was surveyed. Refer to Figure 6.2.

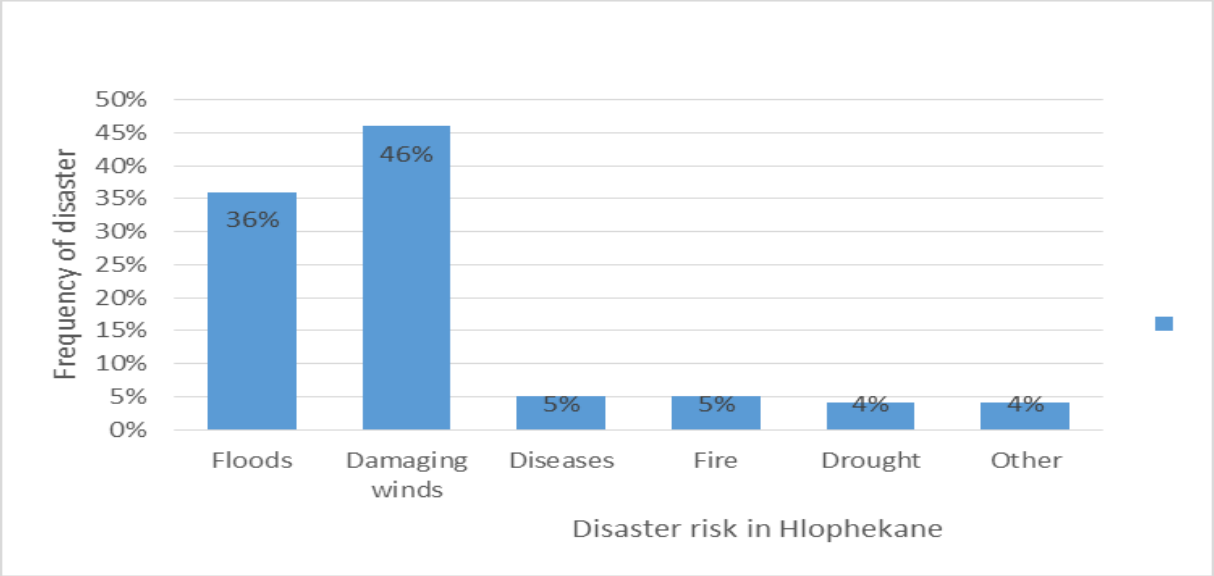

Figure 6.2. Disaster risk experienced in Hlophekane.
Source: Fieldwork, (2019).

It should be noted that damaging winds coupled with floods happen more than any of the disasters that occur throughout the informal settlement. Damaging winds alone happen quite often.

6.3.2. Disasters experienced by each household.

This sub-section evaluates the disasters that have been experienced by different households. This is because different households have different coping capacities and their vulnerability levels differ. For example, some people might be staying closer to waterways and some might have built their houses with durable material. This section focuses on disasters within households which have occurred in the past.

In terms of disasters experienced within each household, 29% (21) of the households indicated that they experienced damaging winds only, 15% (11) experienced both damaging wind and floods, 13% (9) experienced flooding only, 10% (7) experienced damaging winds, floods and fire, 8% (6) experienced floods, damaging winds and disease outbreak, 6% (4) experienced drought, damaging winds and fire and only 6% (4) experienced other types of disasters such as poverty and mental health. These coupled disaster risks did not occur at the same time or simultaneously, but over time, in different seasons and years on each household that was surveyed.

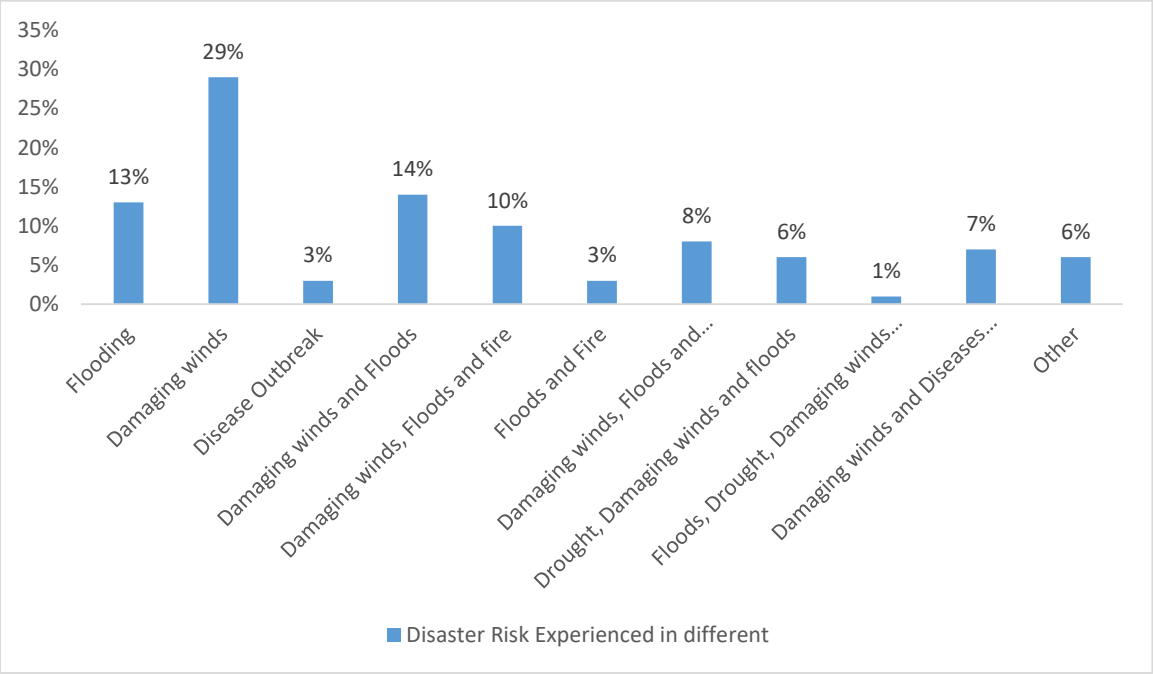

Figure 6.3. Disaster risk experienced in different households
Source: Fieldwork, (2019).

Figure 6.3 shows the disaster risks experienced by the individual households of Hlophekane

Photograph 6.1. Shacks destroyed due to winds and floods

Source: Fieldwork, (2019).

Informal Settlement surveyed in different times or seasons. However, some disasters were experienced in combination or as ripple effects of other disasters. For example, damaging winds and floods. From these findings damaging winds and floods emerge as the most experienced disasters by the residents of Hlophekane. These experiences emanate from the type of materials used to construct the dwelling units as well as absence of unpaved surfaces and stormwater drainage system.

It should be noted that damaging winds coupled with floods happen more often than any disaster that happens in the informal settlement. The shacks are often uprooted by winds. Water from rain easily run off too and there is little vegetation cover to break the winds or to absorb run off water. Since Hlophekane Informal Settlement is located in a storm water catchment, when it rains storm water from neighbouring settlements passes via Hlophekane with force thereby eroding shacks. Photograph 6.1. Shows these dynamics.

In terms of fires experienced, unlike other illegal informal settlements Hlophekane experiences a few fire cases which are caused by candles and cinders, and when a fire disaster occurs it does not pass to the neighbours as shacks are not closely packed like other illegal informal settlements who have a high population density. The Ward Councillor also indicated that the most common disaster is fire since people use candles. Neglected candles, wind, and heard

boys often cause most fires in this settlement. Refer to Figure 6.3, Photograph 6.1, and Photograph 6.2.

Photograph 6.2. Fire hazards
Source: Fieldwork, (2019).

6.3.3. Losses due to disaster

In terms of what they have lost from disasters, 55% (40) of the residents lost their shelter 19% (14) lost their identity documents including passports, 10% lost livestock, 8% (6) lost utensils and clothes, 4% (3) lost crops, and 4% (3) lost family members. These findings indicate that the vulnerability of the informal settlement to disaster risks is high and the coping capacity of the people is low. The intensity of disasters that occur is between low-mid with few incidences of deaths but destruction of dwellings and other household property. Figure 6.4 presents the losses experienced due to disasters in the informal settlement.

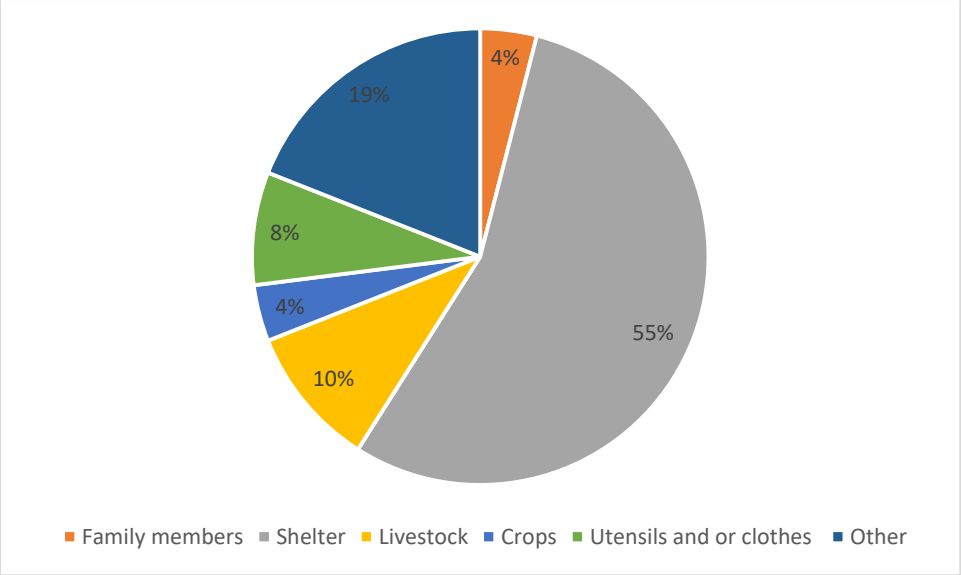

Figure 6.4. Losses due to disaster risks
Source: Fieldwork, (2019).

6.3.4. Disaster trends in Hlophekane Informal Settlement

Trends in disaster occurrences determine how often or periodically residents experience disasters. In Hlophekane Informal Settlement, 72% (52) of the households experience disasters seasonally, 18% (13) experience disasters monthly, 7% (5) experience disasters every day, and these are people who indicated that they experience poverty every day. Figure 6.5. Illustrates these findings.

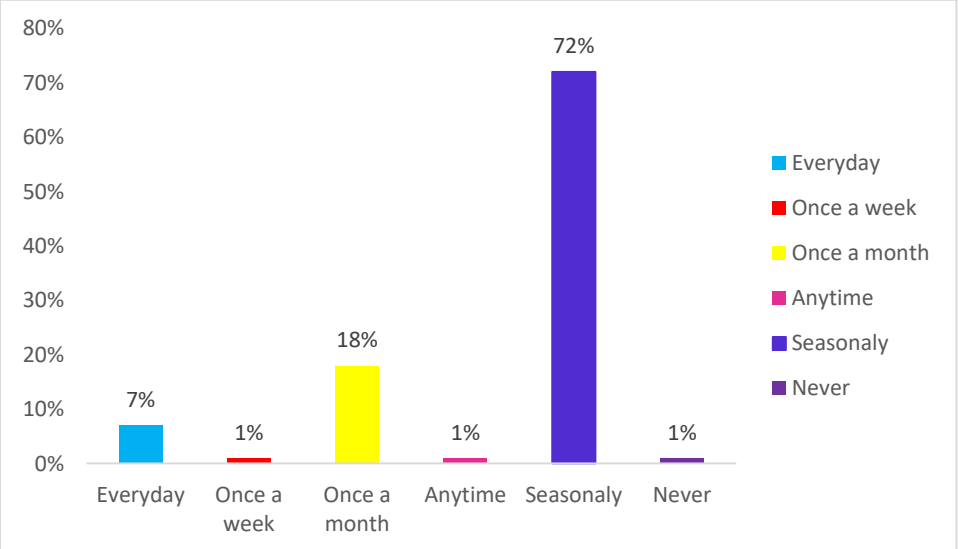

Figure 6.5. Disaster trends
Source: Fieldwork, 2019

These findings show variability in disaster trends for people that live in Hlophekane Informal Settlement. Seasonal disasters are related mostly to natural phenomena that happen every

season such as floods. For example, residents of Hlophekane experienced floods in January 2000, November 2018 and March 2020. The reason why the settlement often experiences flood disasters seasonally is because it is geographically located in an area affected by both subtropical and tropical weather systems (Hart *et al.*, 2013). In addition, the coping capacity of the residents is low. Flood disasters usually trigger malaria incidents in the informal settlement. Monthly, weekly and anytime (abruptly) disaster experiences were rather linked to occasional events and risks such as winds, fires and crime. Such disaster risks need the residents to be always alert.

6.3.5. Disaster reporting system in Hlophekane Informal Settlement

In case of disaster occurrence in Hlophekane Informal Settlement, the residents need to report and alert the relevant Disaster Management Department in Giyani Local Municipality. Findings from the household survey indicate that 18% (13) report to the Ward Councillor, 13% (9) report to the community leader, 67% (48) do not report, 1%(1) were not sure and only 1% (1) report to the police. Figure 6.6 below illustrates these findings.

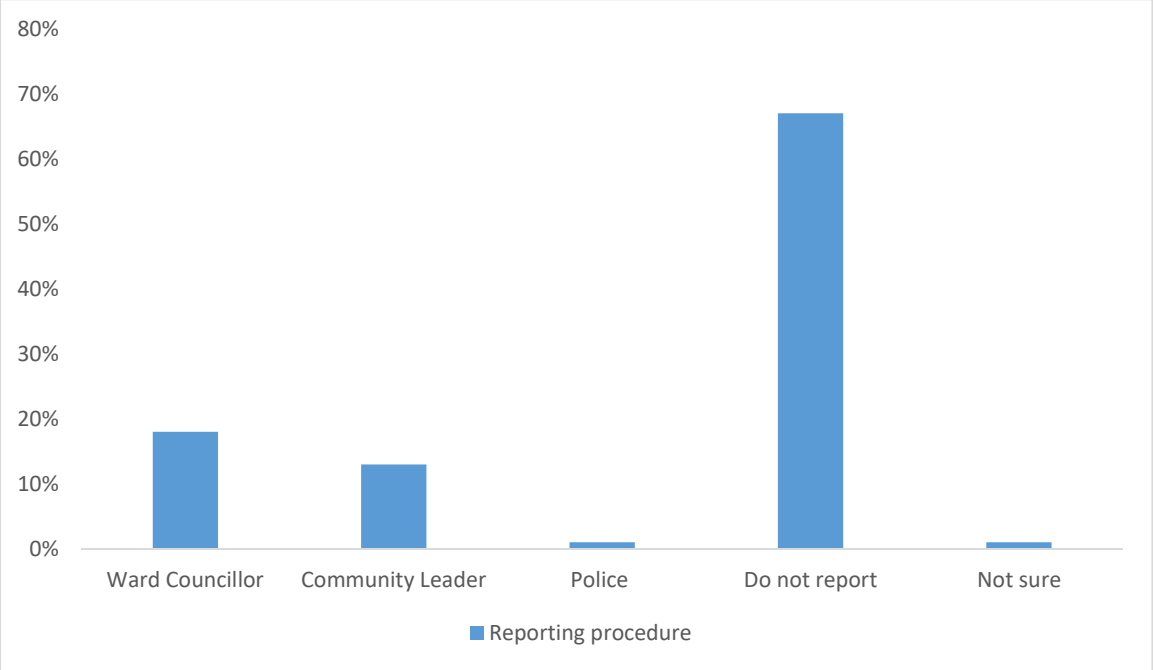

Figure 6.6. Reporting procedure
Source: Fieldwork, (2019).

These findings clearly demonstrate the existence of platforms to report a disaster occurrence. However, the majority of the residents do not report because of their illegal immigrant status for fear of apprehension. As a result, they report household disasters to their neighbours who

also assist to rebuild destroyed shacks. The least cases that are reported to the police and the Ward Councillor relate to floods and fires of a great magnitude. According to the Ward Councillor, his role is to provide disaster relevant support such as food parcels and general assistance in rebuilding structures on behalf of the local municipality particularly with regards to facilitation of communication about disasters to the Municipal Disaster Management Officers. From a Right to the City perspective, access to services is largely determined by your social class and factors related to ethnicity, gender and background. This has an implication for participatory planning for all residents regardless of their status.

6.3.6. Residents' feelings after a disaster occurs

Residents were asked to share their experiences on their feelings after a disaster occurrence. It is in human nature to evoke different emotions when going through challenges (Brozan, 1983). The residents indicated that when a disaster struck they felt very sad 50% (36), stranded 24 % (17), angry 8% (6), neglected, confused and entangled 15% (11) and 3% (2) were not sure. Figure 6.7 below illustrates these findings.

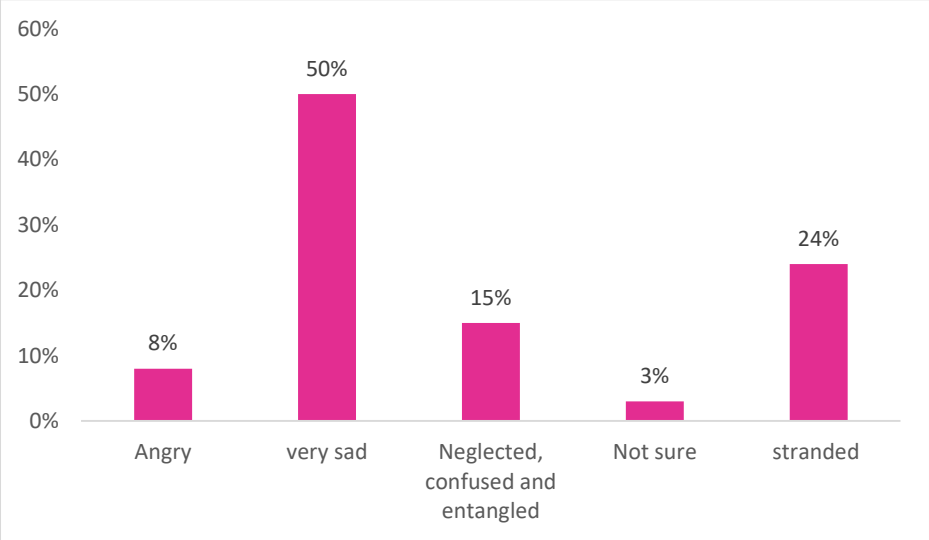

Figure 6.7. Feelings after a disaster occurred
Source: Fieldwork, (2019).

The reason for such feelings could be because when disasters happen residents often do not know what to do, where to report, where to go, or how to react. This clearly demonstrates the relationship between disasters and psychological disorders due to impact from disasters. Disaster risks and disaster events affect individual households and collectives such as communities differently.

6.4. Mapping disaster risk zones in Hlophekane Informal Settlement

This section addresses objective number three on mapping disaster risks in Hlophekane Informal Settlement using GIS. Through mapping, the disaster risk hot spots were identified. According to Sherbinin (2013), mapping disaster risk hotspots assists in vetting data, guiding future institutional strategies, and priority setting. It also assists with developing remedial measures to reduce disasters. Disaster risk hotspot zones emerge from both spatial analysis and interviews. In this research, mapping was done through interacting with the residents to find out where exactly disasters occur. That information was captured in form of points and polygons in a co-ordinates format. This was done by using SW maps application. These were exported to shape files and processed using ArcGIS. Different layers were created and exported to the final maps below.

In this section, disaster risk zones are those spaces that were affected by a disaster repeatedly and could be affected again by any kind of a disaster due to exposure. This map therefore is useful in strengthening coping capacity of the residents as well as the responsible authorities since Hlophekane Informal Settlement has a low coping capacity to disaster response. Below is Figure 6.8 that illustrates the location of disaster risk zones in Hlophekane Informal Settlement.

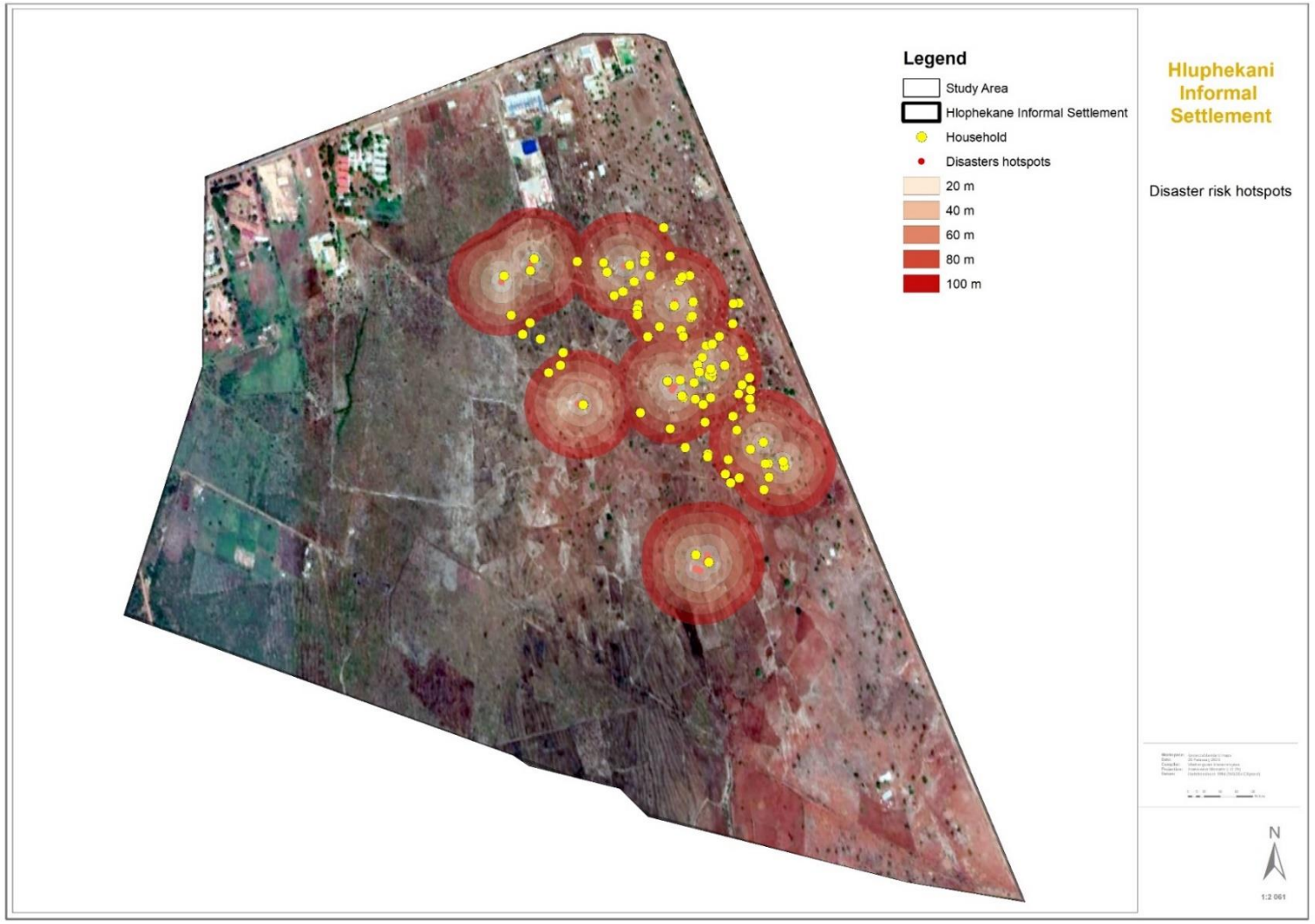

Figure 6.8. Showing disaster hotspots and risks in relation with the Households

Source: Author, 2020.

Residents of this informal settlement are exposed to winds, fire, floods and drought disasters. This is largely because of the material used to build dwelling structures (shacks) and the location of the settlement on a flood plain or waterways. This map shows all disaster hotspots zones combined as experienced by all households. Within the hotspots zones shown on the map, disease risk disaster hotspots were excluded since what the residents explained was based on random events but not on disaster occurrence. For example, one resident indicated that HIV and Aids is a disaster that affects them. From the map, a visible pattern is noticeable illustrating disaster risk trends during the rainy season when water ways and temporary streams flow within the settlement affecting all shacks located within the 100m buffer zone from the river.

Disaster impacts are usually categorised into different factors including physical, economic and social. Within Hlophekane Informal Settlement all the above occur in form of injury, burns, and loss of property, loss of life, migration and distress. In terms of the general impacts of disaster risks, 31% (22) residents indicated that they relocated from one space within the informal settlement to another space due to their shelter being eroded by floods or blown away by winds, 25%(18) experienced the general impact where diseases in a form of malaria, diarrhoea and HIV & Aids, 25% (18) experienced other impacts such as losing their identity documents which meant that they become illegal migrants and could not get proper jobs in South Africa.

Other impacts also include mental health and malnutrition that often lead to depression and other behaviours. Studies often link indicators of poverty such as food insecurity, low levels of education, social class and financial stress with symptoms of depression. Refer to Figure Figure 6.9 and Figure 6.10.

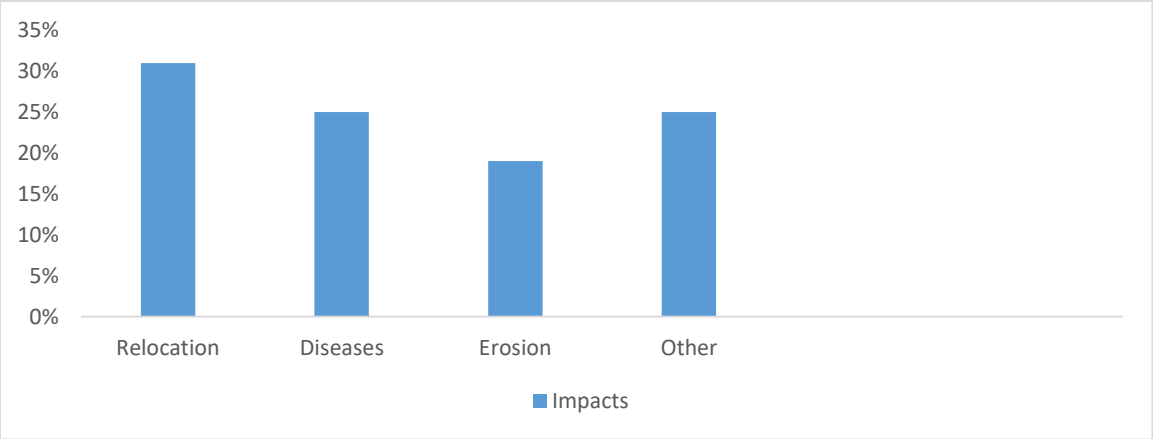

Figure 6.9. General impacts of disaster risk on different households
Source: Fieldwork, (2019).

Figure 6.10. Showing disaster hotspots and risks in relation with the Households with related picture
Source: Fieldwork, (2019).

In terms of prevention measures that are used in order to reduce disasters, 28% (20) residents indicated that they used reinforcement materials such as heavy stones to prevent their houses from blowing up, 26% (19) planting trees around the shelter, redirecting a water channel, 10% (7) did nothing, 21% (15) built their shelters after it was eroded or blown away and 8% (6) rebuilt their housing using different materials which are more resilient than the previously used. Only 1% indicated that once the houses are eroded, they rebuild just using the previous material but with reinforcement. Refer to Figure 6.11.

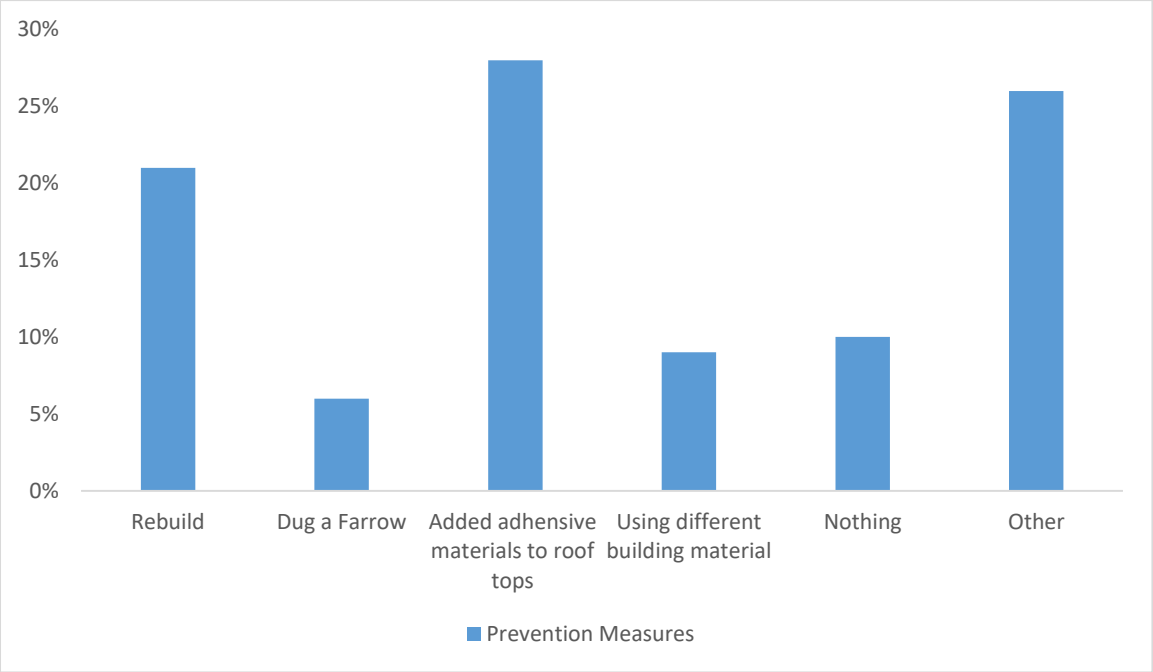

Figure 6.11. Prevention measures after a disaster has occurred
Source: Fieldwork, (2019).

6.5. Chapter summary

This chapter outlined the disaster risk zones in Hlophekane Informal Settlement. These zones are located mostly in between shacks. The chapter also indicates how often disasters occur and the years of occurrence in the past. This chapter also focused on mapping disaster risk zones using GIS.

CHAPTER 7: DISASTER RISK REDUCTION STRATEGIES FOR HLOPHEKANE INFORMAL SETTLEMENT

7.1. Introduction

This chapter outlines the proposed Disaster Risk Reduction (DRR) strategies for Hlophekane Informal Settlement. Disaster risk reduction strategies entail effort and scaling priority towards reducing deplorable living conditions that arise from disaster situations (ISDR, 2009). These DRR strategies include strengthening institutional capacities of local authorities through risk assessment, creating early warning systems and community education among others (Ministry of Social Solidarity, 2008; Matsimbe, 2003). These strategies are informed by the needs of the residents, and expectations of the local municipality. In this chapter, disaster risk reduction strategies were presented from a town planning perspective. Three categories of stakeholders were identified. These are the residents, the Ward Councillor and the local municipality. The first section of this chapter discusses proposed strategies by the residents, the second strategies are those proposed by the Ward Councillor and the third are those proposed by municipal officials.

7.2. Proposed disaster risk reduction strategies: Residents' perspectives

Residents were asked to identify possible options that they perceived as disaster risk reduction strategies in the informal settlement. Approximately five (5) disaster risk reduction strategies were identified through a questionnaire survey. It was deemed important to get the views of the residents because the Right to the City approach emphasises community participation as key to building lasting solutions on issues that affect people (Purcell, 2002). Community participation is also concerned with the creation of improved social and economic conditions through emphasis on voluntary cooperation and self–help efforts of the communities (Hedayat and Ma'rof, 2009). Participation is a vital component of the self-help process. In other words, people must be involved in those decisions that affect their lives, thus gaining confidence, self-esteem and knowledge, and developing new skills (Javan, 1998). Mtshiniwaminsitu re-blocking is an example of a successful community participation project which was located in a storm water catchment of about 250 structures and another successful community participation was the Ruimsig re-blocking of 134 shacks which involved the community and the students from university of Johannesburg (Hendler and Fieuw, 2018).

In terms of what can be done in order to reduce disaster risks that households are facing 13% (9) residents indicated that the government must assist residents to acquire legal documents so that these people are able to get proper jobs and alleviate household poverty by moving to

better places or building stronger and better shacks using durable materials. About 42% (30) of the residents suggested that the municipality must build RDP houses for them because other people benefited from the government social housing scheme and have since moved to stay in Homu 14C. About 8% (6) of the residents preferred upgrading of the informal settlement through municipal driven projects because they did not want to be moved to elsewhere but rather stay in their current location. On the other hand, 38% (27) indicated that they wanted the municipality to do other things such as providing water, electricity, plan the area properly, and let them fall within some sort of group. Refer to Figure 7.1. These findings clearly demonstrate the variability of community expectations form the local municipality.

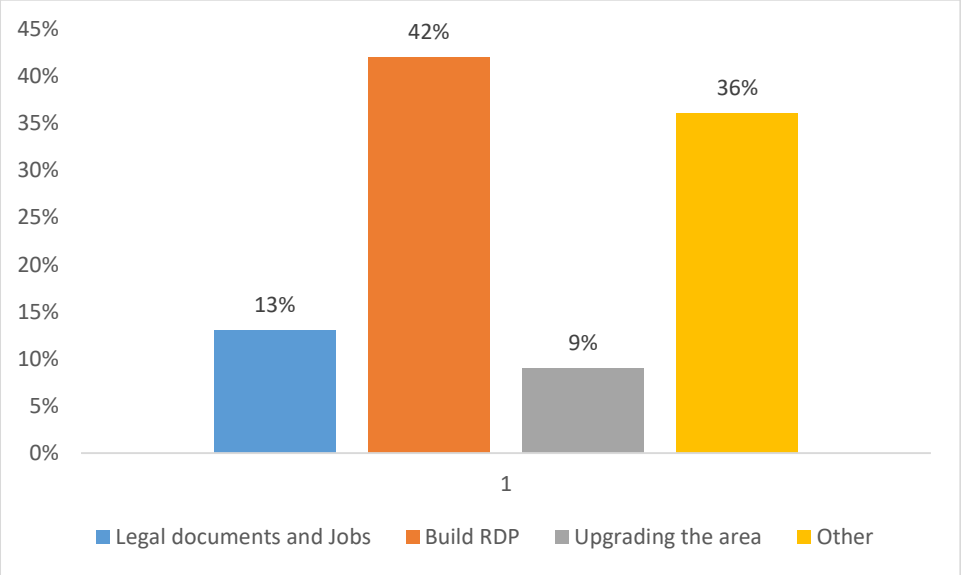

Figure 7.1. Prevention measures for disaster risks
Source: Fieldwork, 2019.

In terms of what government should do 65% (47) of the residents indicated that they wanted to be assisted with better dwelling structures, 28% (20) stated that people should be relocated because they deemed the area too exposed to disaster risks. Whereas the rest proposed re-channelling of water paths away from the settlement, install of stormwater drainage infrastructure and implementation of proper land use planning tool. Refer to Figure 7.2.

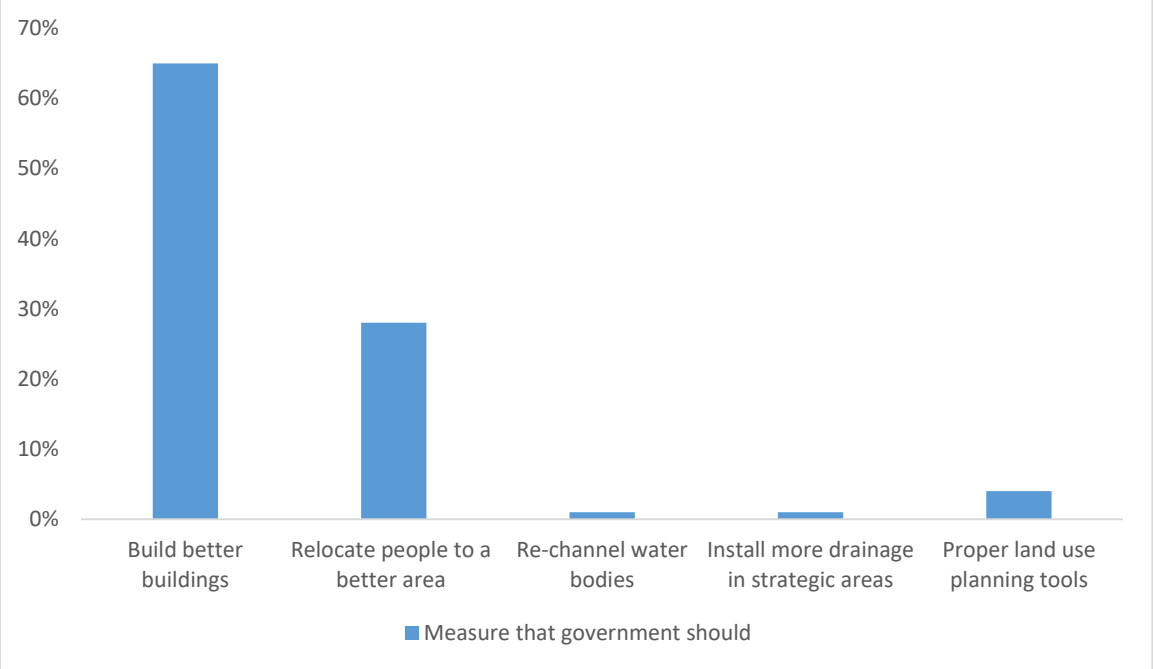

Figure 7.2. Measures that government need to take in order to reduce vulnerability
Source: Fieldwork, (2019).

The above measures are based on community-based disaster risk reduction which aim at reducing vulnerabilities and strengthening people's capacity to cope with hazards. In essence, these DRR strategies aim to increase resilience and strengthening the state mechanism for disaster preparedness. The community-based Disaster Crunch Model also emphasises the importance of community involvement in disaster risk reduction.

7.3. The proposed disaster risk reduction strategies: the town planners and Ward Councillor's perspectives

The municipal officials from the town planning department indicated that in order for the local municipality to develop human settlements that are sustained, they constantly revise the Spatial Development Framework to assist with developing and enforcing orderly developments. In addition, the Land Use Scheme based on SPLUMA 16 of 2013 recognises the importance of reflecting on spatial justice and spatial inclusion. Through seminars and joint planning meetings with traditional authorities, it is expected that development of human settlements on environmentally sensitive areas be avoided.

The Ward Councillor also indicated that as part of disaster risk reduction he agreed with the residents to observe simple behavioural traits that help reduce disaster risks in the settlement such as desisting from clearing trees and bushes, putting off fires after cooking. The Ward Councillor as a representative of the municipality also indicated that he ensures that the

residents work hand in hand with municipal officials when it comes to reducing exposure to disaster risks, advises residents to avoid health hazards and ensure children play in cleared areas.

7.4. Proposed DRR strategy for Hlophekane Informal Settlement

The disaster risk reduction strategy for Hlophekane Informal Settlement is informed by the views of the stakeholders in section 6.2 and 6.3 of this chapter. According to UNISDR in 2009, DRR is considered to be a conceptual framework of components that aim to minimize vulnerabilities and disaster risks throughout a community in order to avoid, to limit the hostile impacts of hazards. The proposed DRR strategies are informed by what community residents and other stakeholders viewed as important in reducing incidents of disasters in the informal settlement.

7.4.1. Strategy 1: Settlement upgrading

As part of this strategy, there is need to have a supportive social task team from the community that can assist in implementing settlement upgrading while the households continue to stay in the informal settlement. The strategy needs to be implemented in a way that the society is resilient to hazards while ensuring that development efforts do not increase vulnerability of these hazards. This is encouraged by the principle of spatial resilience, which promotes developments that can avoid disaster (Carpenter, 2013; Soja, 2010).

The strategy is also guided by SPLUMA 16 of 2013 principle of spatial justice that advocates for formal upgrading of the informal settlement. This ensures security of tenure for the residents. This approach is linked to the multi-disciplinary approach to development projects as both residents and other stakeholders identified a number of projects that are closely linked to insitu upgrading the area as opposed to roll over upgrading and relocation of people to other areas.

7.4.2. Strategy 2: The eco-system resilient approach

The environment has an important role to play in reducing the risk of disasters and reducing the impact of disasters once they occur. Well-managed ecosystems can reduce risk of hazards, such as, flooding and storm surges (Department of the Environment and Energy, 2016). This strategy aims to incorporate the environment into reducing the scale and frequency of hazards (Department of Regional Development and Environment Executive Secretariat for Economic and Social Affairs Organization, 1991). It looks at mainly natural disasters such as floods, damaging winds and landslides caused by floods. The eco-system resilient should be

implemented in a way that is based mainly on the use of available natural resources, activities like digging a furrow, building stone water ways, designing landscapes in an environmentally friendly (DRR by natural design). Opportunities are identified within the natural environment to reduce hazards scale and frequency, and these measures are usually environmentally friendly. Protecting and restoring ecosystems is a project activity that DRR managers and the community can use alongside of other DRR techniques such as the construction of drainage infrastructure (United Nations Environment Programme, ND).

Healthy ecosystems do not only reduce vulnerability or hazards but also act as a physical barrier that reduces impacts of hazard events. This strategy needs to be flexible in order to accommodate different disasters. Disasters have the ability to change seasonally hence this approach requires readily available resources. Within Hlophekane Informal Settlement residents have tried to implement this strategy by digging furrows to re-channel water bodies and some a tried to plant trees in order to break the wind.

7.4.3: Strategy 3: Re-blocking

Re-blocking is a new concept in the upgrading of informal settlements. Re-blocking involves rearrangement of the spatial and structural configuration of an informal (Worcester Polytechnic Institute, 2012). Unlike conventional social housing programs, re-blocking takes place on site and does not move families to locations without economic incentives (Worcester Polytechnic Institute, 2012; Mistro and Hensher, 2009). By keeping the community together, residents are empowered to look for their own solutions to challenges (United Nations High Commissioner for Refugees, 2008).

The economic capabilities of the community, however, makes this process one where many other stakeholder must be involved (Gregory et al, 2020). Because of this, new communication lines have to be created between communities, government agencies and NGO's. Re-blocking therefore leads to in situ upgrade (Worcester Polytechnic Institute, 2012; Mistro and Hensher, 2009).

7.4.4: Strategy 4: Relocation

Relocation is a process whereby the existing informal settlement is demolished and the inhabitants relocated to suitable greenfields elsewhere (Siqhwala, 2002). In the context of informal settlements, efforts should be made to accommodate the residents on the land where they currently reside before considering relocation to alternative land (Siqhwala, 2002). Roll over which meant that families will not be relocated but moved to the boundary of the site,

whilst infrastructure will be installed (Brown-Luthango *et al.*, 2016). All the above have their advantages and disadvantages. See table 7.1 below.

Approaches	Advantages	Disadvantages
The eco-system resilient approach	• It uses the environment to heal itself. • Low budget cost and can be implemented by the community.	• Some land cannot be rehabilitated, therefore it will not be of use. • Unsustainable if not properly done and requires continuous maintenance.
Insitu upgrade	• They are close to livelihoods opportunities. • They used to the environment. • Less budget constraints. • Community participation project. • Gives residents a sense of ownership. • It's a sustainable project as it uses the same land, without sprawling to other areas.	• If the land is extremely exposed to disaster, therefor disasters will continue happening. • Service provisions on shack shifting is not as simple as on a new development. • As a community based project some residents might not be keen to participate.
Rollover upgrading	• They are close to livelihoods opportunities. • Durable building material. • Land can be rehabilitated easily administered	• Budget constraints, as government needs to build temporary homes for residents and still build them shelter on the old settlements. • It might take a long time for the whole project to finish since they have to move out, settle in a different location and move back.
Relocate	• Properly planned township, • Durable and sustainable building material	• Some residents may not be willing to relocate as it disrupts their "fragile community networks" that they are used to and "livelihood opportunities, which employment is probably closer to where they are currently staying • Can be expensive to start a new township • Corruption on beneficiary lists

Table 7.1. Advantages and Disadvantages of strategy 1 identified projects.
Source: Author, 2020.

7.4.5. A SWOT analysis.

This section is informed by the DRR strategies proposed for Hlophekane Informal Settlement. In order to operationalize the suggested risk reduction strategies, a SWOT analysis was done to provide an overview of the strengths, weaknesses, opportunities and threats that characterise Hlophekane Informal Settlement as shown in the table below (See table 7.2.)

Strengths	Weaknesses
• Willingness of all stakeholders to collaborate on DRR strategies • Peaceful co-existence of community residents	• Upgrading or relocation of residents requires a high budget • This strategy may require continuous maintenance if not implemented well.
Opportunities	**Threats**
• Hlophekane is already earmarked for residential purposes according to Land Use Management Scheme.	• Recurring disasters. • Requires on-going maintenance, since disasters always change

Table 7.2. SWOT analysis for the proposed DRR strategies
Source: Author, 2020

The proposed strategies demonstrate strengths, weaknesses, opportunities and threats. However, the best strategy that is sustainable for this study area is strategy that is informed by community interests, and also incorporates the community, planners, politicians, municipal officials and private investors. The strategy must encourage transparency as all decisions should be taken by the stakeholders. Since the area is already earmarked for residential development, adopted strategies may not conflict with the current Spatial Development Framework. The strategies are also informed by SPLUMA 16 of 2013 that advocates for informal upgrading and inclusivity as a vehicle for development.

From the strategies proposed, an implementation plan has to be drafted bringing together all stakeholders in identification and evaluation of the project, incorporating risk reduction criteria in land-use and urban planning, training and capacity building, applying for funding and requesting for donations, recognising legal and institutional arrangements, and formalizing the development of the informal settlement into a residential township The projects to be done under the DRR strategies require careful reflection on the time horizons in planning, and well thought-out budget.

7.5. Strategy implementation plan

This section outlines the activities that can enhance the implementation of the proposed DRR strategy for Hlophekane Informal Settlement. This section presents an implementation plan which seeks to support the strategic plan on strengthening coping capacity by using multi-disciplinary approach and demonstrates how the strategic plan can be operationalized by breaking it into steps whereby each step is assigned to a team member and is composed of item,

item description and action plan. All this leads to achieving one goal which is to strengthen the DRR initiatives through an inclusive multi-sectorial and multi-disciplinary approach.

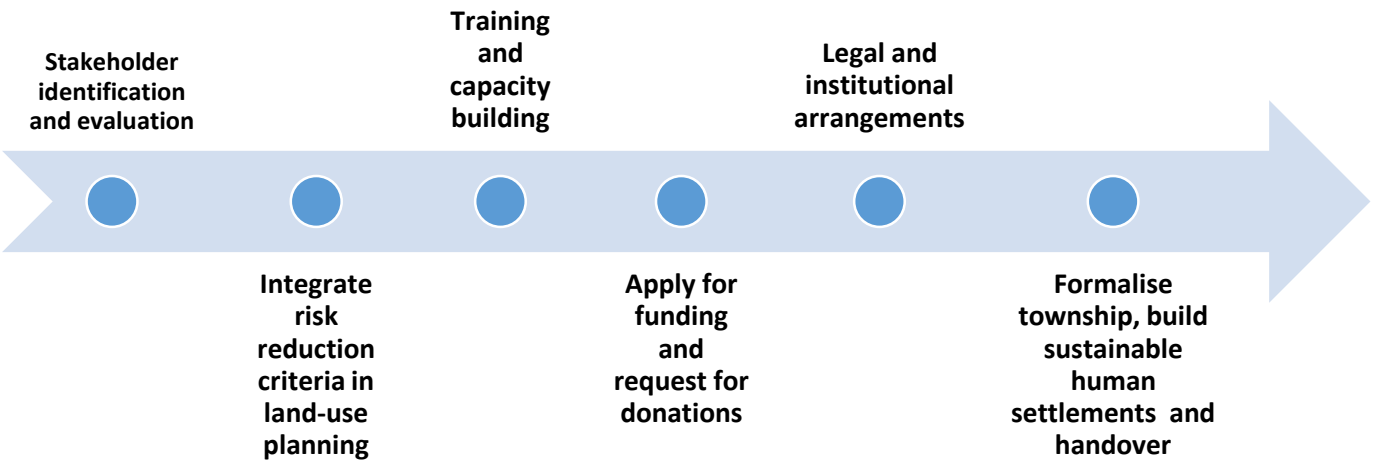

Diagram 7.1. Strategy 1 implementation plan
Source: Author, 2020

ITEM	DESCRIPTION	ACTION PLAN/ OUTPUTS	RESPONSIBILITY
1. **Stakeholder identification and evaluation**	Identify stakeholders that have interest and that are willing to be involved and commit both the community and institutions to this goal of change, get political support and set up a steering and joint committee.	Stakeholder list and commitment from all the relevant municipal departments.	Project manager
2. **Incorporate risk reduction criteria in land-use and urban planning**	Change practices with a focus on land-use planning And policy, building code implementation, and capacity Development to sustain these positive changes	Development of land use scheme and spatial development frameworks Disaster risk management master plan	Integrate departments with town planners as custodians and community participation
3. **Training and capacity building**	Conduct training needs assessment and capacity building for disaster risk management to all stakeholders and the community	Trainings	All stakeholders
4. **Apply for funding and request for donations**	Mobilize resources among NGOS, professional Organizations, government grants and private Sector in the disaster Management centre	Apply for upgrading informal settlement grant and emergency housing grant. Housing grants Donations from partners Fund raising	Finance officers
5. **Legal and institutional arrangements**	Improve legal and institutional Arrangements for disaster risk Management delivery by improving communication channels and implementing no corruption strategies and encouraging transparency	Create housing beneficiary list. First priority has to be given to women, orphans and elderly people	All stakeholders
6. **Formalise township, build sustainable human settlements and handover**	Initiate planning processes such as Town planning and surveying of sites; Resolve land occupational disputes; Rehabilitate the land if required; Installation of permanent engineering Infrastructure, social amenities, economic and social facilities	Township establishment application, with EIA report, Geotech, reports, Flood line report etc, Services that needs to be installed are water pipes, electricity and toilets etc. Occupancy certificate needs to be handed to the owners once, RDP's have been completed.	Town planners, engineers, technical and housing departments and beneficiary etc

Table 7.3. Strategy implementation plan in detail
Source, Fieldwork, (2019).

7.6. Time Horizon in planning

This section aims to show how long certain projects can take to execute. The time horizons have been divided in three terms including short term which takes about (0-3 years); medium term which takes 3-10 years; and long term which takes more than 10 years.

Table 7.4. Time horizon for the selected strategy projects

Projects	Short term 0-3 years	Medium 3-10 years	Long term 10 years and more
Insitu upgrading	• Requesting for project funds	• Drafting of shifting plan with the community, tart shack shifting and rolling over and provide communal services	
Relocating	• Beneficiary list and identifying of land	• Purchasing or negotiating for land	• Township establishment
Provision of services	• Engagements with relevant custodians of different services	• Device a demarcation plan and communal services	
Roll over upgrading	• Creating a beneficiary list	• Township establishment approvals, and Build RDP and hand them over	

Source: Fieldwork, (2019).

7.8. Chapter summary

This chapter proposed DRR strategies for Hlophekane Informal Settlement and set an example of how the strategy can be implemented. Considerations of interests of stakeholders is key in coming up with successful DRR strategies for informal settlements. Strengthening the coping capacity of residents requires a multi-disciplinary approach based on residents' choices. The next chapter concludes the research.

CHAPTER 8: SUMMARY, RECOMMENDATIONS AND CONCLUSION

8.1. Introduction

This chapter summarizes and concludes the research on Disaster Risk reduction strategies for informal settlements for Hlophekane in Giyani, Limpopo Province, South Africa. Hlophekane Informal Settlement is a disaster-prone neighbourhood because it lies on a flood line of a nearby river called Klein Letaba. This situation exposes residents of this informal settlement to vulnerability and risks of flooding and other allied disasters. Developing DRR strategies from an urban and regional planning perspective was an important exercise in order to improve the living conditions of people, as well as making the space more habitable. The chapter captures what it intended to achieve and summarizes these elements with the aim of identifying future areas of research.

8.2. Revisiting of the study area

This research has followed an explorative case study research design, while adopting a mixed methods approach which focuses on both qualitative and quantitative research approaches. The study population was inclusive of all the households that reside in Hlophekane Informal Settlement, a planning officer, a Ward Councillor and a Disaster Management Officer from Greater Giyani Local Municipality. The study sample was constitutive of 72 household heads, a Ward Councillor, and a town planner from Giyani Local Municipality. These elements from the study population were selected using purposive sampling technique.

Data was collected from both primary and secondary sources. Secondary data was obtained from library books, journals, articles, newspaper, magazines, published government policies on disaster, disaster risk reduction and informal settlements and internet websites thereof. Primary data was obtained from surveys, questionnaires, interviews, mapping and observations.

7.7. A proposed budget for strengthening coping capacity by using multi-disciplinary approach

This section breaks down the budget for the identified and selected project. For example, reblocking insitu upgrading that requires a low budget, and encourages capacity building by involving residents. Compared to other upgrading approaches, reblocking insitu upgrading can be carried out in short space of time as illustrated below.

PROPOSAL	ESTIMATED COST	RESPONSIBLE DEPARTMENT WITHIN GIYANI LOCAL MUNICIPALITY
1. Surveying of households and town planning processes	R50 000	Housing department
2. Acquire land	R500 000	Housing department
3. Rehabilitate land if required (eco-system resilient approach)	R100 000	Environmental department
4. Planning, installing engineering services, and social amenities if required	R 1 500 000	Planning, municipal engineering services and municipal consultants
5. Relocking and upgrading	R 1000 000	Community, municipal engineering services and consultants
TOTAL BUDGET	**R3 150 000**	

Table 8.1. Budget for in situ upgrading

Source: Fieldwork, (2019).

8.3. How each research objective was addressed:

The aim of this study was to develop a disaster risk reduction strategy for Hlophekane Informal Settlement from an urban and regional planning perspective. This aim was guided by the following research objectives: (1) to characterize the nature of disasters in Hlophekane Informal Settlement; (2) to map disaster risk zones in Hlophekane Informal Settlement using GIS; and (3) to develop disaster risk reduction strategy for informal settlements in rural towns of South Africa such as Giyani – for recommendation to the local municipality. The next subsections describe how each of the three research objectives were addressed as follows:

8.3.1 Characterizing Hlophekane Informal Settlement and disaster risks.

The research was able to characterize the nature of Hlophekane Informal Settlement and has identified that this is an informal settlement which is ungoverned, and the shacks are built using flammable, non-durable building materials which are structurally distorted and no proper basic services are provided.

The majority of the residents do not have proper identity documents, hence they do not qualify for RDP houses from the state although they have been staying in the informal settlement, there for more than 20 years. Yet, Lefebvre's Right to the City concept states that people should not

be excluded from accessing qualities and benefits of urban life. In this case, social segregation plays a visible role in exposing people to disaster risks associated with staying in informal settlements. There no direct channels to report a disaster (root cause), nor is there a leader within the informal settlement meaning that these people do not even take part in municipal public participation forums such as the Integrated Development Programmes (IDP) process or mass meetings that discuss community development.

In terms of characterizing disaster risks within Hlophekane, the settlement is exposed to a number of disasters such as floods, damaging winds, diseases, fire and drought. The location and building materials of the shacks are the major drivers of disaster risks in Hlophekane Informal Settlement. These make people vulnerable to disasters. According to the Disaster Crunch Model poverty, lack of education or training and unsafe conditions are the drivers of the progression of vulnerability and these are indeed the conditions which make Hlophekane Informal Settlement vulnerable to different disaster risks.

8.3.2 Mapping disaster risk zones in Hlophekane Informal Settlement

The second objective focused on mapping disaster hotspots in Hlophekane Informal Settlement. The disaster risk zones identified indicate that disasters occur throughout the settlement. Floods were identified as the most dominant disaster risk mostly on the southern side of the informal settlement located closer to the river. One way or another, all residents have experienced disasters while staying in Hlophekane Informal Settlement.

According to the Disaster Crunch Model the level of disaster risk depends on the magnitude of the hazard and the degree of vulnerability of the people. This means that a disaster will not happen if there is only a hazard without a vulnerable community and vice versa. If there is no vulnerability and therefore no disaster risks are experienced, and there could be no damage or loss to human lives and property. Hlophekane however is a vulnerable informal settlement.

The impacts of this disaster risk in Hlophekane Informal Settlement vary from relocation (shifting from one space to another), diseases, erosion and losing valuable documents such as identity documents, shelter, livestock, household property, clothes and family members.

8.3.3 Proposed disaster risk reduction strategy for informal settlements in rural towns of South Africa

The proposed DRR strategy was meant for informal settlements in small rural towns such as Giyani. The strategy is recommended to the local municipality for consideration. There are two

strategies that were identified where strengthening capacity for disaster risks reduction using multi-disciplinary approach and DRR through ecosystem approach. From the two strategies, the first strategy was adopted, with parts of the second approach after a SWOT analysis. And from that strategy, several projects that can be implemented were identified and such projects include re-blocking and in situ informal upgrades, relocation and roll over upgrades. In situ upgrading for Hlophekane informal is deemed a suitable project as its low on cost. Part of the project rehabilitation of the land including trees so that they can act as wind breakers. This is a suitable strategy because municipalities always struggle with securing budgets for informal "illegal" settlers. The strategy therefore encourages community participation and sustainable development as people will not be relocated to another area which might be inconvenient to their livelihood. Successful DRR strategies requires constant maintenance such as electricity and water bills of which Hlophekane Informal Settlements dwellers might not be able to afford since majority of them are unemployed.

8.4 Recommendations

The following recommendations should be considered by Giyani Local Municipality to minimise disaster risks in informal settlements.

- Strengthening coping capacity by using a multi-disciplinary approach, which proposes developing programmes which are be based on a bottom up approach.
- As part of the strategy residents need to be trained and capacitated on DRR plans, IDP and SDF.
- From a professional perspective, environmental and geological studies should be done on all environmental sensitive areas to protect both the environment and people from impacts of disaster risks.

8.5. Areas for future research

This research focused mainly on DRR strategies for informal settlements reflecting on a case study of Hlophekane in Giyani. Therefore, other similar research in future may focus on:

- Institutional arrangements and structural constraints of informal upgrades in rural municipalities.
- Effectiveness of SPLUMA 16 of 2013 principles on achieving spatial equalities in rural informal settlements.

- Strategies on improving and strengthening reporting structures in informal settlements.

8.6 Conclusion

With the increasing level of disaster risks and a growing percentage of residents that occupy hazardous areas in South Africa, the government should reduce the vulnerability of communities to disasters; utilise approaches to integrated development planning, spatial planning and community involvement in risk reduction efforts. These activities should not only be induced by good governance and partnerships with multi-actor cooperation, but should be integrated with poverty reduction, development policies, decision making. Disaster risk reduction involves understanding and addressing the risks and vulnerabilities that people face and the preparedness of the community to disasters.

Reducing vulnerability and building a strong coping capacity is a process that requires an integrated approach. The research has revealed that although certain measures on disaster risk reduction must become an important part of development programmes and plans are in place, disasters continue to occur in informal settlements where coping capacity is still low. The research therefore revealed that DRR strategies are key to building resilient communities through collaboration with the affected communities. Community participation must be mainstreamed in DRR strategies in order to make these human settlements habitable. The proposed DRR strategies are flexible and can be used by other local municipalities of rural towns experiencing disaster risks in informal settlements.

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APPENDIX 1: TURNITIN REPORT

Disaster risk reduction strategies for informal settlements: A case of Hlophekane in Giyani, Limpopo Province, South Africa

ORIGINALITY REPORT

22%	19%	10%	20%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to University of Venda Student Paper	2%
2	Submitted to University of the Free State Student Paper	1%
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4	www.preventionweb.net Internet Source	1%
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6	natagri.ufs.ac.za Internet Source	<1%
7	polen.itu.edu.tr Internet Source	<1%
8	dspace.nwu.ac.za Internet Source	<1%

APPENDIX 2: EDITING CERTIFICATE

mawokomayi@gmail.com

Date: 26/06/2020

RE: TO WHOM IT MAY CONCERN

This letter serves to confirm that I have edited the dissertation entitled:

Disaster risk reduction strategies for informal settlements: A case of Hlophekane in Giyani, Limpopo Province, South Africa.

By

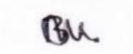
Vhahangwele Charlene Ramunenyiwa

Student No: 11616950

I carefully read through the dissertation, focusing on grammatical errors and spelling mistakes.

Please do not hesitate to contact me for any queries.

Yours Sincerely,



Miss Mawokomayi
E-mail: mawokomayi@gmail.com

Miss Mawokomayi. M.Sc, Communication, (University of Fort Hare) B.A. Hons, Lit. & Media Studies (University of Venda), B.A. Media Studies (University of Venda). Language and Writing Consultant (LWC) (University of Fort Hare).

APPENDIX 3: HOUSEHOLD QUESTIONNAIRE

University of Venda

Appendix 1: HOUSEHOLD QUESTIONNAIRE

TOPIC: Disaster risk reduction strategies for informal settlements: A case of Hlophekane in Giyani, Limpopo Province, South Africa

Questionnaire no: …….. Of 199 **Date of interview: ...…/……/2019**

Section:…….

Private and Confidentiality

This questionnaire is designed only for academic purposes.

No person is compelled to participate in the survey if they do not wish to.

The interviewee has a right to stop the interview while in progress.

Answers that will provide will not affect the respondent in any way and there is no reward for participating in the survey.

Data collected will be treated with full confidentiality and privacy.

However you are kindly requested to complete the questionnaire.

INSTRUCTIONS: Please tick or indicate with a cross your response.

SECTION A: PERSONAL INFORMATION

1. Are you the Household head?

Yes	No

1	2

2. In which age group do you belong to?

10-20 years	21-30 years	31-40 years	41-50years	51 years and above
1	2	3	4	5

3. Gender of the Household head?

Male	Female
1	2

4. Please indicate how long you have been staying in Hlophekane Informal Settlement?

0-12 months	1 -3 years	3-5years	5-7 years	8+ years
1	2	3	4	5

5. What is your birth country nationality?

South Africa	Mozambique	Zimbabwe	Lesotho	Botswana	Malawi	Somalia	other
1	2	3	4	5	6	7	8

6. What is the Educational Background of household head?

No formal education	Primary education	Secondary education	Matric	Diploma/Degree

7. Please indicate the employment category which you belong to?

Employed	Unemployed	Self –employed	Other (specify)
1	2	3	4

8. Please indicate the total monthly income in the household?

0-R500	R500-R1000	R1000-R1500	R1500-R3000	R3000-R6000	R6000-R9000	R9000-R12000	R12000+
1	2	3	4	5	6	7	8

SECTION B: TO CHARACTERIZE THE NATURE OF DISASTERS IN HLOPHEKANE INFORMAL SETTLEMENT.

9. Why did you move to Hlophekane Informal Settlement?

Following a family member	Seeking for a job	Was the only affordable place	Other (Specify)
1	2	3	4

10. How many other people do you live with?

1-3 members	4-6 members	7-9 members	10 members plus
1	2	3	4

11. Are you renting the property that you stay in?

Yes	No	Other (Specify)
1	2	3

12. If you are renting, how much do you pay?

R100-R300 pm	R301-R500 pm	R501-R700	R701 and more
1	2	3	4

13. Are they people renting from you?

Yes	No
1	2

14. If so how much do they pay per month?

R100-R300 pm	R301-R500 pm	R501-R700	R701 and more
1	2	3	4

15. What is your dwelling structure made from?

Bricks	Corrugated iron	Asbestos boards	Mud and clay	Other
1	2	3	4	5

16. How big is your structure in square meters?

Less than 5 sqm	6-10sqm	11-15sqm	16- 20sqm

17. Who controls the activities that happen within Hlophekane Informal Settlement?

Chief	Community leader	Ward Councillor	The municipality	Other (Specify)
1	2	3	4	5

18. Please tick the services and infrastructure that you have within the settlement.

Shops/ spaza	school	Clinic/ traditional doctor	Electricity	Water	sewage	Other (Specify)

19. What is the type of toilet that you are using?

Pit latrine	Toilet with flash	Bush	Chemical toilets	Off-site sanitation	Other (Specify)
1	2	3	4	5	6

20. What source of water does the household use?

Household standpipe	Street pipe	River	Rainwater	borehole	Other
1	**2**	**3**	**4**	**5**	**6**

21. What sources of energy does the household use? (mark with an X)

	cooking	Lighting	Heating
Wood	1	2	3
Paraffin	1	2	3
Cow dung	1	2	3
Coal	1	2	3

Electricity	1	2	3
Solar	1	2	3
Candles	1	2	3
Other (Specify)	1	2	3

22. How much do you pay per month?

	Less than R100	R101-R250	R251-500	R500 and more
Water	1	2	3	4
Electricity	1	2	3	4

23. Whom do you pay?

	municipality	Eskom	someone	The owner	Other Specify)
Water	1	2	3	4	5
Electricity	1	2	3	4	5

24. How do you navigate through the informal settlement?

walk	Taxi	Bus	Other (Specify)
1	2	3	4

25. What are the kinds of disasters that are experienced in Hlophekane Informal Settlement? (Tick relevant)

Flooding	Drought	Fires	Damaging winds	Diseases	Other
1	2	3	4	5	6

26. What disaster risk have you been exposed to as a household? (Tick one)

Flooding	Drought	Fires	Damaging winds	Disease outbreak	None	Other
1	2	3	4	5	6	7

27. What do you think makes you vulnerable to disaster risks?

We closer to a flood line	The type of material used for the building	Location is inconvenient	Other (specify)
1	2	3	4

28. How often does that disaster risk occur?

Everyday	Once a week	Once a month	Never
1	2	3	4

29. If a disaster occur who do you report to?

Ward Councillor	Police	Community leader	Other (Specify)
1	2	3	4

30. When it occurs how does it make you feel?

Angry	Stranded	Sad	Not sure
1	2	3	4

31. What have you lost due to disaster risks in Hlophekane Informal Settlement?

Family member	Shelter	Live stock	Crops	Other (Specify)
1	2	3	4	5

32. From the above, how many have you lost?

Family member	Shelter	Live stock	Crops	Other (Specify)

33. What are the general impacts of disasters risk on the households?

Relocation	Diseases	Erosion	Other (Specify)
1	2	3	4

SECTION C: TO MAP DISASTER RISK ZONES IN HLOPHEKANE INFORMAL SETTLEMENT USING GIS AND AUTOCAD

34. Who are the most affected by those disasters and why? (Refer to map 1)

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35. How far is the flood line from this house?

……

……

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……

36. Where do disasters occur more often? (Disaster hotspots)? (Refer to attached map Part 1,2, and 3)
37. Please indicate where other land use occur on the map e.g. shop, spaza or tavern
38. GPS Coordinate: ……..

SECTION D: TO DEVELOP DISASTER RISK REDUCTION STRATEGIES FOR INFORMAL SETTLEMENTS

39. What prevention measures have you taken/ the municipality taken in order to reduce disaster?

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40. What prevention measures have the municipality taken in order to reduce disaster?.....

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41. What should be done in order to address disasters that you are facing?……

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…….

42. If government was to intervene what would you want government to do?

In situ upgrade	Relocate- upgrade-return	Completely relocate	Other (Specify)

43. What measures do you think could be used to reduce vulnerability (Tick one)

Build better buildings	Relocate to better area	Re-channel water bodies	Install more drainage in strategic areas	Proper land use planning tools
1	2	3	4	5

44. Are there any other comments or insights that you would like bring to the attention of the researcher? If yes specify

……

……

……

Thank you

.

APPENDIX 4: INTERVIEW GUIDE FOR THE WARD COUNCILLOR AND THE WARD COUNCILLORS OR COMMUNITY LEADER

University of Venda

TOPIC: Disaster risk reduction strategies for informal settlements: A case of Hlophekane in Giyani, Limpopo Province, South Africa

Questionnaire no: …….. Of 2 **Date of interview: …..…/……/2019**

Private and Confidentiality

This questionnaire is designed only for academic purposes.

No person is compelled to participate in the survey if they do not wish to.

The interviewee has a right to stop the interview while in progress.

Answers that will provide will not affect the respondent in any way and there is no reward for participating in the survey.

Data collected will be treated with full confidentiality and privacy.

However you are kindly requested to complete the questionnaire.

SECTION A: PERSONAL INFORMATION

INSTRUCTIONS: Please tick or indicate with a cross your response.

1. In which age group do you belong?

18-20 years	21-30 years	31-40 years	41-50years	51 -60	61 and above
1	2	3	4	5	

2. Gender?

Male	Female
1	2

3. Please indicate your ward no?

……

……..

4. How long have you been the Ward Councillor in that ward?

……

……

5. Are you aware of Hlophekane Informal Settlement?

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6. Do you stay there?

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7. Do the people who stay there?

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8. Do they vote?

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……

9. How often do you visit them?

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10. And when having meetings do people from Hlophekane Informal Settlement and Hlophekane mix?

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11. Are there any communication channels that residents use to communicate with the municipality?

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12. What are the types and conditions of dwellings units in the informal settlement?

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13. How can you describe the character of the settlement, in terms of set up?

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14. In general, what are the living conditions and challenges that households face in this settlement?

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15. Are you aware of any hazards or disaster risk that have occurred within Hlophekane Informal Settlement?

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16. If so, how did you deal with those hazards?

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17. What are disaster risk that are commonly faced by the settlement residents?

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18. What is the major cause of this disaster risks within the informal settlement?

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19. And how often do this disaster risk occur?

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20. Which disaster risk is prevalent within the settlement?

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21. How vulnerable are the households to the variety of disaster risks.

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22. What type of health or social concerns can you link the various disaster risks?

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23. Have they ever been fatalities as a result to disaster risk?

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24. What measures do you take/ the municipality take when the disasters occur?

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25. What measures could be taken to reduce the exposure within the informal settlements?

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26. Have you ever had any engagement with the people of Hlophekane Informal Settlements? If so, can you highlight some of the outcomes of those engagement?

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27. Since the meeting/ engagements were there any follow ups?

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28. How can you bridge the gap between the formal and informal settlements?

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29. Are there any other comments or insights that you would like bring to the attention of the researcher? If yes specify?

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THANK YOU

APPENDIX 5: TOWN PLANNING OFFICIALS

TOPIC: Disaster risk reduction strategies for informal settlements: A case of Hlophekane in Giyani, Limpopo Province, South Africa

Questionnaire no: …….. Of 2 **Date of interview: …..…/……/2019**

Private and Confidentiality

This questionnaire is designed only for academic purposes.

No person is compelled to participate in the survey if they do not wish to.

The interviewee has a right to stop the interview while in progress.

Answers that will provide will not affect the respondent in any way and there is no reward for participating in the survey.

Data collected will be treated with full confidentiality and privacy.

However you are kindly requested to complete the questionnaire.

SECTION A: PERSONAL INFORMATION

INSTRUCTIONS: Please tick or indicate with a cross your response

SECTION C: TOWN PLANNING OFFICIALS

1. Indicate your position in this department?

Director	Assistant director	Manager	Senior Officer	Junior Officer	Intern
1	2	3	4	5	6

2. What is your field of qualification?

Engineering	Disaster Management	Town and Regional Planning	Development Planning /Studies	Environmental Sciences/ health/ Planning	Politics and Administration	other
1	2	3	4	5	6	7

3. Do you know of an informal settlement called Hlophekane?

   ……

   ……

4. How long has that settlement been there?

   ……

5. Who owns the land there?

   ……

   ……

6. Do you provide any services there?

   ……

   ……

   ……

   ……

7. Or are they any plans for that settlement?

   ……

   ……

   ……

8. What does the SDF or Land use scheme say about informal settlements?

……

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9. What are the disaster risks that occur in Hlophekane Informal Settlements that you are aware of?

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10. What might be the cause of this disaster risks?

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11. Do you think their socio-economic status influence vulnerability?

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12. Chapter 8 of the NDP talks about transforming human settlements, what policies, strategies are put in place in order to be develop human settlements that allow for a more sensitive and differentiated interventions responsive to social, economic and demographic conditions and anticipated population shifts?

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……

13. Spluma also talks about spatial justice so how have you in cooperate this into reviving rural settlements or informal settlements?

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14. From a land use or Spatial planning perspective what are does the land use scheme or spatial development framework say about informal settlements? (Based on Spluma principles)

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15. Which planning tools have been implemented within Hlophekane Informal Settlement to reduce disaster risks?

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16. Are there any measures that are put in place from the town planning section that aims to reduce disasters in informal settlements??

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17. Are there any other comments or insights that you would like bring to the attention of the researcher? If yes specify?

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THANK YOU

APPENDIX 6: DISASTER MANAGEMENT OFFICIALS

University of Venda

TOPIC: Disaster risk reduction strategies for informal settlements: A case of Hlophekane in Giyani, Limpopo Province, South Africa

Questionnaire no: …….. Of 1 **Date of interview: …..…/……/2019**

Private and Confidentiality

This questionnaire is designed only for academic purposes.

No person is compelled to participate in the survey if they do not wish to.

The interviewee has a right to stop the interview while in progress.

Answers that will provide will not affect the respondent in any way and there is no reward for participating in the survey.

Data collected will be treated with full confidentiality and privacy.

However you are kindly requested to complete the questionnaire.

SECTION A: PERSONAL INFORMATION

INSTRUCTIONS: Please tick or indicate with a cross your response. Indicate

1. Indicate your position in this department?

Director	Assistant director	Manager	Senior Officer	Junior Officer	Intern
1	2	3	4	5	6

2. What is your field of qualification?

Engineering	Disaster Management	Town and Regional Planning	Development Planning /Studies	Environmental Sciences/ health/ Planning	Politics and Administration	other
1	2	3	4	5	6	7

3. Are you aware of a place called Hlophekane?

……

……

……

4. Has there ever been a disaster risk incident reported in Hlophekane Informal Settlement on your portfolio

……

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……

5. As a specialised unit, how can you describe the Disaster risks faced by the community?

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6. What are the common types and the origins of the disaster risks?

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7. Do you see a disaster trend occurring within Hlophekane Informal Settlement?

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8. Which sections of the settlement is most likely to be affected by disaster risks (Refer to map 1)?

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9. What are the levels of vulnerability to the Disaster risks within the community?

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10. How would you rate the coping capacity of the informal settlement?

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11. Do you have any emergency measures to deal with the following?

	Yes	No	Comments
Malaria			
Cholera			
Floods			
Fire			
Drought			

12. What other measures has this department put in place in order to reduce disaster risks?

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13. What are the measures that could be implemented to reduce the vulnerability to Disaster risks within the community?

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14. Who do you think should take such action as recommended in your response to question above?

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15. What type of model can you propose to reduce disaster risks?

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16. Are there any other comments or insights that you would like bring to the attention of the researcher? If yes specify?

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THANK YOU