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UNIVERSITY OF THE WITWATERSRAND



Unnatural Disaster: Assessing Social Vulnerability to Hazards, Case Study of Kya Sands Informal Settlement

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Dissertation submitted to the Faculty of Science at the University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the Degree of Master of Science by research only

May 2019

Supervisor: Dr. Alex Wafer

Declaration

I declare that this thesis is my own, unaided work. It is being submitted for the Degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

M.Rangata

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(Signature of candidate)

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I

Abstract

Informal settlements across Johannesburg were home to approximately 220 000 households as at 2012 (Ciurean, *et al*., 2013). Given the fluidity of tenure in informal settlements, this figure has most likely increased to date. Often located on the urban fringe, on land that is low-lying and considered undesirable for dwelling, informal settlements are usually victim to disaster because of harsh weather conditions. Furthermore, the dwellings are constructed using materials that are flammable or easily washed away by water, further heightening vulnerability. The disasters that arise from this are considered artificial or unnatural as they are largely the result of material inequalities which have little to do with the disaster event itself, and are further exacerbated by a lack of social infrastructure to prevent it. Vulnerability, however, cannot be equated to poverty and, while informal settlements are more vulnerable to disaster, this vulnerability is never homogenous within a locale. This study conceives and operationalises vulnerability quite broadly, allowing a wide variety of hazards to be examined. Using Kya Sands Informal Settlement in the north of Johannesburg as the study site, this study qualitatively investigates social vulnerability to disaster in Kya Sands, and how the intersection of various drivers of social vulnerability produces vulnerability. It investigates the risk perceptions of residents and how they mitigate against disaster. This is done through in-depth interviews with residents which were analysed using the grounded theory method. The researcher has also taken "best-practice'' social vulnerability indicators and asked residents how they experience these as affecting their vulnerability. This study brings together three streams of theory: unnatural disaster, social vulnerability, and intersectionality. More specifically, it uses intersectionality as a lens through which vulnerability and disaster can be studied. It argues that the perception of disaster adopted in literature and the perception of disaster adopted by the residents are different; residents do not base their notion of disaster on the magnitude of the disaster event and the losses incurred as is often done in risk studies, but rather on the spatial and temporal proximity of the hazard. Residents feel like they are in a constant state of disaster which ultimately supersedes whatever perception they may have of their exposure to hazard. The perceptions of residents of the drivers of social vulnerability also differ greatly to what is commonly suggested. The sense of precarity and community shared is so strong that cultural and individual indicators are inconsequential to their overall vulnerability. Residents feel that structural and economic indicators render them socially vulnerable. Moreover, the possession of a single characteristic, i.e. being female, is never a determinant of vulnerability; rather it is the exhibition of two or more characteristics that influences vulnerability. Because of this, and the fact that people are unique social entities, vulnerability can never be homogenous. Evidence of varying levels of social vulnerability exist and this is driven by the interaction of the various drivers. Studying vulnerability through

intersectionality has allowed a greater view of vulnerability that extends beyond the physical characteristics of the said environment, to include a view of how it interacts with the individual, cultural, and social characteristics of the study population. This study highlights the importance of factoring in the perceptions of those considered vulnerable in vulnerability studies, whilst also highlighting the need for a way to translate social research into actionable policy initiatives.

Key Words: Unnatural disaster; Social Vulnerability; Intersectionality

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List of Acronyms and Abbreviations

CBD:	Central Business District
HDA:	Housing Development Agency
NRCS:	National Regulator for Compulsory Specifications
NGO:	Non-Governmental Organisation
PAR:	Pressure and Release Model
PCA:	Principle Component Analysis
RDP:	Reconstruction and Development Programme
UN:	United Nations
UNDRR:	The United Nations Office for Disaster Risk Reduction

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1. Introduction

1.1 Background of the Study

Informal settlements are regarded by the Housing Development Agency (HDA) as houses that exist in urban or peri-urban areas without official approval. These "may contain a few dwellings or thousands of them, and are generally characterised by inadequate infrastructure, poor access to basic services, unsuitable environments, uncontrolled and unhealthy population densities, inadequate dwellings, poor access to health and education facilities and a lack of effective administration by the municipality" (The National Upgrading Support Programme, 2015). They often form on the margins of cities (Dovey, 2015) in what is termed the "urban estuary" wherein people and bodies come together as transient communities in a fluid process to try and access the economy in the city (Valasis, 2015).

It is estimated that in Africa, 166 million, or 73%, of the Sub-Saharan African population live in informal settlements (Hambati, 2013). Local studies further suggest that there are currently 189 registered informal settlements in the City of Johannesburg municipality (Mpe and Ogra, 2014), comprising of 195 474 shacks/ informal dwellings and 220 000 households (Ciurean, *et al*., 2013).

Although they have gradually been absorbed by urban sprawl, making up a large part of the urban area, they still maintain their conditions of precariousness and social vulnerability (Castro, *et al*., 2015). Popke *et al*., (2013) refer to informal settlements as having an underlying landscape of vulnerability.

This underlying vulnerability is evidenced in how informal settlements, by virtue of their socio-economic profile, are often victim to environmental disasters, i.e. excess water as well as man-made disasters such as shack fires. This has been supported by various informal settlement profile studies (Hambati, 2013; Mpe and Ogra, 2014; Weakley, 2013; Murray, 2009).

The susceptibility of those living in informal settlements to disaster is often underpinned by their socio-economic standing, with the rationale that people in informal settlements live there because of little or no income, ultimately affecting their ability to protect themselves through more weather-resistant housing structures, secure tenure, as well as their ability to recover from these disasters. Furthermore, it is in the inability of those in informal settlements to recover from disasters without external support, i.e. state relief, non-governmental organisation (NGO) aid, civil society, etc. that they are described as unable to manage stresses (Ribet, 2009).

This inability emanates on a larger scale from on-the-ground inequality, unequal access to resources, poverty, poor infrastructure, lack of political representation and inadequate systems of social security, early warning, and planning (Ribet, 2009). It is these factors that Murray (2009) suggests reveal a hidden aspect of marginality and social insecurity that is a permanent feature of the lives of the urban poor. As such, Murray (2009) states that many of the disasters experienced by low-income populations are artificial disasters because they arise from hazards created by people and their institutions and are further exacerbated by the uneven disaster-vulnerability and risk exposure across the urban landscape and the lack of social infrastructure in place to prevent them. The Centre for Security Studies (2010) supports this notion that disasters are often created. According to them, disasters are a result of the respective event at first sight. However, disasters are indirectly precursors of human vulnerabilities that arise from physical, social, economic and political conditions and inequalities that have little to do with the event itself (Centre for Security Studies, 2010).

These disasters highlight that the state of one's vulnerability extends beyond the physical to include inherent socio-economic characteristics that render one incapable of coping with certain events. Leaning on Hurricane Katrina as an example of an artificial disaster, Hankivsky (2014) suggests that these artificial disasters are products of intersecting forms of marginalities. They indicate that social structures indeed do interact with environmental hazards to produce disaster.

1.2 Problem Statement

In October 2014, the informal settlement of Kya Sands[1] experienced a fire that left more than 500 homes destroyed, and rendered 2 000 individuals homeless (SA People, 2014). Although the residents received some level of emergency intervention after the fire from the municipal authorities, NGOs, and civil society, many of them lost everything that they owned. Data from Statistics South Africa released in 2016 indicates that 1 in 7 households in South Africa lives in informal settlements and this figure is significantly higher in metropolitan households, where 1 in every 5 households lives in informal dwellings (SERI, 2018), highlighting the extent of the challenge that informal dwellings and informal settlements pose in South Africa. The residents in these informal settlements remain vulnerable to environmental disasters (Murray, 2009). While explanations for the cause and extent of the fire disaster have focused on the material and physical qualities of the settlement (paraffin stoves, structures built from flammable materials, etc), residents themselves have expressed their continued marginalisation and

[1] The informal settlement will be referred to as Kya Sands or Kya Sands Informal Settlement

precarity as the reasons for their constant vulnerability to disaster. Analysis surrounding disaster management has come to realise that efforts aimed at disaster risk reduction can no longer solely focus on structural and engineering measures because vulnerability extends beyond the physical to include the social (Ngcamu, nd).

However, to assume that the social dimension in vulnerability is caused by class/ income level alone would imply that vulnerability is homogenous between people in the same locale and class. Whilst there is often a shared sense of precarity within a community, their levels of vulnerability to hazards may differ significantly. In informal settlements, the residents are inherently vulnerable to environmental disaster by virtue of their socio-economic status; however, they possess different forms and levels of marginality and, therefore, vulnerability. Individuals and households experience multiple, interacting, and often compound, vulnerabilities (Summer and Mallet, 2011). Research that focuses on vulnerable groups is often critiqued for assuming that marginalised groups are homogenous in their experiences and this view overlooks the subgroups that exist within these marginalised groups (Corus and Saatcioglu, 2015). It is this limitation that this research seeks to overcome by recognising the various subgroups and their differing vulnerabilities.

When these various marginalities intersect, the resulting level of vulnerability differs for individuals. This is termed “intersectionality”.

1.3 Research Aim and Objective

This research is guided by the aims and objectives as outlined below.

Research Aim:

To understand whether and how local conceptions of vulnerability and hazard relate to conventional risk and vulnerability indicators in the informal settlement of Kya Sands.

Research Objectives:

1. **To understand the environmental risks and hazards that residents in Kya Sands are exposed to, as experienced by the residents.**
2. **To critically assess the perceptions of the interaction of various social vulnerability drivers and how this affects social vulnerability in Kya Sands.**

3. **To document and assess the different mitigation strategies that are employed by residents at Kya Sands to cope with hazards.**

1.4 Key Concepts in this Study

This study is rooted in assessing and understanding vulnerability. Given the widespread use of vulnerability and hazard-risk assessments in different disciplines, various interpretations of the terms “vulnerability’’, “risk’’, “disaster’’, and “hazards’’ exist, terms that are all central to this study. To avoid confusion or ambiguity, the general definition/ interpretation adopted for these terms in this study will be stated below.

Hazard is considered as a component of risk and it is an event or process with the potential to disrupt society. When it interacts with society, it causes a loss of life or property, thereby becoming a disaster. It may have man-made or have natural origins (Prior, *et al*., 2017). An example of a hazard in this context would be flammable building material, i.e. wood, plastic, or zinc; however, it only becomes a disaster when it interacts with an uncontrolled flame, causing a fire and resulting in a loss of property. It is essential to note that a hazard can only become a disaster if there is exposure; the existence of a hazard does not automatically equate to disaster. It is not the hazard itself that causes disaster but rather the impact thereof, e.g. a small veld fire in an open field would not be disastrous, however, this veld fire, even of a smaller intensity occurring where people live, has the potential to become a disaster because It would destroy lives and homes. In this case, the social impact contributed towards it becoming a disaster.

Exposure is interpreted as per the United Nations Office for Disaster Risk Reduction (UNDRR,2016:a) definition where it is used to denote people, property, systems, or other elements present in the hazard zones that are subject to potential losses. It dominates risk and it is the element that faces the hazard, i.e. people or infrastructure.

Vulnerability is often studied across various disciplines and at varying scales, concentrating either on the physical, social, economic, financial, or environmental. The type of vulnerability being studied often guides the resulting hazards that will subsequently be studied or investigated. In this study, the key focus is on social vulnerability. Vulnerability is the conditions determined by physical, social, economic, and environmental factors or processes (hazards) which increase the susceptibility of a community (risk) to the impact of a hazard (UNDRR, 2016:b). Vulnerability also dominates risk. **Social vulnerability** is more intricate than just vulnerability. This form of vulnerability allows the conceptualisation and operationalisation of

vulnerability to take place at a broader scale, resulting in the simultaneous inclusion of several types of hazards, whilst still allowing these to be shaped by those perceived to be at risk.

Risk is the chance of hardship or loss resulting from the interaction of hazards and vulnerable communities exposed to them (Disaster Management Act No. 57 of 2002) or the likelihood of occurrence (Cutter, 1996). To be at risk therefore means to be at a greater likelihood of occurrence of a specific disaster event as a result of being exposed to hazards or hazardous conditions.

Disaster is a progressive, sudden, widespread, or localised natural or human-induced occurrence which causes or threatens to cause death; injury; disease; damage to property, infrastructure, the environment; or the disruption of the life of the community. Its magnitude exceeds the ability of those affected by it to cope with its effects using only their own resources. This is the definition adopted in the Disaster Management Act No. 57 of 2002 (Halloway and Roomaney, 2008). It is the event that disaster results in negative impacts.

As such, while all these concepts are considerably inter-linked, it is evident that hazard is the possible source of harm whereas risk is the probability that the exposure to a hazard will cause harm, while vulnerability is the state of exposure to harm. Exposure refers the people/ objects subject to the potential loss whereas disaster is the result of vulnerability, exposure, and hazard interacting unmitigated. These concepts are essential for this study as it seeks to investigate social vulnerability. However, in order for one to do so, the hazards that the system is exposed to and how they are currently being mitigated need to be understood.

1.5 Outline of the Paper

This paper consists of six chapters. This study is an empirical study influenced by theoretical frameworks, namely unnatural disaster, social vulnerability, and intersectionality. This First Chapter of the thesis introduces the research topic, its main aims, and outlines how these will be achieved through research questions. **The main aim of this research is to understand the way vulnerability is experienced and perceived by those at risk.** This is done through investigating the hazards that residents feel exposed to as well as past disaster events and the causes of these events. Participants are also asked how they mitigate against the perceived hazards that they are exposed to.

The Second Chapter focuses on the theories of unnatural disaster, social vulnerability, and intersectionality. It is a review of existing studies on the formation and growth of informal settlements in South Africa and the evolution of disaster theory. It considers how disasters were previously viewed as random acts of God while only physical impacts of disasters were

viewed as either natural or anthropogenic, often also affecting social systems. The inclusion of social parameters into thought analysis surrounding disaster management has also led to the expansion of vulnerability and how it is viewed. Vulnerability has expanded in its definition and parameters to include physical, economic, individual, and social vulnerability. While intersectionality is a great concept because it recognises the differences in individuals that render them differentially vulnerable, it is also unfair to ask individuals what affects their vulnerability the most as this is like being made to choose the lesser of evils. This chapter also details the knowledge gaps in the study and assessment of social vulnerability, which is namely the lack of a uniform definition. Moreover, both social vulnerability and intersectionality lack a uniform method of measurement. While this is advantageous as it allows freedom and flexibility in designing the research method, it is a shortfall as you cannot compare results across studies. The chapter concludes with the realisation that, even with the lack of uniform definitions and methods of analysis for these terms, of greater concern is that the perceptions of those at risk are rarely accounted for.

The Third Chapter of the study presents the method that was followed in answering the research questions. It begins with a background of the informal settlement, how the social vulnerability indicators were chosen, and the kind of data that had to be extrapolated from each data source. The chapter also describes how the data is obtained and analysed. This is a qualitative study which relies on in-depth interviews undertaken with research participants. The ethical considerations are also detailed in this chapter as a reflection of the method as the researcher experienced it.

Chapter Four details the findings of the perception of social vulnerability indicators, hazard exposure, as well as how these are mitigated against. It argues that those in Kya Sands are aware of the risks that they face and their decision to settle there was one that is often weighed but the greatest advantage associated with living in Kya Sands is that it is close to employment opportunities. Despite this, the residents are aware of the risks they face but they are also aware of the need to survive. Their greatest danger is not having food for tomorrow rather than mitigating against other hazards not immediate to their survival. They view themselves as living in disaster. The sense of precarity shared is so strong that social vulnerability indicators that affect their vulnerability don't matter to them, i.e. age and gender. What is crucial is the economic and social facets of social vulnerability.

These findings are further discussed in chapter five which discusses the specific hazards that residents felt they were exposed to the most and what the causes of these said hazards are. This is discussed as elemental vulnerability. In the absence of adequate state protection,

residents are exposed to the elements (fire, earth, wind and water) and this becomes a core reason for their vulnerability.

Chapter Six is a short analysis chapter on intersectionality. While it acknowledges the various ways in which different characteristics interact to affect social vulnerability, it concludes by pointing out that having to choose which variable affects social vulnerability the most is unfair as it is like having to choose the lesser of two evils. However, economic characteristics and those related to tenure were identified as affecting vulnerability the most.

The conclusion is provided in Chapter Seven by acknowledging that the experience of vulnerability can never be homogenous as people are unique social entities. While it is important to account for those at risk, there is a need to translate this information into actionable policy initiatives.

2. Literature Review

2.1. Introduction

Some communities are more vulnerable to disaster than others. These are often the low-income communities (Few, 2003). In the South African context, these have been identified as informal settlements. This literature review employs a systematic method of review that is aimed at aggregating and reviewing existing literature and using the research aim as a guide in the review of literature (Strukelj, 2018). It reviews the existing literature surrounding informal settlements, their defining characteristics, as well as the cause for their formation and spread. The concept of vulnerability is also interrogated alongside intersectionality and how these can be applied in the context of this study.

The study begins with a brief review of the literature on the cause and history of informal settlements in South Africa, as well as their presence today. I follow this by looking at vulnerability and I explore the shortcomings of this literature. This leads to the emergence of artificial/ unnatural disasters, a result of the very social and political processes that social vulnerability seeks to explore. I follow this up by comparing the various methods and approaches used to measure social vulnerability. I then investigate intersectionality, because while social vulnerability and artificial disasters support the view that social processes play a tremendous and often ignored role in the production of disasters, these social processes are not homogenous across groups of people. Social vulnerability often measures vulnerability by assessing categories such as age, gender, marital status, housing structure, and income source and level. Intersectionality offers a lens through which various social vulnerabilities interact, i.e. age and gender, and affects one's marginality. I demonstrate how social vulnerability, artificial disaster, and intersectionality are all inter-linked, especially in the context of informal settlements and the urban poor; however, there is still a need for growth and understanding, especially considering the multi-disciplinary use of the concepts. I close by advocating for the need to not view people as vulnerable purely because of their socio-economic standing. Therefore, there is a need to reconceptualise social vulnerability and how we measure it, considering intersectionality and how these various social vulnerabilities interact to affect vulnerability.

2.2. Informality and Precarity

Together with climate change, informal settlements have been deemed as the most significant urban challenge (Dovey, 2015). According to the Housing Development Agency, hereafter referred to as the "HDA'' (HDA, 2012), 21% of all the households in Gauteng live in informal

dwellings and there are about 2 100 informal settlements across South Africa (Ziblim, 2013). They have been termed an “urban crisis’’ wherein cities have become a dumping ground for a surplus population that works and services the informal service industries and trade (Lombard, 2014). To refer to the influx of informal settlement dwellers in the city as a “dumping ground’’ infers waste, abandonment, and isolation from the city.

Various articulations exist for the definition of informal settlements, all of which are based on a variety of defining physical and infrastructural characteristics, i.e. informal settlements, slums, *mjondolo*, *mekhukhung*, or informal dwellings. What is common amongst these different articulations of informal settlements is the way they describe the extent to which the formation of these informal settlements violates planning laws and property rights (Silva and Farrall, 2016). It is from the very notion that informal settlements are not erected according to any formal rules and architectural plans and on land not surveyed or proclaimed as residential that they are deemed “informal’’ (HDA, 2012; Dovey, 2015 Doberstein, 2012).

They are distinctively known for their occupation of marginal land (Musungu, *et al*., 2006), insecure land tenure, and temporary construction materials such as wood, cardboard, plastic, and zinc (Wekesa, *et al*., 2011; Shabat and Tapama, 2017). Though these are factors that contribute to the physical risk of informal settlements, Ngcamu (nd) notes that through informal settlements, the urban poor have made themselves visible and illustrated their capacity to fight and resist.

Huchzmeyer (2009) affirms that indeed, informal settlements are known as settlements of the urban poor. This perception infers that the increasing prevalence of informal settlements nationwide may be an indication of an increase in the urban poor. In their literature, Rogerson (1996) and Botenbal and Van Lindert (2008) dismiss the notion that the rise in informal settlements is due to an increase in the urban poor, and attribute it to a shift in the geography of the urban poor to places where they can now be seen, i.e. urban peripheries. Whether the prevalence of informal settlements is viewed as an indication of a change in geography or a rise in the urban poor, what remains true is that informal settlements are symbolic of lack of affordable housing. Kasala (2014) views informal settlements as the most visible aspect of poverty (both financial and housing poverty). Housing poverty is defined as the individuals and households who lack safe, secure, and healthy shelter with basic infrastructure, e.g. piped water, adequate provision for sanitation, drainage, and the removal of household waste (United Nations Centre for Human Settlements (Habitat), 1996).

The presence of informal settlements is reflective of the slow development of affordable housing in suitable locations. The UN Habitat (2003) emphasises that informal settlements are

a cause and consequence of poverty where people have limited access to financial markets, property, and land, similar to the view adopted by Kasala (2014). They are viewed as a consequence of poverty because, if people could afford better, they would live in better conditions and informal settlements would not exist. Informal settlements, however, are also viewed as a cause of poverty as they have been blamed for trapping people in poverty because of their inability to access finance, leverage on property assets, and basic services and they result in poor health outcomes (World Economic Forum, 2019) So serious is the challenge of informal settlements that it was committed as a Sustainable Development Goal, Goal 11: ''To make cities and human settlements inclusive, safe, resilient and sustainable'' (UN, 2015).

The government is often blamed for regulations that constrain investment in low-cost housing (Turok and Borel-Saladin, 2015; Chiodelli and Moroni, 2014). Government policies that disenable the urban poor from being able to afford low-cost housing, and therefore invest in it, are often stated as a reason for the proliferation of informal settlements (The Star, 2018). The United Nations (UN) Habitat (2003: 5) identifies this lack of political will to address informal settlements as a failure of governance. The failure of government to implement policies that make housing accessible to the urban poor can be seen as a lack of political will to address informal settlements/ housing needs. Khalifa (2015) describes informal settlements as a solution derived by the urban poor to remedy government failure to address housing needs, again highlighting the role that the government plays in the formation of informal settlements. Government is blamed for a huge housing backlog amidst growing urbanisation, unemployment, and land scarcity (The Star, 2018).

The dawn of democracy in South Africa in 1994 saw the birth of the Reconstruction and Development Programme (RDP). One of its mandates was the provision of free/ subsidised housing to qualifying South African citizens (Benit, nd). Many of the inhabitants of informal settlements are those that qualify for these RDP houses yet they are still waiting for their RDP houses from the state (The Star, 2018). As at 2015, 2.7 million households already lived in these subsidised houses, many of whom were from informal settlements (City of Johannesburg, 2016), suggesting that, while informal settlements and the eradication thereof remain a perpetual challenge, significant strides have been made in addressing them.

Other scholars support the narrative that the existence and continuing growth of informal settlements is illustrative of a housing backlog (Huchzmeyer, 2003; Greef and Lawrence, 2011). A statement by the then-Minister of Trade and Industry, Dr. Rob Davies, who was giving a speech on reducing shack fire risk in Kya Sands, in 2015 also touched on the housing backlog faced by the state. His speech pointed out how much this backlog had increased and

been further intensified by the rapid urbanisation pace, population growth, available resources, and the pace of delivery (NRCS, 2015). As at 2011, 2.4 million housing units needed to be constructed before 2014 in order to completely eradicate informal settlements in South Africa (Wekesa, *et al*., 2011). To date this has not been achieved.

However, to apportion the existence of informal settlements solely to the housing backlog initiated by the RDP programme would suggest that informal settlements in South Africa started in 1994 or post-1994. The City of Johannesburg (2016) describes RDP houses more aptly by referring to them as the dominant form of intervention against informal settlements. This suggests that the provision of RDP houses arose as a solution to a lack of affordable housing for the poor. Mears (nd) takes us through the history of the development of informal settlements in South Africa, a product of industrialisation and the discovery of gold in the Witwatersrand basin in Johannesburg which attracted a huge migrant labour workforce from the rural areas, most of whom were not allowed to own property in the city at the time. In 1914 already, a quarter of a million people were recorded to be living in Johannesburg. Since then, it has been evident that the mobility and migration of mostly unskilled labour in Johannesburg has always been larger than the provision of housing (Mears nd). Urban development, praised for driving infrastructural development that enhances people's wellbeing, has therefore always had the unintended consequence of reinforcing environmental threats through the development and proliferation of informal settlements. As such, urbanisation, which is a spatially uneven process, has been a large driver of informal settlements (Hambati, 2013). The rate at which urbanisation has been occurring has been described by the World Bank Group (2011) as neck-breaking. Given this, the growth of informal settlements can only be expected to have grown in line with this.

The government is also blamed for its relaxed planning standards concerning informal settlements (The World Bank Group, 2011). Not only does this contribute to the growth of informal settlements because the inhibition of land is not restricted, but these relaxed planning standards also exacerbate the physical vulnerability of those in informal settlements.

Amoako (2016) defines informal settlement governance as an oxymoron – where the state is both brutally present but also conveniently absent: the brutal presence of the state is manifested through forced evictions and the state is conveniently absent through a lack of planning and a lack of infrastructure provision. Huchzmeyer (2009) supports this view by stating that the South African city continues to be shaped by apartheid's discriminatory and repressive planning that does not accommodate all the social groupings in South Africa. This is what Amoako(2016) denotes as a lack of planning. When confronting informal land development and informal housing construction, the state uses terms such as "eradication",

“elimination”, and “zero tolerance’’ – terms which are harsh and are often applied to life-threatening epidemics (Huchzmeyer, 2009). This is what Amoako (2016) refers to as the brutal presence of the state; it is an indication of the attitude of the state towards informal settlement management.

A man settles where his basic needs can be met, namely: food, shelter, and safety, often disregarding the other risks that may result from this (Zschan and Küppers, 2003). Therefore, while those in informal settlements may be faced with risky conditions daily, the decision to settle there is often based on the immediate need for food, shelter, and safety. Often, people settle as a practical and logical response in situations where, despite the risks, they do not have enough options (Joubert, 2013). Some informal dwellers may have settled in informal settlements as a means of accessing temporary accommodation after they were resettled, like some of the dwellers who settled in Diepsloot after being moved from Soweto (Benit, nd). Key to understanding people’s settlement decisions, therefore, lies in understanding how they perceive and respond to the risks they face.

Housing is multi-dimensional and complex, interacting with multiple factors such as the economy, social institutions, demographic shifts, and the natural environment (Turok and Borel-Saladin, 2015). As such, informal settlements, and any other housing arrangement of this type, cannot just be viewed as representations of power and formality or the absence thereof; they are places of residence much broader than the socio-economic status of its inhabitants. Accounting informal settlements to areas of informality underpinned by a low socio-economic status that is manifested in a lack of access to basic services and poor infrastructure obscures the diversity and complexity that characterises these spaces. Huchzmeyer (2014) suggests that they be viewed as complex and changing social processes that unravel through intricate special arrangements. Efforts to understand them therefore need to occur within the broader context of the processes that form and shape them.

The National Disaster Management Framework differentiates between health risks, environmental risks, financial risks, and security risks which, together, form disaster risk (Disaster Management Act, 2002). These are chronic in informal settlements and often upscale into local emergencies leading to the widespread loss of property, temporary displacement, and prolonged hardship (Hambati, 2013). In their literature, Usamah, *et al*., (2014) state that informal settlements exhibit the signs of vulnerability that are commonly associated with poverty and exposure to hazards. This literature review and research, more broadly, acknowledges the social risk factors that make informal settlements more vulnerable to disaster. However, it will not delve into more detail concerning the factors commonly associated with vulnerability in informal settlements so as to not stray away from the general

bias of homogenous vulnerability often adopted. Rather, it will allow the place-making opinions of residents to emerge without a leading-on by the researcher. Place making is a means to view the complex and multiple relationships between individuals, organisations, and institutions that are involved in the social and spatial construction of places (Lombard, 2014).

Given the reasons for the formation and proliferation of informal settlements, one cannot assume that they will be eradicated in the near future while there continues to be certainty in the risk factors that they face. As such, it is essential that the vulnerability of those in informal settlements be better understood so as to improve their management. The next section will review vulnerability, and more specifically, social vulnerability.

2.3. Vulnerability

2.3.1. Vulnerability defined

Contrary to popular belief, vulnerability is not poverty, nor is it marginalisation, or any factor that seeks to identify parts of the population deemed disadvantaged, at risk, or at need (Cannon, *et al*., nd).However, it is often used to highlight the contextual factors that render certain individuals or groups more susceptible to shocks by negatively affecting their exposure and capacity to respond (O'Brien, *et al*., 2009). It is also known that while individuals may have the capacity to respond to certain events and be able to recover from a disaster event quickly, the repeated occurrence of the hazard constrains their ability to cope (Cardona *et al*., 2012). Vulnerability is often portrayed in a negative way, as the susceptibility to be harmed (Adger, 2006) but its positives could be that it highlights areas for development because the very factors that emphasise vulnerability could be the factors that can be a source of capacity to reduce risk and increase resilience (Cardona *et al*., 2012).

Vulnerability as a term, in its simplest form, is focused on the ways in which people are weak in the face of an event (Centre for Security Studies, 2010). Cardona *et al* (2012) defines it as the degree to which a system or part of a system may react adversely to the occurrence of a hazardous event. Textier (2008) argues that vulnerability is a social product that is materialised through behaviour, which is a result of the social and economic decisions that constrain one's ability to react. The author ascertains through literature that vulnerability is not necessarily a hazard-related process. Olivier-Smith (2004) is in support of this definition as well, defining vulnerability as the dangers posed by hazards perceived as frequently experienced, yet those exposed are not in a position to reduce their risk, therefore their vulnerability exists not only because they are exposed to the hazard but also because they lack the ability to come up with a solution to reduce their exposure and, therefore, risk.

Exposure is a function of vulnerability and is necessary if one is to ever be deemed vulnerable. However, it does not equate to vulnerability because a person may be exposed to something yet not be vulnerable to it (Cardona, *et al*., 2012). The hazard event is therefore not the only driver of risk and vulnerability; it is one of the many moments that signify unmanaged risk (Cardona, e*t al*., 2012). The United Nations Office for Disaster Risk Reduction (2016) defines vulnerability as the physical, social, economic, and environmental factors and processes that increase the susceptibility of a community to the impact of a hazard. These are conditions that may vary over time and within a subgroup/ population. Halloway and Roomaney (2008) define vulnerability as the internal conditions that increase people's exposure and susceptibility to hazards or other shocks and stresses. Vulnerability is defined, similarly to the definition adopted by Halloway and Roomaney (2008), as the conditions that are determined by social, physical, economic, and environmental factors or processes that increase the susceptibility of a community to the impact of hazards (Muyambo, *et al*., 2016). The common thread that runs through all these different notions of vulnerability is that it is a function of characteristics (physical, social, economic, etc) that drive risk and are further heightened by the fact that those at risk are not able to decrease this risk. It is a function of risk and impact, and while there are various methods proposed to measure vulnerability, it is often noted as a flaw that we are trying to measure that which we cannot accurately define (Frigerio and De Amicis, 2016).

Vulnerability is dynamic, yet it can persist over time because of the inherent unpredictability of the physical systems within which it manifests (Burton,2015). Moreover, the study of vulnerability is further complicated by the fact that vulnerability is not static and not being vulnerable to a hazard today is not a guarantee that one is immune to it in the future (Topsell, *et al*., 2010). This is further complicated not only by the unpredictability of the physical systems that vulnerability manifests in but also by the human element in vulnerability.

Vulnerability assessment has four different approaches which affect the design of vulnerability assessments; these are the actor-orientated approach, the systems-orientated approach, the outcome-orientated approach, and the contextual approach (Cutter, 1996). The actor-orientated approach centralises the actor (human), their decision-making process, and the constraints or opportunities that may impact on their decision-making process, i.e. available technology, resources, and the distribution thereof. The systems-orientated approach centralises the system and its adaptive capacity, i.e. how a certain community deals with the impacts of a hazardous event. The outcome-orientated approach centralises the outcome of a disaster event, that is the loss encountered during disaster, while the contextual approach envisions vulnerability as highly contextualised within social, economic, political, and ecological processes and, therefore, it is experienced differently in different communities.

These processes are viewed as the processes that enable loss (Murphy, *et al*., 2018. This study adopts the contextual approach to vulnerability because it visualises vulnerability as highly contextualised. It is because of this that this research will be an in-depth study of Kya Sands, focusing on the social processes that produce vulnerability.

It is a concept that is used in several disciplines, i.e. Disaster Management, Development Studies, Economics, Sociology, Anthropology, Geography, and Environmental Studies (Bergstrand, *et al*., 2015). As such, it has varying interpretations. Given the different approaches towards vulnerability, there are also different ways to measure it, depending on the research perspectives employed. These perspectives will influence its definition and method (Frigerio and De Amicis, 2016). All vulnerability assessments, however, operate on the assumption that they help us understand vulnerability better and thus enable decision-makers to take effective action to reduce it (Miller and Bowen, 2013. The various models often used to measure it, i.e. the Pressure and Release Model (PAR), the Hazards of Place Model, Capacities and Vulnerabilities Analysis, the Sustainability Science Model, and the Access model, amongst others, all attempt to diagnose the inherent social and economic processes of marginalisation and how these can be addressed (Curtis, *et al*., 2014).

The Capacities and Vulnerabilities Analysis reviews people's vulnerabilities by assessing the physical, social, and attitudinal (how people view themselves) factors. It differentiates between "needs" and "vulnerabilities" (Twigg, 2001). The PAR model views disaster as the intersection of processes and exposure and measures the progression of vulnerability (Topsell, *et al*., 2010); whilst the Access Model illustrates how unsafe conditions are formed by the economic and political processes (Twigg, 2001).

Although there are various interpretations of vulnerability and they are differentiated by the method used in analysing and measuring it (Adger, 2006), the various interpretations of vulnerability all have an overlap/ cross-fertilisation across the various underlying theories. Even with the overlap/ cross-fertilisation across the different interpretations of vulnerability, there is an emerging form of vulnerability research that does not focus on the multiple outcomes of a single hazard event. Rather, it analyses the different elements of vulnerability. This research also leans towards this emergent theory because rather than focus on a single event and its multiple impacts, it looks at the elements that contribute to the vulnerability of the Kya Sands population. This is contextual vulnerability.

It is also seen that the state of a system before an event triggers a disaster is multi-faceted, existing as either cultural, physical, systemic, social, economic, territorial, institutional, or organisational vulnerability. However, the number of its facets is heavily contested with several

people recognising different facets (Topsell, *et al*., 2010). Vulnerability has now been dissociated into the various facets, namely: social vulnerability, economic vulnerability, environmental vulnerability, geographic vulnerability, economic vulnerability, housing vulnerability, or individual and community vulnerability (Usamah, *et al*., 2014).The various fragments of vulnerability arose because, while it is evident that vulnerability is essentially an implication of loss, it still needs to be defined in terms of whose loss it is and what kind of loss it is (Cutter, 1996). The personal or individual potential for loss is deemed individual vulnerability while social vulnerability considers the susceptibility of a social group. As this research is concerned with the social vulnerability facet of vulnerability, which is the vulnerability of the social group, or the community of Kya Sands, the next section will look at social vulnerability in greater detail, highlighting the fact that the social proneness of individuals to disaster is often due to inequalities, thereby making disasters social constructs (Topsell, *et al*., 2010).

2.4 Artificial Disaster

The study of social vulnerability arose particularly because it was realised that people are not equally affected by disaster. The reason for that could be circumvented by the necessary social infrastructure. Before reviewing literature on social vulnerability, this study will briefly look at the emergence of the view of disaster as a social construct, as these forms the context for social vulnerability.

Disasters were previously considered as acts of God. However, their increased frequency and intensity has led to an improved understanding of their causes. They are now said to occur when the negative effects of hazards are not well managed (Sanyal and Rattray, 2016). Summer and Mallet (2011) support this in arguing that hazards only become disasters when people's lives and livelihoods become affected. At the International Decade for Natural Disaster Risk Reduction 1990-1999, the significance of social, and not just engineering aspects, was recognised (Sanyal and Rattray, 2016). This improved understanding has driven a desire to understand the social aspects of disaster (Usamah, *et al*., 2014). While disasters are no longer purely acts of God, they are also not solely due to the social structures of the affected communities (Topsell, *et al*., 2010). However, it has been realised that social structures play a significant role in the production of disaster.

The greatest disasters facing humans now are not those that occur owing to natural hazards, but rather those that are due to man-made hazards that often go unnoticed. Moreover, the neat distinction between human and natural disasters is vanishing (Wachinger, *et al*., 2013) as there is always a human element at play in the production of disaster. These man-made

disasters are often seen as normal and they often affect low-income populations. While they do not kill their victims, the victims nevertheless continue to face their risk (Wisner, *et al*., 2003).

Murray (2009) has coined the term “artificial disasters’’ to refer to disasters that have a significant human element in their production, defining them as “social maladies masquerading as natural disasters “. It is said that disasters are merely extensions of everyday life (Boos, *et al*., 2009), particularly for those in informal settlements where disasters are experienced to the greatest extent so much so that they are viewed as part of their normal life. The intersection of vulnerable informal settlements with relaxed planning standards, as well as a lack of disaster planning, produces what Murray (2009) terms as “artificial’ disasters”.

In informal settlements, these artificial disasters are manifested as shack fires and urban excess water. They produce hazardscapes, loosely defined as the geographies of vulnerability (Murray, 2009). The Cape Town municipality apportioned the causal factor for shack fires as either being deliberate, i.e. domestic violence or negligence, or accidental, i.e. due to substance abuse or a lack of electrical supplies (Housing Development Agency, 2012). Most of these aforementioned causal factors are not structural, and the increased occurrence of these unnatural disasters highlights the need to start viewing disaster risk based on all dimensions of a disaster, namely vulnerability, capacity, exposure, hazard characteristics, and the environment (The United Nations Office for Disaster Risk Reduction, 2016). Doing so will emphasise that many disasters could be averted through a focus on the micro-level processes that underpin vulnerable communities.

This research thus supports the emerging theory that unnatural/ artificial disasters arise from socio-economic factors. The concept of artificial disasters rationalises the need to not separate disasters from everyday life. Doing so allows us to see how disaster risks are connected to vulnerability that is expressed in people’s everyday lives (Wisner, *et al*., 2003). It also challenges society’s perception of disaster and the attention paid to it, as government and civil society often only react to disasters when they are widespread and cause ample damage, ignoring that these disasters are merely extensions of everyday life and those at risk are exposed to hazards daily. However, to understand these disasters we need to understand the factors that drive them and how those various factors intersect. This approach makes visible the social dynamics involved in vulnerability, and makes those at risk visible (Topsell, *et al*., 2010).

Ngcamu (nd) draws on other scholars and suggests that people’s behaviour in the face of natural hazards is constrained by social, economic, and political forces. This ultimately affects

their coping capacities (Texier, 2008). To understand disasters, it is thus not enough to know about the hazards that people face; there is a need to also understand the varying levels of vulnerability amongst people and the capacity of those exposed to cope with the disaster event and reduce their risk. This can only be achieved through an understanding of social systems and their stressors (Wisner, *et al*., 2003).

For those living in informal settlements, their capacity to reduce risk is affected by various social stressors such as unemployment, limited access to basic services, illegal land occupation, risk of eviction by the state, and livelihood and food insecurity (Halloway and Roomaney, 2008). Many of the risks that they face are rooted in social and economic vulnerability. Coincidentally, it appears that the very processes that cause risk are the ones that decrease their capacity to reduce risk. When Hurricane Katrina occurred on the United States Gulf Coast in 2005, for many the fatalities that arose from the disaster were reminiscent of the Titanic. In terms of Hurricane Katrina and the Titanic, the vulnerabilities of the events were defined by class such that during the Titanic disaster, less than 3% of women and children travelling first class died because they had life boats on their decks. In contrast, half of all the children and women travelling third class died due to the unavailability of lifeboats on their decks. Similarly, for Hurricane Katrina, most of the fatalities were the frail and elderly living in old age homes that lacked evacuation plans (Centre for Security Studies, 2010; Cutter, 2009; Lixin, *et al*., 2014). While this affirms that disasters are a social and communal phenomenon, it also highlights that even though we cannot control disasters, we can control their underlying socio-economic factors (Stewart, 2008) and this will ultimately reduce disaster risk and impact. What this also highlights is that disaster vulnerability does not emerge simultaneously or randomly; it develops in response to traditional disaster management (Ryder, nd). Ryder (nd) asserts that any time we view and discuss vulnerability in relation to human society, it must be conceptualised as social vulnerability.

Social vulnerability is concerned with potential harm that could be inferred on people and not just the potential harm that could be inferred on physical infrastructure (Singh, Eghdami and Singh, 2014). However, as important a concept as it is, it still needs to be considered within the broader term of geophysical hazards and technological solutions. While poverty and financial deprivation underpin social vulnerability and the relationship between the two is quite strong, they need to be considered separately (Topsell, *et al*., 2010).

This research agrees with the notion of the existence of artificial disaster because unmanaged risks are often a function of the socio-economic status of those at risk. It also agrees that it is often those with a lower socio-economic status who are at an increased risk of unnatural disaster. However, this body of research still draws on Murphy, *et al.* (2018), who caution

against considering certain populations as vulnerable because doing so positions those at risk as passive victims who ignore their potential agency to act. As such, while drawing on the heightened vulnerability of those in informal settlements to artificial disaster, or those affected by Hurricane Katrina, and those more gravely affected because of their socio-economic status, we do not deem them as automatically vulnerable to artificial disaster as doing so undermines their mitigation strategies and labels them as passive victims who have accepted that they are at risk and do nothing about their at-risk conditions. Briefly considering artificial disaster in this study gives a context into the social aspect of disaster and shows the evolution of disaster thought analysis from considering only structural factors to political and social factors. Vulnerability has also seen the same evolution. Moreover, it also shows that most of the disasters that occur in informal settlements are not as structurally rooted as previously thought.

2.5 Social Vulnerability

2.5.1 Social vulnerability defined

The literature as set out in this chapter has highlighted that disaster and vulnerability are both not only physically produced. The social aspects of vulnerability to natural disaster first came to be considered in 1994 at the World Conference on Natural Disaster Risk Reduction (Centre for Social Security Studies, 2010). Through this, social vulnerability as a concept was developed.

Social vulnerability is viewed as a theoretical concept that is difficult to quantify (Frigerio and De Amicis, 2016). It is a concept that is poorly understood. Moreover, it is even less understood when it is applied to multiple hazards (Cardona *et al*., 2012). However, it exists because it has been realised that the social aspects of vulnerability are overlooked despite the fact that they have an indisputable influence on disaster and its severity (Prior, *et al*., 2017). It also removes the notion that vulnerability can only be attributed to the economic conditions of the said population/ community. Generally, vulnerability is said to exist when exposure to a hazard cannot be overcome by coping and the effects of the hazard cannot be mitigated solely by the population exposed to them (Prior, *et al*., 2017). Social vulnerability can therefore also be said to exist when the social characteristics in populations and their social processes cannot overcome hazard exposure by coping, nor are they able to mitigate against the impact of the hazard. By its nature, social vulnerability is predictive as it tries to understand what will happen to a certain community under specific conditions (Cannon, *et al*., nd). It has its roots in inequality and is ultimately derived from the activities and circumstances of everyday life and its transformations (Topsell, *et al*., 2010).

Social vulnerability is defined as a range of societal, cultural, and economic features that contribute to social disparities that influence the ability of individuals, groups, and communities to anticipate, cope with, resist, and recover from the impacts of hazards (Dzialek *et al*., 2016). Essentially, social vulnerability centralises the social system and tries to understand what drives human vulnerability so as to find ways to acquire resources and strategies that are needed to minimise disaster loss (Bergstrand, *et al*., 2015). It has been identified, together with a change in physical hazards, as the reasons why economic damage from disasters caused by extreme weather events has increased (Serrao-Neumann, *et al*., 2015).

According to the hazards of place model of vulnerability, risk and mitigation interact to form a hazard potential. This hazard potential produces the social fabric that is formed by the experiences and perceptions of those exposed and the built environment, thereby forming social vulnerability (Cutter, *et al*., 2003).

Understanding factors that drive social vulnerability will inform adaptation as people are currently coping (surviving with the constraints of their existing resources) and not adapting (reflecting upon and employing practices that generate root and proximate causes of risk) (Popke *et al*., 2014). Even though there is a lack of a uniform definition for social vulnerability, the common thread that runs through all the various definitions is that it is societal, with some studies referring to it as community vulnerability (Murphy, *et al*., 2018). It is this specific form of vulnerability that this study is concerned with.

2.5.2 Social vulnerability approaches

Boos, *et al.* (2009) recognises four approaches to social vulnerability. These are fleshed out in the table below.

Table 1: Approaches to Social Vulnerability

Taxonomic	**Demographic**	**Situational**	**Contextual**
Divides vulnerability into social vulnerability, economic vulnerability, environmental vulnerability, and	Focuses on categorising human impacts as fatalities, casualties, and affected individuals with minimal detail	Focuses on the nature of daily life, actual situations, and how they change. Disasters are viewed as extensions of	Vulnerability is defined by those exposed to the potential loss. It is similar to the situational approach, however here

informational vulnerability	about the overall population	everyday life and not exceptional	individuals are empowered to form part of the decision-making process
Does not account for the dynamics in hazard nature and human interaction	Does not account for the differences in individuals and communities	Accounts for the dynamics within hazard nature and human interactions – disasters are viewed as extensions of everyday life	Accounts for individuals – individuals within communities empowered to form part of decision-making

There are four approaches to social vulnerability as illustrated in Table 1 above. These are the taxonomic approach, the demographic approach, the situational approach, and the contextual approach (Boos, *et al*., 2009). The taxonomic approach to social vulnerability, which is the approach most commonly used, aims to measure social vulnerability according to death, injury, loss, and disruption amongst different groups within a population. It divides vulnerability into social, economic, environmental, and informational vulnerability and further categorises these into age, gender, and status. The demographic approach views humans as components in a wider economic and ecological system by categorising impacts as fatalities and casualties. The situational approach to social vulnerability views disasters as extensions of everyday life and not exceptional events. As such, it focuses on daily life. The last approach, the contextual approach, is also adopted by Wisner (2003). It is rooted in the situational approach; however, the levels of vulnerability, capability, and acceptable risk are defined by the population at risk. It therefore empowers the affected individuals to form part of the decision-making process. The contextual approach to social vulnerability and the ability to cope and adapt is highly contextualised within various contexts, i.e. economic; political; social; and ecological and across multiple sectors (Prior, *et al*., 2017).

While it is tempting to consider the taxonomic approach to social vulnerability, given that it is the most commonly used method, one of its biggest limitations is that it does not account for the dynamics in the hazards themselves as well as in the human interactions (Cutter, *et al*., 2003). Taxonomic approaches to vulnerability, when applied, estimate vulnerability through

the use of indexes (Dwyer, *et al*., 2004; Cutter, 1996). Doing so, disaster is viewed according to losses and this view would miss the "unnaturalness'' of disaster as it does not go deeper into the root causes of the disaster. This research is concerned with locating humans at the centre of vulnerability assessments. Therefore, adopting the taxonomic approach would be counter-productive. The demographic method also appears to be counter-productive for this research as it categorises human impact according to the damage caused, thereby ignoring the disturbance on everyday lives caused by disaster and the constant state of disaster.

The situational approach to social vulnerability would be a fitting approach for this research as it does not view disaster as extraordinary events in the lives of those exposed but rather as the contextual approach to social vulnerability that will be adopted for this research. While the situational approach is appropriate for the aims of this research, the contextual approach takes it a step further by having the level of vulnerability and risk defined by those at risk, thus contextualising vulnerability within the study population and locale.

2.5.3 Measuring social vulnerability

As has been proven in earlier sections (sections 2.4. and section 2.5.1. above), vulnerability is socially produced. Any attempts to study the vulnerability of a certain population to an identified risk therefore need to factor in political and economic inequality. The identification of risks thus needs to be done within the broader social structures that produce it. This complicates its study and assessment.

Social vulnerability has its roots in Vulnerability and, as such, methods undertaken to measure it also have their roots in the vulnerability methods. The understanding of general vulnerability is therefore critical before one undertakes a social vulnerability assessment (Cannon, *et al*., nd).

Before analysing and critiquing the various methods undertaken to measure social vulnerability, this study briefly looks at the assumptions and conclusions that can be made from previous vulnerability studies. The measuring of vulnerability to hazards suggests that the production of vulnerability is uneven; hence the varying levels of vulnerability in society (Dwyer, *et al*., 2004). The uneven distribution of vulnerability often mimics patterns of socio-economic deprivation, suggesting that vulnerability is often intertwined with patterns of global inequality which are linked to how informal settlements form and spread. The unjust distribution of hazard impacts has made it such that it is always those with a low-income level that are impacted the most by disaster. It is also these people that are more exposed to hazards. This has made it crucial to view most environmental hazards, i.e. climate change, as

both an urgent policy concern as well as a social and environmental justice matter (Popke *et al*., 2014) because those who are most likely to be the most impacted by it are those with low-income levels. Whilst hazards are often well known by those at risk and they try their best to address these risks, their ability to do so is constrained by their circumstances and resources, which are often poorly understood (Ngcamu, nd).

Efforts to measure vulnerability therefore need an integrated understanding of all the components involved and how these components combine to affect the resilience or vulnerability of individuals and communities (UNDRR, 2016:b). However, these factors often consider a limited number of dimensions such as the physical aspects of vulnerability, i.e. slope stability; building materials; and economic vulnerability, ignoring the social aspects of vulnerability (UNDRR, 2016:b). There are therefore various methods and resulting algorithms that exist for measuring and analysing physical hazards. However, not enough work is done to understand the social fabric that facilitates community adaptation (Musungu, *et al*., 2016). Consequently, social vulnerability has the challenge of a lack of a uniform method for measuring and analysing it (Prior, *et al*., 2017). Given that social vulnerability also has varying interpretations and emerging approaches, the method that is undertaken to measure it is often dependant on the approach adopted by the research.

This social fabric in social vulnerability can be thought of as the people and the processes that they form. The very essence of "social'' in social vulnerability further complicates measures towards a uniform approach towards social vulnerability as the social is very subjective and what can be considered desirable by one segment of society can be considered undesirable by another (Cote and Nightingale, 2012). Although widely debated, the concept of 'society' can be viewed as constructed by many social levels, from the individual and household, the local community, the regional, national, and even global (Topsell, *et al*., 2010).

As the gaps in social vulnerability assessments have been realised, various approaches to social vulnerability have been formulated.

The Social Vulnerability Model is one approach towards social vulnerability that assesses vulnerability at four **levels**. Firstly, it assesses the **individual level** where the effect of personal attributes, i.e. age, income, residence type, and tenure, are assessed. At a **community level**, the effect of relationships within the community and social networks are assessed by evaluating network size, common action, social participation, and self-efficacy which are not easy to evaluate. Access to medical, welfare, and support services is analysed in relation to vulnerability and is viewed as **regional/ geographic vulnerability.** On the other hand, local government assistance, the presence of charity, and state assistance, as well as how these

affect vulnerabilities, are analysed and assessed as **organisational vulnerability** (Dwyer, *et al*., 2004).

Bera *et al.* (2017) suggest two main methods of measuring vulnerability: the econometric method and the indicator method. The econometric method uses household-level socio-economic data while the indicator method selects indicators from a broad range of indicators that are used to indicate vulnerability levels. The indicator-based method of vulnerability is aimed at describing certain features and it monitors changes in people with the aim of ultimately identifying the primary factors that influence social vulnerability. These factors have also come to be known as social vulnerability drivers (Topsell, *et al*., 2010). Both these methods are more appropriate where the data for the said population already exists. For a population in an informal settlement that is constantly changing this may not be the most appropriate method, especially not when considering the main aims of this research.

People often live and cope with pre-existing disasters which are exacerbated by natural hazardous events, indicating a hidden driver of vulnerability with age, gender, and ethnicity often used as indicators of this vulnerability (Topsell, *et al*., 2010). While these indicators are used as proxies, there are no universally selected indicators. The indicators to be used will be informed by the purpose of the study, the social vulnerability approach adopted, and whether or not the data is available (Prior, *et al*., 2017). Often where the indicator method is used, the suitable indicators are chosen and these are then used to create a proxy variable. A principle component analysis (PCA) is then done to form a composite indicator. The results from the PCA show the indicators that affect vulnerability the most/ the aggregate of two or more indicators and these are often then illustrated on a map to show the areas of high vulnerability (Frigerio and De Amicis, 2016). The use of Geographic Information Systems GIS in identifying priority areas is advantageous, however, it assumes that vulnerability is concentrated in a place which is not always the case (vulnerability of place) (Centre for Security Studies, 2010). This is known as the statistical approach to the indicator-based method but there are two other methods that can be considered, namely using theoretical understandings of the relationships between indicators and subjective criteria to develop and interpret these indicators (Olofsson, *et al*., 2014). The use of indicators in measuring social vulnerability has, however, been critiqued for producing false positives that ignore the variations caused by the interaction of these factors (Olofsson *at al*., 2014), i.e. to have a high vulnerability indicator for females suggests that all females are vulnerable and equally so which is not always the case. Another shortfall of using the indicator-method is that categories such as age, race, and gender are either used as explanatory factors of vulnerability or as fixed categories (Olofsson, *et al*., 2014). It is also not known how these indicators are to be used in decision- making (Topsell,

et al., 2010). Facets of the indicator-based method of social vulnerability will be used for this study but not the entire method will be used. The method used will be further explained in the next chapter.

Up to this point, it has been outlined that most disasters are no longer purely natural as they contain a social element to it, indicative of inequalities within society which result in unequal access to resources and subsequent unequal distribution of disaster impacts with unequal ability to cope with the impacts. As such, the definition of vulnerability, approach, and methods have expanded to include social vulnerability. Social vulnerability, like vulnerability, has the challenge of a uniform definition and the resultant methods to measure it, but what is key is that risk is shaped by social processes, too, and not just physical processes. It is from this point that intersectionality is examined in the next section.

2.6 Intersectionality

2.6.1 Intersectionality defined

Intersectionality was coined as a term in 1989 but its application can be traced back to before 1989 (Hankivsky, 2014). It was first popularised by Kimberlé Crenshaw by primarily illustrating the ways in which race, gender, and class intersect, particularly for black women, and how this positions them before the law (Olofsson, *et al*., 2014), often rendering them more marginalised. It has, however, been noted that to categorise people (subjects) as black women separates them from their everyday unique experiences (Campbell, 2016). Intersectionality has now been reframed and reworked so that it is relevant in Social, Scientific, and Human theory by acknowledging that you cannot reduce people to a single category (McKinzie, 2017). More recently, it seeks to highlight and understand the overlap and interaction between categories of oppression and marginalisation. O'Brien *et al*.,(2009) denote it as "interacting stressors" where multiple factors or stressors interact and, in their interaction, disrupt the social fabric which ultimately affects vulnerability.

Although it is now multidisciplinary in its use, it has roots in Social Science. It arose as a concept from feminist theory (Kaiiser and Kransell, 2008) and it states that inequalities are never a result of a single factor, rather they are a result of various social locations, power relations, and experiences that intersect (Hankivsky, 2014). Alternatively, it is defined as the interactions of social identities and how these shape individual experiences (Corus and Saatcioglu, 2015). Employing it in studies thereby allows the researcher to outline how different forms of marginality co-constitute each other to produce conjectures of vulnerability (Dhawan, *et al*., 2016). Applying it more intrinsically to disasters removes the imaginary

boundaries that have been placed between the social and the natural. Therefore, through disaster and the analysis thereof, we can see how the impacts of environmental hazards interact with social structures. Essentially, intersectionality suggests that any individual or social group is always at the intersection of multiple advantages and disadvantages that overlap (Corus and Saatcioglu, 2015; Gopaldos, 2013). While some scholars suggest that intersectionality is merely an articulation of differences (Olofsson, *et al*., 2014), at its core, intersectionality is concerned with moving away from studying one type of inequality, and instead studying and analysing the interaction of various inequalities. As such, it must always be studied from the viewpoint of those marginalised (Miller and Bowen, 2013). It is because of its focus on the interactions of inequalities that it is not purely additive (Osborne, 2013). Cardona, *et al.* (2012) note that intersectionality does not only outline differences between categories, i.e. men and women, but also within a single category, i.e. between women. Given that this study is concerned with understanding the social vulnerability of residents in Kya Sands, against the backdrop of artificial/ unnatural disaster intersectionality is seen as a fitting lens through which to study the interaction of the factors of the population that produce social vulnerability. Intersectionality is similar to social vulnerability because the manner through which it analyses patterns of structure, power, advantage, and disadvantage is done through categories and these categories are similar to those that are used in Social Vulnerability studies as “indicators”.

Policies aimed at poverty alleviation are often critiqued for considering single-factor poverty triggers, i.e. low-income (Corus and Saatcioglu, 2015), neglecting the fact that individuals may have a low income that can be buffered by social networks. Such intersections create vulnerabilities greater or less than the sum of their singe-factor parts. We also know that, up to this point, literature has demonstrated that nothing exits and acts in singularity; that there is never a sole reason for disaster or vulnerability. Therefore, in studying the population of Kya Sands, this research also acknowledges that it is made up of multiple characteristics that interact to affect the population’s vulnerability. The use of intersectionality often denotes a paradigm based on the identity of persons using categories. This study intends to use it more broadly to bring forth the perspectives of those considered “vulnerable” to highlight categories that contribute towards their vulnerability and how these interact.

2.6.2 Approaches to intersectionality

Not all research methods can be classified into a specific category of approach. However, methods of intersectional analysis are typically one of **three categories**: intercategorical, intracategorical, and anticategorical (McCall, 2005). **Anticategorical approaches** deconstruct differences (McCall, 2005) and focus on the differences between social groups,

denying categories (Winkler and Degele, 2011; Caiola, *et al*., 2014). It considers processes and how they produce and reproduce categories over time (Corus and Saatcioglu, 2015) **Intercategorical intersectionality** contrasts two or more social groups in a similar setting to discover the dominant category of inequality (Corus and Saatcioglu, 2015). The categories considered will be determined by the researcher, but they are usually factors that affect inequality such as age, race, and ethnicity. The use of indicators in social vulnerability can be likened to this as its end goal is also to combine various indicators to determine the dominant indicator that affects social vulnerability. **Intracategorical approaches** are concerned with analysing one social group and determining the overlapping categories of disadvantage within that social group. It considers qualitative methods Corus and Saatcioglu, 2015; Caiola, *et al*., 2014). The research approach to intersectionality adopted for this study does not fit neatly into any of the above-mentioned categories. It adopts facets of each: it is intercategorical because multiple inequalities are considered and chosen, and these are chosen before-hand, but it is also intracategorical intersectionality because it is done at the micro-level, considering people within one social setting – Kya Sands. Again, the very use of categories is critiqued because, while it allows for the in-depth study of social entities, the results obtained must still be generalised and this is where the intricacies and hidden intersections are often left out.

2.6.3 Intersectional analysis

The method chosen for intersectional analysis depends on where it is being studied (Griffin and Museus, 2011). It can be either qualitative, quantitative, or mixed methods but they often have a strong qualitative focus (Griffin and Museus, 2011; Grace, 2014) and it can be studied at an individual level (micro), organisational level (meso), or institutional or community level (macro) (Winkler and Degele, 2011; Corus and Saatcioglu, 2015).

Intersectional analysis, however, lacks concrete, methodological analyses (Christensen and Jensen, 2012) and is an evolving concept (Caiola, *et al.,* 2014). It is further complicated by the lack of a framework (Caiola, *et al*., 2014). It is also used in numerous disciplines at various levels of analysis (Winkler and Degele, 2011). Furthermore, at its core, intersectional analysis is concerned with the study of social entities and any study of the social is already complex. Intersectional analysis is critiqued two-fold, first for lacking a uniform method, but also because the methods that do exist are narrow. This, however, also offers a window of opportunity as the conduct for research is still largely unspecified (Choo and Ferree, 2009). Whichever method is considered apt by the researcher must be relational and all the researchers' assumptions must be made explicit. More important than the method undertaken is the ability to analyse relationships that affect people intersectionally (Choo and Ferree, 2009).

Intersectional analysis addresses the question of social categories and how they are reinforced during times of crises. It thus promotes that humans be understood as being shaped by the interaction of different social forms, i.e. race, age, gender, ethnicity, etc. and recognising that these social forms exist within a connected structure of power (Hankivsky, 2014). It, however, does not promote an additive approach to vulnerability – summing up the independent effects of the social categories – rather, it wants to conceptualise how the different factors will interact to form unique social locations. De Los Reyes (2017) calls on a mixed method approach for intersectional analysis which is a combination of qualitative methods and quantitative methods, a middle ground for both methods which overcomes the limitations of each method.

When analysed qualitatively, the preferred research design is a case study and the preferred methods of data collection are life story narratives through which categories emerge from the way in which people narrate their lives (Christensen and Jensen, 2012). These are done through interviews which also allow one to analyse face-to-face interactions. This study also adopts a qualitative method.

Winkler and Degele (2011) offer a step-by-step method of analysing data for intersectional analysis after it has been collected. This includes describing the identity constructions of the study population, i.e. how they view themselves. The researcher assesses the symbolic representations as well as references to social structures, e.g. class, gender, race. The researcher then identifies the central categories, compares the construction of these, and supplements it with structural data. The next step is to look for representations of these in dominant representations, i.e. mass media and use this to elaborate on the interrelations evident as intersectionality.

While the literature reviewed on informal settlements and their increase in South Africa; vulnerability; and the social production thereof, which has somewhat of a domino effect leading to social vulnerability and artificial disasters, all paint a portrait of an increasing awareness to centre those at risk at the core of any vulnerability studies, it still to an extent defines vulnerability for those affected by hazards. Furthermore, there exists no uniform method for measuring social vulnerability or intersectionality and the interaction of its stressors, allowing room for the researcher to develop a subjective and uniform method to measure it. It therefore becomes evident that the method of inquiry for this research will be unique because it rests on emerging theories which are all still flexible, allowing the researcher to navigate it as they deem fit.

This research acknowledges the results of past studies, however, in going into the field, the researcher wanted all data obtained to come from the research participants themselves, including the hazards experienced by the people on the ground, the social vulnerability drivers that drive their vulnerability, and how these interact. The following section therefore outlines the methods undertaken to investigate the subjective experience of exposure to hazards and the resulting mitigation methods, as relayed by those at risk.

This literature review has illustrated how the concepts intersectionality, unnatural disaster, and social vulnerability have come to be, what they entail, and the shortfalls in each. Intersectionality aims to bring to the fore how the categories that an individual possesses – categories that are often inherent, i.e. age and gender – interact and affect one's positioning or marginality. Similarly, social vulnerability recognises that people are not equally vulnerable and the spread in vulnerability is often linked to global patterns of inequality. Unnatural disaster suggests that many of the disasters experienced are unnatural because they could have been circumvented if the necessary social infrastructure was in place.

These three concepts are inter-linked and are critical for this study as they all seek to emphasise the effect that social processes and social systems have on people's vulnerability. While this research does acknowledge that those in informal settlements, and in particular Kya Sands informal settlement, are at a greater vulnerability to physical hazards by virtue of their socio-economic standing, it draws on social vulnerability and Murray's concept of unnatural disaster to demonstrate that this vulnerability is not just a function of income but extends to include other social factors. Even in drawing upon social vulnerability to highlight the various social factors that encompass vulnerability, this vulnerability is not homogenous within a locale.

This study then draws on intersectionality to illustrate how each person is a unique social entity and, while they may all possess those qualities that social vulnerability draws upon to indicate social vulnerability, when these qualities interact they produce a different vulnerability in everyone. However, despite this, it has been evidenced throughout literature that the greatest challenge remains a lack of a uniform definition for these terms and this ultimately affects the methods that are adopted to measure them. Furthermore, in trying to define and measure vulnerability and its various spin-offs (i.e. economic vulnerability and social vulnerability), there is an attempt to measure that which the academia, civil society, and state have defined and then call on communities to give input in the form of community participation/ participatory vulnerability assessments. Ultimately, even though affected communities are called upon to assist in coming up with mitigation measures, it is not the communities who define the "state of normalcy" that the mitigation measures will be trying to return to. Therefore, to account for

this gap that has been identified, this research study will investigate the intersectionality of vulnerability in Kya Sands in order to demonstrate the link between environmental vulnerability and other forms of social and economic marginality. This will be done from the viewpoint of those affected. Therefore, while the research relies on commonly used methods of assessment, these methods will be undertaken from the viewpoint of those affected. In doing so, not only will knowledge on how the community experiences vulnerability be gained, but the place-making views of residents will also emerge.

3. Methodology

This chapter will detail the empirical methods employed in data collection for this work that are essential in the achievement of the research questions. This section will focus more on the method employed and not on the methodology that was used to develop the method. A review will also be given of the study background, before delving into the research design, data collection, and analyses. The chapter ends with how the researcher experienced Kya Sands and what the limitations of the research method were.

3.1 Study Area

Social Vulnerability is best studied after a disaster event. Vulnerability studies assume that, during recovery, a community that has been struck by disaster is trying to return to its normal state, therefore assuming that the community was "normal'' before disaster struck (Doberstein, 2012) but who defines what normal is and what does it look like? Kya Sands experienced a huge fire in 2016, receives little state intervention, and is located within the ring of fire, a circle around areas in Johannesburg said to be prone to fire – what Murray (2009) considers to be artificial disasters that produce hazardscapes, places where the risk is deemed higher. It has also been the source of protests for state services. It is therefore a suitable place to study social vulnerability as an intersection of civic discontent is already evidenced through organised protests and an increased vulnerability to shack fire because of its physical location and inadequate state services.

Essentially, this study wanted to understand the differences in the social constructions of vulnerability and exposure to hazards for residents in Kya Sands. Doing so required an understanding of the community and, as such, even before research was conducted some knowledge on the study area was necessary. Kya Sands lies in South Africa, in the Gauteng province in the City of Johannesburg. It is the largest informal settlement in Johannesburg North (Adegun, 2016) which could possibly be attributed to the fact that Gauteng is South Africa's economic hub and Johannesburg North is rapidly developing, therefore attracting people who are in search of economic opportunities. Over the last 100 years Johannesburg has become one of the critical nodes where capitalism and globalisation are concerned (Valasis, 2015) and the proliferation of informal settlements across the city can be seen to mirror the global patterns of capitalism and its resulting inequality. Figure 2 illustrates the unequal divide seen between Kya Sands and its neighbouring suburbs. It lies 15 km North West of the Johannesburg Central Business District (CBD) and is in Region A of the City of Johannesburg local municipality (Mpe and Ogra, 2014). It is on both sides of the Kya Sands

Spruit, west of Kya Sand Industrial and south of a landfill site. On its north side is Msawawa, another informal settlement, and South East of it lies the urban suburb of Bloubosrand (Adegun, 2016). It is interesting to note that Kya Sands lies next to a suburban neighbourhood and another informal settlement, symbolic of the unequal process of urbanisation. It has four sections: Section A, Section B, Section C, and Section D.

Its history can be traced back to 1989 where it started off as informal shelter for people who worked at Kya Sands Industrial, from which Kya Sands got its name. It is located on both private and state land and it is reported that the first settlers were invited to settle there by the landowners on the agricultural holding (Weakley, 2013; Adegun 2016). Kya Sands is located right next to a landfill site. Earlier on in the literature review (2.2. Informality and precarity), the city was described as a dumping ground for a surplus population, and here we see the manifestation of that in how Kya Sands is located on a dumping area for the industrial area. Moreover, its members feel like they have been abandoned by the state. Kya Sands is further anchored by the Fourways node, comprising of office developments, retail, and entertainment centres (Department of Economic Development, 2008). This high concentration of development makes up the high economic potential in the area which is a big attraction force for the Kya Sands population within the city. Furthermore, Kya Sands has a link to Witkoppen Road and Wiliam Nicol Road as well as the N1, enabling access into and out of the city which makes it easy for trans-province migrations.

The services offered by the state to informal settlements are provided through the municipality. They are temporary and are called “interim basic services’’ and are limited to the provision of water through communal taps, sanitation through communal ablution, high mass lighting, interval waste collection, and the grading of gravel roads. These vary per settlement and are often provided in response to aggravation by residents in the form of protests (Adegun, 2016). Kya Sands is no exception to this; it receives 48 taps through 8 standpipes, 12 water tanks, 120 toilets, and scattered high mass lights (Weakley, 2013). Although Kya Sands was formed in 1989, it only started receiving these services after a mayoral road show in 2006. The residents have been promised relocation to Lion Park since January 2007 but this still has not materialised (Adegun, 2016).

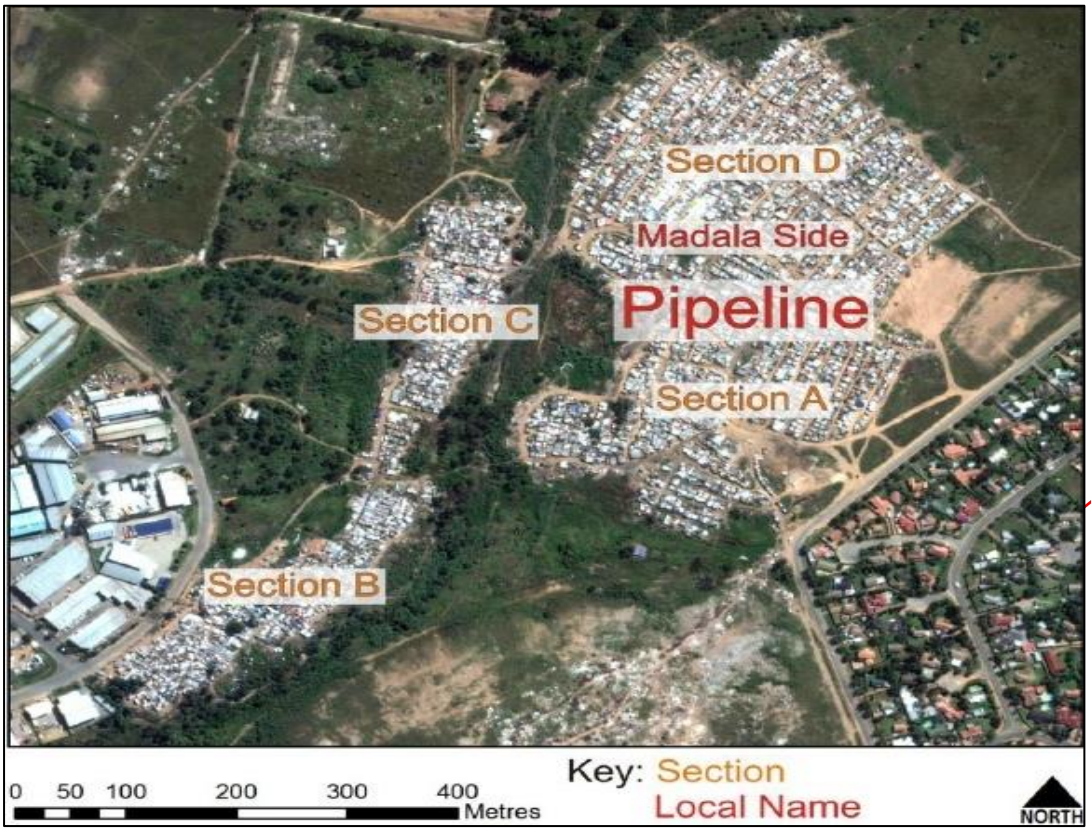


Figure 1: Map illustrating Kya Sands and its different sections (Weakley, 2013))



Figure 2: Aerial view of the bridge of divide (inequality) between Kya Sands and its neighbouring suburbs (Unequal Scenes, 2019)



Figure 3: Photographic representation of Kya Sands in the context of neighbouring suburbs and main roads (Rangata, 2015)

3.2. Developing a Research Method

As has been stated in the introduction to this chapter, this chapter will detail the method that was employed to collect and analyse data. Any method, however, must have epistemological and ontological considerations which frame the method. Ontological considerations are concerned with answering "What is there?" (Vanson, 2014). This research aims to understand the social world of Kya Sands and how social inequalities are produced and perceived, suggesting that people and their characteristics are fluid and research represents but a portion of their reality (Bryman, 2011). This form of ontology is constructionalism (Schwartz-Shea and Yanow, 2012). It is considered appropriate for this research because it is centered around acknowledging that our knowledge of the social world is limited. Given the increasing multi-disciplinary approach of research the clear lines of distinction between the various ontological considerations are also becoming blurred because, while this research can be said to have a constructionalism approach by its acknowledgement of our limited knowledge, it's conclusion suggests that it has aspects of positivism which says that the reality of organisation is different from the reality of the people (Vanson, 2014).

Epistemology considers what the researcher accepts as knowledge by asking "What do you know?" and "How do you know it?" It guides the research method specifically because it directs whether research will be qualitative, quantitative, or mixed. The aim of this research is to

understand social vulnerability in Kya Sands and it does this through rejecting absolute truths (i.e. accepting what hazards residents are exposed to through literature, denying absolute claims of the effect of social vulnerability drivers on vulnerability) and rather understanding it through interpreting their actions. This type of epistemology is interpretivist.

Therefore, this research is qualitative. Given that this study sought to investigate and understand vulnerability in Kya Sands, the interaction between the researcher and residents at Kya Sands through semi-structured interviews allowed for intrinsic, subject-specific and in-depth results that categorise this form of methodology as qualitative. Qualitative approaches are often used to gain an in-depth understanding of the object of study through rigorous descriptions and observations, and they do not involve measurements or numerical data (Bryman, 2011).

Vulnerability essentially speaks to qualities present in the social system even before the disaster occurs (Bergstrand, *et al*., 2015). As vulnerability is socially produced, it is best studied through the views of those considered at risk. It is a case study as it is site-specific and focused on Kya Sands and this paper focuses solely on the arguments that will be put forward by the residents as reasons for their vulnerability. The results obtained are therefore indicative of a dominant ontology and thought process regarding their vulnerability within the Kya Sands informal settlement community and their decision-making processes. They reveal the need to incorporate their views into common Science-World views of social vulnerability, particularly in informal settlements. Although the results obtained are for a small portion of the Kya Sands population, they could be indicative of a broader perception of vulnerability, as interpreted by those considered at risk.

3.3 Data Collection

Table 2: Methods Table Depicting the Various Tools Required for Each Research Objective

Methods Table Research Aim: To understand the way community members understand their vulnerability to various hazards					
No.	Research Objective	Data Required	Data Source	Tools	Data Analysis
1.	To understand the environmental risks and hazards that residents in Kya Sands are exposed to, as experienced by residents	Hazards residents feel exposed to (hazard name, hazard cause, hazard severity/ intensity)	Residents	Semi-structured Interviews	Interview transcription and coding; Statistical analysis
		Disaster events to result from those hazards in the past 10 years, as told by residents	Residents	Semi-structured interviews	Interview transcription and coding; Statistical analysis
		Disaster events to result from those hazards in the past 10 years as reported in the media	Media Sources (Internet)	Desktop study	Statistical analysis

2.	To critically assess the intersection/ interaction of various social vulnerability drivers and how this affects the overall social vulnerability in Kya Sands, as perceived by residents	The perception of the various social vulnerability drivers on social vulnerability Interaction of the social vulnerability drivers on social vulnerability	Residents This will be inferred from the perception of the various social vulnerability drivers on overall vulnerability	Semi-structured interviews	Interview transcription/ Coding/ Statistical analysis Interpretation
3.	To document and assess the different mitigation strategies that are employed by residents at Kya Sands to cope with environmental hazards	Mitigation strategies employed by residents to cope with hazard exposure and the resulting disaster risk	Residents	In-depth interviews	Interview transcription and coding; Statistical analysis

Efforts to measure vulnerability often consider a limited number of dimensions, often also attempting to categorise these risks as physical, economic, social, or environmental. Essential to any vulnerability assessment is that it should answer “who?” (social vulnerability indicators reveal the characteristics of the study population; Research Objective 2), “what?” (hazard identification; Research Objective 1), and “to what extent?” (are they able to mitigate against

it; Research Objective 3). The methods table above (Table 2) illustrates the various tools that were necessary to answer each research objective.

While this research sought to obtain qualitative data, the data required was vast and particularly different for each section/ research objective. Interviews were therefore split into two parts with a break in-between. In the first part of the interview, respondents were asked what kind of hazards they felt they were more exposed to because of living in Kya Sands. These were discussed in detail. However, at the end, participants were asked to limit these to four and rate their severity. The second part of the interview then focused on evaluating how research participants felt the social vulnerability characteristics affected their vulnerability. Interviews were, however, flexible in how they started and the sequencing of questions. It included much probing which directed which parts were dealt with first. The interrelationship between the various social vulnerability indicators was inferred and the factors which either supported resilience or expanded this vulnerability were also inferred from responses; especially those related to mitigation. Ultimately, because these are not direct proxies for vulnerability, some degree of interpretation and translation is always required.

A desktop study was also done on the disaster events that have been experienced in Kya Sands over the past 10 years. This was done to answer the second research question which is "What are the disaster events that have happened in Kya Sands over the past 10 years?" This was difficult to ascertain but, also, caution was exercised to remain within the contextual approach of this research. Having gone to look for specific disaster events, the most common disaster events would be natural disasters or large-scale man-made disasters, suggesting that these are what we project as disaster events, again ignoring the '"artificial disasters". Considering this, an internet search was done on Kya Sands Informal settlement and, without categorising; all the events that were associated with Kya Sands were recorded.

This first research objective to emanate from the research aims is to investigate the hazards that the Kya Sands population is at risk of. This was done through interviews conducted with research participants. Prior *et al* (2017) defines hazards as events or processes with the potential to disrupt society, having natural or anthropogenic origins. When they interact with society, they cause a loss of life and loss of property, resulting in disaster. In their literature, Cardona *et al* (2012) state that the hazard itself is not the risk; it is one of the components of risk. They argue that disaster risk management follows one of four approaches: risk identification, risk reduction, risk transfer, or risk accumulation. Risk identification is concerned with the identification of risk through individual perception, the evaluation of risk, and the social interpretation thereof. These hazards were identified through interviews held with research participants. The researcher did not go into the field with pre-empted/ predefined hazards; this

was asked as an open-ended question: “What do you view yourself as being in danger of here in Kya Sands? Of those dangers that you have mentioned, which one would you say you are exposed to the most and why? What do you think causes it?” This also follows from the perception of social vulnerability indicators because it is often critiqued that it is common to find blanket descriptions of the elderly, children, or women as vulnerable without identifying what it is that they are vulnerable to (Cardona *et al*., 2012). Similarly, hazard causes are often blanketed, considering only the physical sources of hazards without further investigation to understand the social causes of some hazards. The second research question avoids this common fault in vulnerability studies.

Social vulnerability assessments often rely on Social Vulnerability Indicators to measure the level of social vulnerability. The indicators used for this study assess factors considered to be of an individual nature, i.e. age, gender, ethnicity, highest level of education obtained, and employment status. It also measures family characteristics such as household composition and marital status and sociocultural characteristics, i.e. networks in Kya Sands, networks outside of Kya Sands, and perception of risk as well as structural characteristics. Structural characteristics assess factors such as where research participants lived before they moved to Kya Sands, why they moved to Kya Sands, how long they have lived in Kya Sands, their tenure status, and the type of building material used. These categories and indices, however, often measure the level of vulnerability in specific populations/ communities and equate it to a single unit value that is then indicative of the level of vulnerability for the said population as has been explained in Chapter 2, Measuring Social Vulnerability. Statistical analysis is also often employed to measure variance and significance in order to determine which of those above-mentioned factors seem to have the greatest effect on vulnerability. While this study also adopts the use of Social Vulnerability Indicators, it uses these not as a way to determine how vulnerable the Kya Sands population is and which factors influence their vulnerability the most. Rather, it uses the Social Vulnerability Indicators to ask the research participants[2] how they felt these various indicators affect their overall vulnerability.

The first part of this research was thus concerned with asking research participants how they felt the selected social vulnerability indicators affect their vulnerability. The adoption of indicators in the assessment of social vulnerability is often used where the taxonomic approach is adopted. This research adopted the contextual approach and used indicators. What is considered as social vulnerability drivers/ indicators in some studies is considered in environmental justice research as social dimensions (Ryder, nd). The use of indicators here

2 Research participants, respondents, subjects, and participants used interchangeably

therefore still adopted a contextual approach that is centered on the experiences of those at risk. An enquiry into indicators was asked in a semi-structured interview with probing but it still allowed for participants to express their feelings. Respondents were asked questions like “Tell me about yourself. How old are you? Do you think that your age affects your vulnerability? Does it affect what you are able to do if there is a disaster here? Do you think that if you were older/ younger, you would have been affected by disasters differently? How? Have you ever felt like you were at a disadvantage because you’re a woman? What is your highest level of education? Do you think that this is modifiable? Are you interested in modifying it? Why?” This is how the questions related to the social vulnerability indicators were asked.

Given the elasticity of vulnerability as a concept and its ability to cover any person, group, or situation, the selection of vulnerability indicators is often done on the basis of a literature review (Lin and Hung, 2016). These are often viewed as indices relied upon in the assessment of vulnerability (Bevc, 2013). It must be noted, however, that these indices/ indicators are not quantitative (Dwyer, *et al*., 2004) and to use them is not to suggest that this study employed the indicator-based method of vulnerability assessment. Vulnerability is complex and very dynamic such that it often does not fit neatly into models (Twigg, 2001). The use of indicators were used as per the subjective approach to the indicator method (Topsell, *et al*., 2010). This study therefore did not adopting a certain model/ vulnerability assessment method.

There is often a misrepresentation in conceptualisations of intersectionality where it is assumed that the intersection of certain categories affects people in a fixed way (Dy, *et al*., 2014). The researcher was cautious of this and that is why, although indicators were selected, the researcher did not go out to the field with a certain measure of certain categories, i.e. age increases or decreases vulnerability therefore if more than half of the research participants are above the age of 55, then more than half of the Kya Sands population is vulnerable. The individual areas of vulnerability have been adapted from the Social Vulnerability Model (Dwyer, *et al*., 2004). They are considered as social vulnerability indicators.

Table 3: Social Vulnerability Indicators

Social Vulnerability Model			
Individual Characteristics:	Family Characteristics:	Sociocultural Characteristics:	Structural Characteristics:

• Age • Gender • Highest Education Level • Income Source • Ethnicity	• Marital status • Number of dependants • Number of people you live with? • Who is the head of the household?	• Networks in Kya Sands • Networks in Johannesburg • Risk perception	• Where did you stay before Kya Sands? • Why did you move to Kya Sands? • Form of tenure? • Type of building material?

The Social Indicators chosen from the Social Vulnerability Model are very common amongst various social vulnerability assessments (Dwyer, *et al*., 2004). After selecting these indicators, the researcher investigated the relationship between the indicator and vulnerability as determined by those at risk. This gave an indication of the values of the research subjects because their perception of risk and what affects it is shaped by their values and this, in turn, affects their responses to the perceived risk (Olofsson, *et al*., 2012).

During Hurricane Katrina, the particularly old and young died, indicating the importance of age in vulnerability. Similarly, in the developing world, women are more likely to die during disaster because of discriminating processes in the community which is reflective of the role of culture and context in vulnerability assessments (Ryder, nd). The study of the social vulnerability indicators therefore not only provided an indication of the social factors that affect vulnerability, but also reflected the cultural practices adopted by the study population.

Research participants were then asked how they mitigate against these identified hazards or how they try to prevent them from happening. They were also asked who they felt was responsible for eliminating these sources of hazard. This answered the last research objective.

3.4 Population Sampling

The data sources relied upon for this research as has been mentioned was qualitative data. This was in the form of structural data, historical disaster data obtained from media reports, as well as the self-perceptions of vulnerability retrieved from interviews (Cardona *et al*., 2012). These data sources are both primary and secondary. The secondary data sources are retrieved from the internet and therefore did not need any sampling. The primary data, however, was obtained from residents in Kya Sands and the recruitment of the research participants had to be sampled. The researcher made use non-probability random sampling – multi-stage cluster sampling – because different sections within Kya Sands had to be visited. The first few participants were recruited at a community meeting held by the community leaders where this research project was introduced. These participants then referred the researcher to other residents, a form of snowball sampling. Some participants were, however, not recruited by the researcher; they just showed interest when they saw the researcher conducting interviews with fellow residents and asked to take part. Kya Sands is comprised of four sections – Section A, B, C, D and the researcher wanted to make sure that an equal number of participants from each section were interviewed. A number of 40 interviews were conducted, with 10 people from each section. These were not to be viewed as a representation of the entire Kya Sands community but rather it is a selected sample given the time and resource constraints of a MSc. research study. The researcher was not specific in whether respondents were male or female, the only limitation was that participants had to be over the age of 18.

3.5 Data Analysis

Once all the interviews were conducted, they were transcribed. Interviews conducted in any language other than English were first translated into English and then the key codes or phrases were identified for coding. After this, qualitative analysis was done. All the categorised hazards given by residents were grouped together because of similarity, i.e. hazards related to water were all grouped together as water, all those related to shack fires were grouped together, all those related to crime were grouped together, and all those related to ill health were grouped together. Each response was written out in a table as follows:

Table 4: Table to Capture Interview Responses

RESPONDENT 1	Hazard 1	Hazard 2	Hazard 3	Hazard 4	Hazard 5
Describe hazard					
Hazard Cause					
Responsibility to mitigate hazard					
How do you mitigate against it					
Rate hazard by severity					

Fields were created based on the interview responses. This table helped quantify responses as from this, the researcher was able to analyse the data numerically, i.e. xx number of people rated hazard 1 as the most severe and xy number of people rated hazard 2 as the least severe. These were also contrasted with the results from the desktop study done on "incidents that occurred in Kya Sands" to see how many of the reported incidents correlated with those reported. These interviews were also read through individually and codes were created for each for each response, i.e. what hazards do you feel exposed to? Who do you feel is responsible for mitigating against these hazards? Sometimes the respondents would answer the questions directly, i.e. I feel that the government is responsible for mitigating against these hazards whereas other times, respondents would not answer who they felt is responsible for mitigating but during the interview would say "there is nothing I can do, I have to wait for my landlord".

The second part of the interview asked respondents how they felt their characteristics (social vulnerability drivers) affected their social vulnerability. Again, to first get a general idea and a statistical analysis/ summary of results, the researcher wrote down the responses into a table and the responding fields were filled in into a table like this:

Table 5: Table to Capture the Effects of Characteristics on Social Vulnerability

Individual Characteristics	Can I change it?		Does it affect my social vulnerability? How?
	Yes (Describe How)	No	
Age			
Gender			
Ethnicity			

The number of yes and no responses were then counted and used to account for whether respondents felt that the said variable affected their vulnerability and whether or not participants were interested in changing this. In the study, the researcher also accounts and reports for those that were in the minority; the researcher didn't only focus on what the majority said and recorded only their responses. After looking at whether participants felt that a variable affected their vulnerability, the researcher counted how many of those who felt it affected or didn't affect their vulnerability were interested in modifying the variable and how they would do this and just how the variable affected their vulnerability.

The information retrieved from the Social Vulnerability Indicators perceptions, although somewhat quantitatively analysed by counting and summarising the number of "yes", "no", or "doesn't matter" responses and grouping the reasons given that were similar, any other response was not statistically analysed into a metric. This was because attempting to translate personal vulnerability into a single, quantifiable unit decreases its complexity and impact, and over-simplifies it (Adger, 2006).

The last research objective was concerned with understanding and recording how participants mitigate against hazard exposure and disaster risk. Mitigation was asked in the first part of interviews where respondents were asked about the hazards that they felt they were exposed to and how. Again, here answers were coded as per the Grounded Theory Method.

Grounded Theory Method

This study adopted Grounded Theory which is a research method that discovers emerging patterns and offers explanatory patterns for them (Scott, 2009). It is not discipline-specific nor is it limited towards the qualitative or quantitative method, it is applicable with either methods. It became useful in data analysis where the interviews were transcribed. It does not use pre-existing conceptualisations and, as previously stated, this research also did not use previously existing conceptualisations of vulnerability.

3.6 Ethical Considerations

Any research that involves contact with human sources needs to have ethical considerations. This study involves the interaction of people and, subsequently, there are ethics to be taken into consideration. This was done with the aid of the University of the Witwatersrand guidelines for ethical research. Verbal or written consent was required by the researcher from the participants before the commencement of the interviews. A consent form (Appendix A) and a participant information sheet (Appendix B) was given to the research participants for participants to go through. At times the researcher went through these with the participants. After consent has been given, these were signed by the research participants. In the case of illiterate participants, the researcher went through these with participants. Through the permission of research participants, interviews were also recorded, only if and when permission was granted by the respondents. This is done purely for accuracy purposes, to ensure that interview notes, and subsequent analysis thereof, was correct and is a true reflection of what was said. Confidentiality was practiced to the best of the researcher's ability and the research participants' names were not to be used in any instance. Participation was purely voluntary and research participants could disengage themselves from the study at any point if they felt the need to do so. No coercive measures were engaged in by the researcher. If at any point the research participants did not understand, they could ask, and all was explained. Interviews were conducted at the homes of participants to ensure their comfort, or any location within Kya Sands which is considered safe. Before interviews were conducted, the research project was introduced and its rationale and why the participant has been selected was explained. Voluntary participation and confidentiality was re-assured.

All data received will be handled with the utmost care. No participant names will be stored on hard drives or anywhere on the data. Instead, identifier codes will be used in the place of names. No transcripts will list names and data will be kept safe and backed up on Google Drive. The ethical clearance certificate is attached (Appendix C).

3.7 Approaching the Community/ First Entry into Kya Sands

This study was not the first time that the researcher was be in Kya Sands as she used it as the study site for her honours research project and she still had contact with some of the community leaders. It was evident that contact would be required with the community leaders of the settlement to introduce the research project and get permission to access Kya Sands and its members. Contact was made with the leaders through the researcher's research supervisor, Dr. Alex Wafer who, at the time was also introducing Dr. Cinnamon, a United Kingdom-based researcher who does research in Kya Sands to the community. The research project was introduced to the community leaders, the key outcomes intended for this research were also explained, after which the leaders granted their permission and gave the go-ahead to conduct research in the settlement. During the meeting with the community leaders, the ethics clearance certificate was shared with the community leaders. The community leaders then set-up a community meeting at the local crèche where the research project was introduced to the community. Many of the community members were very receptive towards the project. They were open and available to partake in the research, the only concern that they had is that they wanted to know of the tangible benefits that they could possibly get from this. Some were even getting agitated when told that there would be no tangible benefits. Some of the community members thought that this meeting was a meeting for them to voice and discuss the discontentions that they had with staying in Kya Sands.

The mood was generally sombre at the meeting, especially amongst those residents who had been in Kya Sands for longer than 10 years and were old. While they complained that they didn't seem to have any hope while amongst the new and younger residents, the mood was relatively uplifted, and many seemed to say they were coping. Some members were disinterested while others continuously stated that they avail themselves to so many research studies conducted in the settlement even though they never see the benefits of this.

3.8. Reflection on the Method

The researcher began this project with the aim of exploring the responses of individuals to the devastation of environmental hazards like fires with the aim of understanding how people cope, the resources and capacities (personal and extended) that they can draw upon to endure in a context that many of us would find unbearable. It became clear to the researcher when she first visited Kya Sands that it was not so much their exposure to risk that defined their vulnerability as the fact that people normalise this risk because of its unpredictable but perpetual presence in their lives.

The main aim of this research project was to investigate what the hazards experienced in Kya Sands are and what the social vulnerability of those in Kya Sands to disaster is. Furthermore, the researcher wanted to understand how the various factors that produce this vulnerability interact to produce a variegated vulnerability amongst residents. Research was therefore carried out under the premise that disasters are increasingly becoming social constructs, especially those experienced in informal settlements. This means that disasters are results of social processes far removed from the victims, i.e. unequal resource distribution which increases hazard exposure and, therefore, vulnerability. Additionally, this study recognises that social vulnerability, too, is often created and is created by processes that have very little to do with those considered vulnerable. The study of intersectionality is often concerned with how the various categories of inequality/ disadvantage, i.e. age, gender, and ethnicity, interact within individuals to produce a vulnerability that is greater than the one caused by the single factors of inequality and how this positions individuals. Similarly, the study of social vulnerability is concerned with assessing how factors such as age and gender, factors considered "indicators" or drivers of social vulnerability, produce a vulnerability within individuals and which of these factors are the greatest contributor towards one's vulnerability. This research operated with the assumption that not all residents within Kya Sands are equally vulnerable to disaster as they are all unique entities with unique characteristics.

In the same breath the concept of Social Vulnerability indicators is used in the assessment of social vulnerability and intersectionality. How these are used will be expanded on later.

Initially, the researcher wanted to do a Social Vulnerability assessment in Kya Sands, however, in reading up on social vulnerability measurement practices, she realised that none of the existing methods would yield data that would answer the research questions. While much literature on disaster and vulnerability was found, the researcher could not find uniform definitions or uniform ways of measuring these. The researcher decided that, if the vulnerability of those in Kya Sands and the hazards that they are exposed to is to be understood, she needs to do so from their point of view. As such, after the first day on the field, the questions posed to research participants and how they were being asked had to be changed in order to extract data that is more reflective of their thought processes. For example, on the first day in the field participants were asked what hazards they feel they are vulnerable to because they live in Kya Sands. Starting the interview like that, participants closed up and would only answer what was asked, i.e. everything is bad here. When the interview style was changed and the participants were first asked to tell the researcher more about themselves and then asked follow up questions from that, more answers that where

more personal and detailed were yielded. At the end of the second day, even with the change in the format of interviews, the researcher could already notice trends emerging.

The researcher first needed to find out what exactly it is that the residents view themselves as being exposed to as opposed to going into the field with pre-determined hazards from literature. This was done through the interviews that were held with research participants with some probing. These interviews were open-ended and while this worked in terms of uncovering exactly what it is that research participants felt they were exposed to, the data received was very broad. The researcher also saw that it would be a challenge analysing that data. Participants were then asked to limit the hazards that would be discussed to four hazards. This was, however, still challenging because they didn't all list the same hazards and, as such, when analysing them the researcher still had to categorise them for ease in data analysis.

Another challenge that the researcher encountered with having participants define their own hazards was that sometimes what the residents perceived as "hazards" were not the researcher's view disaster-causing hazards, but rather factors that make moving around and living in the settlement a bit more difficult. Upon introspection, the researcher realised that she wanted to project her view of hazards onto residents' perception of hazards, so that they fit neatly into what is typically considered a hazard. The National Disaster Management Act defines disaster as something that is either sudden or progressive that causes disruption to community functioning. Therefore, while it is common to limit the view of disaster and, as such, hazards, to those with the potential to destroy lives and property, the Act also makes provision to those that disrupt the functioning of communities. This has made the researcher realise that often times, studies that embark on assessing vulnerability in a specific population often do not engage the very meaning of disaster and vulnerability to those affected and doing so would tremendously change the manner in which they are studied. Therefore, while the researcher was tempted to define the hazards for the residents so as to make the data manageable, it was realised that this is counter-productive. To make the data manageable residents were asked to relay four hazards that they are exposed to and then rate these according to severity. A desktop study on all the media reports related to Kya Sands was also conducted as the researcher wanted to see how many of those were disaster events and which of those disaster events were in line with the hazards that the residents felt that they were most exposed to.

The study of social vulnerability was a lot more complicated as it also required a great amount of data. In assessing social vulnerability, the researcher wanted to find out how the residents perceive the social vulnerability drivers as affecting their vulnerability. While this was a relatively easy concept, the number of indicators used was numerous and resulted in very

lengthy interviews. They were, however, beneficial as they yielded a good amount of data, functioning more like life history interviews and not just interviews to discover the perception of vulnerability.

Once participants started talking about the hazards that they faced, they were then asked what they thought were the causes of these and what they did to try and cope with these hazards (mitigation). There is insufficient work done on the social fabric that aids in community adaptation after disaster (Musungu, *et al*., 2016), making the assessment of community adaptation important.

While this was not an intention of the research at first, when the researcher noticed that researchers often project their view of disaster on research participants, she wanted to further test this. The common way of assessing social vulnerability takes social vulnerability indicators and analyses these to discover which indicators influence social vulnerability the most. The researcher, however, steered away from the common assumptions that older age increases vulnerability but rather asked participants “you say you’re xx years old? How do you think that that influences how you experience living in Kya Sands? Do you think being older or younger would help you? How?”

The researcher did not have a particular way of doing intersectional analyses as the way in which social vulnerability was investigated covered it, given that it considered the same categories and the interviews were already too long. The researcher analysed the responses from the social vulnerability indicators to see how they interacted.

Participation was evenly spread. There were some people who were eager to participate during interviews and some even asked if they can take part in the research upon spotting the interviews taking place. Some were even willing to queue outside while the researcher was interviewing others. The researcher made use of a research assistant who was familiar with Kya Sands and could help navigate the area so that the whole settlement was covered. However, because the research assistant often helps people with research, there were some people who, when they saw us approaching would tell her that “they are tired of her and her people”. Although the researcher had a research assistant, this was mostly to help navigate the settlement. The researcher generally preferred to be alone with participants when conducting interviews. This was because for the most part no language barriers with residents were encountered and therefore did not need any translating but also because the respondents would be more comfortable, especially because the research assistant had ties to the community leaders.

In hindsight, the limitations of this method were that the interviews were too long as there was a lot of detail. Although a lot of the data collected was subjective as per the research objective, there must be a level of acceptable risk defined to aid in the interpretation of data and to translate the data collected into more tangible action, i.e. policy change. A lot of the residents are desperate for change and they sometimes lie or exaggerate during interviews in the hope of stimulating urgent remedial action. For example, when asked about their source of fuel, one respondent stated that they use candles even though there were visible electricity cables hanging over the dwelling and the TV was playing for the duration of the interview. Another resident was tipped off by their partner to switch off the lights before the interview commenced "otherwise ba tla re re grand ba se re thushe". Loosely translated, this means switch off the lights otherwise they will think that we are fine and not help us. While some residents exaggerated their condition to try get help quickly, others had research fatigue and no longer wanted to participate in research studies because they do not see the benefit thereof, especially the older residents or those who had been in Kya Sands for a long time (generally longer than 7 years) .

There were a lot of unsaid power dynamics that were noticed within the community. Access to community leaders seemed to be limited by association and some of the people don't know what's happening within the settlement. While the community complains of a huge incidence of crime reports, there is a community leader who was able to very noticeably leave their shack unlocked while being assured that nothing will go missing. There was also a community leader who stated that they still have clothes that were received as aid after the fire disaster in 2014 that were never given out. Therefore, while there were evidently people in the community who could still use those resources, the community leaders had gate-kept them, keeping them while they had no use for them. It could also be that the leaders, too, are used to the community members lacking and do not always see it necessary to rush to their aid. However, these unsaid but observed dynamics were never explicitly stated in any of the interviews, highlighting the importance of face-to-face interactions as, through them, we are able to observe things that would otherwise go unnoticed.

The researcher considered too many categories and too many concepts in this study. In future, it would be useful to narrow it down perhaps to one social group, i.e. only women or only men or rather limit the categories that would be considered in social vulnerability.

4. Social Vulnerability in Kya Sands: using best-practice indicators

4.1 Introduction

Social vulnerability assessments often rely on Social Vulnerability Indicators to measure the level of social vulnerability. These comprise of factors such as demographics and migratory patterns. The assessment of Social Vulnerability based on Social Vulnerability Indicators is a form of assessment commonly relied upon in vulnerability studies (Bera, *et al*., 2017). Social vulnerability indicators are often used to come up with an index which is indicative of the level of social vulnerability for the exposed population as explained in the Methods section above. The indicators used below were adapted from Priori *et al* (2017). These indicators were used in semi-structured interviews where participants were asked what it is they thought created their vulnerability/ exposure to hazards. There was a lot of probing involved from what participants would say. For example, I would ask, “Do you think life in Kya Sands would be different if you were younger? How?” and often participants would say “No, but it would help me if I owned my shack” and that would guide the way in which the rest of the interview went and how the perception of the other social vulnerability indicators was asked and assessed.

This section will answer the first question that vulnerability assessments often seek to answer: “Who’ is vulnerable?” The use of social vulnerability indicators is therefore two-fold. Social vulnerability indicators enquire about demographics. The data retrieved and the analyses from these were used to create a demographic summary of the sampled population. This is not to create a general assumption of the Kya Sands population but to give an idea of the population, i.e. whether it’s increasingly becoming a young/ old population. Secondly, this research is very intentional about bringing to the fore the perceptions of those at risk. Therefore, even though the researcher made use of common social vulnerability indicators, they were used to ask participants how they think these categories really affect their vulnerability. The researcher then took those responses and contrasted them with how the said indicators are commonly understood to affect vulnerability. In doing this, the researcher wanted to highlight the similarities and differences in their ontological ordering of the world with common Science Views.

What this reveals is that what we are commonly concerned about in social vulnerability studies as categories that exacerbate marginality and therefore vulnerability, i.e. age and gender, for those at risk these are factors that seemed inconsequential to their vulnerability. This may be related to what it is that they felt vulnerable to, i.e. if I feel at risk to excess water, whether I am male or female is not an issue I am directly faced with when trying to alleviate this.

However, what the researcher also observed is that the very factors that the participants did not feel particularly affected their vulnerability were often mentioned alongside another factor, i.e. when asked of their gender many said that gender did not affect vulnerability, however, when they went into detail and started considering specific hazards then gender would come up. Interestingly, intersectionality came up here because it was often in the interaction of the various indicators that they felt their vulnerability was affected. However, their sense of shared precarity in the settlement outweighs distinguishing factors such as age and ethnicity. It also appears that their vulnerabilities are ones that they have learnt to exist with and the residents were not particularly interested in changing them, especially if this would take, time i.e. highest level of education. They were interested in changing only those they felt greatly affected their vulnerability and those were the ones relating to state of tenure, type of building material, and income.

4.2 Findings

4.2.1 Individual characteristics

i. Age

In order to not take advantage of vulnerable populations or minors, participants had to be above the age of 18. The sample population comprised of 2 people in the sample age between 18 and 20, 15 people were aged between 21 and 29, 13 people were aged between 30 and 39, 7 were aged between 40 and 49 while only 3 people were aged above 50. The researcher talked to more younger people and this may be because, as previously stated, it was the younger people who were more positive about partaking in research studies within the settlement while the more mature population seemed to show signs of research fatigue, the younger population comprising mainly of people in their 20s and 30s. One visibly older resident, when asked to participate in this research, responded: “Nizoz’nikeza imali? Ai le research yenu, sikathele manje sifuna abantu baso sisiza. Niyenza research, niqethe nge skolo nifune imsebenzi niyasikhohlwa.” Loosely translated, this means ‘”Are you going to give us money? Ai this research of yours, we are tired now, we want people who will help us. You do research, complete your studies, get jobs and forget about us.”

All participants stated that they do not view age as a driver of vulnerability to any hazard as it had no bearing. One Respondent said she is looking forward to getting older because she is five years away from receiving her monthly pension (social grant) from the state, which will ease the pressure on her and allow her to go back home and take care of herself as she gets sick a lot. In vulnerability studies, old age (above 65) and young age (children) is always

viewed as a factor that increases ones vulnerability as it affects mobility and financial productivity (Cutter, 1996). Residents, however, believed that it had no bearing as they were all equally vulnerable and, in times of disaster, they all rally around to help each other, especially where mobility is concerned. Age is a factor that residents viewed as not modifiable, but this did not matter much as it was not seen to affect vulnerability. Another research participant also said “Mo re emetsi fela pension.’’ Translated, this means “Here, we are just waiting to get our pension.” This implies that currently they feel like they are adding no value to their lives and are merely passing time. Thus, while age was not viewed as affecting their vulnerability, there were research participants who were middle-aged and were looking forward to getting older so that they could receive their pension (social grant) and “move back home”. Here, we see the first instance of research participants referring to another place as “home”, alluding to the fact that they do not view Kya Sands as home. There is also an inference to age offering some sort of resilience/ buffer against economic vulnerability. Indirectly, the fact that they are waiting on their pension means that they are waiting on the state to provide some sort of relief for the economic strain that they find themselves under, while also affording them the opportunity to stop trying and retreat back home, which is more comfortable than Kya Sands. This is already quite a notable difference from what is commonly reported on in vulnerability literature, where age is concerned, highlighting the importance of context.

ii. Gender

Of the interviews conducted, 16 were conducted with males and 24 of the participants were female. This is, however, not an indication that Kya Sands has a population that comprises of more females than males. What it could highlight is a greater level of exposure to hazards amongst females as there were even visibly more females than males around the settlement during research sightings. A possible reason for this could be that more males than females are employed and therefore most of the men were at work during research sightings. This could also have been affected by the researcher’s gender who felt more comfortable talking to females within the settlement and vice versa.

Inferring that having spoken to more females than males during interviews implies that there is greater exposure amongst females to whatever hazards are experienced in Kya Sands is in line with how residents in Kya Sands viewed it but the reasons they offered differ.

Being female is typically viewed as increasing one’s vulnerability (Cutter, 1996). Gender was said to affect vulnerability in certain instances and to not affect it as much in other instances. Gender was also viewed as affecting one’s vulnerability to crime. Females were said to be

more vulnerable to crime, and they therefore have more limited movement than their male counterparts in the evenings as that is when crime is rife. A respondent remarked, “As a man I am sometimes too scared to walk all the way to the toilets in the evening because that is when they rob you, what more of these women who could even be raped?”

iii. Education level

The highest level of education that an individual has completed is not always an indication of their literacy level, but it is a good indication thereof. Often times, especially in vulnerability studies, a person’s level of literacy, and illiteracy, is asked so as to determine whether the population in question can read disaster warnings and predictions, as well as any other posters that can be put up in their vicinity to disseminate disaster information (Cardona *et al*., 2012). It is also viewed as an indication of the skills set of the study population where those who have a higher level of education are seen as less vulnerable and those less educated are seen as having a higher vulnerability (Cutter, 1996). In Kya Sands, however, no disaster warnings are ever given out on paper as the disaster events that they experience are rarely predicted or pre-empted, thus residents seldom receive warnings. Participants are asked what their highest level of education is, not as an indication of literacy but rather as a means to assess the skills set of the sampled population. This is because an increased skills set opens one up to greater job opportunities, with increased earnings.

Of the interviewed respondents, six reported that their highest level of education was primary school, with the lowest level of education reported by two of the sample was Grade 3. Of the respondents, two reported that their highest level of education is Grade 5, two respondents reported that their highest level of education completed was Grade 6 and a further two reported that their highest level of education is Grade 7. Thirty-seven respondents reported that their highest level of education was in high school: seven reported that their last completed grade was Grade 8; five of the respondents reported that their highest level of education was Grade 10; ten reported that their highest level of education completed was Grade 11; and a further 25% reported that their highest level of education was Grade 12. A further ten reported that they had completed their A-Levels – the equivalent of a South African matric.

A Respondent could not complete the questionnaire on their own and when asked for their age the participant had to convey this using their hands. Even with these displays/ indications of illiteracy none of the participants felt that their highest level of education put them at a disadvantage or exposed them to a greater level of vulnerability. None expressed a desire to further their education with one respondent answering “School is a waste of time. I need money”. When asked how their level of education affected their vulnerability, one respondent

reported, “It does not help. There are some people who have completed their matric but they are here with us, so it does not help. If they were not here and living somewhere better, I would say it helps.”

Highest level of education is therefore not viewed by the research participants as affecting vulnerability and, although it is modifiable, respondents were not interested in modifying it. Another research participant stated “Sale batho ba tla ba re fa di bursary. Neh kena le bursary sister, mara ka bona hore skolo se tlo nsenyetsa nako. Re hloka tshelete ho phela.” Translated, this means “People once came and gave us bursaries. I had a bursary my sister but I saw that school was going to waste my time. We need money to live.”

When research participants were asked how they thought their highest level of education affected their vulnerability and whether this was modifiable and if they were interested in modifying it, participants referred to other people within Kya Sands that had made them disinterested in modifying their education levels. None of the participants referred to other people outside of Kya Sands, i.e. that a higher education level would grant them access to better job opportunities. This is an indication of how they view and construct their world and, in this instance, they view themselves as external to the rest of the world and this is evidenced in their comparisons.

iv. Employment status

In vulnerability studies, the general trend with regards to employment is that those who are employed are viewed as less vulnerable than their unemployed counterparts (Cutter, 2009). It is important to ascertain the levels of employment or unemployment in the settlement, how people make their livelihoods and whether these are affected in times of disaster. Fourteen of the respondents said they were unemployed and receive assistance from the community as the community leaders work with NGOs to provide relief for some families within the settlement, providing them with groceries and food; one person relied solely on the social grant that they receive while two people reported that they are self-employed. Those who stated that they are self-employed said the money received from their businesses was supplemented by a social grant. A total six of the respondents said they are employed full-time, and an additional four of those said they supplemented this with money received from a social grant, while six respondents said they are reliant on their partners as well as their families back home when it gets bad. Three stated that they survive on menial jobs, i.e. casual jobs, like doing people’s gardening in neighbouring suburbs. Eight participants reported that they are engaged in part-time work in the retail sector; four of those reported that this is supplemented by a social grant.

Therefore, while there are many residents within the Kya Sands population who are reliant on social grants, it is not the only form of income and is often used to supplement other means of income. Only fourteen people within the sample population reported that they are unemployed, therefore the majority of the sampled population is employed, it is just that the money earned from their various jobs is not enough. Those unemployed stated that they get by through the help of the community leaders and NGOs, indicating that there seems to be strong social networks in Kya Sands. It is those who are self-employed whose livelihoods are at risk should a disaster occur in Kya Sands as they have shops in Kya Sands or they keep the tools that they need to perform their jobs in Kya Sands/ stock for their shops. For those in full-time employment, their jobs act as a safety net as they offer an additional network that respondents can rely on in times of crises. It was also interesting to note that those who undertake jobs like gardening wanted to be identified as doing casual work and not part-time work or being self-employed.

All the research participants expressed that they felt their economic status did place them at risk because it is due to their economic status that they live in Kya Sands and cannot afford rent elsewhere with better living conditions. One respondent stated, “Bothatha ase mmereko, ke gore ke gola bokae ene neng. O ba le mmereko 2 weeks, after 2 weeks wa fela.” Translated, this means “The problem is not work, it is how much I earn and when. You have a job for 2 weeks, after 2 weeks it is finished.” Research participants therefore felt that the area of concern should not be employment status but rather the type of employment and the income received from that. If indices were used in this research study conventionally, it would appear that the Kya Sands population is not at risk to economic vulnerability as only a very low proportion of the research sample was either unemployed or relying solely on the social grant which is not a true reflection.

v. Ethnicity/ country of origin

Participants were then asked where they lived before they moved to Kya Sands. Thirty-three of all interviewed respondents reported that, before moving to Kya Sands, they were in other parts of the country. Of the thirty-three respondents who moved to Kya Sands from other parts of the country, twenty-two of those reported that they moved to Kya Sands from other parts of Gauteng; twelve of them were in Limpopo before moving to Kya Sands, one respondent was in the Eastern Cape, one respondent was in the North West Province, whilst four respondents were in Mpumalanga. Of the seven people in the sample population that were not in South Africa before moving to Kya Sands, five of them were in Malawi previously and two of them were in Mozambique. This is a sample of the population of Kya Sands and, as such, should

not be taken as an exact representation of the migratory routes undertaken by all residents in Kya Sands. It appears that most of the research participants came from Limpopo originally.

While it is tempting to believe that only seven people within the sample are not South African citizens, there were other research participants who are not originally from South Africa who have just been in the country for longer and have thus been able to move around the country for a while. The migratory patterns/ routes are thus not to be seen as an indication of the spread in nationality in Kya Sands.

Trends in vulnerability studies suggest that those who are in the minority, as well as those who are new migrants, are the most vulnerable (Cutter, 2009; Cardona *et al*., 2012). On whether they believed that their ethnicity/ country of origin affected their vulnerability, some participants felt that foreign nationals were somewhat more vulnerable to disasters because they lack official documents and could be deported at any time but most participants felt that it really had no bearing to their vulnerability. One foreign national, however, when asked stated that he felt his nationality did affect his vulnerability because most times he did not understand what the people around him were saying. He also stated that whenever there is a crisis, he always runs to help others, but nobody runs to help him. When asked how they felt their ethnicity (cultural background/ country of origin) affected their vulnerability, one participant stated, “Mo re phela kaofela, a go na taba gore o tswa ole kae.” Translated, this means, “Here we all live together, it does not matter where you come from.”

Ethnicity/ Country of origin can therefore be seen as affecting vulnerability, albeit not significantly. While doing interviews, the researcher also noticed that throughout the settlement, foreign nationals, especially those who have not been in Kya Sands for longer than a year, were always in groups, even though some lived very far from each other. They also did not want only one person amongst them to do the interview; they all had to take part. One participant had just come to Kya Sands from Malawi and had been around for a week. They said their friends from Malawi who had been here for longer were teaching her how to speak English. This participant had been with a “friend” from Malawi who was taking part in the research and therefore also wanted to take part. Here, the primary language used in the interview was English, however, because the respondent was still learning, they were not very fluent. The “friend” was translating between English and Chichewa. Although this participant was new in Kya Sands, they had already experienced “excess” water in their shack.

Respondents were then asked why they moved to Kya Sands. This question was asked to determine the greatest advantage/ pull factor associated with living in Kya Sands. It was also asked as a slight indicator of the awareness of risk that people have before they move to Kya

Sands or whether the risks that they encounter once they stay in Kya Sands are risks that they were not previously aware of. Eight of the interviewed respondents reported that they moved to Kya Sands because they were looking for jobs and Kya Sands is close to Kya Sands Industrial and the neighbouring suburbs, i.e. Bloubosrand and Fourways which are relatively affluent, so they can find casual work there. The respondents also said Kya Sands is not too far from the Johannesburg CBD. Eight of the respondents reported that they moved there because they were moving with their partners who were either looking for jobs or had just secured employment near Kya Sands; some of these respondents are no longer with these partners. Seventeen of the respondents reported that they moved to Kya Sands as it was closer to work and the rent is cheap. Three of the respondents moved with family and therefore had no choice or say in the move. Two respondents moved to Kya Sands because it was safer than where they lived previously while another two stated that they did not make a conscious decision to move to Kya Sands and that their stay was rather unplanned and impromptu but facilitated by friends who had already settled in Kya Sands. Kya Sands' greatest advantage seems to be its proximity to job opportunities and economic potential, however, many females in the settlement do not seem to be there by choice but rather they because of love, having moved with their partners. When answering this question, none of the participants referred to any risk factors in Kya Sands, only its advantages – the greatest of which is its proximity to areas that have job potential and its affordability**.** Of interest are the seventeen respondents who moved here because they could pay cheaper rent, highlighting the need for affordable accommodation for those employed in low-income jobs.

4.2.2 Family characteristics

i. Marital status

This question of the respondents' marital status was asked as it related to household structure, i.e. are the people living in Kya Sands child-headed households, married households or single-parent households? Single-parent households, large families, and single person households are often considered as the most vulnerable (Dwyer, *et al*., 2004). The household structure of the interviewed respondents consisted mainly of single households, with eighteen respondents within the sample size reporting that they are single, however, most had a live-in partner despite preferring to identify as single as they were not married, legally or traditionally. Three of the respondents said they were divorcees, while three identified as single but with a live-in partner and sixteen of the respondents identified as married. This question was asked as it is related to the financial strain of households.

Often, households with married couples have increased financial resources and therefore increased financial security which translates into increased chances of recovery after disaster. It also translates into increased mental and emotional support. Participants viewed marital status as a driver of both vulnerability and resilience; it is viewed as a driver of resilience for the females who cited that having a partner means increased financial resources in the household. Some of these females stated that they are not really stressed because anything that must be done in the household is their partners' responsibility. Participants who identified as divorcees stated that when they moved to Kya Sands, they moved there with their then-partners. However, it was the males who said that having a partner puts one at risk for shack fires as some of the shack fires that occur in the settlement occur owing to domestic violence because "the men here do not take nonsense". It is viewed as a norm that should one find their partner cheating, especially if a male finds a female partner cheating, it is more than fine and accepted within Kya Sands to burn that shack. Therefore, if you are a woman in a relationship you must be careful, or you risk having your shack burnt down. Marital status therefore influences vulnerability, but not in a way that one would have thought.

ii. Household head

Most of the respondents stated that they are the household heads and therefore the decision-makers – this was twenty-four people within the sample size; while thirteen respondents reported that their partners were the household heads; two of the respondents reported that their parents were the household heads; and one respondent stated that they stay with friends and all have an equal say in decision-making. During research sightings, certain females had to request permission from their partners before taking part in this research. In one instance, the female went inside to ask her partner for permission to partake in this research, after which the male partner came outside to talk to the researcher and then replied that his partner does not know anything and cannot take part in the research. The said female partner was doing laundry and she swiftly went on to continue doing the laundry while the male partner went back inside.

It would appear that this does affect vulnerability as it affects who can make decisions on behalf of the household; even this "advantage" is said to be compromised by whether one owns the dwelling or not. If one is renting their dwelling, their decision-making is compromised. Participants echoed this in saying that there is no point in being a household head and considered the key decision maker if you cannot decide what kind of building material should be used for your dwelling. For the female respondents, however, many felt that they are dependent on their partner who will make all the decisions, as even the decision to move to

Kya Sands was one made by their partner: ”L gona me ke tlisistse ke monna’’ – “Even here, I was brought by a man.”

On whether this affected their vulnerability or not, the female participants who stated that it was their partners who made all the decisions felt that they had less pressure on their shoulders. Some of the males who stated that they were the household heads stated that the decisions they make were still to an extent limited by their type of tenure. Therefore, if you are renting, your decision-making is still limited or dependant on your landlord whereas if you own the dwelling, you are in a better position to make better decisions. Being the household head, therefore, was seen as a factor that was limited by the weight of the decisions that they are able to make. Research participants, however, felt that being the household head somewhat affected vulnerability as it did put them in a better position.

iii. Number of people you live with

The average household size was four. Eight of the participants reported that they live alone; ten of the respondents reported that they are two in a household, this being them and their partner; another ten reported that they are three in a household; two reported that they are four in a household; another two respondents reported that they are five in a household, comprised of two different families; and two respondents reported that they are six in a household, again consisting of more than one family. Some of the respondents reported that they had other children but that those children are at home as this was not an environment conducive for raising a child. This again alludes to the fact that research participants do not view Kya Sands as “home”. Household size was not reported by any of the respondents as affecting their vulnerability. Respondents only complained of the general overcrowding in Kya Sands and how that affected their vulnerability, however, none complained of their household size. When asked whether bigger households are at an advantage in times of disaster as they have more people available to help, respondents reported that, in times of disaster, everybody helps wherever they can. Therefore, coming from a bigger household size does not really matter. What is of concern is how they are all so crowded in Kya Sands and no one can do anything about it.

4.2.3. Socio-cultural characteristics

Often, where adaptation measures are sought, both formal and informal institutions are weakly associated with these measures. It is often found that an individual’s adaptation measures are informed by that individuals’ recognition of need which is informed by their risk perception more than what is gathered from their informal and formal institutions (Ngcamu, nd). Social

networks are therefore viewed as having a weak link/ association with adaptation in that the information gained from these networks does not significantly affect the resident's perception of risk and therefore recognition of need. Social networks for this research were asked to ascertain their influence on adaptation measures but also to assess the resources that residents have available for use, especially in times of disaster. This section will document the networks that are found in Kya Sands that residents rely on, both on a day-to-day basis as well as in times of disaster.

i. Networks in Kya Sands

The networks in Kya Sands are indicative of who respondents can rely on in times of disaster, be it for financial resources, to speed up disaster response, or to reduce exposure to the initial risks while the networks in Johannesburg, outside of Kya Sands, are indicative of who residents can rely on in times of crises, especially in situations where a dwelling is destroyed and someone is in need of temporary accommodation. Respondents were allowed to state more than one group of people that they relied on for support.

Most of the residents, when asked who they rely on, stated that they relied on their friends within Kya Sands; fifteen of the residents cited their friends as their biggest source of support. Two of the respondents said that they do not rely on anyone in Kya Sands for support and that they are not even interested in having friends: "I am alone here and I do not want friends"- remarked a respondent; "I am alone here, my family does not want me" – remarked another respondent. Thirteen of the respondents stated a reliance on family that they have in Kya Sands, while four stated that they rely on their neighbours for support. Five respondents stated that they are not specific in who they approach when they need help in the community and that they are able to approach anyone while two of the respondents stated that they rely on the community leaders for help or when they need to confirm any information received. Contrastingly, two of the respondents also specifically mentioned that they can never go to the community leaders when they need help. When asked why, the answer was just "I just cannot, never!''. A further two respondents also specifically mentioned their partners as their greatest support structure even though reference to reliance on family members was already made. Two said they relied on their religious leaders because they trusted them the most and had assurance that their pastors would not engage in gossip with other people. Another two stated that they rely on their landlords for help whenever they need it.

In terms of who respondents rely on within Kya Sands, this seems to be quite spread out. However, there are two quite strong support systems and these are either that you can rely on most of the people that are around you, these being your friends and neighbours, or you

choose to not rely on anyone within the community. Community leaders seem to be of help to some residents and not to others. It is also important to note that if one does not have anyone that they can rely on within Kya Sands, this does not mean that they have made enemies with all the people around them and that they cannot talk to them, it is just means that they do not view them as people they can lean on for support.

ii. Networks outside of Kya Sands

In speaking about who residents relied on outside of the relations that they have in Kya Sands, twenty of the respondents said that they have family in Johannesburg, this being in Alexandra township; in town (Johannesburg CBD); Bloubosrand which neighbours Kya Sands; Cosmo City which is also not far from Kya Sands; Diepsloot; and Randfontein. Eighteen of the respondents stated that they have no relations outside of Kya Sands while two stated that, outside of the relations they have in Kya Sands, it is the state that they rely upon, this being the police. It would appear as though those that said they do not rely on anyone within Kya Sands have family that is very close, while those who had relations in Kya Sands, did so because they did not have any family members around Johannesburg. There is therefore a bit of a feedback loop as far as social networks are concerned.

4.2.4 Structural characteristics

i. How long have you lived in Kya Sands for?

The sample size seemed to have a fairly spread population in terms of how long they have been living in Kya Sands for, with ten of the respondents reporting that they have been in Kya Sands for less than a year, ten reported that they have been staying there for 2 to 5 years, ten reported that they have been staying at Kya Sands for 10 to 15 years, while ten reported that they have been staying a Kya Sands for longer than 10 years. The researcher observed some reluctance in the older people who were not so keen to participate in this research. It could be that they are indeed tired of participating in research studies around Kya Sands or that they have no hope for their situation changing. Younger participants were more willing to take part in the research, which could be a reason for the seemingly equal distribution in terms of how long they have lived in Kya Sands for.

ii. What is your form of tenure?

In terms of tenure status, fifteen of the respondents reported that they are renting while twenty-three reported that they own their shacks and two reported that they are displaced. The status on displacement was confirmed by nearby residents who reported that the displaced sleep on

the streets or inside spaza shops in the area. The researcher asked why the displaced have not made their circumstance known to the community leaders, to which it was replied that they did not know that they could report this to the community leaders; they do not even know who they are but they know that the community leaders only help their friends. When asked why they are now displaced, the respondent replied that they did have a shack but when they stopped receiving money they had to sell that shack for money to survive on. While informal settlements are viewed as a place of residence for the urban informal, or the urban displaced, it is interesting to note that even within this informality and precarity, there exists the emergence of hobos. It is also interesting to note that while there existed an equal spread in terms of how long respondents have been staying in Kya Sands, more than half the respondents reported that they own their residences. This corresponds with the type of building material used for shacks as reported below. Tenure status was noted as affecting one's vulnerability because it is only when you own a shack that you can decide where to build, the kind of material to use in constructing your shack which would ultimately decrease your shack fire risk, whether you tile the shack, as well as having a pavement outside to prevent excess water from entering the shack. All of these actions are mitigation steps that one takes to reduce vulnerability to hazards Therefore, if you own your shack you are able to take more active steps in reducing disaster risk. If you are renting the shack, however, you cannot make any modifications to it; you can only escalate challenges experienced to your landlord with the hope that they will be attended to promptly. However, the tenants reported that the one advantage that renting provides above owning is that, should disaster strike, they have no responsibility/ pressure to rebuild as that remains the responsibility of the landlord.

iii. Type of building material used

Twenty-three of the respondents reported that their structures were made of bricks, five reported that they were made of wood, three reported that they were made of plastic, a further five reported that their dwellings were made of cardboard, two reported that they used zinc, and two could not answer this question as they were displaced. Residents are increasingly trying to move away from flammable building material as they say it causes too much damage in case of a shack fire. Brick, although expensive, is seemingly cheaper in the long run. Residents had previously been warned by the municipality that they are not allowed to build using brick structures as they will be relocated, however, these warnings are now falling on deaf ears because "If you wait for the government you will wait forever while it is your life and your belongings that are at risk of destruction" said a respondent..

4.3. Discussion

Asking research participants how they thought the selected social vulnerability indicators affect them as opposed to having done the normal method often undertaken with social vulnerability indicators like collecting census data, categorising and applying it onto each indicator, and then applying statistical analyses to see which of those indicators seemed to have the greatest weighting, would have yielded data that does not give us an idea of how the participants themselves view their vulnerability and their world. What has now come from this is very different from the common trends often observed when these indicators are used because the indicators that are often seen to increase one's vulnerability, i.e. older age and being female, were not always viewed as significantly affecting vulnerability by the research participants. What is even more interesting is analysing what has affected these perceptions.

Age is viewed as a characteristic that increases resilience because the older you are, the closer you are to receiving your pension fund after which you can then go back home and take care of yourself. This statement suggests two things: when they are in Kya Sands participants are not able to take care of themselves and it also suggests that Kya Sands is not viewed as home: a place where one can grow old as residents are all looking forward to leaving Kya Sands and going to a permanent place of residence that they consider to be home. This also talks to the hopes that they have for the future; they do not have much hope in their future changing, the only certainty they seem to have is the social grant that they will get they reach a pension-deserving age (The pension deserving age was cited60 for females, 65 for males). What we also see here is an expression of perhaps what they view as their greatest vulnerability and that is economic vulnerability.

When asked to narrate how certain factors affect their overall vulnerability, research participants seemed to consider these factors only within the context of Kya Sands. For example, when asked whether they thought their highest level of education affected their vulnerability, research respondents responded that it does not because even those who have higher qualifications are still living in Kya Sands like them. They were unable to refer to the broader world or job adverts that they had seen but were unable to apply for because they were not qualified enough. They see themselves as removed from the broader world and this also highlights the influence that they have on each other as residents. This is also evidenced in how their perception of hazard exposure was influenced not only by whether they had personally experienced the hazard event but on whether they knew someone who had been affected by it.

Employment status was strongly viewed as a factor that affects their vulnerability and participants felt that what was even more important than their employment status is whether it was permanent/ contractual (stability) and how much they earned. While most do have a monthly income, this is not enough to meet their daily needs and afford them a better standard of living. Not only is the income received low, it is also unstable. Employment status was thus viewed as the most important individual factor affecting their vulnerability, and age the strongest resilience factor.

It is not only those who are self-employed and have informal businesses within Kya Sands or keep the tools that they need for their jobs in Kya Sands that are at risk should a disaster event occur as there are some people who stated that they are employed in Kya Sands in informal businesses. They are also at risk should a disaster event occur, further heightening the economic vulnerability that is already identified amongst participants.

Household characteristics such as marital status and household size were deemed by the research participants as having an effect on vulnerability, albeit very minimal. However, what was inferred is not minimal as it appears that most of the married females are not able to make decisions and often need the permission of their partners to do so. This is also seen in the decision to move to Kya Sands where most males reported that they moved to Kya Sands because they had found jobs, however, most of the females moved here because their partners had found jobs. Household head was an indicator considered by residents to affect vulnerability but limited by the type of decisions that are made. Research participants, especially the males who often considered themselves the household heads, felt that while they are able to make decisions, these decisions are often limited by their tenure status – whether they are renting or owning the shack. “My sister gwa tshwana le ge nkare ke na ke etsang dilo ka mo ntlung, kea renter aho na hore nka aha ka stena ke emela mong wa stan” – said a respondent. This, translated, means “My sister, it’s of no use even if I say I am the one who gets things done around the household. I’m renting, I can’t build using bricks. I have to wait for my landlord (the owner of the stand). Therefore, while being a household head has the potential to either improve or decrease one’s vulnerability, it is hindered by the tenure status and, more often than not, the income status and level. Here, we see the first inference of intersectionality where multiple factors are interacting to affect the overall vulnerability of individuals.

After economic vulnerability, the type of tenure status was seen by residents as the second indicator that affects their vulnerability the most.

Tenure status is particularly seen as over-riding household head because it affects where in Kya Sands you stay and the type of building material used for the dwelling. This is a structural indicator. It appears that those who have been living in Kya Sands for a long time all own their shacks whilst those who are still fairly new are renting. While some residents view the ability to own your shack as an advantage because it affords you the chance to change things as and when you see fit (this is further explained in the mitigation section) whereas others view renting as an advantage because if something happens, it is not their responsibility but the landlord and, as such, they don't have to spend money on repairs. A trend that was observed is that those residents who have lived in Kya Sands for a longer period were the ones who were starting to lean towards brick structures – these were commonly South African citizens. Those who were renting (some rented brick structures and others corrugated iron structures) were often the ones occupying zinc structures. Those who seemed to afford the brick structures to rent where mostly foreign nationals. There is room to further expand on this trend and test it but this is what was observed. There are also many brick structures that are being built around Kya Sands to be rented out.

Participants viewed the type of building material as affecting their vulnerability, especially where shack fire is concerned. Limited finances and government regulation were noted as a constraining factor to this.

The networks that people have were not really viewed as having an effect on vulnerability because participants feel that for as long as they are in Kya Sands, they are all equally vulnerable. This may be because even though one could have strong social ties within Kya Sands, the resource base is still very limited and this affects their vulnerability because essentially they all have very limited resources.

In terms of the number of people in the household, this was not viewed by respondents as affecting their vulnerability. Factors that considered mobility around the settlement, especially during times of crisis, where not viewed by the research participants as affecting vulnerability because in times of crisis, they all rally around to help each other.

Being female was thought to increase one's vulnerability to crime, limiting the mobility of females in the evenings. Another vulnerability that was never explicitly stated as such but tied to gender was the ability of women to make decisions concerning both themselves and their households.

According to research participants, the factors that affect their vulnerability are employment status and type, tenure status, and type of building material. There is also an inference towards

gender, age, and household head. It would appear that participants generally do not feel like they have a varied vulnerability within Kya Sands because they feel that their greatest vulnerability is living in Kya Sands and they all live in Kya Sands. This does highlight the way in which they view their world. Factors such as age, gender, social networks, highest standard of living, and ethnicity, for the most part, are inconsequential compared to the greatest vulnerability that they view which is living in Kya Sands. There is such a strong sense of shared precarity amongst residents that they overlook their differences, but there is also such a heavy feeling of hopelessness that they all feel like there is no help for all of them. In their study of assessing factors that influence risk perceptions, Wachinger, *et al*. (2013) found that personal factors such as age, gender, and education level affect risk perception; however, they are often mediated by other intervening factors.

There is an inferred vulnerability towards gender and, although research participants thought it was inconsequential, the social networks, too, play a great role even though this were not explicitly stated as such. This is seen in the following instances:

- There were more females than males sighted during data collection and more females were interviewed than males. Weakley's (2013) literature suggests that Kya Sands has a population comprising of more males than females. A reason for this disparity could be that the males are at work. This could also be affected by the gender of the researcher.

- It is also the women who are said to be more vulnerable to crime and thus have limited mobility after a certain time of day, usually in the evenings.

- For the most part, women are not able to make decisions independently; this is a task set aside for their partners or their landlords. The social agency of women in Kya Sands is therefore compromised.

- When asked why they moved to Kya Sands, it was the women who moved with their partners either because a partner had been appointed in a job or they were seeking employment. Even the decision to move to Kya Sands is not one that the woman made entirely on their own, and in some cases they moved there with their partners who ended up leaving them. On the flipside, some females were abandoned by their families and are in Kya Sands because of a partner who took them in.

"Akere le hona mo Kya Sands ke tlisitse ke monna mara ntlohetsi", translated: "Even here at Kya Sands, I was brought by a man but he has left me now."

- Women are also said to be at risk of being burnt in their shacks if they ever cheat on their partners. While this also talks to a moral obligation of not cheating on your partner, domestic violence enacted upon women, manifested as the deliberate burning of shacks as punishment is seen as a norm in the settlement.

Those who are closer to the community leaders have access to information that others do not typically have access to, i.e that the community leaders provide food to those who need it.

The way they related the social vulnerability indicators and their relation/ effect on them made a lot of sense; they are in Kya Sands because of their economic vulnerability which is further heightened by the fact that they do not all own the shacks that they live in. The building material that they use for their shacks further increases their vulnerability. Here we see that there is nothing wrong with their thinking and they are not a people who have lost touch with reality, nor are they making irrational decisions. They are aware of their risks but make decisions based on the present because that is what they are currently faced with. This is not something common only amongst marginalised people as we all push our risk into the future and rather choose to focus on the now. What separates the unmarginalized and the marginalised is perhaps the buffer that those with higher income levels are able to create around risks. Here, we see how Western civilisation is based on the near future but this is being done by bits of punctuated time. In the place of the near future, things get pushed into a distant future that they are uncertain of but they live for the present because it allows them to locate themselves in time and maintain hope for the future. They almost feel like they live in a crisis, they just wait for a bigger crisis.

5. Elemental Vulnerability

5.1 Introduction

Vulnerability is still regarded as a key area for research because most research on vulnerability still adopts statistical techniques to measure it, often neglecting people's personal experience of vulnerability (Traustadóttir and Rice, 2012). As has already been stated, a key knowledge gap that this study is trying to close is to involve those affected in studies of vulnerability and to include their perceptions in these studies. Adger (2006) outlines the steps of vulnerability assessments and highlights that vulnerability assessments need to answer **a) who is vulnerable, b) what are they vulnerable to, c) how are they vulnerable and how do they cope** (O'Brien, *et al*., 2009).

In assessing hazards and the extent of exposure to these hazards, vulnerability studies and the corresponding literature often tend to categorize hazards as environmental or social, man-made (technological), or natural (Wachinger, *et al*., 2013). The neat distinction between these said natural and technological hazards is, however, slowly vanishing, as even those which were once considered to occur owing to natural causes are now becoming human-induced (Wachinger, *et al*., 2013). This highlights the increasing centrality of humans in disaster, thus the need for an increasing focus on locating humans when assessing the cause and impact of disaster, as well as the extent of hazard exposure. Prior *et al* (2017) defines hazards as events or processes with the potential to disrupt society, having natural or anthropogenic origins. When they interact with society, they cause a loss of life and loss of property and, in doing so, become disasters. Cardona *et al* (2012) in their literature state that the hazard itself is not the risk, however, it is one of the components of risk.

This part of the research is therefore involved in answering "What are they vulnerable to?" and it answers this by asking those perceived to be at risk what it is that they are vulnerable to. Data collection included conducting semi-structured interviews with residents throughout all the sections in Kya Sands. As has been stated previously, this research adopts a contextual approach to vulnerability. This approach is rooted in the situational approach to vulnerability; however, vulnerability, capability, as well as level of acceptable risk as defined by those at risk (Cutter, 1996). This approach is thus centered on the opinions and perceptions of those at risk. Centering the approach on the opinions of those at risk also assumes the risk identification approach for disaster management as defined by Cardona *et al* (2012) and therefore the hazards need to be identified by those at risk. Measures undertaken in vulnerability assessments need to be reflective of the social processes in the study population/

community (Adger, 2006). In the context of this, it cannot be assumed that people's perception and experience of vulnerability is how the researcher perceives it. As such, the researcher went into the field and asked research participants which hazards they felt that they were exposed to because they live in Kya Sands, what they thought the cause of these hazards is, as well as who they think is responsible for mitigating against these hazards. The researcher did not go into the field with any pre-defined hazards but allowed participants to state what they felt these hazards were.

Data from interviews was then categorised or grouped for ease in data analysis. Their articulations seemed to resemble an elemental vulnerability based on the four elements: earth, fire, wind, and water as opposed to these articulations having been based on natural vs. man-made hazards, as literature commonly denotes. How the groupings were formed is that the researcher noticed a trend in how the residents perceived and related their hazards and this was that they were related to the elements. All those noted as hazards that related to water, i.e. leaking taps/ leaking roofs and water from underground and the river were grouped as water; those related to shack fire regardless of the perceived cause of the shack fire were grouped as fire; and those related to ill health either due to the fumes from the landfill, the waste that isn't collected in Kya Sands, or the intersexual relations within the community were grouped into disease. These were grouped into the element wind because the cause of the hazard is often as easily dispersed as it is for a particle to be swept away by the wind from one location to the other and, as such, diseases are easily spread in the settlement. The hazards that residents relayed particularly related to the impact of the hazard, i.e. loss of material possessions through crime and inferences to insecure tenure were related to the element earth because these were particularly relayed to how they experience their living spaces and how they felt they did or did not belong. The hazards related to earth were particularly different from the others as it is these that were often the subject of protest action against the state. They were also of a different dimension from the other hazards because while the other hazards were often articulated from the view point of what they experience daily, these ones were related from a point of the impact that they suffer from the hazard, when unmitigated as well as what could possibly happen in the future. These articulations of vulnerability, although including some conventional hazards such as fire, are quite varied from the common hazard's narrative, i.e. the inclusion of water as a hazard does not relate to risk of excess water but rather the way in which they experience water as "out of place, not coming out from where it should".

A desktop study was also done on these hazards to see which of these have been recorded in the media as causing a disaster event in Kya Sands. This is a common theme of this

research, where what is commonly depicted in media/ research was contrasted with the views and perceptions of the residents/ respondents.

What the residents' perceptions of hazards reveal is that they do not view hazards and their severity by the impact that the unmitigated hazard and resulting disaster event will cause but rather on whether they are confronted with by the hazard daily or not and whether they are able to mitigate against these individually or not. As such, it was water that residents rated as the most severe hazard even though there have been no excess water disaster-related incidents in Kya Sands, followed by wind, crime, and lastly shack fire. Shack fire was rated last even though they have experienced the greatest losses due to it. While these articulations of hazard and disaster vary from conventional hazard and disaster notions, ultimately what they indicate is how those at risk have learnt to structure their personal and social lives around this constant exposure to hazard and, therefore, constant state of risk. This is what Murray (2009) defines as unnatural disasters arising due to hazardscapes. Furthermore, they have also revealed intersectional vulnerability because the cause of one hazard is often the cause of another and trying to mitigate one hazard is often a cause for another hazard and that is why more than one hazard is often experienced at a time.

The researcher has taken these articulations of hazard and conceptualised them as elemental vulnerability. The term "elemental" vulnerability is used metaphorically. The researcher uses it to demonstrate how their articulations of vulnerability reflect the elements – these are fire, earth, wind and water, particularly that when you are abandoned by the formal parts of the state you are exposed to the elements; and the elements commonly thought of as being necessary for life and constituting the universe become the very reason for your vulnerability. Water, earth, wind, and fire are all naturally occurring elements, but here we see them as being causes of vulnerability. Similarly, for residents the need for a safe living space has become the very cause of their vulnerability. Agamben (2005) argues that life exits as a paradox where life exits in a particular mode (Zoe) or it exists as a bare life where people are placed outside the state or the law and this destabilises one's humanity. For this life to be good, it must be translated by the state. Interestingly, by intercepting their articulations of vulnerability as elemental vulnerability brings the researcher to the very point of the idea of the bare life that Agamben provides, where the lives of Kya Sands residents are rendered bare and fully exposed to the elements and elements which are supposed to be necessary for life become hazardous for that very life. In doing this, the researcher also realises that the way they conceptualise and order their lives is very different from what is commonly conceptualised because where we often try to distinguish between natural and man-made hazards, for residents this was the least of their worries.

Elemental vulnerability is appropriate as it talks to citizenship in the context of abandonment as well as people's claims around citizenship and the vulnerabilities that they are exposed to. Water, fire, earth, and wind are all naturally occurring elements. The researcher will demonstrate how research participants think in these terms, although they do not necessarily think of these as earth, fire, wind, and water and conceptualise it as ontology but they think like that partly because of the qualities that are commonly associated with those elements.

5.2. Findings

5.2.1 Water: re tshwenya ke metsi



Figure 4: A standpipe that is leaking and does not close (Rangata, 2018)



Figure 5: The stream that flows through Kya Sands (Rangata, 2018)



Figure 6: Stagnant, polluted water flowing through Kya Sands (Rangata, 2018)



Figure 7: A shack with water underneath and a standpipe nearby (Rangata, 2018)

Research participants did not explicitly state that they are exposed to excess water in the settlement. They gave various inferences of “displaced” water that they felt exposes them to a greater vulnerability which was categorised as water. These inferences were given as water that leaks through the ceiling especially during rainy periods, water that runs throughout the settlement from the standpipes that are unmaintained and leak (Figure 5, 6, 7), the toilets that leak, the river that runs throughout the settlement (Figure 4), and underground water seepage that occurs often. All this excess water/ displaced water is seen as a hazard for residents. This is interesting to note because water is something that is often said to be lacking, especially in informal settlements, and here we see water as a hazard not because Kya Sands gets an overwhelming volume of water but because the water that they are getting is coming from

everywhere except where residents expect that it should be coming from which is from the tap. It is not necessarily excess water that stops community functioning or results in death but it is always there.

When asked how often this is experienced, research participants stated that this is something that is constant in Kya Sands because the source of this excess water is not just excess rain, but the unmaintained standpipes and the lack of proper drainage channels to divert the flow of water. As they live next to the river, some of this water seeps from underground and they do not have proper roofing and tiling. All these causes that participants cited do not have a specific time of occurring but are always happening Therefore, one cannot even try to plan around/ against it. Participants were then asked whether this occurs evenly throughout the settlement or whether there are certain sections within Kya Sands that are at higher risk than other sections. Section B was stated as the section exposed the most because the taps are not maintained and are always leaking. When asked about flood risk, one respondent simply replied, “Come and sleep here after it has rained and tell me what you experience.”

This excess water that is also visible in the community was also stated by respondents as having a secondary effect because it leads to stagnant water that has a stench and gathers outside respondents’ home. Participants stated that this affects their health. The lack of proper drainage channels, coupled with insufficient access to sanitation, means that a lot of grey water gets mixed up with litter in the settlement and forms part of this runoff water that flows throughout the settlement. This leads to flies around the settlement, which is hazardous for the little children when they play as they often play with this dirty water and get sick It also affects the quality of the air that residents inhale. These flies also contaminate their food. Dirty water breeds disease but more so, it also dirties the shacks, dirties their clothes, and makes it difficult to move around.

Of all the disaster events reported for Kya Sands in the media, only two media articles related to excess water and the last incident in Kya Sands was experienced on the 11th of February 2017. This was due to a burst pipe that took a month to fix. It was fixed for two days after which it burst again. Residents complained that they often do not know who to report problems experienced in the settlement to (Luvhengo, 2017). Other than that, it was mentioned previously in 2011 when Johannesburg experienced heavy rain and the media reported generally on excess water in informal settlements in Johannesburg. There where however no fatalities reported on. The excess water that is evidenced in Kya Sands can also be seen as a type of excess water known as seepage, ponding, and leaking.

In contrast, however, residents deemed themselves exposed the greatest to this excess water. This excess water is thus, for residents, a chronic disaster. However, for external parties, in this case the media, it is seen as a rare occurrence. This may be because there is a tendency to view disasters according to the damage they cause and the lives lost. In defining artificial disaster, Murray (2009) defines these as disaster events that, although they do not kill their victims, the victims are always at risk of it. In Kya Sands therefore, excess water as defined by residents but is related to the constant flow of water in the settlement. This water that is always out of place can be seen as an artificial disaster.

Residents believe that most of the causal factors around the displacement of water in the settlement cannot be modified by them therefore they have very little capacity to try and effectively mitigate this risk. Leaking standpipes can only be maintained by the government through the local municipality. They cannot change rainfall frequency or intensity or the fact that they live near a river. However, when they know that it is going to rain they are able to move things around the shack so that they do not get wet.

Respondents reported that they put buckets under leaking ceilings so that the water is trapped and doesn't run over onto the floor. Many residents also cited that staying in a brick house and having some sort of pavement and tiled floors alleviates excess water. With regards to the improper drainage channels, underground water that seeps, as well as improper roofing and flooring, residents say that the only way to overcome this is to "know where to situate your shack". However, knowing where to situate your shack only works if it is your own shack and the "proper sites" are often put aside for those who will be buying the stand. For those who can only afford to rent, their mercy lies in the hands of their landlords. Throughout the streets though, many residents have taken it upon themselves to dig drainage pathways that divert the flow of water so that the water does not settle outside their shacks. Residents therefore do take some initiatives to mitigate floods.

During data collection, it was noticed that a lot of respondents had tiled their floors or had flooring. This, they say, makes it easier to just sweep out water that flows into their dwellings. Those who are renting, however, are again at a disadvantage because they are not allowed to modify shacks and therefore wait for the landlord to tile the floors, most of which have not. It is also important to note that it is mostly the foreign nationals who are renting as well as those who have not been living in Kya Sands for longer than five years. This water is a hazard that is deemed to affect individuals and, as such, mitigation measures adopted are done so by individuals, and the responsibility to do so is an individual one. It is an encouraging thought that even though for the most part residents attribute this excess water mitigation as government responsibility, they still make an effort to prevent it from ponding; indicative that

they have not lost hope as far as flood mitigation is concerned. It could also be because the excess water that is experienced, for now, is still small-scale.

When asked who they believed is responsible for preventing excess water, respondents replied that because this is water that gets into their shack and yard, it is their responsibility to clean it up and prevent damage. This is also why the measures taken to cope with this risk are personal and vary according to household. The government has provided the settlement with 48 standpipes, some of which do not work, some of which cannot be fully closed and are therefore always running, some of which have a partial leak, and some of which are functional. Therefore, although 48 standpipes have been provided within the settlement, not all 48 are available for use. Given that it is the government that has provided these standpipes/ taps, and it is these taps that are the biggest source of excess water within the settlement, respondents believe that the government should assume some responsibility in maintaining these taps, as this will curb their water problem.

Residents also attributed responsibility for prevention to landlords because it is the landlords who choose where to situate these shacks and this affects the shack's vulnerability to excess water. "We know where there is water that comes to the surface and don't build there," said a respondent. It is therefore known where there is groundwater seepage to the surface throughout the settlement, thus highlighting the importance of local knowledge on disaster mitigation. Respondents also mentioned that it is also the responsibility of the landlord to put in a pavement or stones outside the shack to level the ground and make sure that water does not lay there stagnant and it is the landlords who must ensure that the top of the shack is well built so that it does not leak. It is also the responsibility of the landlord to ensure that the flooring of the shack is levelled and tiled/ has some sort of flooring that enables water to flow outside. For those fortunate enough to own the shacks that they live in, they are able to implement mitigation measures such as tiles inside the shack and pavements outside and they avoid building in those areas known to be susceptible to underground water seepage. But those who are renting are at the mercy of their landlords. Residents have also taken it upon themselves to build drainage pathways that divert the flow of water from the taps away from their homes.

5.2.2 Fire: re a tshiselwa



Figure 8: Illegal electricity connections from Kya Sands industrial (Rangata, 2018)



Figure 9: Illegal electricity connections hanging above a shack (Rangata, 2018)

Research participants also expressed the burning of shacks as a hazard that they are exposed to. The cause identified for these shack fires is said to be the type of building material used which is often flammable, i.e. corrugated iron, wood, or plastic; the type of fuel used, i.e. paraffin stoves, candles, open flames; overcrowding and the layout of shacks which makes the spread of fire faster; negligence (leaving an open fire unattended); illegal electricity connections (Figure 8 and Figure 9); and domestic violence. Shack fire was a hazard that had to be probed for most of the research participants; it was not a hazard that immediately came to mind when they were asked about the hazards they faced in Kya Sands. One participant when probed about shack fires responded “Oh yaa le go tshiselwa re a tshiselwa mara ke

kgale re sa tshiselwa, ebile neh ke lebetsi". Translated, means "Oh yes our shacks do get burnt but it has not burnt in a while, I had even forgotten about this."

It is said that if, as a woman, you cheat on your partner, you can expect him to come and burn down your shack. One participant exclaimed "Banna ba mo ba fisha yho"; "The men here burn yho." Section A and Section D are said to be at a higher risk to shack fire than all other sections in the settlement because of the amount of illegal electricity connections from Kya Sand Industrial as well as the shack layout – they are too close to each other.

There seemed to be an increasing amount of shacks that are built using bricks, even if this is not wholly the case. A respondent remarked that the government had said that they are not to build any shacks using bricks because they are going to be moved but because this is something that they have been waiting on for so long with no action. While they continue to be at risk of shack fires, residents have started building their shacks using bricks anyway, stating that, "Mmuso o tla re tlosa ge ore tlosa, mara rena re tlo aga''. "The government will move us when it moves us, but for now we will build."

When asked when the last shack fire incident was experienced in Kya Sands, respondents stated that after the massive shack fire that happened in 2014 and caused so much damage, it attracted a lot of media attention and government intervention. As a result of that, they received new paraffin stoves from the government and, since then, no shack fires have been experienced. This proves that government intervention does indeed help residents in mitigating against disaster risk.

Residents believe that the provision of electricity will completely stop the occurrence of shack fires along with the provision of housing but this is not something that they believe they can do themselves. Residents believe it is the responsibility of the government to help them in this regard, although they have lost hope in the government. A respondent who was asked to participate in this research when found sitting in their shack, playing a Sudoko game from the previous day's newspaper. This respondent said, "Ai, this government has forgotten about us, they took all the money and spent it on Nkandla, while we suffer here." There is an aura of despair and helplessness in residents, and this is evidenced in how they feel that the government must assume responsibility for the hazards that they face and, as such, no mitigation measures will be completely effective unless the government is involved.

Shack fire seems to be the disaster event that receives the most media attention.

Table 6: Shack Fire Incidents

Date	Homes destroyed	Number of deaths	Cause	Source
December 2006	110 homes	1 death	Unknown	City of Johannesburg, 2013
12 October 2010 (Tuesday)	8 homes	0 deaths	Paraffin stove exploded (faulty)	https://www.iol.co.za/news/faulty-stoves-blamed-for-fires-685559#.VD6f9BYgte4
14 September 2010 (Tuesday)	60 homes, 100 residents	1 death	Unknown	https://www.sanews.gov.za/south-africa/police-probe-kya-sands-blaze
8 September 2013 (Sunday)	136 homes, 500 residents	2 deaths	Unknown	https://citizen.co.za/41085/shack-fires-jgs/
19 January 2014 (Sunday)	70 homes, 200 residents	0 deaths	Unknown	https://ewn.co.za/2014/01/26/200
10 October 2014 (Friday)	500 homes, 2000 residents	0 deaths	Stove left unattended	https://ewn.co.za/2014/10/09/Fire-rages-in-Kya-Sands
11 August 2015 (Tuesday)	25 homes, 70 residents	0 deaths	Unknown	https://citizen.co.za/news/south-africa/863409/kya

				-sands-blaze-to-be-investigated/
11 November 2015 (Wednesday)	200 homes, over 100 residents	0 deaths	Unknown	https://www6.enablon.com/Anglo.SD/go.aspx?u=/ho/DRep&su=ho%21%2D1&pm=0
18 November 2016 (Friday)	14 homes	0 deaths	Unknown but happened at 1 am	https://citizen.co.za/news/south-africa/1351739/14-shacks-burn-down-in-joburg-north/
5 June 2017 (Monday)	5 homes	1 death	Unknown	https://randburgsun.co.za/322955/a-man-dies-when-fire-ravages-shacks-in-kya-sand-informal-settlement/

As can be seen from Table 6 above, Kya Sands has experienced nine shack fire incidents over the past twelve years, affecting a total of 918 homes and resulting in five deaths. The cause of these fires was said to be mostly unknown. This is in sharp contrast to what the research participants reported because research participants stated that although shack fire risk is an ever-present risk, its occurrences have dramatically decreased after they were given new paraffin stoves, and they felt that the most pressing hazard that they are faced with is that of water being out of place in the settlement. However, as per the media releases there are three other shack fire incidents that were not accounted for by the residents. It can also be seen from the above table that these fires have a random occurrence, occurring both during the week and on weekends therefore they cannot be solely attributed to social drinking or the negligence that comes with weekends.

Fire is very necessary in Kya Sands because, through it, residents are able to cook and have light, but it can also become very violent, left negligently, used to settle domestic violence scores, and to show discontent to the state during protest. Fire, although necessary, also has the potential to, and often does, cause a lot of damage.

Even throughout all these disaster events that have been experienced in Kya Sands and the number of homes and lives affected by it, the standpipes provided by the state are the only infrastructure that is able to withstand these disasters. Personally therefore, residents are vulnerable to disaster, however, on a societal scale there is resilience suggested because the infrastructure provided by the state is ever-present along with the settlement. There has never been a section within Kya Sands that has been wiped out by a disaster event.

Even though residents felt least exposed to shack fires, when they do happen, they cause the greatest damage. There is also a community drill in place, highlighting actions that the community has taken in terms of mitigation. Respondents reported that the first sign that there's a shack fire is the colour of the smoke cloud that forms. If it is a black cloud that forms, then it is a shack that is burning. The next action is to try and determine where the shack fire is occurring. If the shack fire is occurring in the street they live in or very close by they must first run home and move their belongings before rushing to help put the fire out. However, if the shack fire is occurring in a street far from where you live, you run to the affected street, get a bucket and fill it up with water. There is often a queue at the standpipes in times of fire and some of the taps do not work which lengthens the time it takes to get a bucket filled up with water. From then, they run to put the fire out, while others call the fire services. A respondent reported that there is a lot of cooperation in times of fire. Any bystanders will be beat up later on, if they are noticed during the disaster event. Another respondent seemed to have a different view, stating that it is only the neighbours who help, the others just come so that they can steal your belongings. This was the only such view, however, it cannot be dismissed. "I feel helpless, if I had a yard, I would not be affected by my neighbours' negligence".

Again, there seems to be a reliance on the state for disaster mitigation, this being through the standpipes provided by the state, as well as calling the fire services. The state intervention received in 2014, through the provision of new paraffin stoves, is also testament to the fact that government intervention helps as it has decreased the occurrence of shack fires. After the fire in incident, investigations were carried out and part of the findings of this research was that a lot of the paraffin stoves that people used were not compliant and were thus unsafe; they would just burst randomly. The flammable building material used, is used because they do not have money to build brick houses, but also because the government has barred

residents from building brick structures as they are permanent and the local municipality has plans to relocate residents soon. However, this is something that residents have been waiting for, for over five years.

There is an increasing number of shacks built using bricks as bricks are not flammable and thus protect residents. Residents are choosing to ignore the call by government to not build brick structures, stating that the move will happen whenever it happens but, for now, their safety comes first. It is also important to note that even for those who manage to build using bricks, it is not often the case that the whole shack will be built using brick but that there will be a mix of scrap material, brick, mixed with perhaps a door made of zinc or parts of the top made using wood. Once again, the option of staying in a brick structure is further lessened for those who are renting. If you own the shack you are staying in, even if you do not have money at the time and can only afford zinc, as time progresses you are able to save up and change your structure to brick. If you are renting, the decision to change to bricks is one that remains with your landlord. If tenants desperately want to move into brick structures, they have to move and the rental costs of a brick structure are often higher, going up to about R800 per month.

The existence of an emergency drill to help in times of fire highlights that shack fire mitigation is a communal effort. While it is easy to assume that this is so because of the strong social networks that are found in Kya Sands, respondents reported that the reason they all help each other out in times of shack fire is because a fire has the ability to spread and affect them all, just like crime.

5.2.3 Wind: re a lwala



Figure 10: Shack situated next to a dump (Rangata, 2018)

The other hazard that residents deemed themselves to be at risk of is the outbreak of disease. All respondents interviewed cited that the state of their health has deteriorated since they moved to Kya Sands and they have fallen sick, however, only 21 of the residents have been officially diagnosed with an illness. Reasons given for the cause of these illnesses vary but residents believe that the cause of these illness is the unhealthy living conditions that they are subjected to such as uncollected rubbish (Figure 10), overcrowding that also makes the spread of contagious diseases quicker, stagnant water throughout the settlement, not enough toilets in Kya Sands (and those that are available are not cleaned/ drained regularly), and no electricity and therefore no fridges to store food which results in flies which carry bacteria, contaminating food. Residents also cite that, beyond the physical illnesses that they complain about, their mental health is at greatest risk because of the stress they constantly live under, also giving rise to high blood pressure. “When I come back from work, as soon as I see this place I get a headache. It is bad.” There is a lot of reported prostitution that happens in the settlement as women try to find means of survival whilst the men curb their sexual urges. This has, however, led to the spread of illnesses like HIV/AIDS and TB. So common are these that a respondent said, “Everybody here is sick so there’s no point in stressing about it. We all sleep with each other. Kaofela re a lwala” - said a respondent. The exposure to disease is said to be the same throughout the whole settlement, with no section cited as having an increased exposure to disease than others. One would think that Section B, with more taps that leak than other sections, would be more susceptible given that the taps have been cited as affecting their health, or Section A as it is near the dumping site, but these seem to have no bearing to the overall incidence of disease as perceived by the residents.

Respondents praised the mobile clinic that is provided by the government that comes every month. This is a free service that is said to help in treating their illnesses, by giving them medication every month, as well as conducting regular health assessments. Because of it, residents no longer need to go all the way to Witkoppen to seek medical attention. The only challenge experienced is when the prescribed medication runs out before the next mobile clinic visit and they then have to take a taxi to Witkoppen to obtain additional medication. The provision of these mobile clinics shows that government intervention does help. It also illustrates that residents at Kya Sands do receive some state services. What is unfortunate, however, is that the government, through the provision of these mobile clinics, is treating the symptoms and not the causes because a look at the causes indicates that these are very structural, and rooted in the very reason for the formation and proliferation of informal settlements. Disease as a hazard also seems to be a hazard that residents seem to have accepted as a "way of life here" as stated by a respondent. Although 21 of the respondents reported that they have personally been affected, they don't all have an official diagnosis and, as such, they are not all receiving medication for it. The mobile clinic, although helping respondents to treat disease, does not alleviate the root cause of these diseases, which are the living conditions in Kya Sands. Residents believe that, ultimately, it is the government that is responsible for moving them, as has been promised for years and that is ultimately what will "heal them".

When asked about their capacity to deal with diseases, respondents said that they religiously go to the mobile clinic every month and get medication, they are just worried about their children because there are certain things that they cannot do because that would put their children at greater risk, i.e. they have a rat infestation problem but they cannot treat it with Rattex as the children may ingest it accidentally. There is also no way for them to say that the children must not go outside. One resident replied, "We just walk around sick, we are all sick." A respondent stated that they have to boil drinking water before consuming it; another reported that they do not go outside when they are burning any waste at the dumping area, and they use small cloths to cover their noses so that they do not inhale the smoke. The general consensus however, is just to drink the prescribed medication. Boiling water, a mitigation effort that some residents have undertaken, requires electricity which they do not have. Therefore, even their ability to adopt certain mitigation measures is constrained not by financial resources, but by a lack of not having the resources. To boil water using an open flame to reduce exposure to a hazard (disease) exposes one to another hazard (shack fire). Mitigation measures adopted for disease are also reliant upon the individual and there does not seem to be any "standard" measures agreed upon by the community.

5.2.4 Earth: re a thubelwa

Crime was mentioned as a risk that residents felt they were exposed to. Sixteen of all interviewed respondents cited that they have been personally affected by it, yet all interviewed respondents complained about the crime. When asked how often this is experienced, a respondent answered, “It’s a way of life here. Just last night, a gunshot went off.” During data collection, the researcher witnessed a police van patrolling the settlement looking for an offender.

This crime has been described as house break-ins and robberies. The main reason given for this crime is unemployment, which gives rise to poverty and substance abuse. The living conditions in Kya Sands are also cited as creating a conducive environment for crime to thrive because there is no electricity and therefore little to no visibility in the evening. As soon as it is dark, perpetrators will not be seen when committing crimes/ waiting at spots for somebody that they can rob. A Respondent remarked that as soon as it is 18:00, gates must be locked and you cannot go outside or you expose yourself to a higher likelihood of getting robbed.

The overcrowded living conditions also contribute to crime as they make it difficult to identify odd behaviour and movements within the settlement. It is odd that residents claim that they are not able to identify odd movement/ behaviour within the settlement because it is overcrowded but they are able to identify people who do not live in Kya Sands when they are in the settlement, i.e. various researchers. A possible reason for this could be that researchers who come into Kya Sands are relaxed and are often accompanied by a research assistant who is from Kya Sands whereas those who come into Kya Sands with other intentions try their best to not be noticed. Residents at Kya Sands also do not have yards therefore access to the shacks is relatively easy, which also contributes to the high crime rate. There are no gates and the locks on the doors are easy to cut off. The windows, too, do not have security bars, making it easy to break in. The overcrowded living conditions, high unemployment rate, and poor lighting compounded with the easy access to yards creates a fertile environment within which crime can thrive.

For those who do not have toilets in their yards, it is said that even the walk to the toilet puts them at risk of being robbed in two ways. You may get robbed on the way to or from the toilet, therefore it is not always a good idea to take your cell phone or money with you when you go. However, they often use the torch/ flashlight function on their cell phones as a source of light. The other exposure to crime when going to the toilets is that, as soon as it is noticed that you are not at your place, criminals may also break in. Items reported to have been stolen include solar panels, cell phones, and bags, all of which were stolen via break-ins. There are also

people who steal groceries by waiting for people who come from town at the river where they have to cross. Foreigners were also reported as a source of crime because it is apparently difficult for them to obtain certain items, making crime an easy option of obtaining these items. There have not been reports of rape taking place, which could substantiate the reason given for crime as poverty because the items stolen are all items that have a resell value or could be consumed by the perpetrators. It could also be that there are rape incidents but that the victims are too ashamed or scared to report it.

Residents believe that all sections in the settlement are exposed to crime but that some sections are at a higher level of exposure. Section D is cited as being at the greatest risk because it is overcrowded. Too many people mean that movements cannot be tracked and it becomes difficult to notice any unfamiliar characters in the section. Section A is also said to be at a greater risk because it is dark and there are many of foreigners in the area. Section B is cited as being at both an advantage as well as a disadvantage; it is advantaged because it has proper lighting, however, the presence of the river makes it an easy target because criminals wait at the bridge for people. However, there is also a respondent who said that one of the reasons she moved to Kya Sands is because the crime is lower than in Msawawa where she stayed previously and says she was targeted in the mornings when she had to go to work, being robbed every month. Even with this difference of opinion, crime is still a serious issue for residents in Kya Sands.

Crime is a hazard that, again, residents feel they are not in a position to deal with its root causes, these being poverty and unemployment. It is the government that can provide residents with job opportunities, from which residents feel they would then be in a much better position to look for better housing and living conditions. Crime was also attributed to the poor lighting in Kya Sands, not having yards, as well as overcrowded living conditions, conditions that residents also felt they cannot change. Respondent 10-2017 stated, “We are all here because of circumstance so none of us can tell another to move or change where their shack is situated.” Some residents try to alleviate the poor lighting by having lights hanging outside, powered by illegal electricity connections or solar energy, but these are often not bright enough as they are still quite rare. Residents believe that if the government provided them with electricity, this would help in fighting crime in Kya Sands**.**

When asked about their capacity to alleviate the crime in the settlement, the residents stated her shack at 18:00 and does not go outside after that. Some residents have installed burglar bars/ gates on their doors but not everyone. If the criminal act happens in your presence, such as a break-in while you are sleeping or a robbery while you are walking, respondents reported that they scream to which a neighbour or any person nearby will run to their aid, who then

chase the criminals and, if they catch them, they take them to the community leaders who take them to the soccer field. At the soccer field, the perpetrators are then questioned, and the victim has to give their side of the story and any evidence if there is any evidence available. The fate of these criminals is then decided upon. Often times they are beaten up by community members after which they then call the police for the law to take its course. This seems to be the most common way of dealing with crime. However, for those who are not around when their shacks are broken into, they often do not report it to the community leaders when they discover that they were robbed because they do not believe you can still catch the criminal if you do not do so during the act. Crime, although affecting individuals, is tackled by the whole community because they say they realise that if they let these criminals walk away scot-free they could be their next victims. The presence of a community drill for crime misleads one into thinking that it is there because they care about each other. However, each person is pursuing their own interests and the only way to do so is to help whoever is being robbed. The community drill does, however, indicate the presence of a community structure/ social structure that acknowledges the community leaders; in fact, the leaders are central to the mitigation measure. Residents also implement preventative measures such as minimising movement in the evening, locking up early, and going to the toilet in pairs in the evenings.

5.3. Discussion

Research participants were asked which hazards they felt they were exposed to by virtue of living in Kya Sands. As has been explained in the Results section above, these were categorised into hazards that related to water, disease, crime and shack fire. These were metaphorically analysed as being reflective of the four elements, i.e. water, wind, earth, and fire. After stating the hazards that they felt exposed to by virtue of living in Kya Sands, participants were asked to rate these hazards from one being the hazard that they felt most exposed to, to four, the hazard that they felt least exposed to. The most common arrangement in this respect was water, followed by wind, earth, and then shack fire least. This arrangement is reflective of how they view and order their world.

Water, although rated first, has never been the cause of a disaster event in Kya Sands where multiple houses/ people were affected. It is, however, the hazard that they face daily in Kya Sands, causing them the greatest discomfort. This is also a hazard that is mitigated individually, limiting the potential for mitigation. It is also not considered as equally spread throughout the settlement with Section B said to be the most exposed. Participants therefore illustrate a ranking of hazards that is based on their own lives and not based on scientific conceptualisations around what should be considered a risk factor. Given that Johannesburg is inland and does not experience excess water often and shack fires are experienced the

most, also causing the greatest damage, one would expect for shack fires to be rated as the hazard they are exposed to the most, but this is not the case. The “out of place means that this is a hazard that they feel most exposed to because it is unpredictable, ever present, and it affects their day-to-day lives. It also has secondary effects. A hazard to them is not necessarily one that has the potential to cause the greatest harm but, rather, the greatest discomfort in their daily lives.

The second hazard that research participants rated is disease. Many of those who complained about being sick did not have an official diagnosis. The cause of this illness again related to the living conditions that they are exposed to, and the prostitution which is so common in Kya Sands. Similarly, when one looks at the events reported on for Kya Sands in the media and which of those are related to disease, there are very few whilst those exposed to the risk deem it to be the second rated hazard that they are exposed to.

Crime was rated as the third hazard that they are exposed to, attributed largely to the living conditions in Kya Sands that they are exposed to.

Shack fire is the hazard that research participants felt least exposed to, yet it is the hazard that is recorded the most, having caused the greatest damage in the past. In rating their hazards and their exposure to these, we see the same decision-making criteria that was seen in their perception of social vulnerability indicators; that they do not consider past events when making decisions but consider the present. We again see that the way in which they construct their worlds and conceptualise their risk is not like common Science World views. It could also be that not only is there a difference between how participants view and construct their world but there is also a disparity regarding what should be considered as a disaster/ hazard and what is not. For example, where the media could only be reporting on “disaster events” based on the magnitude of the impact of the hazard, those affected do not define disaster/ hazard based solely on the number of disaster events experienced. This is in support of Murray’s (2009) view that those who live in informal settlements live in a constant state of disaster and, as such, their definition of disaster is not limited to a rare occurrence of a disaster event.

We also see that, when asked for the causes of these hazards, the participants do not view themselves as being responsible for creating these “dangerous conditions”.

Oliver-Smith (2004) defines vulnerability as dangers that are posed by hazards and perceived by the residents as frequently experienced; yet those exposed to it are not able to reduce their risk. Vulnerability extends beyond the risk exposure to the ability of those at risk to mitigate against this.

The various mitigation measures undertaken by residents illustrate that the residents have adopted some sort of social order in response to the hazards that they face, especially where the hazard faced is one residents believe they are responsible for mitigating against because it can affect them all. This is said because the measures undertaken, i.e. the fire drill and the procedure undertaken for dealing with criminals, can only be developed and initiated where there is community organisation. We also see that the community organisation/ social order is how respondents have learnt to co-exist with these hazards.

Community vs. Individual Mitigation Effort

The way in which participants have rated hazard exposure which is: water (water)>wind, (disease)>earth, (crime)> fire (shack fire) was mirrored with the mitigation measures undertaken for each hazard and it illustrates a relationship between the two - Water and disease, the hazards rated as the ones that resident are exposed to the most, are the ones where the responsibility for mitigation lies with the individual. Water, the hazard as the most severe, is mitigated completely by the individual exposed to it. With disease, the mobile clinic is said to help, therefore there is an inference of the state for help. Crime and shack fire, the hazard that residents rated as third and fourth, are the ones where mitigation is a community effort. With shack fire especially, the hazard that residents deemed as the one they are least exposed to yet is the one that when it does happen, causes the greatest damage, may be rated the least hazardous because not only is it mitigated against communally, but there is also a lot of state, NGO, and civil society help in recovery when it does occur. It may be that this is also a big factor that respondents consider when rating the severity of exposure – whether you have to deal with its effects individually. A shared sense of precarity seems to lessen the perception of the severity of the hazard.

Social Order and Informal Rules

Ngcamu (nd) suggests that social order is not something that is pre-agreed in a community. Rather, it arises because of patterns that are agreed upon by those involved. However, because it is something that arises out of negotiation, it can never be thought of as something that is a definitive, rather it is in a constant state of change. In the various ways that hazards are dealt with in Kya Sands, we see that they seem to have a set way of dealing with certain hazards, i.e. criminals are taken to the soccer field where they are brought before the community leaders before the state is called in. The community leaders are the ones who apportion shacks throughout the settlement – another example of social order. Every community member also has the responsibility to help whenever the need arises (especially

in the event of a disaster event), or risk being beaten up afterwards – another example of informal order.

Informal settlements are often romanticised for their strong social networks that help them to co-exist. Where one would think that these social networks exist because they all really just want to help each other, it is rather that they help each other because whatever disaster that a neighbour may face has the potential to affect themselves. Therefore they help, not only out of common courtesy but also as self-preservation/ protection/ fear that it could also happen to them and nobody would offer their help.

Personal Blame and Accountability

The ability of participants to mitigate against a hazard is constrained not only by a lack of financial resources but the precarity of the resources that they have available. It is said that how they can try to protect themselves against disease is to boil water, however, to boil water requires electricity. In the place of electricity they have to boil water using an open fire which then exposes them to the risk of shack fire. Their ability to put out shack fire is constrained by the malfunctioning taps throughout the settlement. There is therefore somewhat of a feedback loop not only in the shared cause of hazards amongst the various hazards but also in the interrelation of these in disaster mitigation.

We also see that participants sometimes blame each other in the event of disaster, especially shack fire, with a research participant stating that if he had a fence around his shack, he would not need to run around other people's negligence and help them put out a fire, but because he does not have a fence, he is forced to help others irrespective of the cause because it has the potential to affect him.

Inferences of State

Poor governance has been linked to high exposure and vulnerability (UNISDR, 2016). There is a high inference towards the state because for each hazard that residents said they are exposed to; the state has been cited as having some sort of responsibility in the cause. The state is therefore expected to take some action towards mitigation by the residents. However, we also see that the way in which they undertake mitigation efforts towards their hazards suggest that they have lost hope in the state to alleviate their disaster risk and hazard exposure, i.e. in the event that there is a shack fire within the settlement they do not prioritise calling the fire emergency services. In fact, it is the last step that they take in dealing with a shack fire. In the case of this excess water, residents have taken it upon themselves to dig pathways to channel the flow of water. This suggests that they do not believe the state will

take a stance around the planning of informal settlements. Residents also stated that they do not know where to report leaking taps to the municipality because they never get responses. In dealing with the anxiety surrounding disease we see a positive inference from the state where the mobile clinic surrounded by the state is said to help. In dealing with crime, research participants said that the criminal gets taken to the soccer field with the victim and should the criminal be found guilty the community will take the law into their own hands before the state is called because “if you let the criminals walk, tomorrow it may be you”. They therefore do not trust the police to hold the perpetrators accountable.

The state is also inferred upon for mitigation not only in hazard exposure and the capacity of residents to alleviate these but also when participants were asked about the social vulnerability driver and how these affect their vulnerability. A participant said that they are looking forward to receiving their pension because this will reduce their stress and allow them to take care of themselves. This implies that the social grant will reduce their pressure.

6. Analysis: Intersectional Vulnerability

Intersectionality is concerned with assessing how the various factors that contribute to vulnerability interact and affect the resulting vulnerability. It is assumed from this that because people are all different social entities with varying characteristics, the resulting vulnerability will vary for all involved. We see its relation to social vulnerability because both view the same factors as affecting vulnerability and, as such, they asses the same factors. Intersectionality aims to bring to the fore how the categories that an individual possesses, categories that are often inherent (i.e. age and gender) interact and affect one’s positioning or marginality resulting in different levels of vulnerability across individuals. Similarly, social vulnerability recognises that people are not equally vulnerable and this is often linked to global patterns of inequality. It is in the very causes of inequality that the disasters to be experienced are often said to be unnatural, because they have little to do with those who are affected by it and because those affected live in a constant state of disaster. The link between social vulnerability, intersectional vulnerability, and unnatural disaster is therefore found in the social processes that render some individuals as marginalised and others as not.

While this holds true, this research has confirmed that vulnerability is not experienced homogenously and that each person has characteristics that either lesson or aggravate their vulnerability. However, even with that, there are observable trends.

The Kya Sands population seems to be aware of their risk and cope by having accepted their risk. While they understand their risks, they have limited resources to try and change their

situation, shifting most of the responsibility to others, particularly the government and the landlords. Huchzmeyer (2009) notes the existence of shacklords, which is also seen in Kya Sands, as a big factor in the production of vulnerability. Their ability to change their situation is limited by the low-income potential which often means that they need to secure their daily livelihood and that is more important than trying to mitigate against risks.

While the researcher had gone out to understand variegated vulnerability, the results obtained suggest that before the variegated vulnerability in individuals can be understood, there is a need to understand the vulnerability of the settlement in more detail. Their ordering of risks and hazards suggest that their ontological ordering of the world is different from Western Science views. It also appears that our definitions of hazard vary from what they define as hazard.

There are also no social vulnerability indicators that can be seen as primarily affecting risk besides those related to the state of tenure and the building material used. The cultural and individual characters are more reinforced not when they are considered alone but when we consider their interaction with other factors.

The interaction between various characteristics is seen as two-fold; there is an interaction between the various social vulnerability drivers but there is also an interaction seen in the different causes of hazards.

When residents were asked which factors they viewed as affecting their vulnerability, there was never a factor that was ever in isolation and therefore there can never be a uniform view of the effect of a certain characteristic on overall vulnerability. Gender was viewed by some as not affecting their vulnerability, whereas others felt that being female puts one at a greater risk to events such as crime. To others, the biggest risk factors were to not only be female but to be female and married or in a relationship because should you cheat on your partner then it is granted that he will most likely burn your shack. This was also something that was stated more often by the males than females. It could be that the females are too scared to mention it or that it occurs so frequently that it is viewed as a norm, an unsaid rule. Furthermore, there were unsaid but visible actions that inferred that the decision-making of some females was compromised by the very fact that they have partners, i.e. there are some women who moved to Kya Sands with their then-partners who have since left them and there are others who needed to request permission from their partners before taking part in this research, suggesting that they may not have an equal share in deciding matters of the household, constraining their ability to act. There were also some who felt that because they were married or in stable relationships they were better positioned because there was less pressure on them

to have to deal with household affairs and make sure there is food. Here, we already see that it is not one's gender that would result in an increased exposure to disaster vulnerability, but the interaction of the gender with other factors.

Another indication of this is seen when considering the effect of being male on vulnerability because, where one could have assumed that because some females have a reduced decision-making ability, the males are at an advantage, however, some males differed. It was expressed that the greatest factor in decision-making is whether you own your dwelling or not and if you do, you can alter certain things that you otherwise cannot alter as a tenant. Therefore, to be male does not suggest an increased vulnerability, nor does being a decision maker increase it as even that interacts with one's state of tenure.

There is also an interaction seen between the causes of some hazards and the mitigation efforts necessary for others. Ill health is said to sometimes be caused by the dirty drinking water and mitigating against this requires boiling water before consumption. Boiling the water, however, would require an open flame as they do not have electricity and this will expose residents to the risk of shack fires. This then brings us to their lack of access to basic services such as electricity.

While we conduct studies on intersectional analyses to understand the interplay between the various factors of vulnerability, ultimately the attempt to summarise it with a general conclusion means that the detail in the various categories will be lost. Therefore, without attempting to summarise the responses inferred on intersectional analyses, this research concludes intersectional analyses in saying that the interaction between the social vulnerability drivers is similar to the interplay between the causes of the hazards that residents felt they were exposed to. This is why multiple disaster events can be experienced at a time, within a season. It's almost as if the residents exist in this web of causal factors to disaster, and these causal factors when viewed alone seem insignificant. However, even that web of causality to disaster is rooted in the fact that they lack safe tenure.

Their vulnerability, however, can never be reduced to a single social category, that is to say that there isn't an exclusive factor that can account for their social vulnerability. There are various factors can act as proxies for vulnerability, particularly when they interact. The resulting vulnerability varies per interaction and therefore per individual.

7. Conclusion

This study aimed at understanding vulnerability and the hazards that residents face in Kya Sands informal settlement. The multi-disciplinary use of vulnerability suggests or indirectly acknowledges that vulnerability can no longer be analysed categorically just as its receptors/ subjects cannot be categorised or viewed as homogenous entities with the same lived experiences. People are not static, nor can their resulting vulnerabilities be. Through this study it has been discovered that people's perceptions of hazards and the resulting vulnerability is affected more by their spatial proximity to the hazard rather than the frequency and magnitude of the hazard. This is in sharp contrast to the conventional Science-World views of hazards and risk that considers event x probability. This view tends to place great emphasis on the "undesired event" and how this can be avoided or reduced. However, this view is not applicable to the Kya Sands community as the undesired event is seen as living in Kya Sands, a place they describe as "living in hell", '"always in disaster", and not trying to work around reducing or avoiding shack fires. Disaster avoidance strategies do not recognise and account for those who believe that they are in a constant state of disaster. While these results are unique to the Kya Sands context, it can be applied to other studies to rethink how social vulnerability is studied. Furthermore, it can be applied at different scales and communities to study the interplay between the various categories. It has challenged the way we perceive informal settlements and what it is that we think they are exposed to the most. The challenge of a heightened vulnerability to disaster in informal settlements is one that can be eradicated. It will, however, require engaged, multiple-disciplinary efforts from academia, the state, NGOs, as well as participation from the affected communities.

What shapes risk perception?

The main influences of risk perception can be summarised as:

a. **Spatial proximity to hazards –** It's not the hazard that will cause the greatest damage that is viewed as severe, but rather the one they are confronted with daily.
b. **Capacity to Mitigate against hazards –** Where mitigation efforts are communal, the hazard is not seen as severe as when mitigation is an individual responsibility.
c. **Constant state of disaster –** Cyclical relationship between mitigation efforts. There is always an impeding disaster, they just don't know which disaster will occur, i.e. saving money towards a brick structure means they are faced with hunger – that too is a disaster. They view themselves as fighting for survival.
d. **Shared impact of disaster –** They feel much better knowing that they all share in the precarity, lessening the perceived severity of the hazard.

e. **Relation to community leaders –** Never explicitly stated, however, the researcher feels that it affects their perception of hazard as closer relations to community leaders often results in more access towards help in the community.
f. **Presence of state –** Where there is evidence of state, the hazard is not rated as severe, therefore the presence of the state aids in reducing hazard risk and disaster impact.
g. **State of tenure –** Critical in risk perception; it affects agency.
h. **Frequency and amount of income-** Their challenge is not whether they have an income or not, but rather the instability in the income which is often also a low amount.

There is therefore a need to explore the articulations of disaster amongst those considered at risk. This is because, to those affected, a hazard is weighed based on how it affects their day-to-day living as opposed to the effect of the hazard becoming a disaster and the effect thereof. To residents, the inability to meet daily survival needs such as food is more disastrous than that of a shack fire which may or may not happen, the cause of which is not entirely up to you. Ultimately, the residents feel that they exist in a constant state of disaster, they just do not know when the disaster will occur.

A closer look at the perceived sources of the hazards suggests that their greatest vulnerability is a vulnerability of place. Environmental factors were not cited as a source of most hazards, yet structural and institutional factors were. Structurally, they are vulnerable because of the type of their dwellings and the materials used to construct it and this is their greatest vulnerability. The root causes are often shared by more than one hazard. This is in support of Murray's (2009) theory that although most disasters experienced now have a certain level of human influence, ultimately it is the lack of social infrastructure and social processes in place that escalate the occurrence of disaster for others. The greatest constraint in dealing with these hazards, which often become disasters, is that they are unpredictable and there can therefore never be warnings for them.

Social vulnerability has been identified and explored on the basis of meanings held by the residents which have arisen out of their lived experiences and yielded an insider's perspective. Discovering the perception of residents of how certain social vulnerability indicators affect their vulnerability has stood in contrast with the research suggesting that social vulnerability indicators often imply false positives or false negatives (Dhawan, *et al.*, 2016), disrupting the doxic understanding of social vulnerability. This is because what residents cited is in sharp contrast to the common denotations of the effect of these indicators on social vulnerability. Older age, often viewed as increasing vulnerability because of a decreased mobility (Cardona

et al., 2012), has in this instance translated into a decreased vulnerability as you are able to receive the social grant for pensioners and can then move back 'home'. Not only does this also highlight that residents are desperately waiting upon state intervention to alleviate their circumstances, but it also suggests that residents do not have a feeling of belonging while living in Kya Sands as they have another place that they refer to as "home". Kya Sands therefore offers temporary, make-shift accommodation for residents while they are in the pursuit of economic freedom and advancement, but it does not feel like home to them. Factors associated with individual characteristics (i.e. age, gender, and marital status) and those associated with cultural factors and processes are of no concern to residents and are viewed as not having a significant effect on their vulnerability. This was such even though there were practices noticed that one could have said affected their vulnerability. It is the structural and economic indicators that are viewed as affecting vulnerability, illustrating the area in which residents are desperate for intervention. These are also in line with the primary reasons why people chose to settle in Kya Sands. This is similar to the views expressed by Wachinger, *et al*., (2013) that cultural and individual factors, i.e. age, gender, and education don't play as big a role as primary predators such as income. They are therefore just modifiers or amplifiers.

What lens did studying social vulnerability through intersectionality offer?

The inclination to afford greater or lesser vulnerability to societies based on an accumulation of "risk conditions" is refuted by the responses received from the study sample. The study of the effect of the various social vulnerability drivers on social vulnerability has illustrated, as intersectionality suggests, that it is often not just because one has a certain characteristic that they become vulnerable but rather that it is the intersection/ interplay of two or more factors that affects vulnerability. It cannot just be assumed that because one is female one possesses a greater vulnerability, but it was those females in committed relationships and who were unemployed who would possess a greater vulnerability to disaster than a female counterpart who was single, employed, and more closely connected to the community leaders. Similarly, to be male did not necessarily mean decreased vulnerability, however, to be a male in a committed relationship, employed full-time, and owning your shack placed one at a greater advantage than a single male in part-time employment and renting. It, has however, highlighted agency as an important, determining under-current in vulnerability. While it could be viewed as a shortfall of this study that the results of the social vulnerability indicators and how they interacted could not be summarised into a single assumption or point, it does indicate that people are unique, possessing various characteristics even if they are within the same locale and socio-economic class. It is a recommendation of this study, therefore, that communities first be understood and the nuances that exist between individuals be studied

before vulnerability can be studied. Ultimately, vulnerability can never be experienced in a homogenous way (Hopkins, 2015).

There is also a very strong sense of shared community and precarity that emerged when residents were asked about social vulnerability indicators. It appears that residents share a sense of precarity that outweighs the differences that may exist between them (i.e. ethnicity). A resident stated that “Mo re no phela fela kaofela’’ (here we just live together) when asked about the effect of various ethnicities/ nationalities in Kya Sands. This was also seen when residents were asked whether they would be interested in modifying certain characteristics, i.e. highest level of education, and they considered only residents within Kya Sands when giving their answers. The perceptions of residents on how certain characteristics affect social vulnerability also differed significantly from Common Science views. Thus, while methods towards social vulnerability and intersectional analyses are evolving towards a uniform approach, they must factor in the perceptions of those at risk when doing vulnerability studies so as to prevent misguided intervention efforts.

Studying vulnerability through intersectionality has offered the researcher a lens through which to study the nuances that shape people and how they experience life, a lens that common vulnerability studies do not offer. It has also demonstrated that people are products of multiple social categories, interacting daily. As such, we study vulnerability in its different categories (i.e. social, physical, financial) because it does exist in categories but ultimately all these different categories interact to make up one’s vulnerability. Therefore, while we go out and study facets of vulnerability, the results of these studies must be applied as an overarching vulnerability otherwise they become meaningless.

Residents are not oblivious to the risk factors associated with living in Kya Sands but they lack the necessary resources to effectively mitigate against these hazards. While many reported an existence of social networks that they can rely on in times of disaster, this often does not help significantly because they are drawing from the same pool of constrained financial resources. Those who were closer to the leaders, however, did enjoy an added advantage. The emergence of “shacklordism’’ is seen and landlords are often cited as both a cause for hazards and also necessary in the mitigation of certain hazards. This is having the unintended consequence of the emergence of ‘hobos’’ in Kya Sands, displacement within displacement supporting the view that informal settlements are becoming cities and are mimicking the processes in play in formal cities. This also highlights the precariousness of informal dwellings that are not only subject to disaster but also to a shift in income, causing one to lose or sell your dwelling as a means to obtain income. An encounter with a recently displaced resident highlighted this: “I have been in Kya Sands for 10 years. I got sick and could not work. I sold

my shack for R1500 because I needed the money. Now I just sleep wherever I can. I come from the Eastern Cape and will not go back home." As such, studies of informal settlements should not focus solely on the socio-economic status of the inhabitants but rather the processes that are shaping these informal settlements. The fact that the greatest vulnerability in Kya Sands is associated with the insecurity of tenure and the notion of renting vs. owning when shacklords is an illegal concept in informal settlements highlights the absence of state in the management of urban, informal spaces and the role of the state in producing these vulnerabilities, whether directly or indirectly.

The failure of state in assuming a concrete stance on the management of informal settlements is seen as a hindrance towards mitigation efforts. This is because the state has said that no residents are to build their dwellings using brick structures as they will be relocated, however this relocation has still not happened, eight years since it was promised. Residents however continue to be at risk. Despite this, residents have developed their own way of dealing with disasters, illustrating a social order that has arisen. The presence of community drills is evidence of this. Informal settlements are often romanticised for their strong social network but it is seen that residents are not doing it because they care for their neighbours but because failure to do so means the disaster event could end up affecting everyone. "In taking care of my neighbour, I protect myself." These community drills have placed the state as the very last step in the drill, indicating that the community has lost trust in the state and has learnt to rely on themselves. This is not to imply that they do not need the state to intervene; they have merely learnt to structure their lives around the absence of the state.

Moreover, there seems to be a relationship between the rating of hazard as well as the mitigation strategies employed. There are community drills in place for shack fire and crime, events that were rated as the third and fourth most hazardous in terms of severity. Disease has individual mitigation with some intervention from the state helping through the clinic and it was rated second. Water, the hazard wherein mitigation is the sole responsibility of those affected was rated first. It may be that the community drills also ease the pressure and that is why, those disasters with shared community mitigation efforts were rated last.

Throughout all the mitigation efforts mentioned by residents, there was no inference towards enhanced education gained except the paraffin stove drive in 2014. This may also be an area of need, especially where ill health and the displacement of water is concerned. Unfortunately, the rebuilding activities after disaster are often carried out in the same manner using the same resources, thus doing nothing to eliminate vulnerability (Doberstein, 2012). Adaptation and mitigation efforts therefore need to be improved such that they decrease vulnerability.

This paper has highlighted gaps that continue to exist in the study of vulnerability, advocating for a need to steer away from generalised views and rather move towards in-depth studies that will offer an increased understanding of the communities said to be at risk. This Is because whether a disaster is viewed as major or minor, it is the people at the community level who suffer. While advocating for a greater understanding of the social, it does not negate the importance of technical vulnerability studies, but proposes that a multi-disciplinary approach be adopted because nothing acts or exists in isolation. To better inform policy, there needs to be a way to translate the results of social research into “actionable” initiatives, particularly because perceptions are difficult to measure. The study of social vulnerability, however, continues to be complicated and it is not possible that the views of all the residents will ever be accounted for.

There are no conclusions in research, only momentary pauses to collect your thoughts and evaluate your understanding before continuing (Schwartz-Shea and Yanow, 2012). The residents of Kya Sands’ vulnerability is therefore due to various factors but the centre of this remains abandonment by the state and their families which exposes them to the elements which become a source of vulnerability, i.e. abandonment from the state evidenced in insecure tenure and insecure employment. Though they have formed a social order in the place of the state to help them cope with disaster, this is not enough. The vulnerability of the socially isolated, as Agamben(2005) denotes as “bare” cannot be neatly categorised as they are one illness, one temporary job loss, one candle tipping over away from disaster.

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Appendix A: Consent Form

Consent Form

Unnatural Disaster: Assessing Vulnerability to Hazards, Case Study of Kya Sands Informal Settlement

Please read, or ask the researcher to read to you the following before signing below:

1. Participants will remain anonymous and their names will not be used in any research findings.
2. No direct quotes will be used if they make the research participant identifiable.
3. Participants' exact location will be kept private. Where necessary, only the section name will be mentioned.
4. Participants do not need to answer any questions that they do not wish to answer.
5. There will be no direct benefit (financially or otherwise) for participating in this research.
6. Any further questions may be asked before signing below.

I agree to participate in this research _____Yes _____No

I grant permission to record this interview _____Yes _____No

I, the participant, agree to take part in this research through an interview. I have read the information sheet provided and have had any further questions answered by the researcher.

Name (Optional) _____

Signature _____

Date _____

Tumelano ya dipoledišano

Dikotsi tšeo e sego tša hlago : Go nyakišiša go ba kotsing, Setshaba sa Kya Sands

Ke kgopele o bale, goba o kgopele mo nyakišiši a go balele tšeo di latelago pele oka tshaena mo fase:

1. Batšeakarolo ba ka se balwe mme maine a bona ake se ke a tšwa mo di nyakišišong.
2. Ago na mantšwe ao a tlo go shumišiwa ao aka dirang batho ba bangwe ba kgone go tseba gore motšeakarolo o a boletseng mantšu ao ke mang.
3. Magae a batšeakarolo a tlo khutišwa. Mo go nyakegagago, sekeshene yeo batšeakarolo ba dulang go yona e tla bolediwa.
4. Batšeakarolo ga ba gapeletswa go araba di potšišo tšeo ba sa nyakeng go di araba.
5. Ga go tlo ba le ditshwanelo tšeo di tlo fiwang (tsa tshelete kapa mokgwa ofe kapa ofe) ge motho a tšea karolo go di nyakišišo tše.
6. Ge ona le Dipotšišo tše dingwe , o lokollotswe go di botšiša pele o ka tshaena mo fase.

Ke dumela go tšea karolo go di nyakišiši tše _____Ee _____Aowa
Ke dumela gore dipoledišano tša rena di gatišiwe ka segatiša mantšu _____Ee _____Aowa

Nna, motšeakarolo ke dumela go tšea karolo go di nyakišišo tše ka go boledišana le mo nyakišiši. Ke badile dokomane ya Tsibišo le kgopelo mme Dipotšišo kamoka tšeo ke be nnago tšona di arabilwe kamoka ke mo nyakišiši.

Leina (Ale gapeletswe) _____
Tshaeno _____

Letšatši _____

Appendix B: Participant Information Sheet

Research Information Sheet

Unnatural Disaster: Assessing Social Vulnerability to Hazards, Case Study of Kya Sands Informal settlement

To whom it may concern,

I am Mahlogonolo Rangata, a Master of Science student at the University of the Witwatersrand in Johannesburg. My studies require that I do research in an area of my interest. I am interested in vulnerability to hazards, particularly in Kya Sands, and I would like to spend time in your community to understand this better. I am writing this to introduce myself.

Research Project: My research aims to better understand the hazards that residents in Kya Sands are exposed to, which disaster events you have experienced in the past 10 years as a result of this, and how you mitigate against these hazards. I want to talk with people who live in Kya Sands to understand this, both those who have been living in Kya Sands for a long time (longer than 5 years) and those are still new in Kya Sands (less than a year). I want to talk to people, through interviews that should last between 40 and 60 minutes.

I would like to interview you as part of this research. If you agree, the interview will take place at your home, or in a safe location that you choose, within Kya Sands. During the interview, I may ask you questions about your background, your community, and how you experience life here.

If you allow me, I would also like to record our interview to ensure accuracy in my records. I will only do so with your permission, otherwise I will just take notes. If you allow me to record, you can tell me to switch off the recorder at any point.

I do not think that research will place people at risk. However, I will still secure consent from each person before interviewing them and I will not reveal anyone's identity or share their words without consent. I will do my best to keep my written notes and computer files secure.

This research is done for academic purposes and all information gathered will be compiled into a research report. I plan to present my research at academic conferences and to publish it, but I will not reveal your identity.

You and your community will receive no direct benefit from this research but I hope that this research will help your community, scholars, and others to better understand the hazards that you face. Your participation in this is purely voluntary.

If there is something you do not understand please feel free to ask me and I will provide clarity. You are not forced to answer all the questions and you may withdraw at any stage. You can contact me as follows: Mahlogonolo Rangata 071 522 721 688376@students.wits.ac.za or through my research supervisor Dr. Alex Wafer 011 717 6517 alex.wafer@wits.ac.za. You can also contact the University of the Witwatersrand Ethics department as follows : 011 717 1408 Shaun.Schoeman@wits.ac.za

Thank you for your time

Tsibišo le kgopelo ya go dira di nyakišišo mo setshabeng sa lena

Dikotsi tseo e sego tša hlago: Go nyakišiša go ba kotsing, Setshaba sa Kya Sands

Go yo di mo amago,

Ke nna Mahlogonolo Rangata, moithuti wa di thuto t**š**a godimo setheong sa tša thuto e kgolwana ya kwa Witwatersrand, gona go la Johannesburg. Go ya ka dithuto t**š**a ka, ke tswanetši go dira di nyakišišo mabapi le di kgahlego tšaka. Ke na le kgahlego ya go kwišiša le go hwetsa di kotsi tseo mohlomong di ka diregalago go badudi ba Kya Sands. Nka rata go fetsa sebaka le setshaba sa Kya Sands go kwišiša go ba kotsing ga lena. Ke ngwala se e le go ke tsebisa.

Porojeke ya tša diphatišišo: Dinyakišišo tšaka di nyaka go kwišiša bokaone di kotsi tšeo mohlomong di ka diregalago mo Kya Sands, le di kotsi tseo di diragetšego mo mengwageng e lesome yeo e fitilego legore le leka bjang go di thibela. Go kwišiša tše be ke ratile go boledišana le batho bao ba dulago Kya Sands, bao e lego kgale ba dula moo (go feta mengwaga e mehlano) le bao e sego kgale ba dula Kya Sands (bao ba sa fetšago ngwaga wa bona wa mathomo Kya Sands). Nka rata go boledišana le maloko a Kya Sands, le go botšiša dipotšišo, dipoledišano tša rena di tla tšea metsotso ye e leng gare ga metsotso e masome nne (40) le iri.

Nka rata go boledišana le wena. Ge o ka dumela, di poledišano tša rena di tla diragalega legaeng la gago, kapa lefelong leo le bolokilego gona mo Kya Sands. Moo di poledišanong tša rena, ke tlo go botšiša ka letla morago la gago, ke tla botšiša le ka setshaba sa Kya Sands le gore le phedišana jwang.

Ka tumelelo ya gago, be nka rata go gatiša di poledišano tša rena ka segatiša mantšu ele go nnetefatša gore tšeo ke di ngwadilego ke tšeo di boletšwego gare ga rena, mme ke tla dira jwale fela ge o dumetši. Ge o sa dumela, ke tla tšea dinthla ka go di ngwala. O dumeletšwe go mpotša go emiša go gatiša nako engwe le engwe.

Ga ke nagane gore dinyakišišo tše di ka bea batho kotsing, eupša ke tla nnetefatša gore ke kgopele tumelano go motho e mongwe le e mongwe yo ke tlago boledišana le yena. Ke tshepiša gore nka se fane ka dipoledišano tša rena go batho ba bangwe ebile nka se fane ka maina a batho bao ke boledišaneng nabo. Ke tlo leka bo tšohle bjaka gore tšohle tše re di bolelago di šireletšege, ditokomane le dikgatišo tšohle.

Diphatišišo tše di dirwa ele go phetegatša dithuto tšaka. Ke ka moo ge tšohle di fedile, maikemišetšo aka ke go ntsha dinyakišišo tše dikhonferenseng tša borutegi le go phatlalatsa go bohle, eupša nka se ke ka ntsha maina a gago

Wena le setshaba sa Kya Sands le ka se humane di tshwanelo go tšwa go di nyakišišo tše mme ke holofela gore di tla le thuša, ga mmogo le banyakišiši le baithuti ba bangwe go kwišiša bokaone go ba kotsing bja lena. Go tšea karolo go di nyakišišo tše ke ka boithaupi, eseng ka kgapeletšo.

Ge go na le selo seo le sa se kwišišago, lokollogang go mpotsiša me ke tla le gakolla. Ga le a gapeletswa go araba di potšišo ka moka me le ka lesa go tšea karolo ka nako engwe le engwe. Le ka nteletša go 071 522 7210 kapa ka e-mail go Mahlogonolo.rangata@gmail.com. Le ka lletša le supervisor yaka go 011 717 6517 kapa ka e-mail ale.wafer@wits.ac.za. Le ka lletša le ba Unibesithi go la 011 717 1408 kapa ka e-mail Shaun.Schoeman@wits.ac.za

Ke leboga nako ya lena

Appendix C: Ethics Clearance Certificate

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Rangata

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H18/09/25**
PROJECT TITLE	Unnatural Disaster: Assessing social vulnerability to hazards in Kye Sands
INVESTIGATOR(S)	Miss M Rangata
SCHOOL/DEPARTMENT	Geography, Archeology and Environmental Studies/
DATE CONSIDERED	14 September 2018
DECISION OF THE COMMITTEE	Approved
EXPIRY DATE	07 November 2021

DATE 06 November 2018 **CHAIRPERSON** (Professor J Knight)

cc: Supervisor : Dr A Wafer

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

_____ Signature

_____/_____/_____ Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

Appendix D: Interview Questions

Research instruments

Data collection for this research study involved a desktop study as well as interviews. Although these interviews were unstructured, there was key information that I was looking to obtain from the research and, as such, I probed certain responses. I used a phone to capture images, a Dictaphone to record interviews, as well as a notepad and a pen to write interview notes.

Participant recruitment

The first few participants were recommended by the community leaders. I still had to personally set up the interviews for my first day on-site with the participants that I met at the community meeting. After this, I recruited participants from walking around the settlement on the first day and asking people that I met to take part. This form of sampling is known as random, non-probability snowball sampling.

I also needed to make sure that I interviewed an equal number of participants in each section.

Methods of data collection

While in Kya Sands, I took pictures. I also conducted interviews with participants at their homes or at an area considered safe within Kya Sands, all of which was outdoors to ensure my safety, too. With the consent of the research participants, I recorded these interviews. Before the commencement of interviews, I went through both the participant information sheet and the consent forms with participants. Consent was asked for both the participation of the interview as well as to record the interview. I also took notes throughout the interview and in the event that permission was not granted to record interviews, I took notes only.

Interviews were scheduled to last between 40 and 60 minutes and I conducted interviews on Tuesdays, Wednesdays, and Thursdays.

Possible interview questions

1. Tell me about life in Kya Sands? How would you describe it? Do you take part in community activities, do you have these? Probe
   Why did you move to Kya Sands? For how long have you been here? Where were you before you moved here? Probe
2. Do you think that it matters that you're a woman living in Kya Sands? How?

What is your highest level of education? Do you think it would have helped you to study further? Probe

3. What do you think are the dangerous things about living in Kya Sands? What causes it? Probe
4. Have you experienced any disaster events since staying in Kya Sands? Where were you when it happened? Who helped you? What caused it? Probe