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Mathevula, Delani Angel

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FLOODING AND INTERSECTIONAL VULNERABILITY IN SETSWETLA INFORMAL SETTLEMENT, JOHANNESBURG

Delani Angel Mathevula (1259200)

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School of Geography, Archaeology and Environmental Studies

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University of the Witwatersrand

Declaration

I declare that this thesis is my own work with no aid from the parties. It is being submitted for the Degree of Masters of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

D.A Mathevula

_____

(Signature of candidate)

_____day of_____20___at_____Wits_____

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I wouldn't have made it without God's will and timing. He prepared this journey for me long before I was born.

Abstract

This study aimed to explore the link between vulnerability to natural disaster hazards (flooding) and broader indicators of social vulnerability among a sample group of individuals living in the informal settlements of Setswetla, on the outskirts of Johannesburg. The study has drawn on the concept of intersectionality, to think about how vulnerability to environmental hazards are exacerbated for particular groups of people as a result of their citizenship, race, and gender profile. To understand how residents of Setswetla both conceptualize and respond to vulnerability in their everyday lives as a general condition, I have drawn upon data gathered from semi-structured interviews, observational and participative fieldwork in the neighborhood for several months, as well as document reviews, media, and secondary academic literature. Two themes namely the 'Angry Female rain' and 'The intersectionality of vulnerabilities' emerged from the collected data to characterize the vulnerability as per the lived experiences of Setswetla.

The primary finding of the research is that fatalism - i.e. a general sense of reduced agency and inability to plan for the longer-term - becomes the means through which residents can make sense of their vulnerability. In this way, it might be argued continuing to live in an area that is vulnerable to potential disaster is not irrational. Flooding to the extent that people lose lives and livelihoods occurs perhaps once every few years, whereas everyday violence and vulnerabilities like gender-based violence or petty crime threaten people every day.

Setswetla is an impoverished community whose livelihoods are more urgent than the fatalistic rain that falls in two years, and they have no control over it. Women are marginalized and disempowered and experience a similar disempowerment or fatalism towards the brutality of rain and floods thus women, of Setswetla have a philosophical attitude towards the drastic

vulnerability caused by living in the flood zone of the rivers. There is a long-standing history of people's memories, as well as the documentation of the residents' crisis. People's understanding of recent disasters in Setswetla indicates that they have learned from previous incidents and are well aware of what to expect from them in the future. There is an intersectional network of ordered threats that affect settlement choices of occupying the riverbank of the Jukskei River in Setswetla. These findings indicate that a relational or intersectional interpretation of vulnerability is contrasted with a more technological understanding used by policymakers.

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Chapter One - Introduction

The most vulnerable residents in the global South live in marginal and hazardous parts of the cities. People live far from adequate infrastructure, employment opportunities, and social welfare services (Salami et al., 2017). At times, underprivileged communities are situated in areas of environmental threat. These include mining and industrial dumps (Nkosi et al., 2015); regions of extreme pollution (Moreno et al., 2010), and flood zones (Moreno et al., 2010) (Ziervogel & Smit, 2009). The marginal areas of the urban centres are famously referred to as the slums (Roy, 2009). This study used the word informal settlement because it is the term widely used in South African literature. Whichever term is used, these spaces are the parts of the city with little services and where people arrive from the rural areas to make a living in the city outside of or in the margins of the 'formal' parts of the urban economy (Poole, 2004). The living conditions in those are hazardous.

Informal settlements encounter hazards emerging from several causes. These incidents are gradually becoming part of the world's leading disasters and are predicted to increase in frequency in the future (Okaka & Odhiambo, 2019). For example, 'changes in climatic conditions over time, occupation of flood-prone areas and insufficient drainage systems around settlements, lack of waste management, lack of knowledge and understanding of and climate variability' (Salami et al., 2017) will increase the hazards encountered in the urban poor. The challenges associated with environmental hazards in these areas are a mixture of natural and man-made issues.

Flood threats are one of the major hazards associated with climate variability and rising global warming and cities in the global south are especially vulnerable to such hazards, due partly to poor infrastructure and urban planning but also to historical and geographical contexts that

mean many of the largest cities in the global south are located in regions traditionally defined by seasonal flooding, and along coastlines and riverine locations that suited colonial settlement. Global warming is expected to increase by as much as 1.5 degrees between 2030 and 2052. Increased temperatures can pose major climate threats to natural and human systems, if not mitigated. These threats emerge from several factors, such as the extent and rate of warming, the geographical location, the degree of growth and vulnerability, and the choice of adaptation and mitigation strategies used (IPCC, 2018).

Climate risk resulting from rising temperatures puts impoverished communities and livelihoods at risk and increases their vulnerability (Ziervogel et al., 2008). Informal settlements are one of those areas vulnerable to climate hazards, as they frequently occupy land that is prone to flooding and other environmental disasters. The lack of infrastructural facilities such as water, sanitation, and the proper disposal of solid waste forms the basis of being vulnerable to these environmental disasters. Households share services in areas where they are available (Marutlulle, 2017).

Setswetla Informal Settlement is an example of a marginalized group located in a geographical position that is vulnerable to environmental disasters. Setswetla's informal settlement, like any other informal settlement in Johannesburg, is experiencing a high number of immigrants seeking refuge in the city. Residents are occupying the river bank on the flood line. This exposes them to flood risks and other environmental hazards. Setswetla receives a lot of migrants searching for greener pastures in Johannesburg. The high rate of migration, urbanization, marginalization, inhabiting flood-prone areas worsens the incidence of hazardous events in Setswetla. On the other hand, urban planning increases and widens the gap between the developmental policies and increasingly growing concerns about poverty, unequal

distribution of resources, informality, rapid population growth, and spatial fragmentation (Watson, 2009).

Disaster preparedness is the cornerstone to effective mitigation of environmental disasters. Urban informal settlements are especially prone to flooding. Relatively fragile housing systems, poor economy, inadequate social welfare, and a deteriorated climate and environment limit disaster preparedness planning potential in informal settlements (Abunyewah et al., 2018). The vulnerability assessment framework provides a valuable method for municipal level assessment and flood vulnerability planning (Tascón-González et al., 2020). But there are factors behind the vulnerability of communities that spread beyond their residential location. In this project, the study demonstrated how understanding vulnerability requires an intersectional approach: understanding not only the proximal causes of risk but also the deeper contexts in which numerous marginal urban residents try to create sustainable lives.

Problem Statement

Setswetla informal settlement is an area especially prone to flooding. This is because the area is built on a floodplain, and because the rainfall patterns of Johannesburg are characterized by dry winters (which leads to the clogging of existing drainage infrastructures over the winter months) and flash floods in summer. The disaster causes significant loss of human lives and assets.

There is no doubt significant research undertaken on the vulnerability of informal settlement to natural disasters (Williams et al., 2019a, Ziervogel et al., 2016, Salami et al., 2017). Special issues in journals such as Habitat and Cities have devoted much attention to the causes and mitigating factors of environmental hazard in marginal communities. With the increasing focus

on the implications of climate change, it is recognized that several cities with bear a disproportional brunt of the impact (Ziervogel and Smit, 2009).

There is thus significant research done on the anthropological and social impact of these events: attempting to understand the lived experiences and the informal responses and adaptation practices of people living in these areas.

Papagiannaki et al (2018) and Reynaud et al (2013) suggest that both risk and concerns lead to the development of the precautionary and safeguarding behavior of the person at high risk, while previous risk experiences drive the perceived consequences of the floods in the future. Wade et al, (2009) support the authors above, by stating that the knowledge and accountability effects are facilitated by individual perceptions of the risk. Risk perception also enhances self-efficacy beliefs, which then have a direct impact on risk-reduction behaviors.

Residents of Setswetla faced displacement, loss of life and properties as a result of flooding. The physical risks to flooding in Setswetla are caused by the residents' proximity to the river, poor infrastructure in Setswetla, and poor infrastructure maintenance in the city that results in excessive water run-off entering the riverine system upstream. But the community faces multiple other vulnerabilities on a day to day level. However, there is not significant research undertaken on how informal settlement residents make sense of flood vulnerability within the context of a broader range of everyday vulnerabilities and micro-oppressions (Weakley, 2013). It is one thing for statistics and geo-spatial data to show where residents are most vulnerable to

flooding. It is another thing to understand how and why these residents attempt to build durable lives in these contexts.

In general, there has been an extensive focus on flood risk and the information associated with it, developing risk management plans is required but often overlooks how the public order threats in their own everyday lives. The ordering of risk varies from authorities to the public concerned in many different ways (Fuchs et al., 2017). A combination of the knowledge of the risk, people's experience, and how they order things around their experience are necessary to effectively manage disasters and reduce risk (Fatti & Patel, 2013). Informal settlement ordering of flood risks is very important for developing effective long-term adaptation and risk management strategies.

This research aims to try and understand how residents of Setswetla informal settlement order their own experience of vulnerability, towards understanding how and why residents continue to try and build durable lives amid an environmentally hazardous context.

Research Aim and Objectives

This research aims to understand how residents of Setswetla order vulnerability to flood within the context of multiple and intersecting everyday vulnerabilities.

1. To understand the context of Setswetla within existing vulnerability frameworks
2. To understand how residents, order their own experience of vulnerabilities
3. To critically evaluate existing vulnerability frameworks, using an intersectionality approach.

Intersecting Vulnerabilities of the informal settlement

This section of the chapter makes up the literature of this dissertation. I offered a discussion and a review of some of the key theories and concepts in the literature that frames the purpose of this study in the field of vulnerability. The two main theoretical areas of focus are 'Vulnerability' and 'Intersectionality'. These are the main concepts informing the argument in this dissertation however, the vulnerability cannot be viewed without examining the concepts of informality. Informality and vulnerability co-exist when exploring vulnerability in the urban informal dwellings however the two have been largely separated. Understanding informality assisted me to comprehend the origin of informal settlements and their relationship with the local authority, service delivery, gender-based violence, and migration in the context of vulnerability. These linkages ground-truth the degree of susceptibility to environmental hazards and other forms of exposure that was explored later in this chapter and an intersectional lens in chapter 6. Intersectionality is a way through which scholars have engaged with this diversity of compounding vulnerabilities.

Informal settlements are susceptible to environmental hazards due to inadequate infrastructures such as water and sanitation. What adding more to a vulnerable state of residents in informal dwellings is that residents' homes are built with low-quality building materials (Drisdol, 2016). Understanding hazards and transforming that knowledge into protective action is crucial for efficacious vulnerability reduction and therefore results in a significant relationship between risk perception, self-efficacy, and protective action (Sullivan-Wiley, 2017). Studies have been conducted in the literature to investigate the contributing factors to the increasing vulnerability of residents in marginalized urban areas. Although the literature covers a wide variety of these factors, in this review I am going to focus on the three major themes which immersed repeatedly throughout the literature reviewed. These themes are 'Vulnerability, 'informality,

Intersectionality'. Literature covers these themes in different contexts however, this research has primarily focused on the application of vulnerability to the informal settlement.

In this section, the study has outlined and reviewed how other authors have defined the concept of "vulnerability", how the concepts have been criticized or enhanced in terms of their definition. The concept of vulnerability has been used in different categories and thus the study has reviewed ways in which the concept had been applied in a different context. I narrowed down my review to relate to the aim of the study which is focusing on the perception of vulnerability to environmental disasters. I, therefore, reviewed the existing literature about South African Informal settlement's vulnerability to environmental hazards and their perception of the risks and vulnerabilities.

Informal settlement emanates from the concept of informality. Therefore, in this section, I reviewed the literature around the meaning of "informality". Informality is reviewed in terms of what it means and how it has evolved to the formation of settlements and its linkages to vulnerability and environmental disasters. I narrowed down the review to look at what has been explored in the literature in terms of informal settlement and the individual perception of their vulnerability to different issues include environmental disasters.

Human lives cannot be described by using single classifications, such as gender, race, and socio-economic status. People's lives are multi-dimensional and complex. Lived realities are shaped by different factors and social dynamics operating together (Hankivsky 2014). In this chapter, I reviewed the concept of "Intersectionality". An individual or community's vulnerability is due to a lot of converging factors, therefore I find it fitting to review the term intersectionality in terms of what means is or how it has been defined previously. How the

definition has evolved and the key disciplines the concept of intersectionality has been applied to by scholars?

Understanding Vulnerability: Disasters, Hazards, and risks

The concepts 'disaster,' 'hazard' and 'risk' derive primarily from the field of disaster risk management and have evolved. Although the concepts are grounded in disaster management and risk analysis, they have since been used as wider definitions of urban vulnerability and resilience. The United Nations Regional Plan for Disaster Reduction defines a hazard as a natural process or event that can have a detrimental effect on the economy, culture, and the environment, including natural and human factors associated with natural influences. Hazards are the causes of disasters. Hazards are harmful to human growth and threaten the survival of the planet. This section begins by looking at the general definition of vulnerability, hazards, and risk in the context of urban vulnerability.

Vulnerability is defined as the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt (Adger, 2006). (Janssen et al., 2006) reports that the concept of vulnerability has its roots in the study on natural hazards, where is defined as the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or society. Vulnerability together with adaptation and resilience are concepts that are finding increasing attention in several fields of literature, policy formulation, and practitioner communities engaged in global environmental change science, climate change, sustainability science, disaster risk reduction, and famine interventions (Vogel et al., 2007).

Scholars in the natural hazards field mainly focus on the vulnerability of people to impacts of environmental change, especially climate change, for example, impacts of and disasters associated with flooding. In general, there is an extensive focus on flood risk and the information associated with it, developing risk management plans is required but often overlooks public perception of a threat. The perception of risk varies in many different ways, especially between the authorities and the affected public (Fuchs et al., 2017). To respond effectively to disasters and disaster risk, there is a need to combine the knowledge of the hazard, people's experience, and perceptions in the process (Fatti and Patel, 2013).

The sensitivities of risks and exposures are traditionally and generally fabricated. Communal clusters construct different meanings for potentially hazardous situations Field et al., (2012). Understanding Perception of how environmental disasters is important in placing how individuals engage with events and future risks to the fore. Risk and vulnerability to disaster events are perceived differently among individuals and different sectors of society because the impacts of these events are not homogenous across urban areas or within communities. Many of the factors that produce and reproduce vulnerability are not easily detected with traditional statistical tools and indicators (Traustadóttir and Rice, 2012).

The concept of vulnerability is applied as a core concept in disaster risk (Miller et al., 2010) denoting the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt (Adger, 2006). The vulnerability of the community, by contrast, is more diverse in terms of disciplinary and cultural contributions, with considerable internal tensions and debates Vulnerability research has been shaped by theoretical traditions in hazard studies in the geophysical sciences, human ecology, political economy, constructivism, and political ecology (Miller et al., 2010).

Wrigley and Dawson (2016) maintain that the difference among individuals stipulates that we have particular experiences of vulnerability, therefore a simple definition would deny its complexity. Vulnerability is an emerging concept, despite its complexities in having a singular form of defining across the globe, not defining vulnerability will pose challenges to local actors in building capacities against risks and hazards. Therefore, there is a need to define an individual or community's vulnerability. Demonstrate that vulnerability may arise from the individual, community, or larger population and requires different types of policy interventions—from the social and economic development of neighborhoods and communities, and educational and income policies, to individual medical interventions (Mechanic and Tanner, 2007).

According to Downing and Patwardhan (2005), the vulnerability has no universally accepted definition. In most case studies the definitions of vulnerability are only limited to the exposure to risk however, a whole community can be impacted negatively by risks, however, the coping capacity differs and may not be equal. Vulnerability is the perception of exposure to hazards, a loss of control over the situation, and perceived inadequate capacity to resist the direct and indirect consequences of victimization by Cops and Pleysier (2011).

There are various categories of vulnerability depending on the type of exposure and groups. Lewis and Lewis (2014) claims that underprivileged societies are the most vulnerable in the community. This is supported by Palmer et al (2012) outlining that the vulnerable category in a community is those that are suffering from inadequate housing provision. Another vulnerable category is those that are socially vulnerable to environmental hazards (Cutter et al., 2003). There are two main forms of vulnerability: physical vulnerability and social vulnerability. Physical vulnerability refers to the physical characteristics of a person (e.g. gender and age), social vulnerability refers to social characteristics (e.g. race and socioeconomic status) (Rader

et al., 2012). This is evident in developing nations such as South Africa whereby the most vulnerable group resides in the informal settlement, with low socioeconomic status and inadequate housing provision, vulnerable to environmental hazards.

Vulnerability to Environmental Hazards

Floods are one of the world's leading natural disasters in terms of occurrence, economic losses, and victims (Andersen and Shepherd, 2013). However, human activities that degrade the environment often increases flooding intensity. Land use and other human activities also influence the peak discharge of floods. Human activities contribute to the occurrence of flood hazards. These human activities fall into two main categories: deforestation and improper construction damage the natural environment and may increase the occurrence of flood hazards; (2) improper choices of residences, local congestion of engineering structures, and some other factors may directly amplify the losses caused by flood hazards (Gan et al., 2018). Literature has shown that even natural events, such as flooding, have human-made elements. However, individual choices are still made to build shelters in vulnerable sites. The choice is motivated by their wider social insecurity and sense of urgency.

Urban development raises the risk of flooding in cities due to local changes in hydrological and hydro-meteorological conditions that increase the risk of flooding, as well as urban populations that increase vulnerability. (Huong and Pathirana, 2013). Society is facing major global challenges such as chronic poverty, economic and social inequalities, food insecurities, rapid urbanization, natural resource degradation, biodiversity loss, natural disasters, and climate change (Miller et al., 2010). Thokozani (2019) affirms that drought, flood, extreme temperatures, cyclones, and other hydro-meteorological events, unfortunately, play a major role in Africa's history and current situation.

Environmental hazards around the globe have proved to have placed different economies around the globe on a differentiated kind of stress. According to Halkos and Zisiadou (2019), environmental hazards placed experienced in the most developed countries have high economic losses and those that are experienced in the least developed countries have great fatalities.

The present study highlights that livelihood vulnerability between households with different socioeconomic characteristics is far from equivalent because of uneven exposure, sensitivity, and adaptability (Zhang et al., 2019). A study in India, Kolkata shows that household exposure varies significantly across the population and follows predictable patterns based on socio-economic and infrastructure variables. For example, the home flooding model results show that households with higher incomes are less likely to flood. Households living in structures made of more permanent materials are less likely to flood, as are households living near infrastructure. The home leaking model shows that households with relative financial stability are less likely to leak, as are those that have been living in the settlement for long periods and whose houses are made of better quality materials. These findings indicate that extensive risk in informal settlements is unevenly experienced and that policies intended to reduce disaster and climate risk should focus on the lowest-income households, the provision of infrastructure, and security of tenure (Rumbach and Shirgaokar, 2017).

In the process of developing mitigation strategies, factors such as access to information, perception of risk, adaptive capacity, and inclusion in certain social networks determine differences in adaptation response. The differences in responding to risks occur among individuals that may initially be perceived as a homogeneous group, however, with different characteristics. These Characteristic informs how individuals perceive risk and develop a response to mitigate the experienced risks (Ziervogel et al., 2006). In support of Zievogel et

al., (2006), Downing et al., (2005) regards vulnerability as a property or characteristic of target groups, societies, and systems, but also as the outcome of a climate or other hazard process.

(Nygren and Wayessa, 2018) argue that a fuller understanding of how institutional governance produces multiple marginalization requires political-ecological and intersectional analyses of residents' experiences of injustices that encompass interlinkages between social position, gender, and political power. Bronfman et al., (2016) a study conducted from cities in Chile indicate that earthquakes, tsunamis, and wildfires were natural hazards of greatest concern to the national population, they also reflect that there are specific additional concerns in different cities that are coherent with their individual history of natural disasters that implies natural disaster risk preparedness.

Rapid urbanization and climate change together increase the vulnerability of deprived urban communities to natural hazards, undermining urban resilience. Mavhura (2019) stipulates that vulnerability is driven by interacting factors including multiple interdependent physical and low socio-economic variables involving non-linear relationships (Parnell and Walawege, 2011). Dodman et al., (2017) argue that urban development actors need to consider the consequences of their actions for risk, while risk reduction practitioners will need to engage with all elements of urban development, including informality, urban poverty, infrastructure and service provision, land management, and local governance capacity.

Informality and vulnerability

Informality is defined as an alternative urban order, a different way of organizing space and negotiating citizenship. Informal space represents the “unplannable” city that lies beyond the sphere of regulations, norms, and codes (Roy, 2015). These resulted in friction and spatial segregation; heterogeneity, which formulated social instability and insecurity; and anonymity,

leading to the emergence of individualistic survival mechanisms who were assumed to have come from the less conflictual countryside (AlSayyad, 2004). Huchzermeyer, (2006) argues that informality has made possible the survival of a large percentage of the urban population, enabling a range of precarious livelihoods.

According to (Roy, 2015a,) and (Huchzermeyer, 2006), informal spaces are viewed as either dismal concentrations of poverty, a tangible manifestation of economic marginality, or as an alternative and autonomous urban orders, patched together through the improvisation and entrepreneurship of the urban poor. Therefore, informality arises out of poverty, (La Porta and Shleifer, 2014), whereby urban informality represents the aggregating number of unemployed, partially employed, casual labor, street subsistence workers, and street children (AlSayyad, 2004).

Informality is inscribed in the ever-shifting relationship between what is legal and illegal, legitimate and illegitimate, authorized and unauthorized. Informality is unregulated behavior, it may be illegal, like squatter settlements or the hiring of undocumented workers, but it also includes actions and communications that are neither prescribed nor proscribed by any rules (Innes et al., 2007). These differentiated urban geographies that denoting social hierarchies of class, race, and ethnicity that are consolidated, maintained, and negotiated (Roy, 2015).

This production and regulation of space is also the production and regulation of social difference (Roy, 2015). Formality and informality as being relative to state regulation, in which category A is for formality and the three categories of informality which states: those who evade regulation (B), those who avoid regulation (C), and those to whom the regulation does not apply (D). Informality relates to lack of regulation in a way that informal settlements are urban neighborhoods that develop and operate without formal control (Dovey and King, 2011).

The informal sector as a concept emerged in the early 1970s in the discussion engrained in descriptions of the movement of labor to cities in the 1950s and 60s. The sector concept was developed as a model for understanding the new migration of people and the manner of their employment in developing countries. These were usually referred to as the petty traders, street vendors, coolies and porters, small artisans, messengers, barbers, shoe-shine boys, and personal servants. The studies in the informal sector evolved to diverge in many different directions. In the 1970s the informal sector was described as the urban poor, or as the people living in slums or squatter settlements (AlSayyad, 2004).

In most developing countries, informal settlements have marked the urban landscape for at least a half-century. Therefore, the expansion of cities meant the formation and expansion of informally developed residential areas (Huchzermeyer, 2006). (Marutlulle, 2017) argues that cities continue attracting hundreds of new residents every year in search of work and a better life including health facilities, medical services, education, and social security, the housing backlog coupled with a shortage of housing subsidies means that migrants, therefore have no alternative but to live in informal housing particularly shack settlements (Zweig, 2015). However, (Marutlulle, 2017) concludes that government policies, population growth, municipal administrative issues, and economic variables are the major causes of informal settlements.

Urban planning is implicated in this enterprise, creating the root causes of the problem in informal settlements. Urban planning promotes social and spatial exclusion, is anti-poor, and doing little to secure environmental sustainability (Watson, 2009a). (Watson, 2009b) the argument on the informal settlement's exclusion from the benefits of the urban planning is supported by the (Roy, 2015a) arguing that informality, is formed by the state and this is apparent from high-end informal subdivisions to squatter settlements.

The authors have shown how informality has emerged as a result of poverty and marginalization by the decision-makers, urban planners which are the state in the nutshell. In the process of dealing with informality, there is imperative a need to confront how the tools of planning harvest the unplanned within all margin of the city (Roy, 2005a). The vulnerability of informal settlement has been exacerbated by the spatial and economic exclusion of the urban poor from formal or legitimized spaces in South African cities (Abunyewah et al., 2018).

Planning practices are constantly borrowed and replicated across borders (Roy, 2005b). Approaches to urban planning that have originated in the global North are frequently based on assumptions regarding urban contexts that do not hold elsewhere in the world. The approach to city planning gives rise to a sharp divide between an increase in formalized and marginalized population and techno-managerial of government (Watson, 2009c). There is an urgency for urban studies and planning to move beyond the dichotomy of First World "models" and Third World "problems." One possible route is through policy approaches that seek to learn from Third World cities (Roy, 2005b).

Watson, (2009a) indicates that cities in the global North and South have transformed considerably: growth dynamics are now the dominant urban reality, society, spatial structure, and environments. These require that planning turns its attention to these kinds of issues however, there is a very slow change in planning to accommodate thee issues. For example, (Ziervogel et al., 2016a) in cities of the global South, where high levels of informality exist, supplemented by high exposure to, and low capacity for reducing risk, these high levels of intricacy require new ways of thinking about how to manage these risks.

Informal settlements are a critical part of the fabric of the city, yet poor planning creates a risk which in turn increases vulnerability (Richmond et al., 2018a). Informal settlements, where

mostly the urban poor reside, tend to be located in hotspots of natural hazards such as flood-prone areas, fires, and degraded environment (Abunyewah et al., 2018b), (Omedo and Nairobi, 2008). The high risk of urban vulnerability and the impact of disasters disproportionately affect poor black people living in informal settlements who are already socio-economically and physically disadvantaged (Ngcamu, 2012).

It is essential to apprehend the biophysical and socio-economic factors that impact flood risk to manage risks in an informal settlement (Ziervogel et al., 2016b) (Brown-Luthango et al., 2017). For example, Drivdal, (2016) argues that informal settlements are particularly vulnerable to environmental hazards, due to the lack of infrastructure such as drainage systems and because residents' homes are built with inferior materials. However, Geoffrey (2010) clarifies that informal settlements are not only vulnerable to environmental disasters due to poor socio-economic status and degrading biophysical condition the urban disasters and risks have been neglected, lack of an early warning plan, weak institutional arrangements to support residents, lack of political goodwill and insufficient knowledge, experience and capacity by the residents.

Local authorities are facing major challenges posed by the major influx in informal settlement due to the influx of people seeking economic opportunities. This is challenging the capacity of the local municipality, which has a waiting list for state-provided low-cost housing units, whilst the provision of adequate infrastructure to meet growing local need is also a developmental concern. In the suburb of Vredendal North, this has resulted in the proliferation of unplanned informal dwellings in the backyards of formalized low-cost housing areas.

According to Abunyewah et al., (2018b) the devastating impacts of these natural hazards on such settlements can be attributed to the higher levels of physical, economic, social, and

environmental vulnerability in conjunction with an inadequate and poor level of disaster preparedness. However, Weakley, (2014) argues that informal settlement residents are not only vulnerable to the aforementioned disasters, they are also benefiting from what the settlement is offering to them. There is a need to concede the susceptibilities of the population occupying informal settlements however, it is imperative to also recognize the positive role played by informal settlements within the broader urban system, and within the lives of mainly poor individuals and households. Informal settlements do offer the means for individuals and households to build personal, household, and community resilience in an urban context.

The informal settlement is characterized by marginal shelter and lack of access to basic services. This is displaying the most deplorable and inhuman conditions, these are proliferations in harsh terms are nothing short of gross violations of human and citizenship rights (Sandhu, 2015). In which the poorest sections continue to remain "invisible" on the radar of the city housing reforms and provision agenda. Left to fend for themselves, they respond by creating informal and precarious housing solutions on their own, sadly unrecognized and side-lined by state interventions (Sandhu, 2015). Richmond et al., (2018b) state that the drivers of vulnerability in informal communities are mostly a consequence of urbanization, in which the most important root causes of vulnerability in these communities are water and sanitation.

Non-exclusionary forms of urban planning: an answer to informality in human settlements. The following extract from an article on changes to the planning system in Great Britain in the early eighties (Pearce, 1981:59) is quoted: "It goes without much saying that in the end, the system we choose must reflect our values and objectives (Oranje, 1995). However, this is not the case in the global South cities including the case of South Africa. Systems are based on models inherited from the Northern perspectives that have prevailed over the last decades, even though cities have changed dramatically and the frameworks are not attentive to problems at the local

level. Therefore, there is a need for innovations in the structural sense of planning that can impact positively the poor at the local level. These creative ideas discuss the wider (local government) context in which planning takes place and explore how to better incorporate planning institutionally and make it more sensitive to civil society **(Watson, 2009).**

Formal urban development methods focused on experience in the global North, have struggled to solve the associated poverty challenges in the global South. The literature shows that urban spatial poverty in the global South is marked by inequality, exclusion, and lack of individual capacity and involvement in decision-making (Sowgat, 2012). Innovative planning includes; participatory budgeting with a locally-tested approach to engagement in planning and growth ('community action planning'; 'participatory urban assessment') in the global South (Watson, 2009). It is important to differentiate between an integrated model (Inclusive approach) and a poverty-oriented approach. The inclusive approach represents the need for inclusive planning in the preparation of projects that benefit everyone, i.e. are not exclusive to certain communities. However, a poverty-targeted approach means that the basic aim of the intervention – or part of the intervention – is to minimize poverty through strategic and targeted investment in urban infrastructure.

Informal settlement in South Africa

Over 2 million households stay in informal housing in South Africa (Mistro and Hensher, 2009). In South Africa, informal settlements are based on illegal occupation of land which is recognized accessible and affordable solution to the urban housing deficit. Huchzermeyer et

al., (2014) suggest that Informal dwellings have shaped an essential part of Johannesburg since its inception.

The spatial trends of informal settlement formation show that these households are concentrated in the proximity of economic hubs. Alexandra is a typical example of Johannesburg's low-income residential areas (and pockets of informal settlements like Stswetla informal settlement) with its proximity to upmarket Sandton. However, it remains a product of apartheid-era spatial planning. It consists of buffer zones on all sides and is not directly adjacent to the upmarket area (Huchzermeyer et al., 2014).

(Aromokudu and Loggia, 2016) argues that informal settlements can be said to be normal, at least for many of the urban poor. The relevant example to the argument above is Huchzermeyer, (2006) stating that occupation of land illegal in an urban setting is understood as a poor household livelihood strategy aimed at accessing income, increasing wellbeing, reducing vulnerability, and improving food security, access to land for shelter. For example, unplanned occupation while meeting certain shelter needs often leads to conditions that pose a risk to the inhabits (Huchzermeyer, 2006). The informal settlement is therefore characterized by the constant decaying environment, residents are exposed to the eroding polluted and hazardous environment. Residents in the informal settlement are not only prone to sudden and unpredictable natural disasters.

Disastrous events are therefore beyond natural events which are triggered by a longstanding marginalization and abandonment of the urban poor as part of the ordinary functioning of neoliberal urban governance (Murray, 2009). The focus on the fundamental aspect between particular typologies of urban land-use and differential exposure to risk allows an opportunity to grasp the overall desertion of the urban poor living a marginal reality in an unauthorized

informal settlement of the urban poor in a concrete way. Therefore, natural and unnatural hazards can reveal not only the precarious balance between land-use patterns and the natural environment but also the plain inequalities in the spatial distribution of risk between communities. South African informal settlement shows a great deal of marginalization exposing a great of the spatial distribution of risk.

Service delivery and vulnerability

The poor are usually poorly served by urban infrastructure, leading to a range of problems exacerbating poverty. In current history, the effort has been focused on the reality that more than half of the world's population are now urbanized and the bulk of these urban dwellers remain in the global South. All of these southern towns and cities are struggling with the turmoil that they are facing, complemented by rapid population growth, especially in peri-urban areas; lack of access to shelter, infrastructure, and services, mainly poor communities; weak local governments, and severe environmental problems. There is also a perception that this new phenomenon of climate change, resource and energy depletion, food shortages, and the global financial crisis will worsen the current situation (Watson, 2009).

Williams et al., (2019) claim that in the context of poverty, the vulnerability of the urban poor to natural hazards increases dues to rapid and unplanned urbanization, in combination with the impacts of climate change. Poor people have unequal opportunities to cope with shocks as they are deprived of access to sufficient water services and their needs are inequitably ignored (Grasham et al., 2019). The studies show how inequality and poor service delivery are the contributing factors to the vulnerability of the urban poor, however, little attention is paid to the urban poor's perception of risks presented to them by natural hazards.

Murray (2009) states that technocratic understanding of hazards reflects an engineering bias that deflects attention away from the interlinked physical and social vulnerabilities that expose the urban poor not to single but to multiple risks. The informal settlement does not only experience hazards as a result of flooding however, there are also manmade disasters that interlink with the natural disasters at the ground and are experienced daily.

Residents in marginalized areas forced to inhabit the informal settlements dealing with the crisis that the poor living condition of the settlement presents to their lives. These informal settlements are characterized by broken, underserviced, and inadequate infrastructures, the collapsing services delivery, its ruin, and constant decay, high rate of violence and danger (Murray, 2009). South Africa is not an exception when it comes to the characteristic of abandoned settlements above. These settlements are also characterized by internal violence.

Poverty and inadequate quality of services are the determinants of urban violence. Poverty and lack of service mostly lead to increased competition for resources and livelihoods. As a result, urban space in South Africa is increasingly becoming a troubled landscape of xenophobic violence (Tevera, 2013). Citizenship and a sense of belonging are at the centre of the Xenophobic attack in the informal settlements of South Africa.

Intersecting Vulnerabilities

From a critical feminist perspective, intersectionality has been described as a way to mediate the tension between assertions of multiple identities and the ongoing need for group politics(Saatçioglu and Corus, 2015). In one region, disadvantages often overlap with other disadvantages, which lead to overall vulnerability (Saatcioglu1 and Corus2, 2014). Crisis of vulnerable communities would need additional assistance, which would call for additional interventions, i.e. additional capacity, as part of the emergency process of disaster management.

However, we have seen above a few articles on vulnerable groups in disaster pointing out that, too frequently, the roles of vulnerable groups are 'homogenized' in practice without taking into account intersectional characteristics and continuous variables that result in unequal disaster and environmental outcomes (Kuran et al., 2020).

Studies showed several ways in which community members of encounter and handle interconnected vulnerabilities and categories of identity overlapping (i.e., socio-economic status, health status, and type of housing) (i.e., socio-economic status, health status, and type of housing) (Saatcioglu1 and Corus2, 2014). Therefore, intersectionality is a theoretical paradigm based on critical feminist thinking that looks at various overlapping marginalization at the individual and community levels.

The concept of intersectionality is popularly credited to Kimberlé Crenshaw, in which she drew on and the race, class, and gender theorists (Crenshaw, 1989). Crenshaw sought to better understand how the experiences that women of colour had with the legal system in the United States were shaped by their sex and race. Research endeavours use the intersectional framework generally as multidisciplinary scholarship examining how the hierarchies of race, gender, and class mutually create structures of oppression and meaning (Caiola et al., 2014).

Intersectionality is a method of fostering the perception of human beings as being influenced by the interaction of various social categories (e.g. race/ethnicity, indigenous, gender, class, sexuality, geography, age, disability/capacity, migration status, religion). Such interactions take place within the context of related power processes and frameworks (e.g., laws, policies, state governments, and other political and economic unions, religious institutions, media). Intersectionality is also used as an empirical method to solve challenges and social problems (Collins and Bilge, 2016).

Hopkins (2019) argues that intersectionality is about rationality, social meaning, power dynamics, uncertainty, social justice, and inequality, not just about multiple identities. Structures and how they contribute in particular socio-economic contexts to live the experience and the fight for social justice (Gray and Cooke2018); Hopkins, 2019; Ryder, 2017). In such a way that spatial and historical disparities, which in turn limit access to resources and capital forms, hold those populations in geographical, social spaces and places of oppression and thus often at risk and vulnerable (Ryder, 2017).

Risks and distinct types of inequality intersect and are mutually influential (Oloffson et al, 2014). The intersectional approach considers inequalities between individuals and populations while understanding that various roles, desires, interests, and capacities are manifested by individuals, frequently evolving. The ability to plan for, cope with and react to catastrophes is determined by these identities. O'Brien et al (2008) show that multiple mechanisms interact and can influence the outcomes of vulnerability interventions in ways that may not be readily apparent when focusing on one stressor alone. (Chaplin et al. 2019).

Intersectional methods help to discover mechanisms that can influence vulnerability and resilience (Chaplin et al. 2019). People's emotions and how they react to events within the community are crucial to understanding people's vulnerability. The lack of support systems for abused women in the settlement contributes to the pillaging of these gruesome encounters and the suffering surrounding the settlement.

Intersectional thinking questions 'one-size-fits-all' approaches (Chaplin et al., 2019). Intersectional methods acknowledge that 'people have different personalities, needs, preferences and capacities that are not static and will shift and evolve – influencing their ability to plan for, resolve and react to natural hazards and climate variability.' The mechanism

involves numerous aspects of stimulating human vulnerability and resilience to natural hazards through the gender perspective.

Structure of the Dissertation

The thesis comprises seven chapters, (including the introductory chapter above) through which I attempted to develop a rigorous response to the stated aim. To do this, the study unfolded in the following ways:

In the second section of Chapter 1, I offered a review of key literature theories that frame this research study, such as vulnerability and intersectionality in the context of informality, informal settlements in South Africa, environmental hazards, natural disasters and service delivery for there is a strong correlation between these concepts and vulnerability of the community. I reviewed the existing literature on the general definition of the concept of vulnerability and how it has evolved to be defined in the area of environmental hazards. As a result, environmental vulnerabilities are perceived differently. Literature shows that environmental hazards are largely experienced in marginalized areas, what are these areas in the context of South Africa? These are usually urban poor communities known as informal settlements, the term informality was examined in terms of how it exacerbates vulnerability. The formation of these settlements and their exclusion from municipal benefits was critical to review to get the root cause of exposure to hazards. The chapter then identified some knowledge gaps in the literature on vulnerability, which is to consider the concept of intersectionality as one way in which multiple compounding vulnerabilities can be evaluated. The chapter concludes by stating that vulnerability is assessed in isolation in the literature, with few pieces of literature assessing the different sources of vulnerability. The assessment mainly excludes vulnerability beyond natural disasters. Assessing the vulnerability of individuals from

different angles beyond natural disasters allows the approach of intersectionality to define the complexities of vulnerability. The following chapter introduced the research method approach applied to collect and analyse the collected data.

In chapter Two, discussed the methodological approach used in this study to achieve each of the three primary objectives, which are meant to help realize the aim and answer the research question of the study. In this chapter, I also presented the methodology used to answer research questions and the collection of the relevant data. The chapter consists of two sections, the first section provides background information on the research methods chosen and the second section provides detailed information on the area of study. To collect the data, the study was informed by the Grounded theory, this is a general methodology with systematic guidelines for data collection and analysis to generate middle-range theory. This is a qualitative study that relies on semi-structured interviews with research participants. The ethical considerations adhered to in this chapter are also discussed in detail. Chapters 3,4, and 5 provide empiric data for this study, corresponding to one of the objectives of each chapter.

Chapter Three relayed in detail the indicative demographics to paint the picture of the vulnerability of the residents living in the Setswetla community. These are the findings obtained through the semi-structured questions and the observations during the fieldwork. The demographic elements look at housing arrangements, socio-economic status, and how they have stayed in the settlement. The data obtained was indicative data than a statistical representation of the demographics of the community however, it's descriptive of what could be happening on the ground. The chapter proceeded on to conceptualize Vulnerability in Setswetla' in the context of the Typical Vulnerability Assessment in South Africa' using the National Vulnerability Framework published by the Department of Environmental Affairs to put the empirical data into the context of the vulnerability Setswetla Settlement. As a result,

the chapter argues that staying in Setswetla fatalistic due to the community's impoverished living conditions and the occupation of flood-prone areas exacerbating their vulnerability to hazards. The second argument in this chapter is that vulnerability cannot be viewed and assessed in isolation as various intersecting vulnerabilities are intensifying the community's exposure to hazards. Therefore, the inability to integrate other intersecting vulnerability into the process implies the limitations that the vulnerability framework implemented by the Environmental Affairs Department to assess the community's susceptibility to hazards has.

Chapter Four further demonstrated the findings in a timeline format to investigate the memories of disasters in the community. This time-line is a perfect demonstration of the experienced environmental hazards in the settlement over the years. These are based on the findings from the interviewed individuals who have been staying in the settlement for the past five years or more and were built upon what people remembered. The memory lane is supported by a google search of the media release that is relevant to Setswetla and correlates with the outlined events and years. The second part of the chapter describes the perception around these environmental hazards by the residents and how they mitigate the negative impacts therein. The chapter then describes other environmental issues exacerbating vulnerability in the settlement such as fires, breeding rats, and unmanaged waste. The concluding remarks show that people of Setswetla have a long history and memories of the reoccurring environmental hazards alongside flooding events. The undesirable living standards leaves them with no choice of where to live but the occupation of this hazardous community. Therefore, planning ahead of these disasters would be a luxury than focusing on how to get on with the day.

Chapter Five argues that women are burdened and disempowered in their daily lives within their households and around the settlement. Women feel the same disempowerment or fatalism towards the violence of rain and floods. This cement the same argument of why the residents,

and particularly the women, of Setswetla, have the same laidback attitude towards the dramatic vulnerability caused by natural disasters and do nothing to mitigate the effects. The chapter discusses how the vulnerability is not only emanating from environmental disasters however, there are other contributing factors. The findings detail other crisis that residents have to deal with within the houses and around the settlement. This could be the main reason to explain their inability to plan to mitigate and respond effectively to the negative impacts of natural hazards. As per the interviews, this chapter confirms the finding that the community is also vulnerable to criminal activities, alcohol and drug abuse, and domestic gender-based violence.

Chapter Six is a chapter providing concluding remarks of the whole dissertation. The chapter synthesized the overall findings in the study to conceptualize vulnerability using the intersectionality approach.

Conclusion

In this chapter, it can be argued that informality gave rise to spatial exclusion simultaneously giving rise to the vulnerability of the impoverished communities. The chapter has provided clarity on how informality gives rise to environmental vulnerability to the residents. The literature reviewed on informality strongly demonstrates how informality has given rise to the susceptibility of individuals to various sources of harm as opposed to those formal dwellings in formal residential areas. Informality represents the vulnerability of residents in communities of informal settlement due to the occupation of high prone areas to disasters as floods and lack of resources to enhance their resilience to harm. Based on the reviewed literature I can argue that informality as a product of planning has weakened the coping mechanism system instead of providing sustainable living in the city. The poor environmental conditions have exacerbated exposure to harm and weakness the resilience of residence in cities. In the subsequent chapter

I discussed the methods I applied to engage the communities to collect data in Setswetla Informal Settlement.

Chapter Two – Methodology

In the previous chapter, I defined the study goal within a variety of wider literature bodies, primarily literature that looked at the intersection of informality and vulnerability. I tried to use an intersectional approach to understanding the numerous and conflicting vulnerabilities that constitute the Setswetla context. In this chapter, therefore, I narrated in detail the methodological approach applied in this study and how an intersectional approach was represented. To do this, I started my narratives by describing the research informants, their living circumstances, and the existing structures in the community. This was done to provide an image of the state of Setswetla and the systems inside the community. Then, moving into depth of my methodological chapter, I begin by presenting my experience in approaching Setswetla, providing interesting and shortcomings that I encountered. I then explained how my experience contributed to the implementation of the grounded theory approach to create categories that have informed the analysis. Following this, I outlined how each objective has been systematically engaged in the field.

To select the size of the participants during the development of the proposal of this study, an understanding has been made with my supervisor that 30 informants will be interviewed individually. However, the amount modified to 25 owing to the similarity of the interview performance as my interview sessions evolved. Therefore, in consultation with my supervisor, there was a consensus that the 25 samples were adequate to yield relevant data to evaluate and build the case for this report.

The participants in the study were not a massive number, but they represented the residents of the neighborhood. I worked a lot with the women in the settlement, making up 98% of the

participants and 2% of the male participants in total. This was not intentional however, women were the only available participants on site.

To achieve a good portrayal of the settlement experience, I split my participants into three classes depending on the geographical position of the settlement. This was undertaken to achieve a good spatial distribution of responses around the settlement, as the population is what I consider to be split into three parts, the river bank portion, the central sections, and the cemetery section. The living standards often varied from section to section. The houses on the river bank portion are often constructed of bad material, flammable or corrugated iron. The middle portion is made up of brick rooms and several shacks, and the section next to the graveyard is made up of proper houses as opposed to the river bank section. Most of these residents have emigrated from rural areas under hardship and are expected to live in disastrous circumstances due to the lack of capital to secure proper accommodation in the city.

While the region is populated by foreign nationals and South Africans from other provinces where the sense of belonging may be less, the group has existing institutions such as churches, political structures, Stockvels, etc. These systems are critical for alleviating the hazards of settlement.

Approaching the field: an entry to the Setswetla Group

The plan for this research highlighted the necessity for a formal approach to the settlement to gain approval from community representatives to undertake a study, including interviews and settlement observations. I understood the field from far, but it was imperative to get into the study area through someone who had already interacted with community/research participants before. I was introduced to the community by a colleague who connected me to a community development organization called Sankopani Community Development of Alexandra

Township. Through the association, I was exposed to the numerous community leaders responsible for community building programs, where I got a letter authorizing me to carry out my study in the settlement, which was not a struggle. Accessing the community after receiving a letter of permission from Sankopani was not a challenge.

On my first visit to the region right at the entrance, I noticed how the lower portion of the settlement was situated on the banks of the River Jukskei. I saw high amounts of uncollected waste a few kilometres downstream from the river and the shacks where people lived. Navigating about at first glimpse was a pile of garbage. Right next to the unmanaged dumping site, there were few mobile toilets not more than five in size. There is a bridge on my right side next to the mobile toilets. The bridge, however, is situated a few kilometres away from the dwellings, it looks like it was designed to provide access over the river to the vehicles, as the Jukskei River flows across it.

Still standing where I landed the moment I got off the cab, I was facing what I felt was the only way to the settlement. Not shocking though, as this is one of the well-known features of unplanned settlements in the region. The other roads/streets inside the settlement were rather small, such that two persons could not travel at the same time. This is because of the clustered shacks and how they were designed. Immediately, I thought of the problems encountered in the case of an incident triggered by the catastrophe of the fires and the floods.

On my second site tour, I used another path to get to the settlement. I stepped through the gate, which led me straight to the upper part of the settlement, far from the River Jukskei. In this section, my eyes were captured on how the people were constructing right next to the cemetery. The upper portion had a lot of street vendors and a lot of commercial operations going on. In this section of the settlement, I saw several brick rooms as opposed to the riverside portion,

where 80 percent of the shelters are shacks constructed of corrugated iron and flammable content, i.e. plastics.

As I glanced to my far left from the graveyard section of the settlement I could see the Marlborough Gautrain station not far off from the settlement. An interesting observation to see such developments next to a poor settlement. Setswetla is a marginal urban informal settlement in Johannesburg and falls within the Johannesburg Metropolitan Municipality that is around 5 km from Sandton Central Business District, Rose Bank, and the neighborhood is one of the poorly serviced settlements with high unemployment in the city, yet surrounded by well-developed facilities and wealthy suburbs and business districts.

Setswetla Informal Settlement is one of the poorest and most insecure urban informal settlements in South Africa; one of the key contributors to its insecurity is the historical processes that formed the region and the surrounding townships named Alexandra, the spatial exposure to threats, the socio-economic status and the scarcity of services in the area are some of the factors that lead to this.

Geographically, Setswetla is situated on the side of the River Jukskei. Several people are residing in the area building on the flood plain and overcrowding the riverbank. During the year 2000, 2016, and other reported years, the region suffered floods. The likelihood of floods was exacerbated by several aspects, such as the poverty of people living along the Jukskei River. Compacts of shacks have produced less water penetration into the soil and, as a consequence, increased surface runoff around the settlement. Several irrigation pipes in the Jukskei River were blocked by pollution that led the river to flood when it rains.

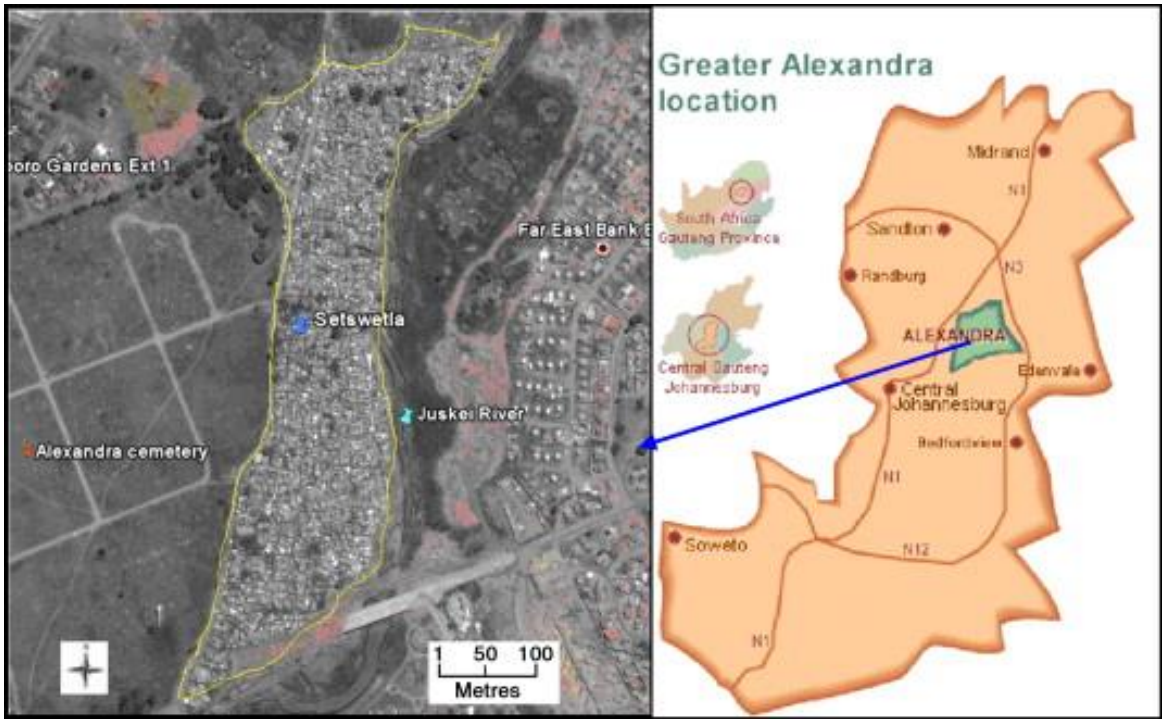

Figure 1 Setswetla Informal Settlement trapped between Jukskei River and Alexandra Cemetery Source: (Kimemia and Annegarn, 2011)

The problems encountered in the settlement are largely the product of what's going on in Alexandra Township. Alexandra Township as Babich (1992) portrays it as "Hemmed in on all sides and boiling every day since more and more squatters poured in, Alexandra is about to burst like a boil." A deeper look at Setswetla parallels Fanon's saying that, after death, the white man refused the black hell by offering them hell in creation. The most remarkable thing about Setswetla is how near to death people survive (Nyapokoto, 2014). Located near death and

inhabitants are reminded of death as it is between figure 2 of the Jukskei River and figure 1 of the Alexandra Cemetery.



Figure 2 Jukskei River

The Jukskei River begins in Johannesburg and runs northward, passes Bedfordview, Ekurhuleni, and back to Johannesburg. The Jukskei Dam, illustrated in Figure 2, is one of the catchments of the rivers under the municipal authority of Johannesburg, which forms one of the catchments flowing into the Limpopo River into the Indian Ocean. It flows northerly to reach the Crocodile River shortly before joining the Hartebeespoort Dam. The Jukskei catchment area has a mild and moderate atmosphere. It is situated in the summer rainfall zone of South Africa, marked by afternoon thunderstorms. The mean average air temperature varies from 10.1 degrees Celsius in June to 20.1 degrees Celsius in January. The typical regular maxima vary from 16 degrees Celsius (winter) to 25.6 degrees Celsius (summer). The average

annual precipitation is 713 mm. The wettest month of January is the total monthly rainfall of 125 mm. The driest month is July with a mean monthly rainfall of 4 mm (Matowanyika, 2010).



Figure 3 Aerial photograph showing the proximity of informal settlements to the Jukskei River in Alexandra, Johannesburg. The 1:100-year flood line is indicated in white. Source: Taken from Steffen Robertson and Kirsten (2000)30

The Jukskei River poses significant challenges to society caused by human-made (pollution) and to natural hazards (flooding events) as the community is situated in flood line (fig.3), waste and litter pollution (fig.4). The issue of sewage is persistent, although the flood arises at seasonal periods and differing temperatures. As reported by the researcher during site visits, the overwhelmed infrastructure, inadequate maintenance access, and poor sanitation services for informal clusters add significantly to the problems of sewage contamination.



Figure 4 Polluted Jukskei Water

The invasion of the riverbank, as well as the entire settlement, was illegally carried out following South African regulation. This implies that no one other than the government has ownership of the land, subsequently, constant basic service is not provided for the settlement. Setswetla has a major lack of basic services provision such as toilets and collection of waste to managed waste disposal sites. On the other hand, there is positive service delivery in the settlement which is the availability of water in which the settlement. There is a supplied with adequate and good conditions for communal water taps in Setswetla (fig. 6), but the sanitation facilities are in a bad state, see Figure 5 below.



Figure 5 The condition of and the number of toilets servicing the river bank occupants



Figure 6 The water taps in Setswetla

It was noted that the settlement is divided into parts, a section on the right which is situated by the river bank, the middle section, and the one close to the graveyard (see fig.7). Based on their relationship to the settlement site, these parts present fascinating dynamics. ~~be~~, for example, the explanation below illustrates how the residents next to the river face the challenges

presented by the river, while the residents in the middle section are not shown in the figure below as it was a challenge to capture pictures of the middle section of the settlement.



Figure 7 The River Bank Section on the Left and the Graveyard section on the right

A Grounded Approach

The research of social sciences is a diverse and dynamic phenomenon, ranging from census data from hundreds of thousands of human beings to an in-depth examination of a particular social life. Social science researchers use suitable ~~analysis~~ methodologies to identify, analyse and explain these social processes, which can usually be segmented into quantitative or, qualitative research methodology in other cases, the mixed research method (Tuli, 2010). In this research, I applied the qualitative research approach to gather data for this study. In this regard, I interacted with a sizeable number of people who were representative of the total population of the Setswetla Informal Settlement Community. Specifically, a total of 25 informants in Setswetla were approached around the settlement to answer a list of a semi-structured questionnaire. It is for that reason that I applied the qualitative approach for data collection. To gather data, I used standardized questionnaires to gather information on the question in a subject that is linked to (To understand the existing vulnerability profile in

Setswetla, to understand how residents perceive their vulnerabilities and to critically evaluate existing vulnerability frameworks, using an intersectionality approach). Specifically, 10 questionnaires were distributed to the community. Only 8 number of the questionnaire was retrieved for which this study is based upon. Of the total number, 23 were female participants, 2 were males. This further proves the probe that the settlement is dominated by the female gender during the day who are vast in knowledge with the subject and purpose of this study. Whilst these characteristics provide insight to the study, it is imperative to state that the application of the grounded theory approach led to an insight into human nature and the daily lived experiences of people at Setswetla.

The grounded theory conceptualizes qualitative data to construct hypotheses from the data gathered as well as its evaluation using thematic analysis. This is an inductive approach to the production of substantive codes from the data obtained. Grounded theory is a general approach with structured instructions for data collection and interpretation to produce a middle-range theory. The term "grounded theory" reflects its underlying premise that researchers can and should establish a theory based on careful analysis of empirical evidence. The analytical method consists of coding data; designing, testing, and incorporating theoretical categories; and writing analytical narratives during the investigation (Charmaz and Belgrave, 2015).

I applied a qualitative methodology to examine people's understanding and awareness of their vulnerability, especially concerning flood threats, hazards, and mitigation strategies in the context of Setswetla. Tuli (2010) argues that the technique of qualitative analysis also depends on personal communication between the researcher and the population being examined. This viewpoint, contributed to greater insight, bringing in the wealth of knowledge and a wide scope of data for the study of research participants. Qualitative methodologies, however, are inductive, that is, geared towards exploration and operation. A high degree of legitimacy, are

less concerned with generalization and are more concerned with a deeper interpretation of the study issue in its particular context. This tied well with the aim of the ~~research~~ study, which aimed to study the experiences of the participants about their everyday vulnerabilities and flooding events.

I tried to learn people's experiences in this settlement, and the residents recalled the incident of flooding that took place in their community. I inquired to understand how they understood what happened in the event of crises. Cantered on that experience, I wanted to see how this collection of history and timelines allowed residents to frame and conceptualize their exposure to flooding.

The method allowed me to investigate and learn how they have experienced extreme flooding, injuries and destruction due to the floods encountered, both now and in the past. Again, through this process, I studied how residents have reacted to floods, damages, and losses in past flooding and heavy rains events. The research required a great deal of contact by conversations and interviews, evaluation and explanation of certain issues and actions in the study field to gather in-depth knowledge of the subject of the study. I engaged with the people of Setswetla in the form of formal questionnaires and semi-structured interviews. I communicated with the residents/participants in a range of methods that helped to execute the three described objectives (Table 1).

Table 1 links between objectives, Methods, Tools Data Collection Process and Questionnaire

Research Aim: was to investigate how perceptions of intersecting vulnerabilities influence attitudes and the preparedness for environmental hazards in Setswetla informal settlements.

Objectives	Data	Tools	Structured Interviews
1. To understand the existing vulnerability profile in Setswetla	Demographics and the context of the study	• Interviews	• Do live alone? • Do you work? • What do you do? • What is your housing arrangement? • How long have you been staying here?
2. To understand how residents perceive their vulnerabilities	• People's experience around flooding events • Awareness around the effects of flooding events about their location	• Interviews • Desktop research	• What are the existing community structures/organizations and what is the role of the above-mentioned organization within the settlement? • Do you recall a time/ event when you or

			someone you know had to deal with a crisis? • What was the nature of a crisis? • Has this happened before? • Are environmental hazards a big problem here?
3. To critically evaluate existing vulnerability frameworks, using an intersectionality approach	Vulnerability assessment framework	Desktop research	Review of the existing Vulnerability assessments

*Table **Error! No sequence specified.** Links between Objectives, Methods, and Tools*

Research Objective 1: To understand the classification of Setswetla within existing vulnerability frameworks

Dhunpath (2000) suggests that the approach to life history is perhaps the most authentic way of explaining how motivations and behaviors represent the close convergence of social and human experience in the postmodern world. To achieve this objective and to understand the current vulnerability profile in Setswetla, I made observations about the settlement to understand certain dynamics in the area, to document the specific material resources of the area, to take photographs of the relationship between the river and the buildings, and to search for specific vulnerabilities, etc.

The drawbacks of this analysis are that I am not from the city, I invited the local people or the settlement official to accompany me and take a walk around the settlement, which happened to be my fellow campus student. The key justification for keeping an assistant on-site is to explain some details and to solidify the information that I might find important and relevant to the report. My observation included taking pictures of any object; environmental features, shacks (on President's approval), any government basic facilities and amenities that will help me connect the surrounding area with how Setswetla people are vulnerable to flooding.

The findings then guided me to an exercise of community mapping. The community mapping exercise then helped me to develop an in-depth understanding of the whole settlement in terms of the current internal community structure, environmental features, basic services offered, local and demographics/age range / socio-economic status. As far as the environmental aspects

of the settlement are concerned, the mapping exercise also gave me a clearer understanding of the geographical location of Setswetla, where the most disadvantaged communities within the settlement are situated, how deteriorated or preserved the natural environment is; looking at Setswetla's blue and green natural properties. For example, lack of collection of waste contribution to land pollution and the contaminated river.

To reinforce my observations, I conducted a variety of interviews with the participant as alluded to above. A sampling of research participants included finding individuals who have been living there for a long time and have real knowledge about the crisis in the settlement. This allowed me to go through some gatekeepers for example the Sanikopani community development officials in the settlement to get access to the people. I acknowledged that may be problematic because it may mean that I am not getting access to people unsolicited it is a mediated contact.

Research objective 2: To understand how residents, order their own experience of vulnerabilities

This was the second goal of the study, which sought to explain how residents view their vulnerabilities. This has given me an appreciation of the major environmental threat and stressors that people face in Setswetla, the root causes of these threats, and the experience of future and historical disasters. To acquire an in-depth understanding of their experience in the study field, the interviews involved residents who have been living in Setswetla for a longer period.

To accomplish this goal, the study conducted a semi-structured interview involving 25 participants. Initially, the study aimed to interview 30 people for 30 minutes each, however, the study stopped at 25 because of common finding throughout. Interviews conducted on two

separate days. These interviews were followed by a set of observations, informal and unstructured interviews to help me establish a clear understanding of the subject.

To perform these interviews, the first step identified key participants with the help of a neighborhood representative I was very careful in how conducted these interviews. Informal settlements have a lot of people who come in to stay and move out to live in other places almost every day. My key distinguishing character was based on how long a person lived in Setswetla and how old they were in terms of age. They shared and discussed the gaps in awareness and experience of the floods. Therefore, I chose people who have been living in Setswetla for the last 2-5 years.

The information obtained during this interview was used as a measure of the susceptibility of Setswetla residents to flooding. This series of interviews consisted of questions that allowed me to collect information on previous devastating flood disasters, the damages and casualties suffered during those events by the participants, or some other person who might encounter the problems created by the floods.

The questions will include, but not limited to, asking the participants 'Do you know any floods/heavy rainfall incidents that have taken place? What occurs when there are heavy rains and floods? Is there something good or negative that they should do?

Research Objective 3: To critically evaluate existing vulnerability frameworks, using an intersectionality approach

In this section, I critically examined the current vulnerability system from the point of intersectionality. This chapter was guided by the observations of chapters 4 and 5. The chapters

will have allowed me to develop the gap and the benefits of the existing vulnerability analysis framework. It should be remembered, though, that this review of the system will be performed briefly to take into account the scope of the MSc procedure for sampling.

The sampling method for this analysis will be based on selective and theoretical sampling. (Coyne, 1997) mentions that, using a theoretical sampling method, the researcher chooses the sample according to the needs of the sample. The theoretical sample thus helps the researcher to initially opt to interview informants with a large general knowledge of the subject or others who have encountered the subject and whose experience is assumed to be standard. Selective sampling is complementary to theoretical sampling. (Coyne, 1997) notes that there is selective and analytical sampling within the framework of qualitative analysis. Selective sampling ensures that a decision is reached before the start of the analysis, according to a preconceived but fair initial collection of parameters. The research then used theoretical and selective sampling to collect data.

Once data analysis is finished and all interviews are completed, the data collection process continues. The first step in this process was to transcribe all the interviews. Interviews will not be done in English and have been translated and transcribed into English.

Data Analysis

The collected data was analysed using Braun and Clarke's (2006) six-step thematic analysis methods. The Thematic analysis applied allowed for a search for themes, review of themes, definition, and naming of these themes, as reported in the interviews that were conducted. The thematic analysis is a mostly qualitative research that often uses the go-to method. The technique provides an easily interpretable and concise description of emerging themes and

patterns within a dataset (Smith, 2015). The thematic analysis is critical for the recognition, examination, and recording of data themes: knowledge of data, generation of initial codes.

The study used thematic analysis of the data to examine the qualitative data of this study. The analysis approach is a grounded theory and development of cultural models that demand a greater intervention and understanding by the analyst. Thematic analysis results go beyond counting explicit terms or sentences but concentrate on defining and explaining both implicit and explicit concepts within the results, i.e. themes (Guest et al., 2012).

Thematic analysis is a systematic and inductive collection of techniques designed to define and analyses text data themes straightforwardly and convincingly. The primary concern is to portray the stories and perspectives of the research participants as objectively and comprehensively as possible. As described earlier, applied thematic analysis can be used in combination with different types of qualitative data; however, for the sake of conciseness, the content of this book focuses on the analysis of the text produced by in-depth interviews, focus groups, and qualitative field notes. These are by far the most common sources of textual evidence experienced by qualitative research researchers (Guest et al., 2012).

Ethical considerations

In academia, all study requiring interaction with human resources requires ethical considerations as important to their humanity and dignity. I consulted the Code of Ethics for Study on Human Subjects of the University of Witwatersrand and applied for a clearance certificate. During the interviews, I received the verbal and written consent of each individual. These interviews were performed on the grounds of secrecy, voluntarism, and confidentiality. Participants were permitted to disengage from the study if they thought they wanted to do so without being convinced. Explanations were made at any stage when the participants required

clarity about something. Participants were presented with the Participant Details Sheet, which was combined with the permission document before the interviews. I read the consent form in situations where the participants were elderly or illiterate.

According to (Sultana, 2007), the thesis must pay more attention to questions of reflexivity, positionality, and power dynamics in the area of ethical and participatory analysis. Setswetla is a very vulnerable and well-researched culture, as well as one prone to media scrutiny and politics, which will also need further ethical consideration. The naturalization, the recognition of my presence, notwithstanding the curiosity of what I was and where I came from, has culminated in a collective positioning of me as an acceptable outsider doing 'useful' research.

I did this by adapting to new situations to establish a relationship with different individuals, while at the same time becoming attentive to the ethics and dynamics inherent in those 'fitting-in' procedures and the power ties involved. Such issues are not expressed in the 'nice' legal principles of administrative documentation, but must be discussed and dealt with regularly in the sector.

Some Concluding Reflections on the Methods

The techniques used were semi-structured interviews, which meant that I went to the settlement and gathered evidence through contact and questioning with individuals. Most people felt relaxed with me around the settlement, there's just a situation where I was asked what's going on and whether I'm going to give the participants anything in exchange, and when I answered they said they weren't involved. It was fascinating to see how the participants expressed interest in engaging after I introduced myself to them and how they shared a wealth of useful

knowledge with me. The participants were so open to sharing with me their experience of settlement, which was often stressful and life-threatening tales. There are stories they've heard in the past, or they've seen someone come closer during the crisis.

Semi-structured interviews have been conducted around the settlement. There was no specified place where people met or came to interview, no formality was named after the first referral from the Alexandra Sankopani Group Organization. I listened to the people on my own, but there were instances in which I interviewed a group of women who were not in the plan but saw that they gathered in small groups during the day I had the chance to talk to them in groups. They also allowed them to recall the incidents and to narrate in detail the events that triggered them around the village.

Before the interview and after I introduced myself, I wanted to tell them a little bit about where I was coming from, which is something that I knew very well had to do with them. This supported me as if they didn't see an outsider, but one of them was language and culture. This made it easier for the participants and encouraged me to open space. Instead of sounding fancy and educated, I didn't use bombastic words, I tried by all means to simplify stuff in their local language. Fortunately, I know 8 of the 11 South African official languages. This is not the intention, but I found that when I was in the region, I had to turn to native languages. I told them that there was no incorrect or right response to this, based on their knowledge, which is no one or me has any idea about it. This strengthened their confidence and value during the interviews.

In addition to the above, I gave the participants a space for a speech by listening attentively and paying particular attention to what they said that would help the participants feel noticed

and their stories understood. I was sometimes quiet after asking the participants the question, where they did not completely articulate themselves, and I would come to them at the end of their sentence very quietly and politely to allow them to continue by having follow-up questions where possible. Therefore, the principle was never to disturb the participants to give them a place to thoroughly and openly express themselves, but when I saw that they do not touch where I needed to reach the goals of the research, we structured questions that would bring them back to the importance of the study.

Any of the details exchanged was tragic when they were narrated, so I expressed condolences to the affected participants because I could feel the sorrow in their tone as they were narrating their experiences. The participants were engaged in modesty and without any factor of judgment and a positive attitude towards them throughout. I feel like most women around the settlement need local community-based initiatives to keep them occupied away from their shacks for a few hours, as well as some sort of guidance. The most pressing issue is recognition of some of the problems discussed in the chapters below.

In this chapter, I gave an outline of my first days in the research field, a review of what I could see on the floor. This provides a detailed overview of the research area. I went on to describe how I can unpack the surface realities of the settlement by unfolding the chosen methods and tools of data collection concerning each purpose, sampling process, data collection, and considered ethical behavior. The following chapter 4-7 introduces and addresses the scientific observations on the field.

Chapter Three - Characterising Vulnerability of Setswetla

To carry out the study in Setswetla, the first point of entry in data collection was to paint and analyse the picture of how vulnerable the research participants in the community of Setswetla could be to hazards particularly flooding. In this way, the study looked at the participant's job status and what they did for a living in a very generalized manner because the data collected did not characterize the statistical representation of the community. To obtain a sense of the socio-economic status of people in Setswetla settlements, the study had to define some of the elements that would build up the community/social individual's wellbeing. This is based on Gasper et al (2011), demonstrating that demographic and socio-economic characteristics of communities can make citizens especially vulnerable to environmental disasters.

It is important to note that the data presented in this chapter is not a statistics presentation of the community's demographics however, the findings from the 25 informants were used to paint a very generalized picture of how the lived experiences could be. I did not interview the whole community and therefore the findings are not representing the actual lived experience however a description of what could be happening in the settlement as the findings were common across the entire semi-structured interviews.

The study participants were not a large or representative sample group, but represent a small group of mostly female residents in the neighborhood. This high participation of women in the settlement was not an indicator of gendered division as the dominant household arrangement. Women were interviewed because it was easy for me to approach women as the settlement is known to be dangerous and being alone in the settlement exposed me to all sorts of criminal activities taking place. The second reason of the dominating women in the vicinity is that -I quote ' O*ur husbands left the village to come here looking for a job when they get those jobs*

that they call us to come and stay with them in the city' **(Participants 20, 2019)** says the participants sitting under the tree gazing at the Jukskei River**.** Semi-structured interviews were performed over working days in the week and during working hours. The most interviewed participants were females, making up 98% of the participants and 2% of the male participants. It was noted that the high participation of women in the study was not a measure of the female population against that of the male equivalent in the settlement, but rather a limitation that was possibly largely linked to the researchers' gender identification as a woman, and partly a reflection of some of the vulnerability dynamics in the neighborhood.

The chapter will discuss the description of these demographics in the context of vulnerability however the descriptive data does not represent the entire population of Setswetla. The data was used to characterize the vulnerability of the settlement to give a sense of what life is like living in the Setswetla settlement. The main argument reiterated in this chapter is that yes from the surface and through semi-structured interviews it can be deduced that Setswetla's impoverished living conditions and occupation of flood-prone areas are exacerbating their increased vulnerability to natural disasters. The second argument in this chapter is that vulnerability cannot be viewed and assessed in isolation of contributing factors, the vulnerability framework implemented by the Environmental Affairs Department to assess the community's susceptibility to hazards in different sectors is simplified and limited to certain factors while overlooking others.

Socio-economic-demographic factors are among the variables that affect and classify the vulnerability of the populations. This chapter relates to the objective one of this study aimed at understanding the classification of Setswetla within existing vulnerability frameworks. To do this, I conducted semi-structured interviews and observations to paint the lived experiences of Setswetla. This chapter contains two sections: Section one is the layout of the collected data

characterizing vulnerability of Setswetla and section two is titled 'The Conceptualization of Vulnerability in Setswetla' in the context of the Typical Vulnerability Assessment in South Africa' here I applied the National Vulnerability Framework published by the Department of Environmental Affairs to put the empirical data into the context of the vulnerability Setswetla Settlement.

Characterized categories of vulnerability in Setswetla

Wrigley and Dawson (2016) maintain that the difference among individuals stipulates that the community has particular experiences of vulnerability, therefore a simple definition would deny its complexity. The devastating impacts of these natural hazards on such settlements can be attributed to the higher levels of physical, economic, social, and environmental vulnerability in conjunction with the inadequate and poor level of disaster preparedness(Abunyewah et al., 2018).

Social vulnerability

- Age

Elderly people are known to be more vulnerable than the general population to a range of weather-related hazards such as heatwaves, icy conditions, and cold periods (Carter et al., 2016). However, in this study, the researcher sought to find out about the age of the participants in search of experiential knowledge in the community. The older you are and the longer you have been staying in the settlement would enable the researcher to find out more about the experienced hazards in the settlement as opposed to young people who were not there 5-10 years ago. As depicted in the study of Dube and Munsaka (2018) that the indigenous knowledge of local communities plays an important part in disaster risk reduction activities. The study also

found that communities possess valuable capacities in the form of indigenous knowledge, which can empower them to deal with all kinds of hazards and disasters. I was, therefore, interested in interviewing adults who have been staying in the settlements for a very long time and have extensive knowledge based on experience to characterize the community's vulnerability over time. However, these adults have then divided into two; 'Young adults and matured adults (referring to elderly|)'. The main aim of dividing the adult groups into two was to get varying perspective from the people who have lived in the settlement for a very long time that will be contrary to the version of the younger group in the settlement as they would have moved into the area a year or 2 ago looking for greener pastures in the city. The interviewed participants were mostly aged ranged between 30-40. According to the knowledge of the participants, Setswetla is vulnerable to multiple factors such as crime and heavy rains. Rainwater was mentioned repeatedly through the interviews and as the main source of vulnerability in the settlement.

- Educational level

Lack of education on the causes and mitigation measures that one can use to reduce the effects of flooding exacerbates vulnerability. Individuals and communities are differentially exposed and vulnerable and this is based on factors such as education status (Cardona et al., 2012). The highest level of education completed by a person is not necessarily an indicator of their level of literacy. To assess vulnerability, the questions on the level of literacy and illiteracy of a person is asked to decide whether the population in question can read, interpret and understand the disaster alerts and forecasts, as well as any other posters that can be put up in their vicinity to disseminate early warning of disasters (Cardona et al., 2012). The better educated are better placed to mitigate the deleterious consequences. The greater resilience of the better educated may also arise because of better access to financial resources or greater availability of social

resources. However, this was not the case in Stswetla. The findings indicated a high level of illiteracy, however, through indigenous knowledge and experience of living in the settlement residents are well aware of disasters they are faced within the settlement that exacerbating their vulnerability.

- Gender

According to Reyes and Lu (2017), Women are the main victims of disaster, and household care during and after disasters are more likely for them. Of the 25 interviews conducted, 2 interviews were conducted with males and 23 with females. However, this is not an indication that Setswetla has a population that is more female than male. What could be highlighted is a higher level of exposure to hazards among females, given that even more females than males were visible around the settlement during research fieldwork. A possible reason for this could be that more males than females are employed and, as a result, most males were employed during research observations.

The presence of women around the settlement was an indicator that women are the primary target of disasters and the main people to respond and mitigate disasters because their male partners are always away for work. This is another indication of high exposure of women to hazards, for example, outbreaks of fires or dangerous criminal activity that requires male power.

Women are generally deemed to be more fragile (Cutter, 1996). Gender has in some cases been said to affect vulnerability. Gender was also shown to affect one's vulnerability to crime. Women were said to be more prone to crime around the settlement in the evenings. Movement around the settlement was more restricted to females than their male counterparts.

- Employment status

Unemployment impairs the number of monetary resources that one to reduce one's vulnerability to flooding. The majority of these fast-growing urban areas already have high levels of poverty, unemployment, informality and environmental risk, etc. Employment status and what people do for a living or to earn a living gives a good perspective of the ability to respond to disasters. When asked what they did for a living, women around the settlement revealed that they are unemployed and their employed men work odd and precarious jobs. Some women were seen sitting on the street selling chips and fruit to a passer-by to supplement their household income that is brought in by their husbands. Women's major role since they are not employed is to look after the shacks/house and the kids. In such a situation women have little role to play when it comes to decision making they no to little no say in the process because they are not bringing any income into the house. This reveals another signs of male domination in households. Women seem to be more vulnerable than a male counterpart for they are always at the home meaning when disasters take place during the day they are the ones to deal with the crisis.

- Ethnicity

Dwellers of informal settlements, mostly in-migrant, have low economic capabilities that seriously impact their ability to prepare adequately for an impending natural hazard. A high percentage of in-migrants are low-income earners or unemployed rendering them incapable of renting a house or room in a properly laid out residential area (Abunyewah et al., 2018). Setswetla is largely occupied by people who are not originally from Gauteng Province. Most of the interviewed research participants were mostly from Southern African countries- Zimbabwe, Malawi, Mozambique. The second largest group is from Limpopo if there were

local citizens. It was noted during the study that the majority of the citizens in the settlement were foreign nationals who left their homes to make a living in the city of Gold.

Physical Vulnerability

Family Structure- Female-headed households and households with a large number of dependencies are considered to be more vulnerable to the negative impacts of disasters. According to Antwi-Agyei et al., (2013) households and communities experience different degrees of climate vulnerability. These differences can be largely explained by socioeconomic characteristics such as wealth and gender, as well as access to capital assets. Setswetla is an informal settlement comprising of poor building material prone to fire and flooding disasters. These shacks are often 1 roomed corrugated iron shack with flammable material used. The household setting is made up of parents and children while there are single-headed families mostly single women. Lack of adequate housing exacerbates communities' vulnerability to external shocks. This is outlined in the reviewed literature wherein Palmer et al (2012) argue that the vulnerable category in a community is those that are suffering from inadequate housing provision.

Exploring housing dynamics revealed that people are staying in informal settlements because it is not possible to rent or buy decent homes Musungu et al (2012). The residents of Setswetla dwell in the river bank as it is cheaper and some do not pay rent at all. The settlement is located in marginal and often poorly drained locations. Consequently, Setswetla is prone to flooding events due to its geographical location. Occupation of decaying and flood lines exacerbate the vulnerability to hazards produced by these poorly drained and flood-prone areas. Adger (2006) argues that vulnerability is the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the lack of capacity to adapt. The

capacity to adapt is minimal in Setswetla possess as a majority of the residents work odd jobs meaning their income is low it only caters for basics.

The reviewed literature argues that Informality allowed a large percentage of the urban population to survive, thereby allowing a range of precarious living conditions Huchzermeyer, (2006). Participants indicated that they came to South Africa looking for jobs and that staying in Setswetla opened to a lot of precarious and odd jobs from the informal sector. Amongst the participants, one of them mentioned that it is not nice here, it is not safe at all but it is what they can afford as a place to stay and get price jobs.

Vulnerability of livelihood

Residents if not all came to the city of Johannesburg seeking greener pastures. They leave their comfortable homes and be forced to settle for what they can afford because the jobs that the settlement exposes them to are largely temporal jobs from the informal sector with a high level. They are working odd jobs while the initial hope was greener pasture-good paying jobs when they get to JHB only to find that what the city offers is way different to the dreams and the comfort of their own homes back in their birth homes.

Production and space control also creates and controls social gaps (Roy, 2015). Setswetla comprises poor African citizens who are mostly depending on social grants and odd jobs. Setswetla shows a high level of social disparities from within and compared to the nearby suburbs as well as the business centres for example Sandton. The lack of capital to secure safe accommodation results in the occupation of the river bank.

Lewis and Lewis (2014) assertions show that the poor are the most vulnerable in the community. There is a section of the interview where I asked participants what they did for a

living to understand their sources of income to sustain a living. Figure 11 shows that men are revealed to be the ones fending for their families from the income earned in the informal sector.

Some household's families are relying on the child Support Grant that from the South African Social Security Agency (SASSA) which in 2019 is R 420 per month, however, this amount changes every year and the child gets it until they reach the age of 18. The child support grant is aimed at lower-income households to assist parents with the costs of the basic needs of their child. The grant isn't meant to replace other income but intended to bridge the gap in the cost of living (SASSA). To qualify for a child support grant in South Africa a parent or caregiver should be e a South African citizen or have permanent residency and have the following: Not earn more than R48 000 a year (R4 000 a month) if you're single and If you're married, your combined income shouldn't be above R96 000 a year (R8 000 a month) (SASSA, 2019).

Cohesive Social networks to cope with vulnerabilities

There are forms of social cohesion networks reported in the community that is meant to respond to disasters and mitigate the effects of negative impacts arising thereof in Setswetla. Social cohesion is thought to influence health in several ways: by promoting the adoption and reinforcement of health-related behaviors and by increasing access to resources and amenities(Kuhlicke et al., 2011). These networks show how the community organizes itself to help each other respond to disasters and protect each other from hazardous events. These structural networks or social cohesions are usually Church structures, political parties, communal committees, and stokvel.

'There is nothing that we do to protect ourselves before and during the rain. What we normally do is to run to church, they shelter us there'. Says participants 10 pointing at what looks like a Northside direction of the settlement on somewhat looks like the location of where the church

is. Political party representatives within the community conduct inspection around the settlement to identify the affected shacks that were affected. During the inspections, their names of the affected residents and are then taken to a place of safety i.e church hall of a daycare Centre. Comrades here facilitate the process of moving people to a safer place and getting food and clothes from the aiding organizations.

The other community structures they are involved in are churches, women's Stockvels, and burial societies. These are organized structures that are meant to assist in times in times of dire need. The society was formed for foreign nationals reigning from Mozambique and residing in Setswetla informal settlement. In this society, we save R50 every month per member that is put away as an emergency fund for when a member gets seriously ill and great funds to medical attention OR in a case where one of our members passes on and their body have to be repatriated back home to Mozambique because it is body repatriation is expensive we are not even earning a lot of money in our respective jobs or smaller businesses'

'I am part of the Stockvels that deals responsible for assisting members with any medical needs when they are sick because they largely work in informal employment with low wages, therefore, medical bills turn to be a burden when one becomes sick. The other Stockvels wherein some research participants indicated was grocery based. Participants together with other women in the settlement contribute R 350.00 every month-end and saves it or create a loan shack scheme where they loan people money to save up the returns to grow the money. This money is then used at the end of the year where they buy groceries in huge bulks from Macro, pick n' Pay, Shoprite, etc. The other important Stockvels mainly for foreign nationals was the body repatriations one. They indicated that they are struggling alive it is, therefore, a big challenge when they are dead. They collectively came up with the idea of helping each other by contributing money every month put it away to help the deceased to get home. In this

kind of Stockvels, they mentioned that they take a member's details of the next kin in South Africa and from back home. The personal details include home addresses and contact details to contact for when the member is no more'.

Social cohesion structures into Setswetla

variables relating to the construct of resilience and, in particular, social cohesion are more strongly associated with psychological distress than variables related to vulnerability. The department of the Disaster Management from the City of Council engages the settlement during the summer season to capacitate the community about precautionary measures during wet days. The same applies to the winter season, the department does the same when winter approaches to raise awareness on possible fires eruption in the settlement.

Another organization like the Gift of Givers comes to aid with food and removal of the affected residents to the much safer shelter when there are flood disasters taking place. Gift of the Givers was reported to have removed residents in the past to a safe environment and built proper shacks for these citizens. However, participants also indicated that some organizations do not help, they only come here during or after the disaster while we are still stranded to come and only take the pictures for media purposes and attraction clicks viewers on the page.

The Conceptualization of Vulnerability in Setswetla

To achieve the desired objective 1 of the study, which seeks to understand the classification of Setswetla within existing vulnerability frameworks. It is important to analyse what this empirical evidence tells us of the state of vulnerability in Setswetla. I provided empirical data on the established demographics of the Setswetla informal settlement, collected through semi-

structured interviews and observations during site visits. To do this briefly, I unpacked first the internationally accepted vulnerability concepts and then apply one of the South African Traditional Human Settlement Risk Assessments outlined by the South African National Environmental Affairs Department. The unpacking of these concepts will assist in locating the study in an international context when defining vulnerability.

It is important to understand the concepts contributing to the overall vulnerability of people to build or paint the picture of how susceptible the community is to hazards. These are the key things that are considered when assessing people's overall vulnerability. The terminology given by UNDRR indicates that risk is a feature of hazards, exposure, and capability and is characterized as the possible loss of life or the destruction and harm of assets in the community. The overall risk is therefore described by a combination of three words, as set out in Figure 12 below; hazards, exposure, and vulnerability.



Figure 8 Functionalities of Risk

Hazard is defined as a process, harmful event, or social interactions that can cause loss of life, injury or other adverse effects, property damage, social and economic disruption, or

environmental degradation. Exposure is identified as the situation of people, facilities, homes, production ability, and other tangible human assets located in hazardous areas, for example, exposure assesses the number of people in the area or types of assets that are susceptible to damage. Exposure to Setswetla will mean the situation of residents, infrastructure, houses, other tangible human resources situated on the riverbank, which in this case is a risk-prone environment.

According to this summary, we can already deduce the great extent of vulnerability of the community as per the observed situation in Setswetla and information obtained through the semi-structured interviews. It was indicated that the living arrangement in Setswetla consisted of 3-4 family members in a 1-roomed shack and the community has a high number of people living on the riverbank exposing them to floods and river pollution, confirming their vulnerability to the disaster at the surface.

According to the UNDRR, when there are hazardous events such as floods, they cause loss of life and harm to the community infrastructure. Death loss and related harm reflect the degree to which society is vulnerable to such incidents. From the surface, we have seen how hard Setswetla has been hit by the flood events that are the main focus of this research. I, therefore, contend, in the view of the UNDRR, that the informal settlement of Setswetla is vulnerable to heavy rainfall.

Vulnerability is characterized by physical, social, economic, and environmental influences that can affect the vulnerability of individuals to hazards. These include, but are not limited to, poor building design and construction (informal housing is an indicator in Setswetla), insufficient asset security (earnings per month are very low, they live for survival, they cannot afford safe protection measures), Setswetla is aware of the hazards of living there but poverty forces them

to remain on the riverbank. The lack of choices of where to live exposes the community to different hazards and therefore exacerbating their vulnerability. Poverty, poor housing material, and occupation of the riverbank in Setswetla contribute to the degree of vulnerability of the settlement.

Production and space management also build and control social differences (Roy, 2015). Setswetla is made up of poor African people, most of whom rely on social grants and odd jobs. Setswetla demonstrates a high degree of socioeconomic inequality from within and in contrast to the surrounding suburbs as well as business centres such as Sandton. The lack of capital to acquire safe housing results in the occupation of the river bank. The riverbank exposes the community to river pollution, floods and proved to be unsafe for children and therefore worsening their vulnerability to disasters and hazards.

Most migrants remain in informal settlements because it is not possible to rent or purchase a decent home Musungu et al (2012). The inhabitants of Setswetla live on the bank of the river because the land is cheaper and some don't pay rent at all. The settlement is situated in marginal and badly drained areas. As a result, Setswetla is vulnerable to environmental disasters due to its geographical position.

Occupation of flood lines exacerbates the susceptibility of these poorly drained and flood-prone areas to hazards. Adger (2006) suggests that vulnerability is the state of susceptibility to harm from exposure to stress associated with environmental and social change and the lack of capacity to adapt. The capacity to adjust is limited in Setswetla as the majority of the residents work odd jobs meaning that their income is low and only serves basics. The literature reviewed argues that Informality has allowed a large percentage of the urban population to thrive, thus giving a variety of precarious living conditions (Huchzermeyer, 2006). Participants suggested

that they had come to South Africa searching for work and that remaining in Setswetla had opened up to a lot of insecure and odd jobs in the informal sector (**Participants 1,5,8, 13,14 2019).** Among the participants, one of them said that it's not pleasant here it's not safe at all, but it's what they can afford as a place to stay and get work.

Assessing Setswetla's Vulnerability using South African Vulnerability assessment framework

These internationally adopted concepts are adopted in the South African Vulnerability assessment framework. This is the framework work or vulnerability assessment tool that assesses communities to be considered vulnerable to hazards or not as depicted in figure 13. A vulnerability assessment framework is a way to identify and prioritize threat impacts. A risk assessment helps individuals to recognize the most significant adverse impacts in the community.

This system vulnerability is then assessed by defining a set of indicators or impacts and then measuring exposure, sensitivity, and adaptive capacity against these indicators. Assessing risks, measuring sensitivity and adaptive capacity assist in evaluating the community's vulnerability to hazards. The vulnerability assessment is carried out in a rather systematic manner in Figure 13 below. There are four steps involved in a Vulnerability Assessment to conducting a vulnerability assessment in a given sector in the case of this study the human settlement sector, namely; Step 1: Identify potential impacts of indicators, Step 2: Assess whether the impact will take place (exposure) Step 3: Assess how important the risk is (sensitivity) and Step 4: Assess if you can respond to the risk (adaptive capacity).

The framework looks at the indicators as a list of potential impacts that may take place in a given area as a result of hazards. The purpose of this list of indicators is to provide a starting

point for the Vulnerability Assessment to paint a picture of possible or experienced hazards in a community. After listing all the experienced hazards in a form of indicators the framework allows for the evaluations of the level of exposure to the particular indicator or impacts.

It is empirical to know the level of "sensitivity" in order priorities when planning mitigation measures. Therefore, the framework gives room to assess the sensitivity of the community to the identified impacts. What then does this mean? it refers to the seriousness of the potential impacts. If a particular impact was to happen how badly will it expose me to harm?

The assessment process through this framework looks into the assessment of the response measures in place. This is referred to as the concept of "Adaptive Capacity". At this stage, we are aware of what the list of all potential impacts is. We are aware of whether or not we are exposed to particular impacts, if we are exposed how sensitive is the issue. Therefore, we need to determine whether or not we have the systems in place to respond to the climate change impact. "Do I have systems in place to respond to the impact? The video below summarises the process of assessing adaptive capacity.

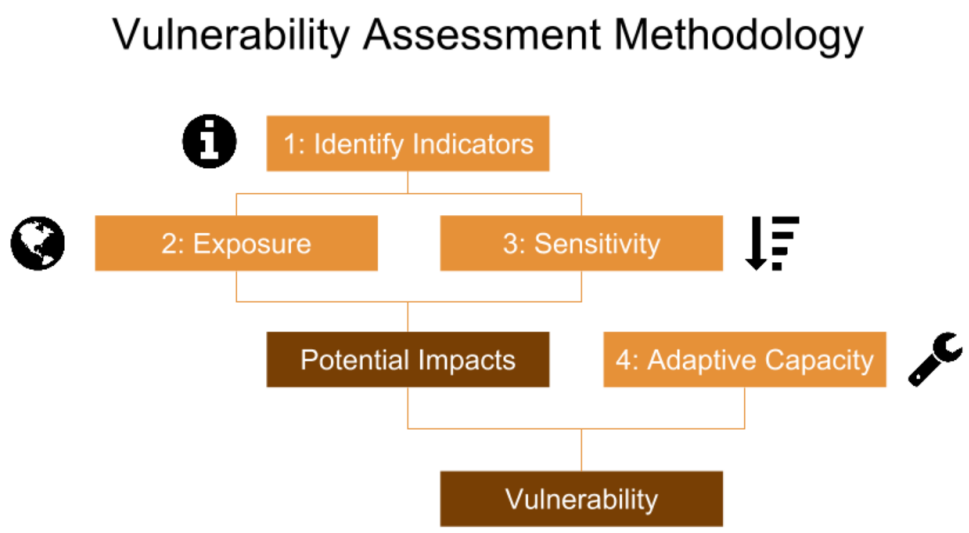

Figure 9 Vulnerability Assessment Framework

Below I outlined the steps carried out in the vulnerability assessment framework using Setswetla findings to complement each step. The use of Setswetla data from the 25 participants is not a statistical representation of the entire community however, a qualitative description of what could be happening on the ground and how vulnerable the community could be to floods and other factors. I detailed each step and apply a practical example to each step and conclude by explaining what it means to the Setswetla community. Step 1 looks at the indicators of disasters, step 2 assesses the exposure to the natural disasters indicator, step 3 measures the sensitivity to the indicator and step 4 is the part where the Adaptive Capacity to natural disasters and their impacts is evaluated.

Step 1 What are the Indicators: In this step, the VA process enables the identification of major indicators of disasters that pose challenges in the human settlement field? The framework has already defined potential impact factors in the field. In this case, Setswetla is a society where people live, thus falls under the human sector, below is one of the indicators that speak

to informal settlements and natural disasters, such as the increased risk of severe weather events to already vulnerable conventional and informal dwellings, which are mostly unplanned and not comprehensive.

Now we're going to look at how the system reads or interprets Setswetla's demographics in the light of an increased risk of severe weather events to already vulnerable informal dwellings that are unplanned and without comprehensive service or infrastructure: **Example: The agreed approach to this step is to ask "What are the possible impacts in your area?"**

Setswetla is undergoing a rise in the frequency of catastrophic incidents, primarily caused by floods, fire, environmental pollution, etc. This exposes them to life-threatening incidents that affect most of them. They get minimal support from outside during these hazards and there's no access to the resources. The roads are very narrow in the spaces where the houses are grouped, undermining the easy pf access into the settlement hence the minimal assistance from the local disaster management department. The lack of response measures to the outlined natural disaster such as heavy rains increases the vulnerability of the settlement.

Step 2 What is my exposure to the natural disasters indicator? The impacts have been defined as per the indicator selected i.e rain or fire. The next step here is the assessment of exposures to these extreme disasters. In simple terms, this step seeks to decide whether or not a specific effect is important to the community or not alternatively is it meant to determine whether or not the community is exposed to these indicators. The following is the approach of the framework and to put the measures in the sense of Setswetla as a per the data collected: **for example, the agreed approach to this step is to ask:** Do you have traditional and informal dwellings in your area? 'Will this particular impact take place in my area? OR will you be exposed to these particular impacts should it rain?

Now in the case of Setswetla, to answer the question 'Do you have traditional and informal dwellings in your area?' The answer will be informed by the question that was used to examine the living arrangements and observation around the area. The inhabitants of Setswetla have indicated that they live in shacks (informal dwellings) with their families and the observations I made when moving around the settlement have cemented these findings. These shacks are in the form of the corrugated iron shack with flammable content. Therefore, using the framework, the situation in Setswetla tells us that the community is largely composed of informal dwellings, which are shacks made of corrugated iron and plastics, with few households having 1 brick house in an unplanned location. The situation of Setswetla people, the form of infrastructure and housing, as well as the location of risk-prone areas, explains the high level of exposure to disasters.

This is outlined in the literature reviewed in which Palmer et al (2012) suggest that the vulnerable group in the society is those who suffer from insufficient housing provision. In all my findings, it was discovered that the participants lived in a family environment where most of them leased and some kept in their shacks made of corrugated irons and plastics. When asked about household arrangements, the results indicate that most of the participants remain in a family environment. Typically, it would be a father and a mother and two children or just a child. Older children in many households are sent back to the villages because the city life is not good for them or the living arrangement does not allow them to be kept private, so they are sent home and left with the little ones to have privacy in the house because it is usually a one-room shack or a brick room. Despite the privacy, staying in one shack as a family or 1 bricked room is an indication of a lack of housing provision. The lack of sufficient housing exacerbates the vulnerability of neighborhoods to external shocks.

This second question aimed to explore whether this particular impact is going to take place in my area? Or am I going to be subjected to these unique impacts? In the case of the Setswetla residents, they would have replied yes if there was heavy rain they would be vulnerable to the effects of the floods. Observed and profiled demographics show the destitute living conditions in Setswetla that increase their vulnerability to severe weather events and related impacts, for example, heavy rainfall can easily flood and wipe out their homes/shacks because they live in shacks made up of poor material, unlike a family living in a brick house/room.

The rapid growth of cities is pressing the government and civil society organizations to provide adequate and affordable shelter and services for the urban poor, particularly new migrants (Williams et al., 2019a). In the absence of sufficient shelter and affordability for land or house purchases, it has been found that where land was free to occupy, there was a lot of exposure to natural hazards. On the other side, where there is a proper layout, bricks rented and some of the rooms owned by the participants showed that they were subjected to unnatural disasters such as explosions, criminal activity, illicit power connections, and domestic abuse. It was also noted that there have been cross-cutting disasters in three sections. The key differentiating factor was the degree of impact, sensitivity, awareness, and capacity to respond to these hazards.

Step 3: Measure the sensitivity to indicators: now that I identified the indicators of catastrophic events in Step 1 and measured their exposure to the indicator in Step 2, I can move on to Step 3 of the VA framework to determine their sensitivity to the indicator. Sensitivity evaluation defines the degree to which Setswetla can react to a change.

I addressed the third stage by questioning if severe weather events are taking place, how critical is the effect on their lives, and how bad (internal) their societies will be if these events take

place? This is referred to as "sensitivity" and is usually measured on a scale (e.g. 1 to 5 or High, Medium, Low). Example: The agreed approach to this step is as follows:

- "What percentage of households are in traditional and informal dwellings in your area? More than 15% = high; between 15% & 10% = Medium; Less than 10% = low".

Observations as one of the data collection methods have shown that the average percentage of informal dwelling shacks is more than 80 percent. The percentage of households in the form of informal dwellings in Setswetla indicates how vulnerable the society is to external shocks from natural disasters. Housing structures in Setswetla indicate a high vulnerability to severe weather events. The impacts of extreme weather events are therefore important to Setswetla, as they are highly vulnerable to the change that the events of the floods will bring to their lives.

Step 4: Assess the Adaptive Capacity to natural disasters and their impacts. In the first three steps, I used one of the indicators that speak to the informal Settlement setting and assessed whether they were exposed to these indicators, and assessed their sensitivity to indicators using the data collected. This culminated in a list of possible impacts, most of which are earthquakes, fire, and environmental degradation, as found without collecting details from the participants, but more will be unpacked in the following chapters.

I looked at the fourth phase of the Vulnerability Evaluation, which has helped to evaluate the capacity to respond to these impacts. In this context, individuals are allowed to demonstrate that they have the means to react or buffer against the impacts that is what adaptive capacity means. Adaptive capacity is described as the ability of structures, organizations, humans, etc. to adjust to potential harm, to take advantage of opportunities, or to respond to the consequences of hazards. For example, based on the agreed method, I asked the following question:

- "Do they have systems in place to respond to the impact?" systems such as (policy, resources, social capital) to respond to the change? The answers are given in the form of a rating of either high, medium, or low to respond to increased impacts on informal dwellings?"

The Community's capacity to react or buffer against impacts is dependent on the availability of financial resources and social capital. It can be argued that Setswetla has a very low-risk adaptive ability. Setswetla has several informally working people who are in a precarious form of work. The income received is very low and helps them to live from hand to mouth every month. Most of the women I talked to have stated that they are dependent on a child support grant to contribute to household spending, which is now R440 per child.

What does this mean, then is that low income is used for survival not to respond to severe weather incidents, provided that it is very low? It can therefore be inferred that Setswetla individuals are vulnerable to severe weather events based on what the demographic profile tells us that they are residing in Informal dwellings, a high percentage of these informal dwellings, low socio-economic status (lack of education and low-income status). The community lives from hand to mouth with the low income that men produce, which is complemented by the SASSA grant. Planning for something that is yet to come or come at intervals of years makes no sense for people who are searching for survival. The framework has presented the process of conducting an assessment to determine an individual or community's vulnerability to the impacts of extreme weather events. However, it is critical to argue that the framework is limited to natural disasters excluding other factors that are mostly disasters beyond natural disasters however when coupled with these extreme events can exacerbate the community's vulnerability.

Koks et al (2015) suggest that flood risk management interventions, such as evacuation or flood insurance coverage, should not be implemented homogeneously across broad regions, but should instead be customized to local characteristics based on the socio-economic characteristics of individual households and communities. People migrate under pressure from rural areas and are forced to live in disastrous conditions with no qualifications or job experience. People in Setswetla are given low wages jobs and occupying the least desirable positions. Employment status and what people do to make a living or earn a living provide a clear insight into the capacity to respond to disasters. When asked what they were doing for a living, the women around the settlement reported that they were unemployed and that their employed men are working in odd and precarious jobs.

According to Reyes and Lu (2017), women are the key victims of disasters. The presence of women across the settlement was an indication that women are the primary target of disasters and the real source of disaster response and mitigation since their male partners are always away for work. This is another example of the high exposure of women to hazards such as outbreaks of fires or violent criminal behavior requiring male power.

Some women were seen sitting on the street selling chips and fruit to a passer-by to augment their household income, which their spouses bring home. Women's main function, since they are not working, is to look after the shacks and the children. In such a scenario, women have little role to play when it comes to decision-making, they say little in the process because they don't carry any money to the household. This shows yet another symbol of male dominance in households. Women appear to be more fragile than a male counterpart because they are always at home when disasters happen during the day that they are the ones to deal with the emergency. Wrigley and Dawson (2016) maintain that the distinction between individuals stipulates that

the group has unique perceptions of vulnerability, and therefore a straightforward description would deny its complexity.

Lewis and Lewis (2014) have argued that the disadvantaged are the most vulnerable in society. There's a section of the interview where I asked the participants what they were doing to understand their sources of income to support a living. Figure 8 shows that men are found to be those who fend off income earned in the informal sector for their families.

Conclusion

I am of the view that the vulnerability framework does not accommodate the ideal situation on the ground at Setswetla informal settlements. The system does not include how people cope with disasters in their lives, local awareness from residents according to their own experience with natural and unnatural disasters. The main emphasis is on natural disasters, such as the impacts of consequences of climate change that do not go beyond natural disasters.

Setswetla is an informal settlement with the characteristics of a deprived urban community. These include high levels of poverty, inadequate housing, social and economic disparities that increase the vulnerability of the community as identified. Dodman et al., (2017) argue that the consequences of urban development involved in the planning and risk reduction process must engage in all aspects of urban development, including informality, urban poverty, infrastructure and service delivery, land management, and local governance.

We have now built up the picture demographic profile of the Setswetla population to characterize the picture of the settlement's vulnerability. We recognize that most people are refugees, either from other regions of Southern Africa or from South Africa but coming from

other provinces of SA searching for greener pastures. However, the situation did not offer them what they were looking for or hoping for as greener pastures were looking for and that the level of poverty in Setswetla is high.

The majority of women are not working while their partners or male settlement residents are employed. Exacerbating the poverty level of settlement because they are employed in the informal sector without security. Women are usually at home and not economically active while their husbands go to work. Housing is primarily a family setting in a room shack on the banks of the river.

The chapter explained the meaning of the concepts and provided links to Setswetla's situation. Hazard is characterized as a process, risky events, or human activity that can cause loss of life, injury or damage to the property, social and economic disruption, or degradation of the environment. Setswetla's situation on the surface reveals that there's a ticking boom waiting to get off. This means something will happen that could cause a major disruption to the community or a great loss of life.

This chapter also attempted to apply the vulnerability framework into the context of Setswetla to demonstrate how a conventional vulnerability analysis would understand the community's experiences. It is an informal settlement with a high level of poverty, situated in an area with a high risk of flooding, and made up of housing systems that are not very secure. As we have seen from demographic data, there is a very low level of adaptive or resilient ability – the population is mainly weak, and there are very few institutional infrastructures for response or support.

This vulnerability profile is potentially useful since the system is capable of recognizing areas of high vulnerability by using very few resources and based on observable data (using remotely

sensed data, GIS data, and corroborated with some rapid grounding). This theoretically makes initiatives at the local level more focused and appropriate. The results of this section complement findings from conducting in-depth interviews in several ways (which is discussed in the following chapter). So what then, is the benefit of the vulnerability framework, if it only tells us what people themselves already know and experience as part of their everyday lives? Well, on one hand, it speaks to the municipal decision in ways that they can hear. If we follow the argument of Scott (1998) in his seminal text Seeing Like a State, we will recognize that the state often does not 'see' its citizens unless they are enumerated into statistics and data that they can interpret. The vulnerability framework gives the state a clear instruction of where and how to intervene. But as Scott argues, and as is further illustrated by Corbridge et al (2005) in seeing the State, in partial response to Scott's argument, we know that the response by the state is seldom quick, effective, or appropriate. As Roy (2009) has argued in her book Why India Cannot Plan Its Cities, knowing about the vulnerability of communities in informal settlements does not mean the state has an interest in intervening. In other words, the status of these spaces as 'informal' and therefore not entirely sanctioned means that the state can always say that the people were never supposed to be there – it is partly their fault. It is not the objective of this thesis to argue whether the Johannesburg municipality takes its responsibility seriously or not. What I am simply arguing is that, from a theoretical level, the vulnerability framework does not ultimately provide the kind of knowledge that makes a great deal of difference to people who live in these spaces in terms of their agency to shift their vulnerability. It merely confirms their understanding – and the violence that is done by allowing statistics to speak for people means that in fact, the vulnerability framework can have the effect of actually silencing the very people who need to speak. Expert data comes to speak more loudly than people themselves.

None of this is to argue that the vulnerability framework is a massively important tool for responding to the vulnerability of the most at-risk communities in society. It is simply to say that it captures only a part of a much more complex story about vulnerability.

In the following chapter, I returned to the field itself, and unpack how people understand their vulnerabilities – I want their voices to speak in place of or alongside the expert statistical data. In the first part of the chapter, I attempted to unpack the experience of flooding in the area, and show how people have responded to past events of a traumatic natural disaster. As we will see, despite their recognized vulnerability, the overwhelming experience is one of powerlessness and lack of agency. Tracing flooding events back almost two decades, we will see that the vulnerability framework has done little to mitigate the constant impending threat of flooding that threatens to wash people's worlds away. Drawing on work that looks at the role of superstition and myth to make sense of uncontrollable events (e.g. Ashford 2005 Witchcraft, Violence, and Democracy in South Africa; Wilhelm-Solomon 2017 The ruinous vitalism of the urban form: ontological orientations in inner-city Johannesburg) I show that in response to the uncontrollable nature of flooding, residents of Setswetla adopt a fatalism. The flooding serves as a way to mark time over the longer dare – it becomes a way to demonstrate the extent of abandonment: we have been here twenty years and nothing changes. Quite apart from the flooding – which is violent but relatively rare – residents are all too aware of the very real everyday problems that they face: violence, disease, hunger, etc.

The vulnerability cannot be interpreted in isolation, thus it is important to include other intersecting vulnerabilities in the structures to gain in-depth knowledge as to what triggers the vulnerabilities of the informal settlement, as a consequence of the continuous nature of flood-prone areas despite the multiple times of government eviction and the displacement of

environmental disasters. The intersectionality of vulnerabilities will be unpacked in the chapters below and explored in chapter 6 of the report.

Chapter four - Everyday Vulnerability in Setswetla

"The river gets wider and wider every day. It rained in 2000, it also rained in 2016 but the damage was unlike other years, the 2016 one was the worst and it is going to happen again because of the lack of basic service, occupation of the riverbank, the malfunctioning drainage system in other areas that when it rains their water comes to affect us. The river gets full even when it is light rain or there is no rain at all-Research Participants in Setswetla"- ***(Participant 1, 5&13, 2019)***

The study introduced the demographics of Setswetla in the previous chapter and placed them in the sense of vulnerability and informal settlements in South Africa. I drew from South Africa's current vulnerability assessment method. I conducted this to measure the community's vulnerability to hazards. The chapter revealed that the demographic profile of Setswetla is low and vulnerable to hazards due to a lack of resources for hazard planning and mitigation. Therefore, I discussed in this chapter how local residents order their own vulnerabilities on the basis of their familiarity with these spaces.

The study is categorized this chapter into two sections to explain how local people organize their own vulnerabilities. The guiding context was to consider the difficulties that exist in a long and short-term period. The first part of the chapter discussed the memories of flooding that were portrayed in a time-lined timeline of events by participants. These events occur in cycles of ten years or five years, although it was commonly said that they take place in intervals of 2 years lately. Their stories of flooding events told of their disastrous experience. The socio-economic situation makes them feel less agitated to deal urgently with rain because, as it is a natural occurrence, they do not have power over it. Unlike the smaller things that take place in

a flood-prone area, they bring more pressure on their lives. Section two of the chapter discussed the daily threats in Setswetla that wear people down.

Therefore, what the researcher attempted to do here is discuss how individuals in the Setswetla community recall particular flood events. To explain how floods are very drastic environmental phenomena. Yet these incidents are characterized by rather violent effect that turns to framing the memories of people living in a community. Every couple of years, flooding incidents happen and they stick in the minds of people for a very long time. In the second part of the chapter, however I discussed other aspects that also influence the lives of everyday individuals living in these spaces.

The chapter positions the memories of flooding within Setswetla's broader order of daily life. I did this by unpacking the understanding of flooding in the wider experience of coping with vulnerabilities from different sources. There are wider collections of vulnerabilities and a collection of things that control the lives of people. The key in this chapter is to understand how local residents of Setswetla organize their own vulnerabilities in a full range of long-term rhythms marked by unique major events and short-term rhythms marked by daily life.

Flooding is something that structures the sense of long-term memory for individuals. Due to unpleasant stuff encountered during such events, the memory of those events odes does not wear off. These unpleasant experiences do not however, affect how they plan their daily lives. Flooding incidents happen once in a while and are massively violent and massively damaging. Between the 10 years or two years before more flooding incidents could take place, there are a lot of devastating events occurring. In a place like Setswetla, which is on the floodplain, people recall floods and are mindful of their susceptibility to flood disasters. There is however, the daily lives of rodents, domestic abuse, fire, crime and pollution that people in the Setswetla

space have to make sense to deal with. People structure a sense of time to remembering a specific event

Awareness of natural hazards and vulnerability management by native communities is a resource for community cohesion and a good memory of past disasters (Roder et al., 2016). Awareness of weather- and climate-related impacts indicates that disaster experiences influence the preparedness of individuals (Jacobsen et al., 2016). Public ordering of hazard actions is often overlooked by the method of designing risk management strategies by decision makers. Risk ordering differs in several ways, particularly between the local authorities and the communities affected. The disconnection between authorities and communities has contributed too many unsuccessful flood risk management strategies (Fuchs et al., 2017).

The authorities need to take into account how people estimate their choices and willingness to respond to a hazards, along with the effectiveness and expense of these options, to get a much better picture of the decision of people to react to the threat (Grothmann and Reusswig, 2006). The recent rise in destructive floods indicates an immediate need for effective management of the risk of floods. Understanding how orders of things affect the execution of mitigation steps is a core element of such management (Schlef et al., 2018).

In urban poor areas where extreme poverty is caused by wealth injustice, underprivileged living conditions, as well as restricted access to land and basic infrastructure, rising levels of criminal activity, crime, lack of security and general fear of the use of public space are often observed (Brown-Luthango et al., 2017a). I quote, 'It is not safe to wake up at night and go to the women's bathroom, these toilets are far from the houses and there are no street lights, this is the situation in Setswetla. There are facets of the problem of not providing electricity and public toilets (basic service) that contribute to both living standards and safety problems in the

settlement. It is arguably also a type of weakness, since it is one of the facilities that individuals cannot practically provide for themselves, so it is beyond their ability.

Flooding: a violent but seldom threat

February 2000, 2010 and November 2016 are the years in which Setswetla experienced devastating flood events. Most of the residents were negatively affected by these floods. Participants described the flood events as not new to the settlement and stressed that they were a recurring event experienced over the years. Participants recalled a considerable record of a number of damaged valuable properties, damaged shacks, with hundreds of homes swept away by the tides of the Jukskei River in heavy rainfall. It is during these events that residents are forced to evacuate the Setswetla and find refugees from their friends, local parishioners and other local public shelters. In particular, the occupants of Riverbank are the most affected residents.

The findings show that Setswetla is exposed to a large amount of water. Water has negative impacts on residents' lives and livelihoods. Water that affects the community of Setswetla is said to be rainwater when it rains heavily, or water that accumulates in the Jukskei River from other parts of Johannesburg when it rains, and through malfunctioning drainage systems that flood their homes. Memories of environmental disasters are linked to the results and the cultural interpretation of these events. Participants illustrated different ways to reflect back on the memories of heavy rainfall in the past.

A girl child was a 3-Old child of the Mozambican nationality fell and died into in river Jukskei. It was November 2016, just like any other household on the banks of the river, that the Mozambican family reacted by drawing up a buffer plan against hazardous rainfall. The family decided to climb the tree to run away from the surface of the water, with the parents carrying

their children. The tragic event took place when the father lost the grip of the child he was carrying, the child then slipped into the water and tides carried her away. Her body was recovered after some few days later in up the stream at Buccleuch, North of Johannesburg.

Memories and indigenous knowledge on geo-referenced flood events ranged across age groups. Youth would only have memories of November 2016, while adults between the ages of 40 and 50 years, specifically referred to the flood disaster of 2000, 2010, 2016 as the worst. The memories of the older participants were profound and very descriptive, as they offered a lot of illustrations for each case as opposed to young adults. This can be translated as indigenous knowledge comes with years of cultural experience.

There have been amazing tales of losing valuable material and at times, loss of life during the Setswetla floods. Participants indicated that they felt vulnerable to heavy rainfall as they had no money or any other capacity to adapt to and resolve the aftermath of the floods. Rainwater was seen as catastrophic in the interviews; however, an interesting finding shows that even if there was no rain in Setswetla there is still a problem with water. When asked, how is the water in the absence of rain a problem? Participants point out that if there is rain in the other sections of Johannesburg, which is connected to the Jukskei River, the settlement is affected, and Jukskei fills up and overflows into their shacks, flooding their shacks.

Water accumulates and fills Jukskei while they are away from the settlement, meaning that there is no one to evacuate furniture and other essential belongings from the shack to their relatives and mates, where the upper part of the settlement is normally considered protected from the river bank to the grave. They end up with damp beds, clothing, broken furniture and food being lost or washed away. As a result, their husbands do not go to work the next day and children miss school. They pursue refugees from friends and relatives who often do not have

enough room to cater for the entire family, sometimes food is also a problem because they do not have an emergency fund set aside as they often operate in the informal sector and thus earn less living from hand to mouth.

Heavy rains flooded shacks endangered the lives of the participants. Participants referred to the fact that their shacks were filled with water at night while they were sleeping. There is a case of the pregnant lady although this was not at night they just demonstrated and used her case to show the attack of water while you sleeping is very high because water seeps through the shack and in a very silent mode you cannot hear anything. During the day the pregnant lady went to take a nap and the water came to her shack. People came out in the astonishment of the river filling up without any signs of rain. The pregnant lady was the one who was missing from the scene, and the sister went to look for her in the shack only to find her in the shack, and she was fast asleep. In that way, if nobody found her, she would either drown. The river was said to fill silently, too, the river does not have high levels of noise when water is accumulating. The noise from a lot of water in the river could be called an alert device and could thus be used to plan and go to a safe location.

People in Setswetla seemed to have a different experience of the highest recorded flood as the main problem in the area. As mentioned, the settlement is divided into three parts

geographically. There is a river bank segment, a middle section and a section closer to the graveyard, as shown in Figure 14.

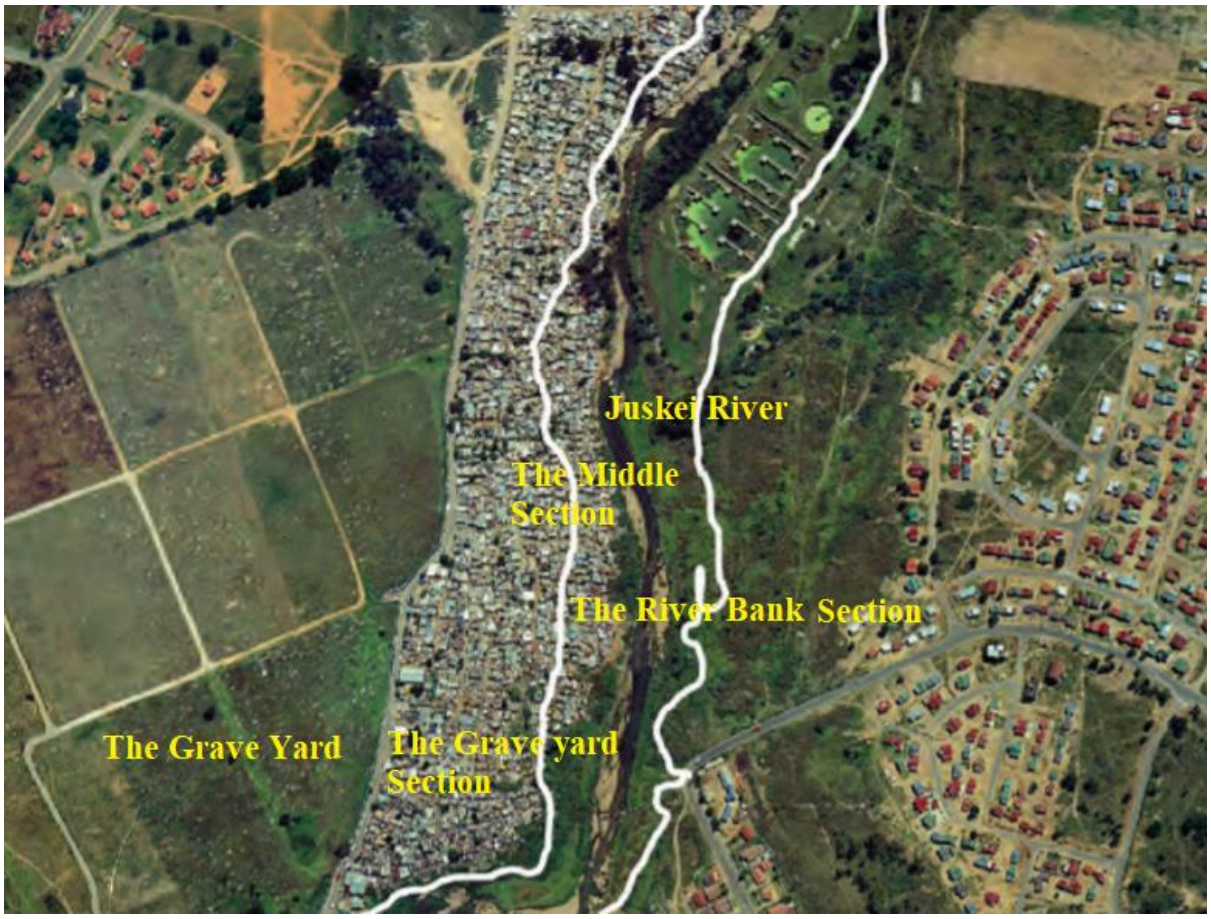

Figure 10 Sections in Setswetla Informal Settlement

During the interview, it was revealed that "we are barely affected by the floodwaters on this side (Middle and Graveyard sections) but we have heard or seen people staying closer to the Jukskei River complaining about water or badly affected by the effects of heavy rainfall shown in Figure 14. We are far from the river and at the steep point of the settlement, so water is essentially flowing down from us to the river that affects people in the lower part of the riverbank settlement. We are directly impacted by noise, lack of basic facilities, fire caused by alcohol misuse, violence and illegal power connections.

Figure 15 shows the part that is greatly affected by disasters in the Setswetla settlement. This is the portion on the river bank. Others said: 'People (the inhabitants of the Riverbank) don't listen to the tragedy that comes with staying near the river but still remain there. They die, and there are reports of children drowning in the polluted river. We are used to these floods or the catastrophic accidents triggered by the water flowing out of the river when it rains, but these people are turning back later.



Figure 11 Jukskei River during the November 2016 Flooding. Source SA People News, 23 November 2016

In order to reinforce the empirical proof of the flood events in Setswetla, the researcher searched Google for a media release of papers on flood events and recorded results in Setswetla. These are part of the many news articles found online that I am going to use to cement the empirical data relating to the dates and years listed above in the timelines of the environmental hazard; 'Rain, rain, rain: more flood chaos looms Feb 11, 2000,' 'How we were attacked by the river November 15, 2016' 'Rats and floods: just part of life along the Jukskei River, January 1 2019,' Flooding fear. In 2000, the rivers in Gauteng, Mpumalanga, North West and Limpopo

flooded and the water levels soared over the bridges resulting in road blockades and in some sections the bridges of the Gauteng regions were washed away. Alexandra was also impacted by the disaster rescue team being on standby as Jukskei River showed signs of rising from its normal levels.

In the year 2016, the media reported a flood incident that described a 3-year-old girl who had been washed away by the river while the tree branch and her parents were hanging on to break down. The baby dropped into the water from her father's grip. The body was found six days later. As soon as the water had subsided, the group had come together to rescue each of them and pulled out the car that had drowned in the water from the mud.

Earlier, we examined environmental disasters that settlements encounter every day in order to give the residents of Setswetla a broader sense of risk. What this suggests is that the research had the ability to examine people's insight into the root causes of the crisis they were facing in the settlement. The majority of participants suggested that disasters are focused around the site of the river bank, which exposes them to floods, insufficient planning by local authorities, and to an adequate malfunction of drainage systems.

The ordering of disasters has an effect on how residents handle disasters. Setswetla's view and organization of life indicates that the socio-economic position, cultural values and indigenous awareness and geographical location within the settlement affect how people handle their disasters.

There are no known coping steps that individuals or societies have set out for rainy days. They're all waiting and coping with the rain when the rainy season begins. Residents in the community are advised to take clothes, food and blankets away to their friends or relatives when they see dark clouds appearing in the sky. Upon seeing the dark clouds forming, women

flee to their shacks packing clothes and blankets to a much safer location. The safe place not affected by rain is the middle part of the settlement and the upper part of the settlement, in this case the bank inhabitants rush to the nearby section in the middle part of the settlement.

It is said with sadness how they watch they leave their furniture behind to be soaked in water and later break. The only mitigating measure applied when there is ample time to act before the onset of rain is to take the furniture onto the top of the roof. The furniture still gets wet however from the rooftop it does not get washed away with water or does not get soaked unlike when they leave the furniture in their shacks. In general, there is no effective measure employed to buffer against the effects of rainwater or floods. When asked what can be done to minimize the risks and constant replacement of furniture, participants stated that there was nothing they could, unless if the government can come to their rescue and give them safe land to build their shacks. However, this was not the case with the foreign national in the settlement. They pointed out that there are no other alternatives as this is the place they can only afford and that they were not here in South Africa misuse money but to make money and send it back to the families.

The effective mitigation idea proposed by one of the participants ‘is for the local authority to put the demarcation fence across the riverbank in place because it is where most individuals are impacted, it is a very unsafe place and it is hazardous for their lives. The government has in the past remove them to protect the residents from the risks associated with occupying the river bank based on previous experiences, but people continue to come back. The fence would mitigate disasters resulting from the occupation of the flood-prone region significantly and effectively’. Say the lady who was standing on her feet pointing at the river bank. The lady owns a 1 brick room in the middle section of the settlement, she is not affected by floods at all however a first-hand observer of what takes place when there is floods.

The community organizes itself to ensure that the stability of the settlement eliminates future losses. For example, residents from the middle section of the settlement are typically not affected by rain or water from the Jukskei River, however they help the affected community members to remove property from the shack to mitigate damaged furniture such as beds and wet blankets. In order to prevent soaking, they also transfer these goods to the top of the roof of the affected shack.

'Hi pustule swijumba swa tiumpahla hi yiya ka maxaka na vhangana' We fold our clothes into small bundles using big clothes to tie them together and then take them to our relatives and friends who are not usually affected by water and also give them a place to stay for that night.

There is little that we do before and after the rain to shield ourselves. What we generally do is run to church and there they shelter us. The representative of the political parties within the settlement performs an inspection of the settlement to determine the shacks affected. The names of affected people are registered by elected leaders and pledge to relocate them. Affected residents go to their neighbours or day-care school before the rain subsides, to rest there. The process of transferring people to a better place, food and clothes from the helping organizations is facilitated by comrades in the settlement.

During the summer season, the City of Council Emergency Management department engages the settlement to educate the community on precautionary measures on rainy season. The same applies to the winter season, the local authority raise awareness of the potential fire eruption in the settlement.

Another organization such as the Gift of Givers is providing food and removing the displaced people to a much better shelter when flood disasters occur. It was claimed that Gift of the Givers had removed people to a safe area in the past and constructed proper shacks for these residents. Participants have suggested, however, that certain organizations do not aid, and they only come here during or after the disaster when we are still stranded to come and take the pictures for media purposes and draw viewers.

As a community, there are no mitigation measures we can prepare and execute because the river is becoming wider and wider every day. The land we occupy is unlawfully occupied, so it seems by law that we do not even count for any government assistance. We can do little in our capacity because water comes in suddenly and we still have the river flowing to its full capacity even though it does not rain here. The community had some sort of community movement against such heavy rains like a blowing whistle but these days it is no longer there, everybody is on their own now. So when we are lucky and see that Jukskei is getting full we just run to the place of safety either your relative, friends or church.

There is no successful mitigation mechanism that can be enforced to buffer residents against floods and other emergencies, due to the current situation of the amount of soil eroding in the river causing the river to widen and putting residents at greater risk, heavy rainfall leading to flooding of shacks, high levels of contaminants such as litter and waste filling up the river. The mitigation plan will be to get the inhabitants of the river banks into a secure area. In addition, participants suggested that it is possible to relocate the existing inhabitants of the river bank because there are people who have relocated to a much better area in the past. It is emphasized that moving from the river bank to the safe environment is the task of the government, not the person affected. Participants suggested that they have no resources to purchase land or rent in a proper location because it is the government's job to remove them from the riverbank. The

occupation of the river bank was free of charge and affordable for those who paid rent. The greatest focus from the participants, however was that they only needed land to build their own homes. The primary and most important mitigation measure for the participants was access to the land.

This rain challenge is a natural occurrence, it arises with floods in the summer season, it is often harmless and it is devastating in some instances. There is a strong possibility that these flooding events will happen again for those people still occupying the river bank. Most of them are foreign nationals who come in and out almost every day to occupy the place without any awareness of past events just to be expected when the rain falls, and several of them are aware of it.

Future flood-related disasters are likely to occur or at any time of the day because the challenge they face in the area is that even if it does not rain, Jukskei gets full somewhere in the Vaal region, for example, and they have water seeping through their shacks.

Strong rain needs an interval of 2 years. The flooding of 2016 was not the first to happen in the region or to impact us. The analysed trend suggests that every two years it rains heavily. It could rain even this year because we haven't had anything in the past two years compared to 2016, one implying it's on the way regarding the hazardous one we've just experienced called Dineo. 'Even this coming weekend, I am sure it will rain because it has been humid, it hasn't rained in a while and its summer season.'

The one I expect to come this year "I yam nwa-nsati" ya nwa-nsati yi karhiha ngopfu-The one I expect is a female flood, the female flood is too severe. It was concluded that the gender of the rain, when it is angry, depends on the severity of the rain. It is then generally concluded that it is a male when it doesn't cause a great deal of harm. To add on that in most situations,

the female rain would affect the girl kid. About the incident in November 2016 when a girl child dropped from the tree while the father was carrying her and waves swept her away. These rains are expected to occur and they are likely to occur again and mainly impact the people on the river bank.

Even if it doesn't rain here there are incidences where the water ends up in the Jukskei River and affects the Setswetla community. It has increased the frequency of flooding to make the community aware of what is likely to happen at any given time. Not only because of undesirable shelter and the location of the river bank, flooding is a major challenge, but the inadequate drainage system in Alexandra Township also contributes to the severity of the floods. The water from that side of the township flow by the settlement in the river and also when it rains in the neighboring places, water comes to the Jukskei River and eventually the settlement in full force.

Locating perceptions of flooding risk within broader experiences of vulnerability

The first section of the chapter provided timelines for floods based on people's memories. However, we also want to understand how recalling these events makes it possible for us to get to the location of these spaces. People remember these dramatic incidents, but when I asked how vulnerable they are to floods, they feel like they can't control the rain and are vulnerable to it. They don't have the urgency to make those choices. When you look at smaller things like crime, domestic abuse, there's no time to worry about moving to another place to buffer against the flooding, but poverty, crime and domestic violence are their daily lives and seek immediate intervention.

My main emphasis was not on investigating the entire spectrum of environmental disasters, but similar disasters that are interlinked and cannot be studied in isolation. This section therefore

presents the overview of major environmental disasters that intensify social insecurity in settlements. These environmental disasters include pollution, rodent breeding, explosions, uncollected garbage, water and sanitation, etc.

Setswetla possesses impacts that contribute to people's everyday life, which explains why the non-frequent but nevertheless devastating environmental hazards are often ignored or under-played by people. They are too busy worrying about the depressing and hazardous parts of everyday life for example being abused, being hungry due to low income from working precarious jobs, chasing rats from their children and out of their shacks etc. So even though in chapter 4 and 5 we have seen that these people are vulnerable based on their low level income and informal housing, impacts of flooding, environmental pollution, breeding rats and fire incidents in the area. Chapter 6 shows us the reason why they don’t see their vulnerability as an urgent issue that requires their attention that much - or don’t think too much about it and remarkably why they don't act to reduce the risks. Chapter 6 demonstrates to us that the community is in the middle of trying to live and survive the situation beyond environmental disasters presented to them in Setswetla daily. In this section, I discussed the vulnerabilities faced every day that are beyond environmental disasters in the settlement.

Pollution

The site of the river bank, as opposed to the parts next to the cemetery and the middle part of the settlement, has been subjected to several problems that the river has brought to their lives, such as waste, the risks of children drowning and certain odours due to pollution.



Figure 12 Polluted Jukskei River

Increasing numbers of migrants flocking to Setswetla's informal settlement and Alexandra's nearby township due to 'no rent or low monthly rent means that drainage systems are increasingly burdened and automatically increase the level of pollution in the river due to overpopulation, as shown in Figure 16. Overpopulation in urban slums requires qualified officials to deal with water and sanitation problems. The provision of basic services to informal settlements in Africa as well as in South African cities has proved to be a problem.

Rural and urban areas are economically, socially and environmentally intertwined (Gebre and Gebremedhin, 2019). Recognition of intersecting social dimensions helps in understanding gradations of vulnerability and the role of rural ties in addressing vulnerability. The poorest people on the globally are mostly living in rural areas and depends largely on agriculture and other climate sensitive activities for their livelihoods.

Rural areas gain from urban development, such as market, farm inputs, employment opportunities (Gebre and Gebremedhin, 2019). Compounded with inadequate resources to cope with and adapt to hazards, their lives, assets and livelihoods remain highly vulnerable. Migrating to cities is one of the self-constructed coping mechanism.

Urban areas are places where lots of people live on a small amount of space with better and improved access to social services(Gebre and Gebremedhin, 2019). In contrast rural areas are characterized by high dependence on agriculture, low levels of human development, low adaptive capacity and little attention from policy makers (Qaisrani et al., 2018). Therefore, people from rural areas migrate to urban areas in search of places where other forms of livelihoods can be attained. People migrate from rural areas to occupy unpleasant living conditions in the city looking for resilience in vulnerable conditions. This explains their perseverance of informal settlements vulnerable conditions while they are being able to send money home to their families through precarious forms of employment.

Looking into social differentiation, existing social networks and processes of social inclusion and exclusion is key to address intersecting vulnerabilities and social networks as a source of resilience. It has been argued that many aspects of adaptive capacity reside in social networks (Adger 2003) and that these are a crucial source of resilience (Folke et al. 2005, Folke 2006, Berkes and Ross 2013). This applies in particular to rural communities in the Global South, where often a lack of access to resources, knowledge, and functioning institutions is a major obstacle to sustainable development.

There is high level of waste not collected and accumulating right next to the shacks where people work, eat and sleep. Setswetla is no exception to these waste problems. Observations during the site visit revealed that settlement is receiving little to no service delivery from the local authority. In the past few days, there has been no evidence of fresh waste collection on site as observed during the fieldwork days. Setswetla has a high degree of waste disposal at the self-constructed waste site, as shown in Figure 17 below.



Figure 13 Community Self-Constructed Dumping site

Participants explained how these uncollected litters and other forms of solid waste end up in the river and are dispersed throughout the settlement. 'There is no appropriate collection of waste around the settlement, and this has been the case since I lived here,' notes the participants who have been in the settlement since 1996. This garbage, which is not gathered, ends up in our shacks either flowing out of the river or around the settlement.'

This topic was further explored in order to understand how the city space litter ends up in the participant's shacks. Participants showed that when it rains in other parts of the city, the paths of surface run water are connected to the Jukskei River and litter is collected along the way and accumulates to the Jukskei River. Which then ends up at the Setswetla Informal Setswetla shacks, it often a mix of cans and plastics.

The litter in the river and the one that ends up in their shacks are said to pose a threat to their health, as it is not clean and smells awful. In view of the litter collected from other parts of the area, the residents of the settlement dump their litter into the river. This is due to the lack of adequate collection of waste by the City of Johannesburg.

There is no adequate drainage system in the settlement; the condition is compounded by a malfunctioning drainage system in Alexandra Township. A desktop study shows that the problem in Alexandra Town is the aging of facilities, the backlog of maintenance, the superimposing of storm water systems with access interlinks. In this situation, it is common for sewage and storm water to mingle when interlinking fails. Exposing residents of Setswetla, which occupies the river bank and exposed to water pollution/waste. Participants have shown that their wellbeing is at risk with a high degree of exposure to water that passes through their shacks and must be washed with their bare hands. They are still exposed to the foul smell that is inhaled regularly from the waste coming from the river, which is very harmful to their health.

As reported in the demographic section above, Setswetla's resident stays in a family setting. A group of women who are mothers indicated that some kids when they are not monitored by elders and sneak out to and play by the river. The majority of the waste, garbage and other forms of pollutants in the river expose our children to the community's risks. There were incidents of children swimming and drowning in the water. The settlement is too densely packed that there are no open areas for our children to find a playground, so children play by the river or riverbank. The river has proven to be hazardous to us and we have had incidents of children falling into the water and drowning fortunate they've been saved in time. What's going to happen in a situation where there is no one around to save these children? It's not a safe place to raise our children.

The absence of basic facilities from the local authority is not a risk; however, exposes the community to threats and hazards. Participants pointed to the fact that insufficient toilets exposed them to criminals at night in particular. Safety is threatened when they have to get up at night to go a long way to the bathroom. Women and children are the most vulnerable group here.

Inadequate collection of waste affects the community because the litter end up into their shacks from Alexandra Township and some areas in Johannesburg. The waste is collected from the source site to Setswetla by a surface run-off of rainwater. Waste is said to have the potential of infecting them with certain diseases, but this has never been confirmed or no case has been reported. Due to insufficient maintenance of the settlement facilities in the Alexandra Township i.e blocked drainage system raises the risk of flooding.

Settlement itself is hazardous to people because of a lack of basic service delivery. Collection of waste to mitigate the foul smell of settlement is the task of the government. Supplying adequate water and sanitation in the settlement is 'our right,' the government should provide us with proper water sanitation. The community resorts to the bucket system as it is not safe to walk out late at night, particularly for women.

Breeding Rats

The researchers' observation on the first visit to the settlement was that there was a substantial amount of waste around the settlement, uncollected waste at the disposal site. Accumulated waste results in the breeding and attraction of rodents. Rats breed faster in a dirty environment; the participants believed that rats were associated with high levels of pollution around the

settlement. The breeding of rats was said to pose serious challenges and hazards. Rats have their way to get into the settlement and eat the food and clothing of the people. Participants say that these rats have the capability to harm them and transmit the disease to the residents. These rats feed on waste and sometimes bite them while they sleep.

Setswetla suffers a great deal from the consequences of the high number of breeding rats in the settlement. The responsibility is transferred to the local authority since there is no disposal of waste in the settlement. The mitigation measure is said to be the duty of the government to enforce it as they claim that these rats are breeding here because of a pollution. 'If the government were able to arrange a collection of the waste plan in the settlement, it will minimize the large amount of waste pillaging around the settlement and accumulate in the river as people use the river as a dumping ground for the waste they create.

Overall, rats are known to transmit over 35 diseases that can affect both humans and livestock, including plague, salmonellosis and leptospirosis. In addition to the possible health hazards that could occur in the village, these rats kill their belongings in the shacks as they go in and eat everything in the shacks.

Fire

The fire has been frequently described as a life-threatening hazard in the settlement to which residents are exposed to on a daily basis. Events of fires in the settlement were the product of human negligence and illicit power connections. Where there was a high degree of illegal electricity link, people would open electricity boxes to connect to their shacks. They also result in the overburdening of the electricity box and burst into the fire that destroys their shacks.

The settlement has the servitude flowing through the settlement to the surrounding suburbs however the settlement still suffers from illegal power connection. Participants stated that the absence of a sufficient supply of electricity in the settlement frequently results in an unauthorized electrical connection resulting in hazardous fires involving many shacks in the settlement, leading to the loss of valuable possessions.

South Africa is currently facing a huge amount of load shedding. The lack of electricity affects domestic operations, industries and other significant sectors. As citizens of the country, we are always warned to switch off electrical appliances load shedding kicks in. Participants expressed how negligence has led to damages due to appliance left on. For example, few ladies were said to have left their stoves on when there was a load shedding and to have gone out to chill with other ladies. In the meantime, they forgot that they cooking and left their stoves on, resulting in a severe case of catastrophic fire affecting 1 to several shacks in the nearby. Participants suggested that such actions would expose them to fire because it can happen while they are away and destroy their furniture or can also result in physical damage or death.

The settlement is so compressed and densely populated that is impossible to even move freely in between the shacks. It this is kind of setting that exacerbate their vulnerability and high impact of fires erupting in the settlement. When a fire erupts the community does try to put it off by simply putting water however, this is no easy task to do because there is no adequate water supply in the settlement. Residents have to run a bit of distance to fetch water to put off the fire. The department of disaster management is only a few kilometres away from the settlement, based in Alexandra Township. However, it was revealed that they always struggle to help or cannot help at because they are cannot get into the settlement or access that affected shacks to put off the fire due to lack of access into the settlement.

In the past, the community had whistles in each household to blow when there is fire. The blowing of a whistle was a sign that there is someone is a crisis and they all needed to act accordingly in this case to reduce the burning of the occupants and treasured assets. Participants. The whistleblowing mitigated loss of life as the community came together to put off the fire. This was another sign of humility and solidarity. If you are caught seating or minding your business and not helping the community leaders take down your name.

To mitigate fire events in the settlement, participants alluded to the Early warning systems that reach informal settlement effectively should be implemented to warn the community about load shedding in time that residents should be aware of what time there will be a load shedding. This is going to avoid women leaving their electrical appliances such as stoves and other electronic appliances.

Crime

The crime has also been raised a lot as one of the risk exposures in the settlement. Security issues have appeared a lot in interviews as experienced in the top part of the settlement as opposed to those in the lower part of the settlement with significant water and flood concerns. The crime was said to be severe in that part of the settlement because of the events that took place in that area of the settlement, for example 4 ladies interviewed on various occasions suggested that the tavern next to where they stayed added a lot to the insecurity of the location. It's not safe at night, people fight and stab each other, people steal money to buy alcohol and drugs, and many have been robbed at night.

The crime has been raised a lot as one of the danger exposures in the settlement. Security issues have appeared a lot in interviews performed in the top part of the settlement (find the name) as opposed to those in the lower part of the settlement with significant water and flood concerns

who have been highly exposed to crime. The crime was said to be a serious concerned in that part of the settlement because of the events that take place in that part of the settlement, for example 4 ladies interviewed on various occasions suggested that the tavern next to where they stayed added a lot to the insecurity of the location. It's not safe at night, people fight and stab each other, people steal money to buy alcohol and drugs, and many have been robbed at night.

Participants were asked to elaborate further on the causes of criminal activity. The high unemployment rate, the use of drugs and alcohol were related to the criminal activities in Setswetla. Most people come to Setswetla to look for greener pastures, but there are many people without a source of income. This is attributed to the weak economic condition of the country and the lack of educational qualifications.

The settlement is facing a high degree of unemployment and thus has recourse to alcohol to cope with the burden of unemployment. The dilemma begins when they fight and it doesn't end well without bloodshed. Drug misuse also leads to illegal activity. Unemployed men break their drinking habit by robbery. Finding alternative activities for unemployed people would also reduce the high level of alcohol use and as a result, fight crime.

Conclusion

There is a longstanding history of people's memories and the recording of incidents in the media accounts, such as News 24 in Setswetla. Residents recall these flooding’s as catastrophic events that put their lives at risk once every 2, 5 or 10 years. Setswetla, however is an underprivileged community, an s a result, people order their own flood risk in comparison to other existing neighborhood vulnerabilities. There are things that happen every day, such as pollution, burning, domestic violence and crime. This needs their immediate attention because they have power over them.

Environmental hazards are a recurring problem and are always coming back without warning, since they are natural occurrences. It can be argued that Setswetla's approaches to disaster management indicate that they have learnt from past events and are well aware of what awaits them in the future, and that they turn their attention to survival problems as they live from hand to mouth, which is a regular problem, as opposed to heavy rainfall that happens once or twice a year.

Low income indicates that there are no resources in place to adapt to disasters in the future, and it's not like they don't learn from previous incidents, therefore continuing to build on the river bank. The reality on the ground is that there is no capacity to implement effective mitigation measures for example there is no alternative land to inhabit on or adequate resources to rent proper houses in the safe environment. Setswetla provides the residents with easy access to city and jobs.

Despite the lack of proactivity on the part from individuals to plan for disasters, Setswetla has high community cohesion during these catastrophic heavy rainfall and fire eruptions. It has been revealed that the neighbours come in full force to help the families affected when they see you at risk of losing your life or property. Residents come together to attack and also fight people who steal cables or illegally link electricity, which is the root cause of the fire in the settlement.

I addressed the experience and ordering of environmental disasters, and there is no doubt that in Setswetla, there is vulnerability in relation to the number of hazards such as flood events that have occurred in the vulnerable or disadvantaged living condition, fire eruption and criminal activities. This is concluded by resident’s order concerning the crisis they face as a

result of living in Setswetla. The following chapter will therefore concentrate on exploring the intersection of vulnerabilities resulting from non-natural hazards.

Chapter Five - Theoretical Discussion of intersectionality

"The November 2016 case put our lives at risk because of its (the rain) anger. The manner in which the rain in 2016 was hazardous it was concluded that it was an 'angry female rain woman. "To validate the concept of the angry female rain, the rain violently killed a girl-child to prove that it was a female snake. Unlike the male rain that is polite and there is no reported harm to residents after the male rain- **(Participant 5, 2019)**

It is evident in Chapter 4 that the residents of Setswetla have a strong memory of their encounters with environmental disasters such as floods, fires, pollution, etc. However, literature has shown that vulnerability derives not just from environmental disasters, but also from other intersecting factors that makes the population vulnerable (Hankivsky, 2014). Chapter 5 offers a good picture of what occurs in Setswetla in addition to environmental disasters such as crime, domestic violence, and substance abuse.

I believe that it is not the natural hazards alone that can exacerbate the vulnerability of the Setswetla settlement as per the conventional Science-World views of hazards and threats i.e the Vulnerability Framework that we explored in Chapter 3 however, the ones they are confronted with every day. For example, the views of the framework place focus significantly on the indicators of hazards these are mainly undesired events and how they can be mitigated or avoided, while overlooking the everyday lives of residents and their daily challenges, exacerbating the vulnerability of settlements. Through the application of thematic analysis methods, I developed, reviewed themes, defined and named these themes, as reported in the interviews that were conducted. For example, 'The angry female rain' Gender-based violence'.

Women across the settlement are marginalized and disempowered in their everyday lives, experiencing a similar disempowerment or fatalism towards the brutality of rain and floods. I

argue that the intersection of, poverty, daily drug abuse, and domestic violence may be the real reason why they are unable to adequately manage the impacts of flooding and other environmental risks that they have to contend with at the same time as other problems. This is why the people and especially the women, of Setswetla, have a seemingly fatalistic attitude towards the drastic vulnerability caused by living in the flood zone of the rivers.

In this chapter, I argue that despite the information brought forward by the framework in Chapter Three when assessing the vulnerability of Setswetla based on their demographic profile of settlement, the framework has its limitations. The framework is critical and very useful in assessing vulnerability in the human settlement context, including informal settlements, however, I believe that there are missing elements that can be incorporated into the framework to make up the missing link that can be complemented by other methods such as intersectional approach in the assessment of vulnerability process.

The purpose of this chapter was to bring forth the concluding remarks derived using the intersectional approach to identifying the vulnerability of a community. These concluding remarks have briefly referred to the vulnerability framework applied in Chapter 3. The framework approach was used to determine the vulnerability of Setswetla based on their painted picture of what could be the vulnerability profile. The main goal of this chapter is to achieve objective 3 which seeks to critically evaluate existing vulnerability frameworks, using an intersectionality approach.

Intersectional approaches provide a way to consider and respond to various factors, and to increase knowledge of people's needs, desires, capacities, and experiences (Chaplin et al., 2019). Various categories interact with various systems. These interactions take place within the framework of integrated processes and power structures, such as legislation, governments,

and other political and economic associations, religious institutions, and the media. These processes establish interdependent forms of privilege and inequality shaped by colonialism, imperialism, racism, homophobia, wealth, and patriarchy. This is evident in Setswetla, a marginalized and oppressed society abandoned by local authorities and not benefiting from the benefits of the city as a reality of generated informality.

The study acknowledges the findings of the previous studies conducted regarding the vulnerability literature. However, in this study, the researcher went to the field with the underlying hazards caused by flooding however, the approach during the data collection procedure was not specific to a hazardous event. The data was then collected from the primary recipient of these hazards to enable the investigation of the general crisis in which flooding came at the forefront together with other vital crisis to their lives. This gave the researcher to document the experiences of the research participants in a holistic manner including experience with non-natural disasters.

Marginalized urban communities are characterized by poverty and low income and have cases of domestic violence which could be linked due to the high level of poverty and unemployed women because men are the only breadwinners. McIlwaine (2013) shows that urbanization and gender-based violence varies according to geographic scale as well as a range of other causal and contextual processes in cities of the global South. Women experience domestic physical and sexual violence from the male partners across and research assumes that poverty is a key driver (Gibbs et al., 2018).

Informal alcohol outlets have an extensive influence in making the situation of domestic violence and crime worst, particularly the prevalence of hostile incidences in and around the community (Brown-Luthango et al., 2017). Alcohol abuse contributes to criminal and domestic

abuse and gruesome fights turn out when they are out drinking in the late hours of the night. Alcohol, drugs, crime, and domestic violence again women are intersecting in shaping the vulnerability of the settlement.

The lack of basic services and informal housing affects women residents in an informal settlement, risking their lives when want to access toilet facilities at night in a dangerous settlement known for the high rate of criminal activities that affect women and children the most. Inadequate sanitation facilities, infectious disease pressure, and environmental pollution in communities represent a serious public health risk (Govender et al., 2010).

Understanding Intersectionality in Setswetla

'Female Rain'

We started this chapter with a quote about the angry female rain. The rain, as we saw in chapter 5, is a challenge to people living in this place. The rain is furious, it comes now and then and destroys lives and property. What does that say, why do people talk about the rain in the form of a female rain? Why are these women talking about rain as female rain? Well in this section of the chapter, let's take a moment to think about what it's like to be a woman in this environment. Where does rage or angry female rain come from? The interlinked themes of gender, sexuality, and rain appear to be equally important (Solomon, 1992).

The 2016 rain is said to be an 'angry female rain' suggesting that the snake does this havoc in the form of heavy rainfall when the eggs are taken. Therefore, the direction it takes to trace where the eggs could be hiding is marked by heavy rainfall and strong wind. The snake's gender is perceived as a heavy rainfall that causes flooding and powerful wind that causes a very dangerous occurrence that kills everything in its way. I quote from the female participants who

emphasize the female snake rain whose eggs have been stolen *'you know how we women are when we're angry we're destroying everything'*- **Participants 8**

Vulnerability perpetuated by gender inequality and other aspects of power dynamics in society has been widely ignored and less evaluated. Gender inequality and gender-based violence prevails and are overlooked by the vulnerability framework in the assessment of vulnerability in chapter 4. Although the assessment in the chapter was based on the demographic profile which does not include gendered vulnerability. The assessment itself regardless of the form of data used does not speak to gender as one of the key themes within the framework.

What we see in Setswetla is a classic example of the intersectionality of vulnerabilities. Not only do the rains affect women because they are tenants, but they are also weaker in the community, but women are often affected more than the counter-parts every day. So when they lose everything through abuse and floods, it's almost like this woman says she doesn't care anymore. She's probably going to let go of it and let it happen because she has no power over it. Being susceptible to anything indicates that a person has no control over a specific situation. The fact that they have no power over crime, domestic violence, and floods, they don't think much about these incidents before the incident occurs again.

Why does a metaphor like the November 2016 case place our lives at risk because of its (the rain) anger? The rain was so disastrous and therefore we conclude that it was an 'angry female rain. Women when bothered and angry at something they destroy or reciprocate violently. '*To confirm the angry female rain conception, the rain ended up killing a girl child to prove that it was a female snake*. As opposed to the male-rain that is polite when it rains no recorded damage at all from the male rain'-**Participant 5**. The heavy rainfall is perceived as an 'angry female snake.

What is happening within the community of Setswetla is that a woman would project this anxiety into the angry female rain that comes once every 5 years to 10 years. There are things that a person can't manage, so there's no need to worry about them before they happen. Daily poverty and domestic violence are their sense of urgency, but exposure to floods is something they cannot manage. The only solution to the distress of the floods is to wait before it happens.

Gender-based violence

It can be argued that being a female in Setswetla, puts one's life at greater risk of events such as crime and domestic abuse. As you have seen in chapter five, a lot of women have to contend with domestic and gender-based abuse. Again, we have seen in chapter 5 that there are community structures such as churches, political structures, Stockvels, etc. These structures have a significant role to play in alleviating the impacts of disasters and in reducing the risk of deaths in the community however, do little to nothing with the issues affecting women in the settlement. For example, it is said that the political leaders of the community go around the settlement, inspecting the affected houses and organizing shelters for those who would have had their shacks washed away or their blankets and food soaked in water. The local church of Setswetla offers shelter for the families affected during the heavy rains. However, these structures are overlooking other issues such as domestic violence, particularly against women and girl-child in the community. The ladies interviewed said that people only mind their own business with their lives and do not intervene when a husband or boyfriend physically abuse their ladies. This also proves that the stresses pile up inside a lot of women around the experience of abuse as these challenges overlap with other vulnerabilities. The pressures get too far from inside and there's no help at all hence the feeling of oppression and disempowered by their partners, criminals, and the rain.

So what's going on here is that people are projecting regular forms of injustice, daily forms of abuse, and disparities. They're projecting it on this rain that doesn't come every day that comes now and then. The rain takes place in two or three years, which is based on their historical records. What's going on here is some sort of build-up of pressure for a very long period. Women have been struggling with this burden of abuse and poverty for years to the point that they can't cope with any injustices. It is also catharsis in the form of rain.

Gender-based violence has been considered a crucial issue that urgently needs to be confronted. Women also expressed the greatest challenges to be the violence by spouses and criminals in the settlement. Gender-based violence is typically the product of unemployment and drug abuse in Setswetla. Women are being harassed and physically attacked by their partners in their homes and criminals around the settlement. The high rate of crime due to unemployment and substance abuse puts women's lives at risk as they are frequently assaulted in their homes and robbed around the settlement.

Men around the Setswetla are said to be undermining women. Women have less decision-making authority in the settlement, which could be seen to intensify their vulnerability in the settlement. The lack of authority to deal with decisions made at home dismantles and breaks women's confidence, which increases their vulnerability to domestic violence. Women are therefore seen as the weakest links at home and in society because they lack monthly income and do not make a financial contribution to the family. Findings indicate that the most important difference between men and women is the ability to earn cash regularly.

Migration to the city of Johannesburg for work has been highlighted as a popular answer to poverty. Women accompanied their relocating partners to the city with the initial goal of helping them in the search for greener pastures. These men are typically working in the

informal sector doing precarious work, when things don't go as expected it increases the household's financial stress levels, putting women at risk of being choked and beaten by their husbands.

Why Anger and the Angry Female rain?

Gender disparities are a major constraint faced by women in Setswetla. Women in Setswetla are being marginalized. This is demonstrated by the female participants showing that the 2016 flood was a 'female-rain.' When asked what identifies the gender of the rain, participants affirmed that they know the gender of the rain because of the harm it causes. Their memories of the event are characterized by the damage caused by the hazards i.e the storm.

'You know, when a woman is angry, they destroy everything and nobody's going to touch them says (**Participant 8, 2019)** while beating her chest**.** The beating of the chest symbolized what could be happening emotionally. It usually a demonstration of one's feelings. Looking at the quote above it can be deduced that women in Setswetla violently relate to the rain. What violence? This is the violence they are experiencing from their partner and around the settlement. No help of justice being served to these violated women. Therefore, women turn to bottle everything and there is the build-up of anger.

Similarly, the heavy rainfall (female rain) was further linked to the snake. When probed more is being indicated that 'the eggs which were taken without the permission of the snake, are traced and recovered through violence'. The damage the heavy rainfall does to the community is only the expression of anger and reciprocating bad behavior/action of stealing with violence.

The angry female snake rain shows its powers and demand for respect in its territory **(Participant 8, 2019).** Therefore, in the case of Setswetla, this can be interpreted as something women are yearning for? To reciprocate the violent treatment, they are receiving from the settlement and reclaiming their power and respect as women. How are they yearning to claim respect and good treatment? By using violent actions against their perpetrators.

Linking the rain to the female snake can be inferred to be how these women feel and what they're going through and are ready to vandalize everything and call out to get the moment of outpouring so that they can start afresh because there's no hope of any support coming from the community authority to save them from the oppressive relationship that's shown.

Findings indicate that women have less access to and control over resources; fewer opportunities and less access to formal education or training. *'Domestic violence would never stop if most of us around us are still unemployed and do not further our education-* **Participant 3, 2019.'** Observing how women have narrated cases of domestic abuse in the settlements, this is perceived as a normal habit. The analysis of their response indicates that there are no preventive steps to protect women from domestic abuse.

To minimize the vulnerability of individuals, I agree that there is a need to incorporate and analyse all the complex factors that lead to vulnerability in the intersectional approach. In general, intersectionality promotes the perception of human beings as being influenced by the interaction of various social factors, e.g. race or ethnicity classes, Indigeneity, gender, class, sexuality, geography, age, disability/capacity, migration status, religion (Hankivsky, 2014). The difference within these categories can shape how people act and relate to the environment in which they live. Some experience is pleasant, and some harm people's lives.

Informalities have created a framework in which varying forces and social class do not improve or mitigate the vulnerability of populations. Thus the intersectional approach tends to draw attention to the root causes of social vulnerability, providing a more complex view. In Setswetla, vulnerability is related to many things like social isolation from the city in the form of informality, which has limited both access to services and alternatives from being vulnerable. Thus, structures that favour some classes over others (Kadetz and Mock, 2018). Unfortunately, Setswetla has been built to accommodate the most powerless, less affluent class in society that is automatically vulnerable to disasters.

Concluding remarks on the intersecting factors in Setswetla

Setswetla informal settlement is well aware of the threats posed by flood events and has over time, been educated to address the vulnerability of floods. On one hand, they realize the risk faced by staying on the flood plain to their homes, but insecurity within the community plays a key role in efforts to alleviate the floods. Owing to the poverty situation, scarce resources have made people in Setswetla embrace the risks of settling on the flood plain because they have no other choice. The choice of occupying other places is determined by the amount of income, in which the income in Setswetla is very low and thus they have to live where they can afford to live and thus pay less attention to heavy rainfall. What matters most is the everyday life influenced by poverty and domestic abuse based on gender. As a result, the limited income secured is often retained for livelihoods than a strategy to alleviate the heavy rainfall that will come in two years, or five years, or even ten years.

The main purpose of this chapter was to objectively analyse current vulnerability systems using an intersectionality approach. I went to the field to investigate vulnerability management in Setswetla, and we have seen that Setswetla is also vulnerable to flooding alongside other

environmental hazards, such as pollution and fires. However, the framework would have focused only on environmental disasters and would have opted for the exclusion of intersecting vulnerabilities i.e gender-based violence and crime. The empiric data obtained show that indeed Setswetla is highly vulnerable to flooding, but this is a once-in-a-time occurrence compared to daily vulnerabilities caused by poverty and domestic violence. The inclusion of intersecting vulnerabilities in the vulnerability framework is crucial to a deeper understanding of the intersecting vulnerabilities of the settlement. The ordering of risks and hazards by residents reveals the opposite view relative to the typical vulnerability framework. In a way what is considered more disastrous and has a sense of urgency for intervention in the framework varies from what the community finds critical and urgently needs intervention. What is more important for them is to thrive daily.

There is a two-fold relationship between vulnerabilities in Setswetla. There are vulnerabilities formed by regular short-term rhythms in combination with long-term rhythms that occur every 5 years or 10 years. These interactions form the overall weakness of Setswetla and cannot be viewed in isolation. Viewing the other rhythm over the other would compromise the full spectrum of the vulnerability of people in the community of Setswetla.

Empirical data have validated that factors capable of putting people's lives at risk in Setswetla have never been isolated. This is why a holistic perspective is taking place in Setswetla through an intersectional approach to exploring and sorting vulnerabilities. Gender has influenced most women's well-being and has felt vulnerable in the hands of partners and males across the settlements, and no one is doing anything to help them. However, it was felt that some felt that being single heads of the household put them more at risk, that they did not have the power of man to move things about when heavy rains and fire broke out.

Culturally women are seen as the housekeepers, meaning anything that happens during the day enhances their exposure to these hazards. Women are left alone to fight fires, floods, and any criminal activities that can happen while men are away. These cultural norms and values prevent women to fully express and stand their ground to their partners because of their weak financial muscle in the household. Women are abused daily and they are not protected by law or people around the Settlement.

The right to travel around the settlement has been undermined. The fear of becoming victims of settlement-based illegal acts is related to inadequate living conditions. The protected group in the settlement are men who are willing to defend off criminals as opposed to women. Women must therefore pursue alternatives that are considered safe for their lives, such as remaining at home and minimize movement around the settlement during certain hours of the day. The fear of being robbed is a constraint on the residents.

Setswetla poses a high degree of concern that women, as compared to men, are more vulnerable to crime than men. L It can be argued that poverty, inequalities, unemployment, and lack of sufficient educational qualifications and skills lead to criminal activity. These criminal activities are also connected to fraud and misuse of drugs. This also leads to women falling marginalized. The fact that little is done to minimize crime and domestic violence raises the vulnerability of women to these behaviors and is perceived to be natural.

It can be argued that inadequate infrastructure, low socio-economic status, and lack of basic service are crucial to the insecurity of women in Setswetla. Women are considered not healthy in their homes and around the settlement. Women are not protected in the possession of their husbands who sexually assault them.

Poverty thus raises the degree of poverty between women and men in Setswetla. Women are exposed and vulnerable to criminal activity, gender-based abuse in their homes and around settlements. In the next chapter, I will demonstrate how vulnerability needs to be interpreted in an intersectional way, taking into account important community-based factors that pose a danger to the community.

Chapter Six - Conclusion

This research aimed to investigate how the ordering of intersecting vulnerabilities affects attitudes and preparedness for environmental hazards in Setswetla's informal community. The study has three objectives established to facilitate the method of achieving the main aim. These objectives are to understand the classification of Setswetla within existing vulnerability frameworks, to understand how residents in Setswetla order their own experience of vulnerabilities, and to objectively analyze the existing vulnerability frameworks, using an intersectionality approach.

The literature reviewed has shown that there is no standard definition of vulnerability or vulnerability assessment process. Across the disciplines, vulnerability assessment encourages moving away from vulnerability analysis categorically or in isolation by looking at a single feature. To identify a community's vulnerability in an efficient way to minimize risks, scholars accept that vulnerability should not be interpreted homogeneously because people have different experiences influencing their order of vulnerability.

The analysis shows that the vulnerability of Setswetla is unevenly distributed. Proving further that the weakness cannot be presented in a homogenous prism. People's background in Setswetla defines their perception and order of vulnerability. The vulnerability is influenced by their resources, spatial proximity to hazardous geography i.e the Jukskei Riverbank, relationship status, service delivery, severe weather events, etc. This indicates, however, that the main concern is not with natural disasters, but rather with disasters beyond natural disasters in the settlement i.e gender-based violence, crime, pollution, etc.

The risk assessment is typically biased and related to natural disasters. The vulnerability sensitivity of Setswetla has shown a deficiency in the vulnerability assessment process. The

system is also science-based ignorance of non-natural disasters that can be triggered by interactions between individuals within the group. This is a very important missing aspect of mainstream science-based global views across academic disciplines. Science-based beliefs that are limited to the probability of events. People in Setswetla live from hand to mouth. Their concern is not severe weather events known to take place once or twice a year but survival is the most pressing issue, safety issues, and domestic abuse. However, these are items that are not being discussed during the traditional vulnerability evaluation.

The main findings of this research are focused on two sources, namely the literature review in the form of a desktop study and the compilation of empirical data in the form of semi-structured interviews. The literature review in Chapter 2 looked at various concepts applicable to the research, namely Vulnerability, Informality, Environmental Risks, Perception, Natural Disaster, and Intersectionality. In the first section of the literature review, I looked at how the definition of vulnerability is described across disciplines and how it applies to environmental hazards. System risk mitigation also depends on the perception of risk and risks automatically position the vulnerability of the person. The study looked at the relationship between vulnerability and perception in a particular society. Vulnerabilities turn to be spatially defined in society, which is why this study then looked at the relations between informality and vulnerability. Finally, the study aims to examine people's understanding of their vulnerability and factors affecting their sensitivity holistically. Therefore, there is a need to look at how the intersectionality approach helps to resolve the vulnerability of people.

To comprehend the main purpose of the research, the empirical research was conducted in the form of interviews and observations on Setswetla Informal Settlement in Chapter 4. In this segment, the people's experiences in Setswetla were explored using the first set of questions with 15 participants recorded in chapters 5 and 6. I went back to conduct more interviews and

to take pictures where I spoke with 10 more participants. In total the conducted interviews were 25 in counting, however, with more people because I sometimes interviewed ladies in a group of 5 or 2 or 3s across the Settlement.

Demographic Profile

Objective 1 is intended to understand the classification of Setswetla within existing vulnerability frameworks, the findings have informed Chapter 4 of this study. Interviews conducted showed that Setswetla is a product of an almost exclusively migrant population group, either coming from other provinces of South Africa to Gauteng or from other sister African countries, primarily Mozambique and Zimbabwe. Participants have shown that they have come to Gauteng for greener pastures and thus have proper homes in their respective provinces and countries where they see it as their permanent homes, as opposed to Setswetla's temporary structures. The settlement is predominantly made up of people with low visibility of children and youth, which may be because interviews were performed on a weekday while children are supposed to be in school. Participants suggested, however, that they remain with their partners and their younger ones, when the kids are older enough to take care of themselves, they are sent back home to be with the elderly, since it is much better for education than for the environment in Setswetla. Women are highly unemployed relative to men, but the majority of working men are employed in the informal sector and their jobs are precarious where there is little hope for tomorrow. The houses in Setswetla are informal dwellings made of corrugated iron and flammable material. There is no sign of an appropriate provision of service in the settlement.

The ordering of risk is influenced by previous experience over the years, but lack of capital resources prevents them from preparing these hazardous incidents as they occur once in a while. The purpose of Objective 2 to understand how residents, order their own experience of vulnerabilities, the resident's comprehension and awareness of adverse situations, such as the frequency of floods. People's experience indicates that the impacts of the floods are unevenly distributed around the settlement. The most affected residents are the residents occupying the riverbank, as opposed to the less affected group in the middle section of the settlement and next to the graveyard section of the settlement.

Ordering of their vulnerabilities

Due to the lack of appropriate contingency measures and reserved resources to mitigate the effects of the floods, the group is coordinating itself and supporting those impacted by the floods or fires in the settlement. Community solidarity is highly effective when threats are related to a fire eruption since only 2-3 shacks are damaged and the fire is controlled before it can spread in the area. As opposed to flooding events, community cohesion during fire events is effective during the event while with flooding community solidarity is eminent after the event. As the rain is heavy, and people are afraid to go out and help. Some community members, however, are said to offer a helping hand when there are signs of heavy rainfall, it can be deduced that there is some form of community cohesion before the event as well. Despite community structures within the settlement, it has been disclosed that in the past, the organization outside the settlement has assisted the affected household with clothing, food, and shelter. Individually, it has been discovered that it is difficult to prepare for dangerous situations because there are other daily vulnerabilities they face and they appear to be lethal to the event of a flood that occurs once in a while. In addition to heavy rainfall, participants showed how vulnerable they are to environmental contamination, resulting in high numbers of

breeding rodents eating their belongings in their shacks and placing their lives at risk of health-related hazards as rodent***s*** *are* vectors of disease. Congestion of shacks due to inadequate planning and undesirable building material used to build these shacks leads to risks of fires that endanger their life and ruin their properties.

Intersectionality

Indigenous knowledge of these occurrences has shown a very fascinating fact from the residents. Setswetla's heavy rain fall is viewed as an angry female snake that has lost its eggs. Thus, through the trace of its larvae, the snake kills everything in the form of strong wind and rain. It was related to how women respond when they are angry that they ruin everything based on how they feel inside. An angry female snake destroying all the assets to find its eggs related to an angry woman destroying everything to find inner peace as they piled up problems inside, and they can no longer bear it is a red flag to be inclusive when contemplating vulnerability evaluation. This can be achieved by incorporating an intersectional approach into the process.

Objective 3 attempted a critical examination of existing vulnerability frameworks, using an intersectionality approach. The framework chosen has shown that, to date, the vulnerability assessment focuses on natural disasters, ignoring other factors on the ground that form the vulnerability of societies taking place daily. It has been found that Setswetla is still vulnerable to domestic violence and that no one is doing anything to support the victims, lack of social facilities as a result of the exclusion from urban fibre and its benefits, alcohol and substance addiction and criminal activities that affect women in the region are the weakest links in the society to protect themselves against their partners and criminals.

Significant research has been done on the vulnerability of informal settlements to natural disasters (Williams et al., 2019a, Ziervogel et al., 2016, Salami et al., 2017) but little is known about studying the perception of urban informal settlement residents about their vulnerability to flooding hazards and their protection mechanisms. It is argued that Setswetla's perception of floods is profound, but due to the results of informality, the flood defence mechanism is overshadowed by the sense of urgency of other life-threatening issues that are taking place every day around the settlement such as women's oppression and gender-based violence, fighting for survival and criminal activities.

The ordering of vulnerability in Setswetla is closely linked to how close people are to the danger. The degree of susceptibility to hazards is therefore determined by spatial proximity to a hazard i.e. occupation of the river bank or living with an abusive partner. Capacity to mitigate hazards is seen as a critical issue, but they face daily challenges, leaving them no chance of preparing for a natural hazardous future as they fight for survival, but community cohesion gives them hope to survive some of the challenging events such as floods and fires. The community is aware of their vulnerability to multiple hazards, but the poverty in which they live makes it difficult to secure a room in a safe environment. There is a constant state of vulnerability to disasters that occur around the settlement, which are daily vulnerabilities that threaten people's lives, especially women, as opposed to men. Gender-based violence intersects with existing disasters and therefore exacerbates Setswetla's vulnerability to external shocks. These disasters are taking place on an ongoing basis, women are seen to be abused by everyday criminal activity throughout the settlement, and inadequate basic service continues to put their lives at risk. It feels like there's no hope at all, they feel like they're forced to leave in a precarious state to survive the life of the city and take care of their families. These are the things that are mostly overlooked with the typical vulnerability assessment framework.

If I were to expand my studies and raise them to the Ph.D. level, I would be interested to think about how to rethink the National Vulnerability Assessment Tool. In a way that will allow us to redesign the framework to address hazards beyond natural hazards and local knowledge when interpreting these events (we have seen how rain is interpreted as an angry female rain), this is the reality of how these women are treated and are angry inside, yet they do not have a platform for outpouring and healing.

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