WOMEN'S VULNERABILITY TO WATER AND SANITATION ACCESS: A CASE STUDY OF CARLETONVILLE INFORMAL SETTLEMENTS

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[redacted]

A thesis submitted in partial fulfilment of the requirement for the degree of Master of Philosophy In Integrated Water Management

at

IIE MSA

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March 2022

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Abstract

Water is necessary not only for drinking purposes, but also for growing food and preparation, care of livestock, personal hygiene, care of the sick, cleaning, washing and waste disposal. Because of the dependence on water resources, women have accumulated considerable knowledge regarding water resources, including location, quality and storage methods. However, efforts geared towards improving the accessibility of the world's finite water resources and extending access to safe drinking water and adequate sanitation, often overlook the vulnerability of women as a result of exclusivity of those basic services. In many communities, availability of a safe and sufficient water supply and improved sanitation facilities has a disproportionate effect on the livelihoods of women. Women usually bear the responsibility for collecting water, which is often very time-consuming and burdensome, not only to them, but to their household as well. Without safe drinking water, adequate sanitation and hygiene facilities at home and in the community, it is disproportionately harder for women to lead safe, productive, healthy lives. There is a huge gap between women's livelihoods and water accessibility. Consequently, this study evaluates how water access and sanitation lead the women in the informal settlements into vulnerability in two informal settlements.

Based on the results of the interviews from the participants and the review of literature, the study highlights that the women in these settings cannot function to their fullest ability due to inadequate water and basic sanitation. The women need adequate water for self-care and household care. The water they collect is not enough to even irrigate their small gardens for income generation. The problem is that the sanitation facilities such as the pit toilets, unventilated toilets and the bucket toilets are not safe and reliable, and so the woman have to resort to other methods of sanitation access like open defecation. Because of the fact that there are more women than men in both of the researched settlements respectively, the women are constantly vulnerable to physical sexual harm when they leave their

homes for water collection. In summary, the exclusion of adequate water and sanitation in women put women in vulnerable positions. The implications of this study are that the domestic roles influenced this research to pin women as a point of focus in the informal settlements. However, the reality is that both men and women need the basic services, but because of the fact that gender perceptions are perpetuated by societal customs and traditions, women issues are then more urgent. The practical recommendations of this study are that the government should consider building permanent ventilated sanitation structures for each household in both of the researched settlements.

Keywords: Vulnerability, Access, Informal settlements, Water and Sanitation

Declaration

I, Dintle Ntleni Korie, declare that this thesis submitted for the degree of Master of Philosophy in Integrated Water Management at IIE MSA, is completely my own work. This work contains no material that has been accepted for the award of any other degree or diploma at any university or other institution. To the best of my knowledge, this thesis contains no materials published or written by another person, except where reference is duly made in the text of the thesis.

Signature: ……

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Date: 10.03.2022

Acknowledgements

First and foremost my sincere gratitude goes to Lord Jesus Christ Almighty High for giving me strength and courage to finish my Thesis successfully. If it was not for His guidance, I would have given up along the way. Thank you.

I would also like to thank the JB Marks Education Trust Fund for giving me a scholarship to obtain my master's degree in Integrated Water Management and providing me with financial support for my tuition and accommodation. I would also like to express my gratitude to the former Acting Executive Mayor of Carletonville, Dr Mogomotsi Sello for providing me with exposure at the Merafong Waste Water Treatment Works in preparation for my Thesis. Thank you for believing in me

I would like to give special thanks to my supervisor Ms Linda Downsborough, for her academic guidance and support in my masters' journey. Your input is greatly valued and appreciated. My gratitude goes to the participants in this study: without your participation, the completion of my Thesis would not have been possible. I would like to give special thanks to Mr Ndzilane who has been my mentor throughout my Master's Programme.

To my family and friends: thank you for providing me with emotional support throughout my masters' journey. Your love, prayers and support has been greatly appreciated. Special thanks to my brother Nkopane Korie, for supporting me with study resources, my mother Joyce Korie for her emotional support, my father Gerald Korie for his prayers, my sisters Maomolemo, diopelo and Sebolelo Korie, Mabakoena and my brother Dintho Korie for believing in me. To my Best friends Cindy Nkhahle, Sibusiso Mbonambi and Lelethu Peyi thank you for supporting me.

Dedication

I dedicate this Thesis to my Lord Jesus Christ, my parents who has been my source of strength; Mr Gerald Korie, Mrs Joyce Korie, my siblings, Aso korie, Diopelo Korie, Dintho Korie, Nkopane Korie and Kananelo Mokhemisa

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Abbreviations And Acronyms

DWS	Department of Water And Sanitation
IWRM	Integrated Water Resources Management
NFBSP	National Framework for Basic Services Provision
NEMA	National Envirnmental Management Act
OD	Open defecation
PT	Pit toilet
RDP	Reconstruction and Development Program
UN	United Nations
UNICEF	United Nation Children’s Fund
WASH	Water, Basic Sanitation and Hygiene
WHO	World Health Organization

1. CHAPTER ONE: INTRODUCTION OF THE STUDY

1.1. Introduction

Advancing access to water, basic sanitation and hygiene (WASH) is the first step of achieving each of the world's crucial human rights issues, and it mostly affects women living in informal settlements. Faurès and Santini (2008) state that inadequate water access for productive purposes is one of the root causes of increased vulnerability and poverty in women's lives and their children. Approximately 780 million people in developing countries do not have adequate, safe water and sanitation (Centers for Disease Control and Prevention and others, 2016). Amongst that number, 65% of the population suffering the most from inadequate water supply are the women and girl children. As stated by Scanlon, Cassar and Nemes (2004), water is a human right and the access to water and sanitation are widely recognised by the United Nations (UN) as a fundamental human right, making it a basic primary need in every person's existence. Gross, Van Wijk and Mukhwejee's (2000) research findings indicate that not only most are women knowledgeable about water resources, their location and quality and storage methods, but they are also well informed about problems and habits that are in their respective communities, which are crucial to development. As a result, a woman's active participation in water and sanitation activities can contribute towards improved health and safety.

Looking at the effects of inadequate water and sanitation on women living in informal settlements, it is evident that women need to participate in WASH activities. This is accompanied by empowerment, provided that they are given the opportunity to have control over resources to meet their water, sanitation and health needs (WaterAid, 2016). According to Narayan (1993), women's involvement in solving WASH issues is crucial. The empowerment of women helps the communities to meet their full health, economic and education benefits.

As such, WASH projects in the communities with full financial benefits aimed for women will positively allow development.

Sweetman and Medland (2017) highlight that it has always been The United Nation's mission to acknowledge and attend to the appalling livelihoods women are facing due to lack of efficient water supply and sanitation. The integration of the UN's Sustainable development goals assists in tackling the issue of poor livelihood in our communities. The UN emphasises the relationship and the interconnection of adequate water, sanitation, and hygiene through goal number six and as well as gender equality through goal number five of the sustainable development goals (Ray, 2007). Improved, adequate water supply, greater access to safe water, and basic sanitation have clear linkages to improved human lives.

1.2 Water Access And Its Impact On Women

Access to water has significantly proven that there is not only a distinction between the rich and the poor, but also between men and women. Access to water has shown that women are the key collectors of water, and water access has inevitably given them the responsibility to make sure there is water in the house. Connor (2015) states that limited clean water access uniquely affect women, especially in developing regions such as southern Africa. Managing the household's water supply has an effect on women's employment, education and leisure activities (Connor, 2015). Women find themselves walking long distances of up to 6kms to collect water at the nearby streams, pools, wells, lakes etc. This movement could expose them to physical and sexual violence opportunities.

1.3 The Vulnerability Of Women Living In Informal Settlements

Providing clean, adequate water and basic sanitation in informal settlements, and ensuring that it is, and remains, fully functional, is the first mandate that the United Nations has placed focus on. However, according to Wondimu (2020), over 65% of the residents have inadequate basic sanitation, and this is due to access to

safe sanitation as a rapidly growing challenge in the world. Sinharoy, Pittluck and Clasen (2019) highlight the importance of addressing the water and sanitation needs of people living in informal settlements as essential to acknowledge and support the vision that United Nations has under their sustainable development goals. The United Nations declared access to water and sanitation to be a human right, simply because lack of water and sanitation in informal settlements is related to social and health implications throughout the world.

The government of South Africa is currently facing a challenge to meet the needs of thousands of people living in informal settlements that lack clean, adequate water and proper, basic sanitation. The Department of Water and Sanitation (2016) has identified this phenomenon as one of the urgent social issues of post-apartheid. The state of informal settlements in South Africa has become a challenge of human rights and sustainable social development, unfortunately women and children are the most vulnerable groups that are significantly affected by the existence of informal settlements within a community. Women living in informal settlements experience negative social effects such as HIV and Aids, gender-based violence, gender inequality and poverty. In addition to the negative social and health effects of informal settlements, there is unavailability of latrines in their private homes.

1.4 The research problem

The provision of adequate water to the informal settlements of Carletonville by the Merafong City Local Municipality is limited, more especially in informal settlements such as Shawela and Wedela, the townships of Carletonville (Nealer, 2020). Nealer (2020) adds that South African townships are notorious for inadequate water supply and as well as poor sanitation. Van Wijk-Sijbesma (1998) observes that cultural and historical events have influenced women to be the primary collectors, transporters, and users of water, more especially in developing countries. Women, in general, have more responsibilities that need their attention, and they include health, household, and childcare. The Shawela

community only has one communal tap that is in poor condition as it has aged. The possible risks involved are that women would have to walk a distance from their homes to access the water and have to make use of pit latrines that could potentially expose them to assaults. According to Chambers and Conway (1992), a livelihood consists of people, their capabilities, and their means of living that includes food, income, and assets. The purpose of this study is to identify and discuss the influence that poor water and sanitation have on the lives of the women in Shawela and Wedela.

1.5 Main Research Objective

The main objective of this study is to examine how does inadequate water and basic sanitation lead women into vulnerability.

1.5.1 Sub-objectives

- To examine how women in Wedela and Shawela access water and sanitation
- To evaluate the vulnerability of women due to inadequate water and basic sanitation access
- To analyze the influence of water access on women's lives.

1.6 Main Research Question

This research is aimed to answer the following question:

How are the women vulnerable as a result of inadequate water and poor basic sanitation access in Merafong's informal settlements?

1.7 Delineation And Chapter Overview

This Thesis has been divided in six (6) chapters. Chapter one (1), illustrates the first principles of the research which includes; the introduction of the topic that

highlights adequate water and basic sanitation's impact on women; critical outline of problem statement, research question, aims and objectives of the research. Chapter two (2) provides a detailed theoretical foundation of water, sanitation and gender linked with vulnerability. The connectedness of these theories gives a broader preliminary understanding of the research and its outcomes. Chapter three (3) provides the research approach, the design and as well the data collection techniques. Chapter four (4) presents the results of the data collected during research. The data is evaluated and explained, transcribes from photographs, recordings and manuscripts into text, graphs, tables and models. Chapter five (5) provides a discussion of the study findings in chapter 4. Lastly, chapter six (6) gives a critical summary and conclusion of the research alongside with limitations and recommendations.

2. CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

The previous chapter provided the introduction to the study, and it unpacked what is meant by women being vulnerable as a result of inadequate water and basic sanitation access. This chapter will provide with the “sources” pertaining to the study. The literature review is highly crucial as it is highlights the past research that is done by the scholars. The existing research stands to support the ideas of this study.

Women’s vulnerability to adequate water and sanitation access is a complex topic that needs to be dissected critically. There is a distinction between men and women, and that distiction highlights how women are the primary focus. The other point that needs to be unfolded is vulnerability and its nature. A clear defination of vulnerability and its connection to water and sanitation access is provided in this chapter. The availability of adequate water and basic sanitation in the context of South Africa is much more critical than than ever taking into consideration the population growth of south Africa. According to Huchzermeyer and Karam (2006), South Africa's income inequality is one of the worst in world, and it continues to be divided mostly along racial lines. Out of all races, black people in South Africa have the highest percent of informal settlement dwelling. All this is caused by poverty resulting from unemployment. A substantial number of South Africans are unable to afford well-located formal housing due to high rates of poverty and unemployment. As a matter of fact, lack of adequate water and basic sanition is perpertuated by poverty. Poverty drives people to settle for poor conditions. The informal settlements suffer the most with services pertaining to water and sanitation. It is important to understand the extent in which women living in informal settlement experince with inadequate water and basic sanitation access.

As a result, this chapter, being the heart of this research connects these all these topics to to effectively describe and explain the ideology behind women living in informal settlements and water access. Several studies have been conducted to

understand the relationship between gender and water access. The findings indicate that the water shortages in South Africa are due to drought and mismanagement of water resources, and the effects this has on gender inequality as well. However, it will be academically injustice not to consider examining and measuring the degree in which the women living in informal settlements are vulnerable to. As such, this will help identify the knowledge gap and provide a guide to theoretical context towards research on the impact of inadequate water and basic sanitation access particularly in women living Carletonville informal settlements.

2.1.1 Gender in Water and Sanitation

According to Baker, Story, Walser-Kuntz and Zimmerman (2018), the right to water and sanitation is recognized as a priority to attaining all other human rights. Globally, and yet still, it is found that 2.1 billion people have no provision to safe drinking water in their homes, 2.3 billion do not have basic sanitation, and 1 billion are practicing open defecation.

Winter, Dreibelbis, Dzombo and Barchi (2019) explain that women living in informal settlements are affected by inadequate water supply and lack of access to sanitation. Adequate water accessibility go hand-in-hand with sanitation. Without water, women may resort to unsafe means to manage their sanitation needs. Unimproved sanitation is an urgent issue in informal settlements and without proper intervention, the issues at hands will escalate as population increases as well. Looking at the sanitation practices and the reasons behind those practices may have huge health and environmental implications. In most instances, the provision of water and sanitation services is limited to informal settlements, and to an extent, not available. Clear obligations to serve informal settlements are in most cases to given, due to utilities underproviding these services (Mels, et al., 2019). Women, being the primary users of water, often carry the burden of having to take care of their families with little or no access of water

supply. Inaccessibility of water and basic sanitation supply in household, schools and healthcare facilities has implications for women's safety, emotional and physical well-being.

The word "gender" refers to socially constructed roles, behavior, activities and attributes of which these roles are based on the different expectations that society have on people based on their sex and beliefs (Blackstone, 2013). As a result of these distinct roles, there has been gender inequality where one group is significantly highly regarded over the other, while the other group bares the unfavorable responsibilities. The emphasis of gender-based goal pertaining to water and sanitation is essential to attend to in order to understand how limited water resources and poor sanitation affect women and their livelihoods (A Policy brief, 2006). The development of communities has always on a slow progress because of inequality. According to UNDP (2008), women carry the burden of collecting water for the entire household in informal settlements. The collected water is used for preparing food, for drinking, bathing and washing, for irrigating crops and also taking care of the livestock. Women are bestowed with the responsibility of locating to the source of water, decifer the water quality and as well as sustain the water. Women collect water, reserve it and manage its use. All of this is a 'one gendered role' that is performed by women in informal settlements. The challenges in the informal settlement deriving from growth and poverty make the perspectives of gender more crucially important. As critically stated by Caruso, Sevilimedu, Fung, Patkar and Baker (2015), population growth in informal settlememt put drastic stress on the economy of a developing country.The UN-Habitat (2014) emphasises that with close to one billion people around the world live in informal settlements and often times these families have no legal protection to their homes and possessions.

As stated by Statistics (2010), women in particular try by all means to protect and still need to extract enough water form the water sources, and attempt to make sure that these sources do not further become polluted. Given the pressure women have to sustain their families, supply water to their crops, provide water

to their livestock, it is almost impossible for them to avoid poor water supply. Women have to bear the burdens of travelling longer distances in search for water that is less contaminated by human activities, industries, or deteriorated water supply due to mismanagment of water sources. Women in informal settlements have to leave their homes to draw water from a communial water source or from a nearby stream, and this makes it difficult for them to balance their household duties (Statistics, 2010).

According to Pouramin, Nagabhatla and Miletto (2020), there are signifificant connections existing between water, gender, and health. These connections worsen water and sanitation inequality among women living particularly in informal settlements causing health burdens. Poor water supply to informal settlemts is associated with poor health living conditions. Poor water and sanitation practices are the leading factors for water born diseases such as bacterial infections from the contaminated water and neglacted sanitation (Fletcher & Schonewille, 2015). Taking into account of the role that the women play in water provisioning for households, they are at constant risk of vulnerability to diseases (Organization World Health, 2019). Women have health and social needs that that would get critical without the presence of adequate water and standard sanitation (Ray, 2007). Water and sanitation plays a vital role during women's menstruation, pregnancy and caregiving. Women need water to keep hydrated and sanitized during their manstruation days and pragnancy period. When these basic needs are not met, it is challenging for women to participate equally in society. Sanitation facilities in the informal settlements are generally not safe, clean and easily accessible. Women need special care more than men because of their vulnerability. Women need basic needs such as washing facilities, private latrine and home taps to carry out effective household duty in the comfort and safetly of their homes (Budhathoki, et al., 2018). The activity of women practicing open defacation leaves them vulnerable to violence and sexual assault.

2.1.2. Fundamental Principles of adequate water and sanitation

BORJA-VEGAEVA and KLOEVE (2018) emphasis that humans have the right to water and this right entitles everyone to sufficient, safe, adequate and accessible water for personal and domestic use. This is the basic principle of adequate water and basic sanitation. If this primary principle is not met, it becomes a violation to human rights. The idea of providing safe and clean drinking water as well as basic sanitation dates back to the 19th century. Water and sanitation were viewed as basic requirements and drivers for development in the second half of the twentieth century (Bos, Roaf, Payen, Rousse, Latorre, McCleod & Alves, 2016). Economic analyses of investments in on-premise or in-home piped water supply and sanitation do point to public health advantages, but they mostly focus on the gains from lowering the opportunity costs associated with collecting water over long distances. Bos, et al. (2016) continue to allude that economic analyses of investments in on-premise or in-home piped water supply and sanitation do point to public health advantages, but they mostly focus on the gains from lowering the opportunity costs associated with collecting water over long distances.

De Albuquerque and coopération (2014) emphasis that it is imperative to take note that the state of people in communitites who lack sanitation differs from that of people who do not have water access. When one household lacks adequate, clean and hygienic sanitation, it leaves a negative impact on the health of both the people in that environment and the people living nearbyn (even where these neighbors do have access to sanisation). This means that community water supplies have a responsibility to improve the sanitation of the communities in informal settlements, for the sake of those around them as well as their own. On the other hand, De Albuquerque (2014) analyses that it is most likely that one family's lack of water access would not significantly have any effect on the health and access of its neighbors. However so, water is significantly inter-linked to aspect of human daily activities both directly and indirectly (Samra, Crowley, &

Smith Fawzi, 2011). The challenge with water supply, of course, does not lie with quality, but the challenge lies with having adequate quality and quantity at the places and times needed. Looking at the basic needs of water, communities need water for drinking, cooking, personal hygiene and sanitation facilities that do not make them vulberable to health or dignity. Samra, Crowley and Smith Fawzi (2011) continue to add that access to safe and adequate water is a first basic right of human, despite their race, culture or creed.

Through the 1998 National Water Act, South Africa recognises and follows the constitution set by the government that declares “access to water and food for all” (Maphela & Cloete, 2020). However, Schaffer (2005) states that dispite this constitution, South Africa is still experience inequalities in access to safe drinking water, the problem has more effects on the women who live particularly in informal settlements. These inequalities defeate the purpose of access to water and food for all.

2.1.2.1. Access to safe drinking water

The World Health Organisation (WHO) and as well as UNICEF reports that close to a billion of people around the world still have no access to adequate water supply, sanitation and hygiene (WHO, 2019). Globally, 2.1 billion people around the world do not have refined drinking water services, while 3.5 billion billion people in third world countries do not have properly managed sanitation services, and 3 billion do not have basic gygiene facilities (WHO, 2019). Unfortunately, South Africa is one of the countries that are counted amongst the countries with poor water and sanination services. Regardless of this fact, there is still inequality of water supply between the advantaged and the disadvntaged communities within the country. Unfortunately, women are amongst the people in the disadvantaged communities. South Africa has a total population of 59 million with 60 percent of the population living in the cities and the surrounding and 40 percent living in informal/rural settlements (Molobela & Sinha, 2011).

2.1.2.2 Water distribution

Water distribution is the core of water availability and access. Without water distribution, communities will remain prone to poor water acess and quality. The primary goal to water access is the provision of safe and clean pipes water to the taps of all households in a community. Masindi and Duncker (2016) emphase that alternative water sources such as central standpipes, communial tanks and community bottled water are part of water collection . What keeps surpressing poor water availability in communities is the neglaction of water infrastructures. The water leaving the source will most likely be contaminated before reaching the communities. As stated by Lagardien and Cousins (2004), the National Framework for Basic Services Provision (NFBSP) outlines thats that in South Africa there is the political will and policy framework to highlight the challenge of providing Basic Services to the marginalized. According to the socio-political considerations, in a mission to join policy, municipal and local levels, there should be a distinctive method in founding them by on building consensus among the various stakeholders on the way forward. Lagardien and Cousins (2004) continue to suggest that in order to safely deliver proper sanitation to marginalized, sanitation planning, implementation and monitoring should be co-ordinated on National, Provincial and Local levels through dedicated co-ordination forums.

Dinka (2018) states that the significant primary goal is to provide safe piped water to all users' taps. Other techniques, such as central standpipes, covered wells, and community bottled water, are in use due to necessity. Even healthy water leaving the source or treatment facility is more likely to become contaminated before it reaches the customer if the distribution system is leaking. The distribution system must be built, controlled, and maintained so that there is no leakage and the internal pipe pressure is always greater than the exterior hydrostatic pressure. This will ensure that water is delivered with fewer leaks and pathogenic germs are not allowed to develop excessively.

2.2 Vulnerability

2.2.1 Defining Vulnerability

Soumaila, Niandou, Naimi, Mohamed and Schimmel (2019) state that "vulnerability" has become very popular in recent studies, however, there are several definitions defining the word vulnerability, depending on the field, the objective of the study and the environmental problems encountered. "Vulnerability" to water access target everyone who is a user of water, both male and female, however, Geere and Cortobius (2017) critically highlights that due to cultural norms within various rural regions in Africa which dictate that women manually fetch water, women are exposed to direct contact with water at a higher rate than.

This, therefore, increases the likeliness of women contracting water-related health problems. Somaila et al. (2019) continue to add that the standard use of "vulnerability" refers to the ability of a system to be harmed, i.e., the degree to which the system is likely to suffer damage as a result of exposure to a hazard. Women, as a system are at risk livelihood harm as a result of inadequate water and basic sanitation access. Fleifel, Martin, and Khalid (2019) explain that "vulnerability" constitutes around the motion of women leaving their homes (point A) to access water at nearby streams or temporary water supply (point B). This movement exposes women to dangers that threaten their physical security, health security and as well as social security. The resulting health impacts from the dangers and realities of this activity not only impairs the physical development of women but also hampers their ability to perform other daily activities including household chores, nurturing, work, and care to thrive in their communities (Fleifel et al., 2019).

2.2.1.1. Social Vulnerability

'Social vulnerability' is the heart of understanding vulnerability as a whole. Inadequate water and improper sanitation highlight the idea of social vulnerability. According to Fordham, Lovekamp, Thomas and Phillips (2013), social vulnerability refers to the possible harm to people. It combines a variety of factors

that determine the extent to which a precise and specific risk as a result of discrete and identifiable even in society puts someone's life and livelihood at jeopardy. Cutter (1996) states that Socioeconomic status, gender, race, ethnicity, and age are the main components of vulnerability at an individual or community level, and aggregate measures of these factors can speak to social vulnerability. These elements distictively highlights the social gap set out by education, cultures and employment. These characteristics may be more or less prevalent in specific neighborhoods, indicating potential community barriers. The poor and marginalized are more likely than the wealthy to have less resources and safety nets, such as good health services, good social services such as water and sanitation, transportation systems, and decent housing (Blaikie, Cannon, Davis & Wisner, 1994). Unfortunately, Women and children are prone to have fewer resources and face more barriers to recovery than men. Racial inequality has influenced the minorities to be vulnerable to increased risks for social injustice, which can place them in closer proximity to social vulnerability (Lott, 2002).

Social Vulnerability is attributed upon six points conceptualized by Downing, et al. (2006) to highlight the driving forces to social vulnerability. Amongt other factors, poverty is the leading factor of social vulnerability in the informal settlements of South Africa. The six attributes significantly contextualize the effects of water access on health, safety and income opportunities. Social vulnerability refers to the difference in exposure to stresses experienced or predicted by different exposure units. unequal social distribution nullifies the ideologies of development . Vulnerability is a dynamic process that shifts across multiple time frames. The parallel between vulnerability and poverty is the more vulnerable a community is, the more poor they are . The less vulnerable they are, the less poor they are (Philip & Rayhan, 2004). Social Vulnerability is constituted around actions and multiple attributes of human actors. The community members may perpetuate social vulnerability in both direct and indirect conduct .The dominance of social networks in social, economic, political, and environmental relations, drive and bind vulnerability. Vulnerability is built on multiple scales at the same time. Integrating

the vulnerability of people, places, and systems entails several pressures.To better understand the culture of social vulnerability, Social Vulnerability Assessment in the Risk Assessment Process is applied below:

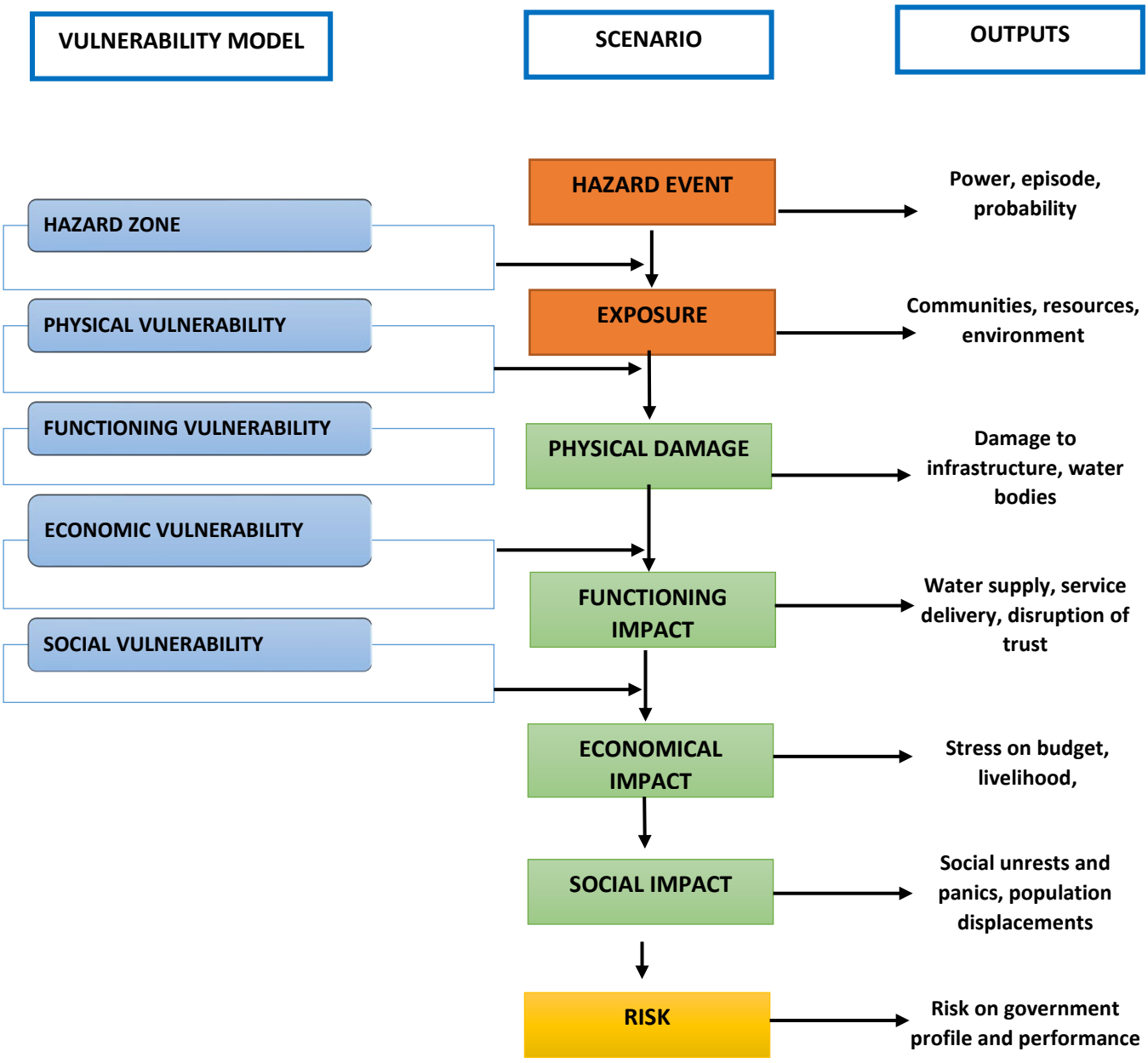

Figure 1: social vulnerability assessment for different vulnerable themes

According to Fordham, Thomas and Phillips (2013), social vulnerability to public services is deeply rooted in historical context; current social structures such as

the lack of adequate water and basic sanitation and unemployment for women. When members of a community are socially vulnerable, they tend to be in a difficult situation to withstand unfavorable impacts from the stressor to which they are exposed to. These impacts are due to characteristics inherited in social survival, institutions, cultural systems and distribution and limitations of resources. Ultimately, this makes the members of the community immobile to develop themselves and their livelihoods. When the members of the community are immobile, it puts a huge stress on the government (Downing, et al., 2006).

2.2.2 Vulnerability of women in informal settlement

As stated by Jooste and Mathibela (2020), the South African government has made a number of commitments to protect women and girls from gender-based violence and as a result of that to advance gender equality across the board. Despite this, women continue to face challenges in gaining equal and secure access to services and socioeconomic prospects such as decent housing and water access. This is because of the current policy and implementations that do not fully reflect their rights and needs, particularly when it relates to informal settlements (Jooste & Mathibela, 2020). There is a deep relationship between vulnerability, women and informal settlements. These three phenomina amount to the greater impacts of the subject matter with “women” being the epicenter. Informal settlements are present due to unfavourable situations, while vulnerability is present as a result of unfavourable situations. According to Meth (2017) gender interactions are directly shaped by the materiality of informal living, although often in contradictory ways. Residents are frequently forced to use external facilities or the bushes due to a shortage of inside toilets and water. Menstruation, in particular, has an impact on women's needs. They are at a substantial danger of (sexual) attack if they access external facilities late at night. Many households are inhabited by women only, a common feature of informal settlements and a lot of women spoke of their utter fear of security, health implications due to cold and social injustice. Female headed families are

constantly in fear of their safety as their homes are structurally secured. Meth (2017) continues to highlight that this fear is attributed to lack of security mechanisms in their informal residences, specifically the locks, the presence or absence of burglar guards, and/or a fence protecting the property.

2.2.3 Vulnerability from adequate water and basic sanitation access

The inadequate water access is an often overwhelming obstacle to helping oneself. Communities cannot grow food, they cannot have decent housing, they cannot stay healthy, they cannot develop and they cannot keep working for their families. Adequate water access is a persisting issue in the marginalized communities of South Africa. Freshwater of acceptable quality and adequate quantity to serve human needs and to fulfill marginalized community functions is of utmost importance (Mudombi, 2020). According to Orr, Cartwright and Tickner (2009), the continuing inadequate water access underpins action of food security, poverty, economic decline, and safety and health risks. A community that has no water access is a community that is dysfunctional in all dynamics of society. The disruption of adequate water access in the marginalized communities threatens the wellbeing of women, particularly the women who solely depend of water for sustainability. According to Fleifel, Martin and Khalid (2019), women are forced to find alternative water sources due to unreliable water access. On their daily walk to fetch water, women in the marginalized communities are particularly vulnerable to a number of dangers that threaten their physical security. This movement leave women at disproportionate dangers and health risks in fetching water to gender-unique water sanitation needs (Fleifel et al., 2019). Consequently, women are at a disadvantage in meeting their basic water needs.

A good sanitation system, as well as proper hygiene and clean drinking water, are essential for good health and social and economic growth. Improvements in one or more of these three aspects of good health can significantly reduce morbidity

and severity of many illnesses, as well as improve the quality of life of a large number of people in informal settlements, particularly women. However, women become vulnerable in society when they lack basic sanitation (Kayser, Rao, Jose, & Raj, 2019). Vulnerability from proper sanitation is defined as the state whereby individuals and households are negatively affected by activities pertaining to the sanitation service delivery as a result of their respective circumstances (Richmond, Myers & Namuli, 2018). Vulnerability that is perpetuated by sanitation services and delivery may be grouped into those that are 'external' and as well as those that are 'internal' to the informal settlement communities and service providers, as summarized in table below.

In addition to the myriad daily struggles that women encounter, they endure a variety of psycho-social stresses as a result of unsafe, inadequate, or a complete lack of sanitary facilities. The mental, emotional, social, and spiritual components of what it means to be well are all included in psychosocial health. Psychosocial stress is experienced differently depending on gender, class, age, type of sanitary facility, and location of the informal community. Sanitation in the form of open defecation (OD) and pit toilets (PT) appears to perpetuate the existing quo of unequal gender roles.

Table 1: External and internal vulnerabilities to the individual or community

Vulnerabilities external to the individual or community	Vulnerabilities internal to the individual or community
• AUTHORITATIVE VULNERABILITY (LACK OF LEGISLATURE OR ACCOUNTABILITY)	• Health vulnerability (exposure to illnesses and diseases)
• PHYSICAL VULNERABILITY (POOR SANITATION FACILITIES, LACK OF ACCESS FOR SERVICES)	• Financial vulnerability (ability to afford services, vulnerability to poverty)

• SOCIAL VULNERABILITY (DISHARMONIZED COMMUNITY)	• Skills vulnerability (limited technical and mechanical skills)

As critically stated by Tewari & Bhowmick (2014), vulnerabilities has two sub-sections which are internal and external vulnerability. External vulnerability refers to the experiences that have become the factors to experinces of the internal. The distict relationship between these two phenomina is intense in such a way that Internal vulnerabilities are influenced by external vulnerabilities.

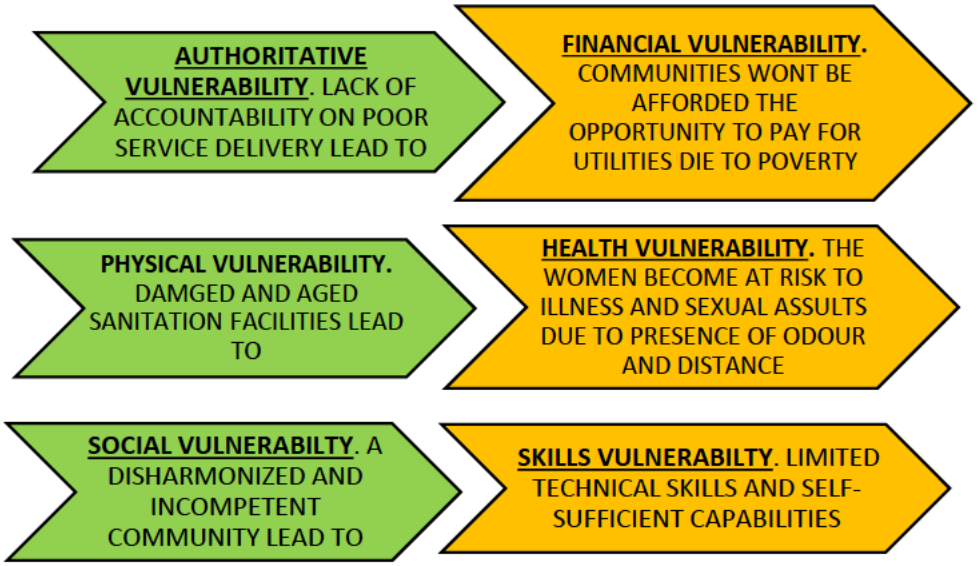

Figure 2: The relationship between external and internal vulnerability

2.3. Informal Settlement In South Africa

The South African informal settlements are classified as communities that are highly diverse, disproportioned and clustred. Generally, the have a range of locally specific names, such as *slums, zozo* and *shacks* (Gilbert, 2007). According to Huchzermeyer and Karam (2006), South Africa's informal settlements are

significant dawned with disparities in access to basic services such as water, sanitation, and electricity. This is particularly apparent in relation to informal settlements located in townships. It is important to understand the different kind bodies that informal settlements are constituted on. The informal settlements should be provided with minimum services such as water and toilet facilities. Municipalities have a mandate to supply communal standpipes which should be placed along road servitudes and often at inconvenient locations on the perimeters of the community homes.

Water availability in South Africa is a privilege in the poor communities, more especially in the informal settlements (Gangoo, 2003). Community members in the informal settlements have different channels of sourcing water. Traditional methods of water sourcing, extraction, and supply are not cost viable for small communities in informal settlements and outback settings. This is certainly relevant in Carletonville's informal settlements, which require easy, alternative solutions to meet their domestic water needs. Water supply to such informal settlements can be sourced from water tankers, rivers/streams, communal taps and other means of water collection. Furthermore, many of the informal communities are located near water sources, particularly rivers. In the absence of proper sanitation, many people rely on shallow pit latrines, river banks, and other natural resources (Gangoo, 2003).

The Department of Water and Sanitation (DWS) is responsible for leading and regulating the water sector in South Africa, as well as developing policy and strategy and providing support. A basic sanitation service, according to the South African Department of Water and Sanitation, includes: appropriate health and hygiene education; a toilet that is acceptable to users; a toilet that is safe, reliable, environmentally sound, easy to keep clean, private, well-ventilated, and keeps odors to a minimum while preventing the existence of flies and other disease-carrying pests. However, Muanda, Goldin and Haldenwang (2020) highlight that many households in South African informal settlements do not have proper toilet facilities. Day-to-day practices include using available facilities to defecate or

discard bucket contents, as well as using self-made facilities, buckets or porta-potties, plastic bags, and open defecation (in nearby bushes, and in, behind, or between shacks, behind existing facilities, unoccupied or disused shacks).

2.3.1 Availability of water in South Africa

Lack of adequate water and basic sanitation is a key indication of poverty and as well as under-development. The South African policy in water and sanitation recognises the urgency of supplying communities with water supply, and hence these services are outlined through the department of water and sanitation. The Department of water and Sanitation is the key stakeholder for the developments of large water resource infrustrauture and therefor it is resposible for the planning and implementatio of large water resource development projects (Mjoli, 2015). These projects directly supply water to South African communities. As stated by Masindi and Duncker (2016), DWS is incharge of the water provision in South Africa, implements policies and strategies, and also provides structural support to the sector. The two Acts which are the National Water Act (1998) from National Envirnmental management Act (NEMA) and the Water Services Act (1997) are govering the DWS. These Act together with the national strategic objectives and frameworks work in harmony to conduct an effective use and management of water in the country.

However, Du Plessis and Schloms (2017) state that water in South Africa is highly scares, making it a semi-arid country. Most parts of the Northern Cape, the Free State, North West and Limpopo provinces are among the arid areas in South Africa. Rainfall levels average 450mm per year while the world rainfall average is 860mm per year. Rainfall patterns in South Africa are inconsistent, with a difference in the western and eastern parts of the country. This means that water availability is much more and less more in respective parts of the country. Given that the tola annual surface run-off is 49 000 million cubic metres, the available

reliable yield is only 14 200 million cubic metres per year or 29 percent of the total surface run-off (Du Plessis & Schloms, 2017).

Another issue with long-term water supply is a lack of adequate policies and programs that take into account township diversity. The most vulnerable to water contamination are small informal groups. Furthermore, they struggle to raise the finances needed to enhance water treatment and delivery systems, and as a result, they fall short of meeting drinking water quality standards.

2.4. Summary

This chapter provided with literarure for the study. This chapteris highly crucial because it supports what the research is all about. This chapter highlighted how different genders play a role in water and sanitation. Vulnerability was also adressed in this chapter as to how women fall into vulnerability as a result of inadequate water and sanitation. The next chapter is the methodology, which will inicate how the study took place.

3. CHAPTER THREE: METHODOLOGY

3.1. Introduction

As defined by Goddard and Melville (2004), research methodology refers to a specific method or technique used to identify, select, process, and analyse information about a focused study. Significantly, the methodology allows the researcher and the reader to thoroughly evaluate a study's overall validity and reliability (Goddard & Melville, 2004). As a result, this chapter focuses on the research setting, research approach, data collection approach and as well data analysis. The success of a research study is dependent on the effectiveness of the research methods. It is imperative to give some background information of the study area to give context to the topic and so this chapter begins by describing Carletonville and its informal settlements namely Shawela and Wedela.

This study explored the challenges faced by women living in informal settlements with regards to water access and sanitation. Data was collected by the researcher using structured questionnaire interviews in which participants (women) shared some of their experiences of living in the informal settlement. The researcher drew on the interpretivist paradigm to highlight the information extracted from the participants and as well as literature. The purpose of this study was to examine how poor water and basic sanitation affects women living in informal settlement and leads them to be considered as vulnerable.

3.2. Research Setting

The research is based in Carletonville's two informal settlements which are Wedela Township and Shawela Township. According to Nealer (2020), Carletonville is a town under Merafong Municipality in the West Rand District of Gauteng and has three main Townships namely Wedela, Khutsong and Blybank. The Merafong City Local municipality was a cross-border municipality. The municipality was transferred to the North West Province in 2005. From 2005 to

2009, the municipality was part of the North West Province, until it was reincorporated into Gauteng Province by the Constitution after violent protests in the Khutsong Township. Rand Water supplies Carletonville with water and directs the water to Carletonville reserve tanks.

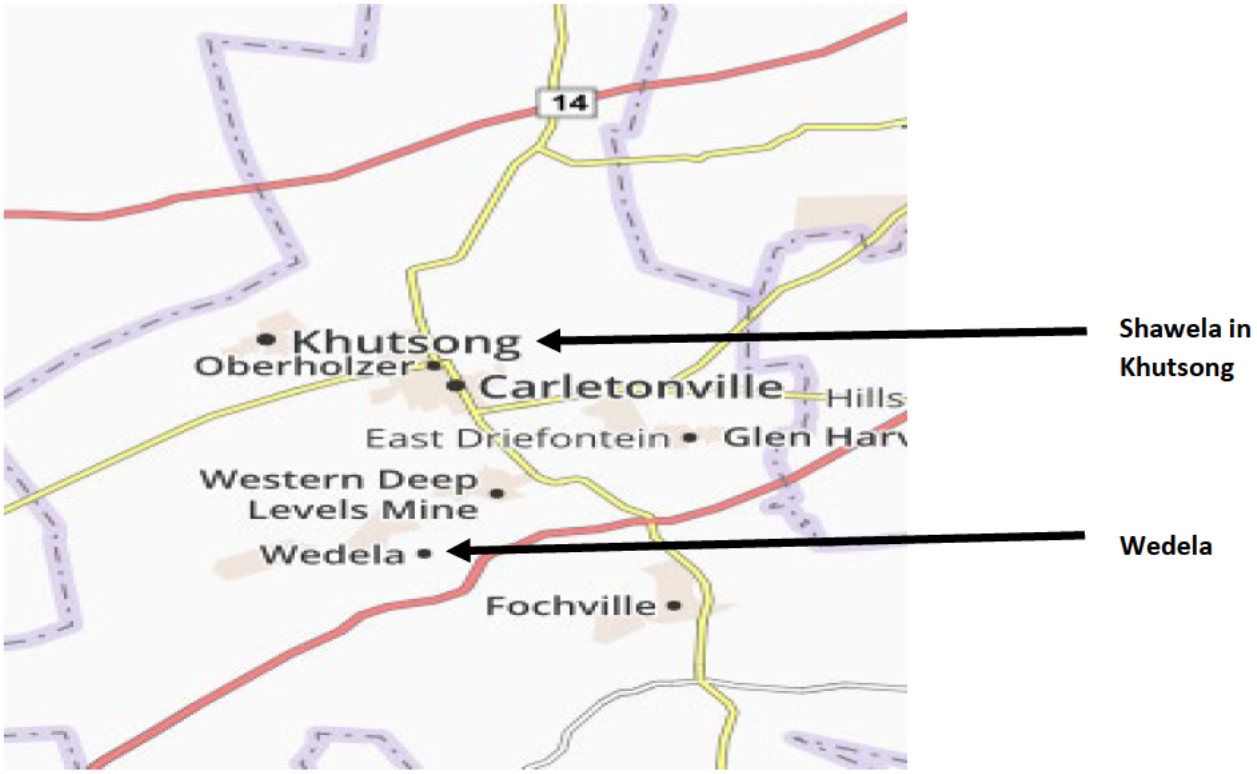

Figure 3: map showing location of Carletonville with its informal settlements (Khutsong and Wedela)

3.2.1. Historical Development Of Shawela And Wedela Informal Settlement

According to the Merafong Department of Town Planning, Wedela was established in 1978, while Khutsong in which Shawela is located, was established in 1957 under Section 66 (1) of the Black Communities Development Act, 1984. The establishment of these two townships was mainly due to gold mining. The women who migrated from their various hometowns established these informal settlements in a mission to be close to their husbands. Their role was to fetch

water for cleaning, cooking, washing for their children, while the husbands were working in the mines. As the community of Khutsong and Wedela expanded, so too did the informal settlements of Wedela and Shawela.

The local government did not recognise these informal settlements because they were not registered with the Township Establishment and Land Board. Consequently, these informal settlements were illegally established. Shawela and Wedela Informal settlement were excluded from the supply of water and sanitation. The community of Shawela relied on the nearby stream as their primary water source, while the Wedela informal settlement women relied on nearby houses for water access. Open defecation in the bushes was practiced in both of these informal settlements as there were no toilets readily accessible.

3.2.2 Geographical And Physical Background Of Carletonville

Carletonville is a small Town situated in the Gauteng Province. It was formed by various mining companies and since then it has attracted people from different areas to live in it. The total area of Carletonville is 35.14 km^2 with a total population of approximately 23, 000 people. The town is dominated by black Africans who are Sotho and Xhosa speaking (Stats SA, 2011). Khutsong and Wedela are both townships of Carletonville, however they are 25km apart from each other. Khutsong is much bigger than Wedela due to original establishment. Wedela was established for the mine workers and their small families, while Khutsong township was established under the RDP initiative by the government of South Africa. Shawela is the informal settlement within the Khutsong township.

Figure 4: Map Showing Wonderfontein Spruit Flowing North To Carletonville

Wonderfintein Spruit is one the physical features found in Carletonville. As indicated in Figure 4, the stream runs from the North in Randfontein, passing Khutsong informal settlements, and all the way down South to Potchefstroom. Van Eeden, Liefferink and Tempelhoff (2008) state that the Wonderfontein Spruit carries toxins and contaminats from mine water discharge, waste water discharge and as well the metal industry water run-off. The stream of water flowing from the north to the south is acidic and more concerning is the fact that part of it passes through Khutsong informal settlements; leaving the people who access that water vulnerable to health hazards.

The water flowing in the Wonderfontein to the nearby settlements is highly contaminated. Since the 1950s, 75 years of gold mining (and subsequently uranium mining on the West Rand) activity in the Wonderfontein Spruit Catchment has resulted in the contamination of natural waters with underground dolomitic waters, dewatering, sinkhole formation, and the allowing of elevated levels of toxic and radioactive heavy metals in the Wonderfontein Spruit (Van Eeden, Liefferink and Tempelhoff, 2008)

3.2.3 Socio-Economic Activities In Carletonville

The three (3) main socio-economic activities in Carletonville include farming, industry and mining. According to (Kempe, 2014), 85% of Merafong mines employ men. This is due to the need for hard labour in the mines. Carletonville communities rely on crop production for income generation. Both subsistence and commercial farming are significant sources of food/ sufficiency in Carletonville and women are often involved in this activity. Carletonville is surrounded by mining companies that have attracted people from different provinces. People flock to Carletonville to seek employment and due to population growth, more industries and shopping facilities expand. However, the water discharge from the mines and the industries have affected the farming sector negatively (News24, 2014). The highlighted economic activities helped provide this research with context.

3.3. Research Approach

3.3.1 Research Paradigm

This approach acknowledges that the dynamics and the nature of society is constantly changing and thus understands that there could be different interpretations of an event, influenced by the individuals' historical and social ideology (Silverman, 2016). Marshall and Rossman (2014) highlight that the interpretative paradigm focuses on the everyday conduct of community members. It is guided by a systematic analysis of socially impactful action through direct and critical observation of community members (Marshall & Rossman, Designing qualitative research, 2014).

Rehman and Alharthi (2016) state that interpretivism supports the idea that social actuality is analysed and percieved by the individual according to the fundamental belief that they hold. Interpretivism suggests that some of the community memebers and individuals do not regard themselves as vulnerable to poverty. It is the state in which they define vulnerability and the degree in which vulnerability is measured. As a result, knowledge runs through experince rather than acquired

from or imposed from outside the community. It is within the interpretivism paradigm that we comprehend that reality is dynamic and narrow and may have different interpretations.

Research design

This research has been designed using qualitative research methods. The aim is to understand the aspects of social life, and its methods and to achieve this, a qualitative approach is applicable for this kind of research. Silverman (2016) defines qualitative research as an approach that allows for quality, in-depth data to be extracted from the unconventional and all-rounded phenomena under study in a special context. The main purpose of the study is to gain understanding and critically examine the impact water accessibility and sanitation has on women living in informal settlements. It is with this notion that qualitative methods be used to extract rich, descriptive data and to allow participants to engage in their own words and language. Qualitative research serves as a fundamental route to provide the researcher with data and give answers to the questions at hand. Cifuentes, Alamo, Kendall, Brunkard and Scrimshaw (2006) suggest that qualitative research consists of an in-depth analysis that stands to help the researcher create a deeper and wider understanding of the effects of inadequate water and sanitation on women living in informal settlements.

3.4 Case Study

(Crowe, et al., 2011) indicate that the case study approach is effective when there is a need to obtain an in-depth understanding of the issue at hand, event or phenomenon of interest. This methodological approach provides insights regarding the area of study, its past experiences, community involvements, reports, progresses and responsive measures. The aim of this study is to: draw focus on how and why women are vulnerable to inadequate water and poor sanitation access, understand the behavior of the persons involved in the study, cover factual events as they will have a significant impact in the study and as well

as clear out boundaries between the event and the context (Yin, Case study research: Design and methods (3rd ed.), 2003). Carletonville's informal settlements of Shawela and Wedela are the case study areas for this research. They have been chosen because they were historically established by women who moved close to the mines where their husbands were working. The informal settlements sprang up rapidly and illegally and were not subject to service provision. The areas are also within easy access of the researcher who lives in Carletonville town.

The case study focuses on past reports and articles of Carletonville water and sanitation services in the informal settlements. As stated by Nealer (2020), Carletonville is a gold-mining town situated on the western side of Gauteng province, with townships including Khutsong, Wedela, and Kokosi. Carletonville is one of the richest, gold-producing areas in the world. Nealer (2020) observes that even though Carletonville located in one of the richest, gold-producing regions in the world, the delivery of potable water supply by the local municipality is not consistent as it faces multiple challenges from aged infrastructure to improper governance and population growth.

3.5 Data Collection Approach

Harrell and Bradley (2009) define data collecting methods as a fixed systematic approach to collect relevant data. Qualitative data collection consists of two approaches to collecting primary data; naturally occurring data, and data derived from a research intervention (Harrell & Bradley, 2009). The data extracted naturally is usually from observations and casual conversations. The other method of data extraction is by means of research, giving the study special key first-hand information, such as interviews. Secondary data collection is done through literature, documents and reports. As a result, this section below will discuss the data collection techniques used to collect data in this research.

3.5.1. Primary Data Collection Technique

3.5.1.1 Interviews

Boyce and Neale (2006) define interviews as a qualitative reseach technique or an activity that involves intimate individual or a small collective of people to engage on their persepective on a particular idea, subject matter or situation. The aim is to learn more about the participant's beliefs, opinions and views. Interviews can be structured and open ended where the researcher asks the questions and the participant responds. Qu and Dumay (2011) state that the advantages of conducting interviews include collecting detailed information about the subject topic. It is always advantagous to get the first hand information from the source. It is also imperative to physically observe the situation as a researcher (Puri, 2010). This forms part of the qualitative methodology.

Three (3) households were interviewed in Wedela township, and seven (7) households where interviewed in Khutsong township (Shawela). All the participants were women, and were interviewed face to face. Appendix (A) provides a list of questions that were asked to the participants during the face to face interview. The interview with the participants allowed open ended questioning exploring the experiences and opinions from the participants. The interviews provided a significant amount of data, particularly around the issues pertaining to water access in informal settlements. If participants did not have time for an interview a questionnaire was given to the participants as an alternative method of collecting information. Amongst the seven, two were given questionnaires. Most of the participants in the Shawela informal settlement were reluctant in responding to the questions. The researcher then formulated a questionnaire which was given to the participants. With the help of the questionnaire, the participants opened up.

3.5.2. Secondary Data Collection Technique

3.5.2.1. Document Analysis

Document analysis is also part of a qualitative research methodology, and it is defined as a systematic method for reviewing as well as evaluating documents that are both printed and electronic data. (Bowen, 2009). It is imperative to use document analysis because it has a role of supporting and strengthening research. This kind of research is as important as the primary data collection because it a gives strong support to the study. It can often be useful in triangulation.

As a result, this research was supported by documents that were published by reputable authors. The documents that were used for this research include journal articles, local newspaper articles, municipality reports and memos. Documents, reports and manuscripts from the Merafong city department of water and sanitation were analyzed to provide this study with context. The report indicated how the informal settlements in both Wedela and Shawela receive their water, and the amount of water they are allocated. The report also highlights the measures taken by the municipality to suspend the solids from the wastewater treatment works before being discharged into the environment.

3.6. Selection Of Participants

Participants were selected based on the relevance of the study. Amongst other selection criteria, the research focused on women. More specifically it focused on women who have small gardens in their yards, women who head the house, women with more than 4 children, unemployed women and women improper sanitation facilities in their yards. It was difficult to identify participants upfront and so the researcher just walked around the settlements seeking willing participants to participate in the study. Several women were not comfortable to have an interview and be recorded but they did agree to complete a questionnaire. The

researcher also asked the women if they knew of other women who might be willing to participate.

3.7 Data Analysis

The main outcome of this study was to understand how women experience inadequate water access and basic sanitation access and to what extent they are affected by this. It is highly critical that this section of this study condenses raw data and involves discovering and critically assessing common patterns within responses in order to meet research goals and objectives. The formula used by the researcher to condense and make sense of raw data was the use of relevant themes. The themes of this research are water access, sanitation access and women living in informal settlements. All these themes formed part of data analysis. Data analysis for this research was purely reliant on information extraction, interpreting, sifting and contextualising. The recordings from the participants and interview scripts were used as the foundation of this research. The researcher analysed the collected raw data by means of transcribing it. All the raw information from various participants had a distinct pattern and correspondence to the themes.

The themes were supported by coding that was derived from the constant comparative method of data analysis. Constant comparative method primarily allows the researcher to sort and organise excerpts of raw data into groups according to attributes, and organise those groups in a structured way (Boeije, 2002). The main use of a constant comparative method is to highlight patterns from the insights given by the participants. Each of these insights will fall under their specific group, known as codes. Grouping the patterns to their respective codes will prevent the researcher from being biased in any form or manner.

3.7.1 Thematic Coding

Coding data in a qualitative study is considered one of the most difficult steps in the research process. As part of document analysis, the researcher made use of

thematic analysis to effectively understand certain patterns of certain themes. The researcher used thematic analysis to create themes that reframe, reinterpret, and/or connect data items. Women and water accessibility is a topic that has complex themes in it. The amount of water that is available to household in informal settlements is relative to households respectively. As a result, the analysis of photographs formed part of thematic analysis as means of interpreting data and supporting documented data.

3.8. Ethical Consideration

Sanjari, Bahramnezhad, Fomani, Shoghi, and Cheraghi (2014) indicate that it is essential to formulate specific ethical guidelines when undertaking qualitative research. The scholars indicate that researchers are faced with ethical challanges through all stages of study, from the designing right through to reporting. Therefore the following ethical principles were followed:

3.8.1. Voluntary participation

In the interviews, the researcher was mindful that the participants (women) might be hesitant, especially if they have husbands that are traditional, who will not allow their wives to communicate to males. As a result, the researcher was accompanied by a female acquaintance who helped translate questions to the women. It was explained that participating in the interview or completing a questionnaire was voluntary.

3.8.2 Informed Consent

The collection of information required a signed letter of informed consent from participants. The researcher made use of the consent from which the participants signed as token of agreement to be interviewed. The contents of the letter included an explanation on the purpose of the study, what was required from the participants including all possible risks involved in order for participants to make an informed decision on whether or not to participate.

3.9 Trustworthiness Of The Study

In adaptation of the concept by Connelly (2016), this research was constituted on credibility, dependability, confirmability and transferability. The researcher understood the principle of true value, also known as credibility, supported by direct quotes from the interviews and substantial data pertaining to the topic. The researcher was aware that the research aims to add to an existing body of knowledge, however, the findings done through this research should be enough to be a new study for other researchers. The ideas of this study were formed through dependability. Confirmability emphasizes that the participants' opinions and views should not be translated in a bias or for personal motivation. And lastly, transferability is the most quality of this research. The researcher aimed to generate information for external research through the findings.

3.10 Summary

This chapter described the research design and methods used in this study to examine the effects of water and sanitation access in Shawela and Wedela informal settlements. Some insights were provided into the research setting to help give context to the study. A qualitative approach to data collection was followed using interviews and questionnaires. The next chapter presents the findings from the interviews and questionnaires.

4. CHAPTER FOUR: RESEARCH FINDINGS

4.1 Introduction

The aim of this study was to examine the effects of water access and basic sanitation on the lives of women living in Carletonville informal settlement. This chapter begins by providing a clear description of water sources available to people living in the Shawela and Wedela settlements, respectively. The chapter then tries to unpack the link between the water sources and the outcomes of poor access to water and sanitation. These outcomes are represented through indicators of health, safety and socio economics which have also been used as indicators of vulnerability. The findings were supported by thirteen (13) face to face interviews with women in the 2 informal settlements and the expert interview with the water and sanitation officer, as well as photographs and observations.

The socio-economic profile for Shawela and Wedela informal settlements are indicated below. The data providing the gender, household size and source of water and toilet facilities was extracted from the 2011 census (Stats SA S. S., 2011). These factors listed are significant in dissecting and highlighting the importance of water accessibility to women living in informal settlements.

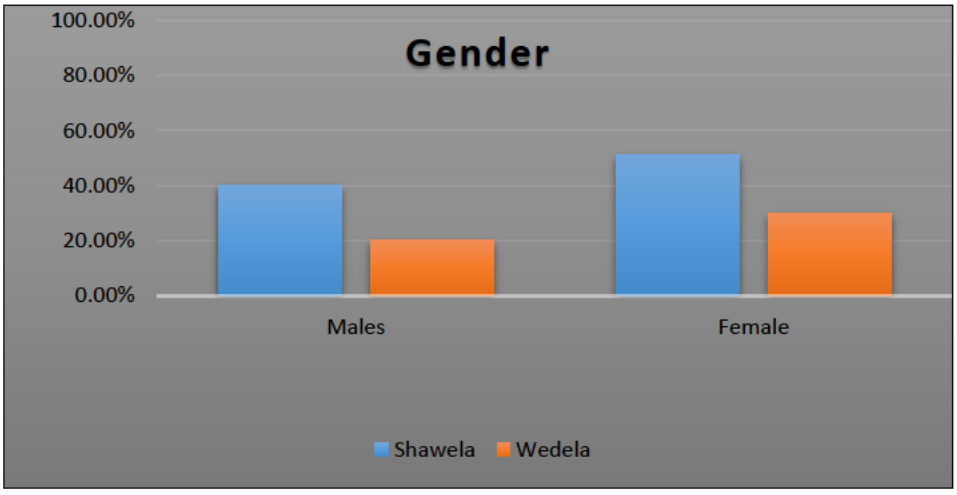

Figure 5: Gender difference in the informal settlements of Shawela and Wedela (Source: Stats SA 2011)

4.2 Socio-Economic Profile Of Wedela And Shawela Informal Settlements

4.2.1. Gender

The graph above depicts the ratio of males and females living in both informal settlements. The graph shows that there are more women than men in both of these informal settlements. It was highlighted during the house-to-house interviews in both of these informal settlements that most of the households are female headed households. Divorce, separation, immigration, or widowhood are amongst the factors of female headed households. The majority of women in Shawela informal settlements have indicated that the absence of their husbands is due to labour in various factories, industries and mines that are in another province. This graph suggests that women therefore have a very important role to play in supporting the household.

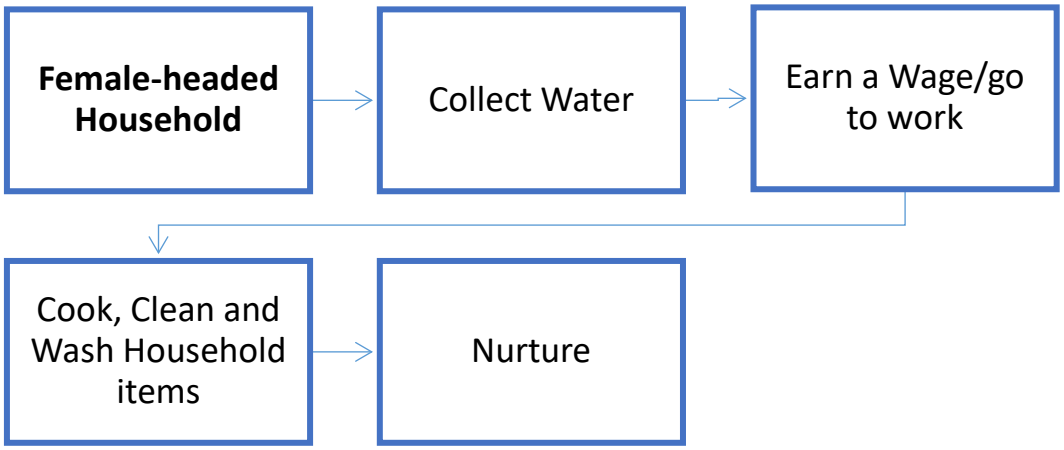

Figure 6: Female-headed household responsibility cycle

The figure above, shows a typical cycle female-headed has to follow on daily basis. The female-headed families have double responsibility, which is to collect water, still go to work to provide for their families, cook, clean and wash the clothes and nurture their children.

4.2.2 Household Size

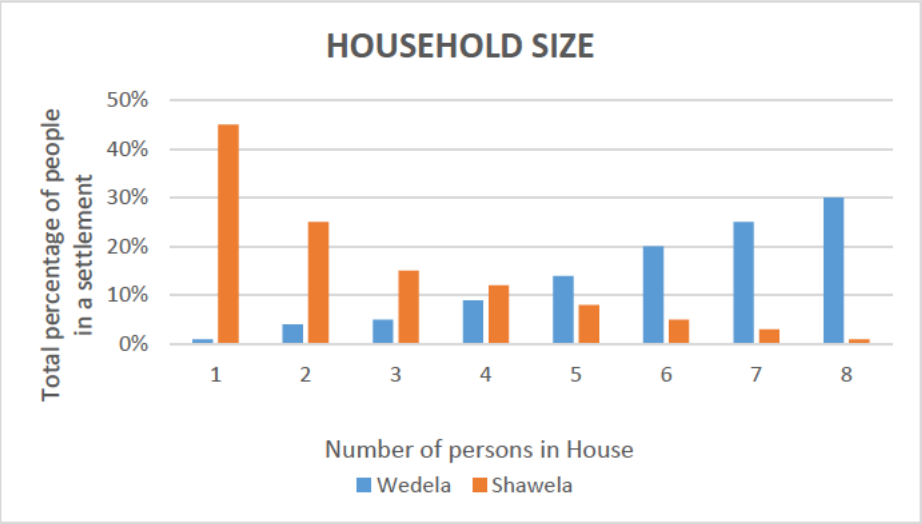

Figure 7: Number of people living in one house of Shwela and Wedela (Source: Stats SA 2011)

The graph above shows a pattern of household size for Shawela informal settlement and Wedela informal settlement. The graph shows a high percentage of households in Shawela who have 1 to 3 family members in one house, while in Wedela there is a high percentage of households with 6-8 family members in the house. The major difference between Shawela and Wedela is the population density in relation to area size. Shawela is a much bigger informal settlement than Wedela which has a small population density. As a result, there are generally smaller shacks with two rooms that would only occupy 1 to 3 persons in them (Figure 7). Wedela informal settlement has spaced out shacks.

Wedela informal settlement shows high percentage of households with 6 to 8 members in them. However, there one house in the Wedela informal settlement that is occupied by one person- a woman. This woman highlighted that she has adequate water supply and also that she has no water access problems. This proves that adequate water is relative, adequacy of water is dependent on the number of members per household. Water will be more on households that have less than 4 members (Shawela), as opposed to households that have more than 4 members.

4.2.3. Sources of Water

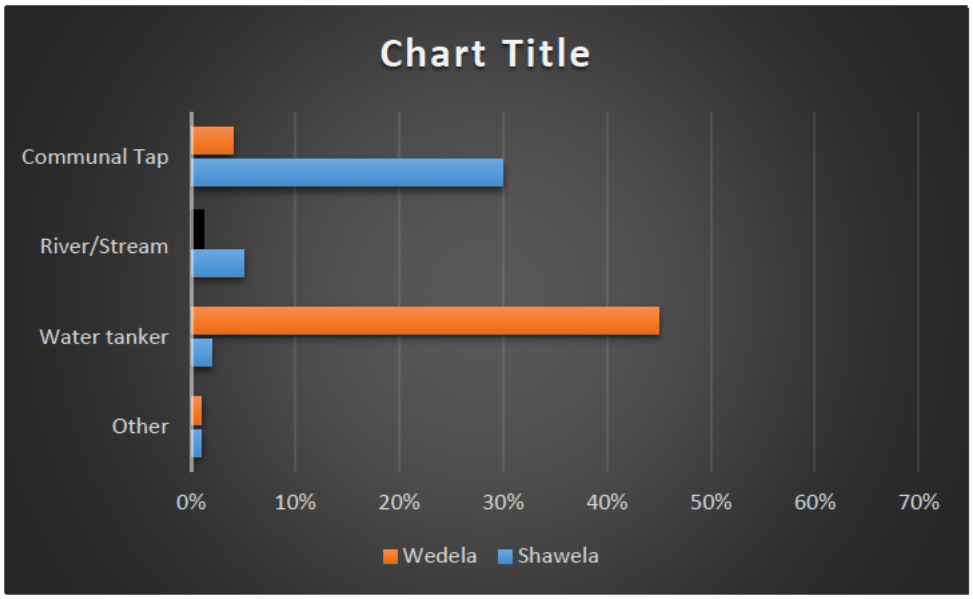

Figure 8: Different types of water collection between Wedela and Shawela informal settlements (Source: Stats SA 2011)

This graph shows the different water collection methods from both wedela and Shawela informal settlements. The people in Shawela informal settlements have no private tap in their yards, they have to collect water either from the nearby stream of from the community communal tap. According to the Meafong City local municipality water and sanitation official, the water from the nearby stream (wonderfontein) is contaminated with wastewater. Often the water from the communal tap would stop running for two consecutive days. This was due to the water disruptions and limited supply from the water supplier. In Wedela, a water truck was supposed to come daily but it often does not arrive daily as it should. This causes people to run their household responsibilities on limited water availability.

4.2.4. Toilet Facilities

Sanitation plays an important role in settlements, however, Shawela and Wedela informal settlements are subject to improper sanitation. A proper sanitation

infrastructure found in the formal settlements is a facility that is safe and secured, clean and odorless, has fictional ventilation and allows treatment and/or removal of human waste. A Toilet is a dignified private facility that should be utilized by anyone. A toilet without ventilation is accompanied by health risks that couldn't have been curved with proper sanitation facility.

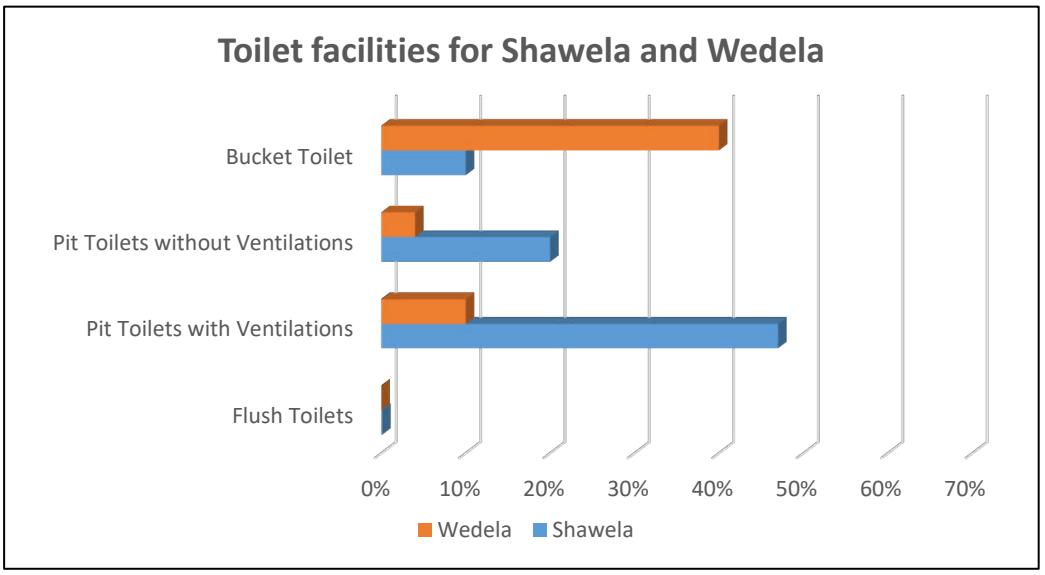

Figure 9: Different types of toilet facilities for both Wedela and Shawela (Source: Stats SA 2011)

The figure above shows toilet facilities for Shawela (Figure 9) and Wedela. There are four (4) main toilet facilities for both Wedela and Shawela informal settlements. The toilet facilities are bucket system, pit toilets without ventilation, pit toilets with ventilation and as well as flush toilets. All these four different toilet facilities are found in these two informal settlements, respectively. Wedela has the highest number of households using the bucket toilet system. There are thirteen (13) bucket toilet stand points in the entire settlement. The municipality truck collects the waste on a weekly basis. According to Taing (2015), more than 60000 South African households still have no proper flush toilets in the comfort of their homes.

4.3 Water Sources For The Shawela And Wedela Informal Settlements

4.3.1. Wedela informal settlement

The main source of water for the Wedela informal settlement is the communal tap stand-points. There is also the delivery of water by means of water trucks. Both of these sources of water are accessed by the community of Wedela informal settlement. Figure 10 shows a woman collecting water from the communal tap. They do this activity on a daily basis, and because of the absence of children and male figures in the household, the women have the burden of carrying the full buckets back to their homes alone. In an interview with a woman of this settlement, she mentioned that the fathers are absents for reasons such as work, death or ran from family responsibility. The children are absent because water collection occurs while they are at school.

> *"I have no one to help me carry buckets. My children go to school in the morning and my husband goes to work in the morning too. These buckets are too heavy for me"*

Figure 10: A woman opening the Wedela informal settlement communal tap. (picture by researcher)

The woman was demonstrating how they access water from the communal tap. The woman highlighted that this tap is accessed by more than 4 households. The issue with the water from the communal tap is that it is not reliable.

> *"These tap are unpredictable. We live by hope that there will be water today.*
>
> *Yes the tap are new and they are of a good standard but water from the taps are not reliable"*

Sometimes water is delivered by water tankers when the taps have no water, but the community indicated this water is not clean.

4.3.2 Shawela Informal Settlement

The Shawela informal community collect water from the community tap and a small minority from the nearby stream. Some women have resorted to fetching water at a nearby stream because of the limited water supply from the community taps. A women has indicated as follows regarding the community taps:

> *"The taps have a problem. Sometimes they work, sometimes they don't work. When they don't work, we fetch water from the stream"*

Aging infrastructure is a huge problem in the informal settlements and Shawela is not immune to this. The community taps, which are the main source of water, are not maintained by the water suppliers and this compromises the community members. According to the Merafong municipality water quality technician, the quality of the nearby stream is poor (Figure 11). Several tests were conducted on the stream and the results are that the stream is contaminated with sulphur. Consequently, the water from the stream is not safe for human consumption (Figure 12).

Figure 11: a woman from Shawela Informal settlement showing the quality of water collected from her bucket (picture by researcher)

The picture above shows how contaminated this water is. This is the water collected from the nearby stream of Shawela informal settlement. In the bank of the stream are disposed plastics lying around and some of them are found inside the stream. The water quality of the stream is highly poor.

Figure 12: a water quality technician assessing the quality of the water leaving the waste plant to the stream (picture by researcher)

This picture shows the water technician sampling water for testing to affirm that the stream is contaminated. The wastewater leaving the treatment plant is discharged to the stream, and in most cases, the solids in the discharged water are not 100% suspended.

Figure 13: An old pit toilet in Shawela residence (picture by researcher)

This picture shows a pit toilet in a Shawela residence that is in a poor condition. The walls have cracked on the inside, the door has to be supported by hand. The most challenging part about this toilet is that when it rains it cannot be utilized as it heavily leaks. The woman in Shawela informal settlement have highlighted how the use of pit toilet (Figure 13) has posed a serious health hazard. According to the World Health Organization, this is the cheapest and most basic form of sanitation you can get.

Leaking bucket toilets in Wedela informal settlement pose a health concern to the women in that settlement. The toilets have been in a deteriorating condition for the longest time now, and the reports are not attended to. Figure 14 below is a clear depiction of how most of the bucket toilets are in this settlement. The leaked sewage flows from the toilet all the way to the streets where people have to pass.

Figure 14: A picture showing sewage flowing from the bucket toilet all the way to the streets (picture by researcher)

4.4 Outcomes of water access and sanitation issues

As mentioned in the literature review section, vulnerability is inseparable with inadequate water access. Lack of adequate water in the informal settlements poses a threat to the health and safety of the women, and as well as the economy of that region. The table below outlines the three main results of inadequate water and basic sanitation access in the two informal settlements:

Table 2: Vulnerabilities and brief description

EFFECTS OF WATER AND SANITATION ISSUES	BRIEF DESCRIPTION OF ASSOCIATED VULNERABILITY INDICATOR
Health	*Vulnerable to illnesses, diseases and stress*
Safety	*Vulnerable assaults, injury and sexual harm*
Income security	*Vulnerable to poverty and malnourishment*

4.4.1 Health

It is evident that access to water and sanitation is critical to the health of the women living in the informal settlement. The women living in the informal settlements are constantly at risk of illness and diseases due to poor living conditions. Inadequate water and basic sanitation access in the informal settlements are the leading factors of these diseases. The water provided from the water tankers is contaminated and not completely purified. The lack of water and decent sanitation facilities in the informal settlements has cause health conditions such as trachoma and diarrhea that is associated with poor hygiene practices.

Women from the Shawela informal settlement have highlighted that the sanitation practices are affecting their health, and most of them cannot afford specialised medical services.

> *'We are poor, when we get sick and visit the local clinic, we are told to go the hospital and most of the time we do not have transport money to town. When I am sick from diarrhea, I am forced to stop my household responsibilities and nurse my sicknesses. Sometimes I have to leave my children and go be nursed by my relatives in a different area. It is also difficult to leave my children behind because they depend on me for food'.*

The woman also complained about the presence of flies in their pit toilet.

> *'Our pit toilets are not in a good shape at all. The squat hole produces unpleasant smell and allows the flies to breed rapidly. They are full and we constantly have to remove the human excreta by means of digging the pit. All of this makes us feel less of humans- it is like we are animals'.*

One woman also added that the pit toilet has affected the most sensitive part of her body due to poor pit latrine in her home. She reported the toilet to be filthy and inhuman:

> *'Every time I use this toilet, my private parts begin to itch, and I will be notified that I have contracted an infection after visiting the clinic. I took the decision to defecate in the bush behind my house'*

Figure 15: A picture showing a malfunctioned toilet in the Shawela informal settlement (picture by researcher)

This figure shows an old flush toilet in one of the Shawela residences that is in a poor state. The toilet is surrounded by litter as well as by leaking water. This pit toilet is not only used by that residence occupants, but by the people in nearby houses as well. One women complained about the water leaking from the pipes. But the most disgraceful activity the residents have to endure, is the act of manually unblocking the drain. Another woman in Shawela expressed that the toilet that is utilized by 4 families in different houses is considered as an unclean practice in her culture. A married women is not allowed to share her personal space with other men of different families. It is actually a disgrace:

'Having to share a latrine with different men is bad cultural practice, but because I have no choice, I do it anyways. If it was safe for me, I would have helped myself in the bushes instead'

4.4.1.1. Stress Effects

The lack of access to safe water and adequate sanitation has stress complications on individuals, especially women. As a matter of fact, women and their families do not thrive when they have no access to a nearby source of safe drinking water, a toilet or latrine, and awareness of appropriate hygiene practices. Inadequate water access and improper sanitation are the main contributors to stress. Three ways in which inadequate water perpetuates stress is showed in the figure below:

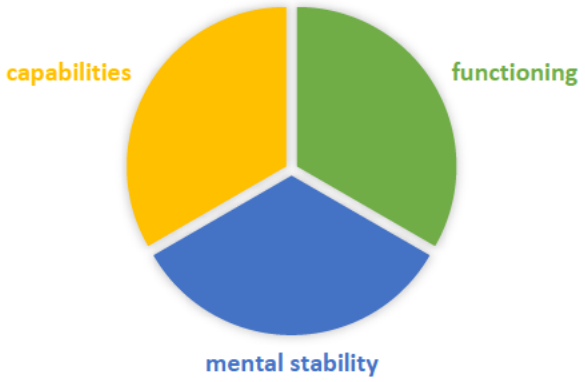

Figure 16: Three type of effects of stress resulting from inadequate water and sanitation.

The relationship between water access and the lives of community members is highly imperative, not only for physical well-being on an individual, but for the mental health as well. Collecting, transporting, and storing water are daily tasks that women often perform for themselves and the household. Mental problems such as stress and depression, have been shown to significantly impede such daily activities in vulnerable women. Stress can have a negative impact on daily actions such as collecting safe drinking water, transporting it, and storing it. Both

of the informal settlements in this study are contributing to the mental health of its community members, particularly women. The day to day realities of lack of water access, availability and quality are the driving forces of mental health, especially to women who have have the responsibility of nurturing their families. This is what was affirmed by one woman in the community of Shawela.

> *'it is stressing that I have such a big responsibility of making sure that not only do I have collect water, but I have make sure that it is clean enough to drink. At the end of the day, the health of my family is not dependent on the water suppliers but on me. This is stressful for me as a mother; I constantly have to make sure that me and my children are not sick'*

"Not knowing when the next water supply will be and for how long the supply will carry you and your family is daunting". A women in Shawela informal settlement indicated that uncertainty is her worst nightmare. It is evident that insecure access to essential resources such as safe water, and adequate sanitation can have a negative impacts on mental health. Since women are the primary water collectors, their mental health is mostly affected, compared to men. The impact is immense that it also affects their functioning, highlighted by two women in Shawela.

> *"It is stressful that as a woman I should carry the burden of not knowing for how long will the water we have carry us. The stress is so big that I cannot seem to perform my household duties effectively"*

Figure 17: A picture of a woman's kitchen in Wedela Informal settlement showing three 10L buckets of water.

The picture above shows three 10L buckets that store water for one certain household in Wedela informal settlement. The woman indicated that the amount of water in those buckets was not enough to fulfil all the household duties. It becomes a constant worry, which has turned into stress, that each and every day they should make sure that there is water in those buckets.

> *"I have accepted that each and every now and then I have to enter into a phase of stressful moment due to the buckets of water running out. It has been years now the situation being like this, and yet I cannot get used to it"*

The women in both of these settlements experience stress in so many ways. The stress is generated when a certain activity is repeated almost daily. The stress accumulates as a result of either poor sanitation and hygiene, or lack of adequate water access. The picture (Figure 18) below was taken from the Shawela informal settlement portraying how poor sanitation and unhygienic practices influence the women's mental health. The dumping site that is next to this woman's shack is not maintained and therefore it has become a home to unbearable smell and rats. The woman who lives in this shack has stressed that she feels that she is the most underprivileged out of all women in the settlement. The state in which her house is in and the area her house in at is a factor to her mental health.

> *"My house is right at the end of the settlement where there is rubbish dumping next to it. The worst part is that the water truck seldom stops in my area. Right now I am on medication due to stress of not having any water and sanitation services"*

Figure 18: A picture showing a shack in Shawela informal settlement that is situated next to the dumping site (Source, researcher)

4.4.2. Safety

For millions of women, finding a water source and collecting it are major daily duties. Women have little to no time for employment, education, or nurturing for their families. Women are limited to reach their full potential if they don't have access to water or toilet facilities at the comfort of their homes. The continual necessity for women in informal settlements to leave their houses to fetch water exposes them to danger. In cases whereby women who do not have access to proper sanitation such as latrines, they have to walk to communal toilets or public spaces. During the night when women have to walk to access the community toilet, they are at risk to physical attacks and sexual violence. Through a critical observation of Wedela informal settlement, the inconvenient and unsafe position of communal ablution facilities perpetuates the risks women face. At night, poor lighting around the facilities poses a significant safety concern for women and children. The way women use these communal facilities is influenced by their risk perception. In certain circumstances, women and girls restrict their food and

beverage consumption to reduce the need to use the toilet, which has additional health consequences, such as poor nutrition and stress.

The figures below (Figure 19 and 20) show bucket toilets placed on the corridor of the settlement. The women have to leave their homes to access the toilet which are placed in the open. On the other hand, the bucket toilet in Wedela Informal settlement is surrounded by vegetation. This poses another safety hazard because the women are at risk of being ambushed after they have utilised the toilet, more especially at night.

Figure 19: A picture showing an isle of bucket toilets in the Wedela Informal settlement

Figure 20: A picture showing a bucket toilet in Wedela Informal settlement surrounded by a pile of vegetation

Women from Wedela who live alone fear that they might be attacked by local men when they go out to access the toilet at night due to the fact that there are no

lights in and outside the facility. The perpetrators could take advantage of the fact that anyone accessing the toilet may not see them.

Carrying a cellular torchlight is not entirely effective either one women was once threatened by local men who were passing

> *'Not having light around the facility poses a threat to us. The cellular torches actually raises a signal to the thugs that someone is in there. The entire settlement has no street light, and the toilet also'*

The participant who has been living in the Shawela community for the past 11 years stated how vulnerable they are as women living in a settlement as follows:

> '*Not having water access and sanitation facilities in this community is a big challenge for us as women. Our safety is not secured because the men do not accompany us when we leave to go collect water from the communal tap. We are afraid that we will be attacked while walking to the pit latrines'*

The women pointed out the most dangerous path they have to pass through when they have to access the communal tap. This path is notorious for the robberies of most community members who have walked on it. A woman from Wedela indicated how men from a nearby tavern get violent when they are drunk.

> *'In the neighborhood there is a small tavern where men get violent after their joyful session. We become targets to sexual harassment. We are exposed to all sorts of assault because we leave our homes to access the toilet. It is not safe at all to leave our children alone in the house while we are out to the toilet'*

4.4.3 Income Security

Manual labour/casual labuor is the most common form of employment in the Shawela informal settlement. The women largely engage in domestic work, taking domestic jobs in the formal residents. The majority of the men/husbands get their

income from piece jobs, collecting rubbish and renewable materials for recycling. They sell it to a recycling firm for wages. When asked about their income this was how the majority described their living. Because many were unqualified for good positions, few men were hired by local industries to conduct manual or casual work. Even so, the money they receive is not enough to cover all the household responsibilities.

Some women indicated that some companies refuse to hire them simply because they are from informal settlement background and so it is believed that they would steal from an employer to feed their families. This makes it difficult for the local women to find decent jobs to support their families. In as much as the manual jobs made a huge difference in the household income, they could in no way sustain the livelihoods of the family members, more especially of the women. The women in Wedela indicated that they have the land and soil in their yards for farming (Figure 21), but they do not have adequate water to maintain and sustain their crops. This is another form of generating income, but inadequate water access limits the production of crops. This is further highlighted in the participants' comments in table 2 below:

Table 3: Participant's comments on adequate water access and farming

'I have a small garden outside that I use to grow small crops to cook for my family. I have to include my small garden in the allocation of water we receive. The water we have is little, it is not enough for the garden as well'
'I sell the vegetable I produce from my garden. The money I made helps cover minimum household needs such as candles, paraffin, mielie-meal and toiletries.'

In many societies and cultures, women are generally barred from productive or income-earning labour practices. Generally, women and their families thrive when they have access to a local source of water for food production, income security, a

toilet or latrine, and awareness of appropriate hygiene practices such as hand washing. Access to water has a major impact on food security.. Communities such as Wedela rely on water for small scale farming. Without adequate water access and supply, the ability to grow enough food is jeopardized. In informal settlements, this becomes an even bigger problem.

Figure 21: A woman planting cabbage in her Wedela residence.

This figure shows a woman planting cabbage seeds with no signs of water access next to her. The soil is fertile but she only limited water supply to grow her crops. The crops do not grow healthy and plenty because of a lack of irrigation. The women uses the water provisioned for her household chores for her garden as well. This takes up a lot of her little water needed for household chores and duties.

Many households in the Wedela informal settlement are practicing subsistence and as well as commercial farming. When farmers are unable to maintain their

crops due to lack of water, it can cause additional stress to the existing hunger in the informal settlements. A woman in Wedela informal settlement indicated that she requires lot of water for her big garden. The garden is both for subsistence and as well as commercial farming. When asked how she will be affected if her crops die out due to inadequate water, she replied by saying:

> *"I depend on crop irrigating for health, vast surplus of vegetables. If my garden does not receive enough water, I will not have food to eat and income because there will not be any vegetables to sell"*

4.5. Summary Of Water And Basic Sanitation Access issues

Water availability and access stands out the most, in relation to water quality in these two informal settlements. The need for water has translated into an emergency in both of these informal settlements. Inadequate water and unavailability may slow down the development and the functionality of the community and its members. It is evident that water stress and lack of sanitation disproportionately affect women living in informal settlements than the women living in formal dwellings. Service delivery in the informal settlements of Shawela and Wedela informal settlement has been poor since the establishment of these settlements.

The informal community of Wedela and Shawela have been exercising their dissatisfaction for many years and it seems their grievance will not be attended to anytime soon. Despite the fact that Carletonville is located in one of the world's richest gold-producing regions, a drive through the area and a cursory inspection revealed that the town's roads, storm-water provisioning, potable water reticulation system, sanitation, public housing, and the natural and human-changed environment are not being maintained to the standards that were in place and being maintained until recently, more especially in the informal settlements. The next chapter is the discussion of the findings.

5. CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter discusses the results in correlation of the research questions posted in chapter one. It discusses the impact of inadequate water and basic sanitation on women living in informal settlements, specifically of Wedela and Shawela informal settlement. Furthermore, it discusses how water access influence women's livelihood vulnerability. The following section will discuss inadequate water and basic sanitation in Wedela and Shawela and the vulnerability outcomes of inadequate water and basic sanitation access.

From the establishment of these two informal settlements in the 1950's until now, the study suggests that there has been a change in water and sanitation access. However, the change is not enough to sustain the lives of the women in these informal settlements. For example, the communal taps that were installed are now aged and dysfunctional. This has put stress on the water access because now the demand is paramount but access is limited. The women in Shawela and Wedela become vulnerable when they have no access to adequate water and basic sanitation in their own community that they have been occupants of for many years.

5.2. Inadequate water and basic sanitation in Wedela and Shawela

The findings in chapter four highlighted the safety, health and income security concerns in the informal communities of Carletonville, specifically Wedela and Shawela informal settlement. The households are excluded from formal water and sanitation delivery networks. According to the research done by Evans (2007), the women in informal settlements are compelled to use limited water often of poor quality, from unreliable sources, and at a great expense, since they lack access to piped water and sufficient sanitary facilities. This is the case of Shawela and Wedela, sanitation and the ability to adopt sanitary behaviors are frequently unavailable.

What persists the community of Wedela and Shawela to vulnerability is the exclusion of resources to develop. There is a significant disproportionate need of resources between men and women. Water is a necessity to everyone, but the study shows that women need water more than men. Women are in the most direct contact with contaminated water and human waste because of their domestic duties and obligations. Water, sanitation, and hygiene standards must account for the fact that women, particularly vulnerable women, have a reduced tolerance for harmful compounds. Gender-related differences is highlighted in three points: different needs and priority, power and vulnerability differences, and equity and equality issues.

5.3. Vulnerability outcomes of inadequate water and basic sanitation access

Health, safety and income security are the primary concerns of vulnerability in these informal settlements. A lack of basic needs and services leads to informal settlements having impacts on the well-being of its members. This includes inadequate sanitation which leads occupants to be exposed to sexual assaults, physical assaults, theft and health implications. While each of these informal communities has a significant number of facilities, many of them are dysfunctional and unusable. Where facilities are used, there are specific issues that contribute to their deterioration, such as overuse, vandalism, a lack of awareness, compliance, or contempt for use patterns or regulations. Pierce (2017) attend to the fact that where water infrastructure is in place, access may be uneven and availability may be inconsistent. In the case of Shawela, where a facility would be shared by other nearby households, comes an inevitable health hazard. Shared sanitation, defined as any sanitation facility shared by more than one household, can pose security issues and induce tension and anxiety in women, especially when shared among a large number of people (Kwiringira, Atekyereza, Niwagaba, & nther, 2014).

Women have different needs and priorities than men, and for many years, women in the Shawela and Wedela informal settlements have been living without

adequate water and proper sanitation. Without water or functional latrines at home, women cannot live up to their full potential. The main concern with inadequate water access and supply is that the women cannot run their household to the best of their ability. Cooking for the whole family, cleaning, self-care and irrigation needs substantial amount of water. It becomes almost impossible for women to fulfil their household duties due to insufficient water access. Women need water supply not only for productive uses, but also for domestic purposes. Sanitation and hygiene for good health are their family responsibility. Securing water for both productive and domestic uses is critical in achieving food security and improved informal settlements, particularly in in Shawela and Wedela informal settlements. However, despite the role that women in these informal settlements need adequate water for enhancing food security, health, employments and development, they are still deprived adequate water access. Women's limited access to water is also often coupled with their limited assistance from the men. This is because men are often away from home due to work in the mines, deceased or fled from family responsibilities.

Gender power relations are the core causes of gender inequality and one of the most powerful social drivers of water access (Sen, George, Ostlin, & Ramos, 2007). There is such a strong relationship between expected (or anticipated) power and vulnerability, more especially in people living in poor communities. Further, while the poor experience a deterioration in their powerfulness, raises their vulnerability. With reference to the study, the women then become incapable of developing their lives as a result of water and sanitation exclusion. They have become much powerless in such a way that they are distress about sustainability. The women in both of these settlements are significantly anxious about whether the little water they have will be able to sustain them and their families a longer period of time. The fact that the water tankers in Wedela informal settlement do not come daily to provide adequate water to the households, makes women find alternatives of sourcing water. The women in the informal settlement living without access to improved drinking water – for example from a protected borehole well

or municipal piped supply – are forced to rely on sources such as stream, unprotected and possibly contaminated water sources, or vendors selling water of unverifiable provenance and quality. There is a decrease in social contract between the water supplier and the communities when water utilities fail to deliver basic water services, perpetuating a downward spiral of water inadequacy and fragility in many informal communities, particularly Wedela and Shawela (Aboelnga, 2018).

Individual responses to water and sanitation access are influenced by gender differences and inequality. Understanding gender roles, relationships, and inequities can help explain why people make certain decisions and what their options are.According to Scanlon, Cassar and Nemes (2004), the regulation on Water and sanitation highlights that "equitable access to water, adequate in terms both of quantity and of quality, should be provided for all members of the population, especially those who suffer a disadvantage or social exclusion". Every citizen is deserving of basic services from the government. Services should not only stretch out to the middle class, but also to the marginalized communities living in poverty. As stated by Luh, Baum and Bartram (2013), recognizing that people are different and require different types of support and resources to ensure that their rights are realized is an important part of achieving equity. Measures to compensate for unique discrimination and disadvantages must frequently be done to ensure fairness. A critical research by Water UN (2006) suggests that women can be empowered and the root causes of poverty and gender inequality can be addressed if they have equitable access to water for productive purposes. Lack of access to reliable water sources, on the other hand, may be the root cause of women's limited access to water and a major contributor to the poverty of female-headed households, particularly in the Shawela and Wedela informal settlements.

5.4. Summary

In conclusion, this chapter has discussed the study findings of inadequate water and sanitation access to women residing in informal settlement, particularly

Wedela and Shawela. It suggested that the outcomes of vulnerability are the primary factors of lack of development in these settlements. Chapter 6, making it the last chapter of this research presents the conclusions and as well as the recommendations of this research study.

6. CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

Water and sanitation is an essential basic services for everyone. This study has evidently highlighted the implications associated with lack of adequate water and basic sanitation. This chapter provides a 'check-box' that answers the research question, aims and objectives in chapter 1. This study has successfully answered the key research themes which are: vulnerability as a result of inadequate water and sanitation, water sanitation access and women living in informal settlements. With the contribution of participants living in both Shawela and Wedela, and as well as water and sanitation suppliers, this research study is factual and authentic.

6.2 Summary Of The Research Findings

The main objective of this research was to examine how inadequate water and basic sanitation lead women to vulnerability, using Shawela and Wedela as a case study. The findings generated from the research confirm that the calamity goes beyond water and sanitation access. The root problem lies with the settlement. The geographical positioning of the informal settlements perpetuates the exclusivity of access to water and basic sanitation. Most of the women in these two informal settlements highlighted how they felt is if they are the forgotten, minority people in their own country. The informal settlements of Carletonville have a different socio-economic activity than the formal settlements. There are more women than men in both of these settlements, this ratio affects the daily activities of water collection and management. Water collection on both of these settlements, respectively, is a daunting one. 2% of the population of Shawela collect water from the nearby stream, while 30% of the population collect water from the communal tap. In Wedela settlement, the water tankers do not arrive every day to provide water to the community. On the other hand, water supply is limited; the household needs are paramount, but the water supply is minimum. The women in the Shawela informal settlement are forced to leave their homes to

collect water from either the communal tap stand-points or nearby stream. This movement puts the women at risk of dangers. Furthermore, the greater risk is when they have to access sanitation facilities. 40% of the women in Wedela informal settlement use the bucket system. The bucket/mobile toilets are placed in the isle of the settlements for access. In most cases, two to three households utilize one mobile toilet. This leaves women vulnerable to sexual assaults and physical assaults. The appalling conditions of the pit toilets in the Shawela settlement have health concerns. Health consequences associated with pit toilets are trachoma and diarrhea as a result of poor hygiene practices. The women in Wedela settlement have stretched out their grievance concerning their small gardens. Inadequate water supply affects their income security as they cannot produce vegetables to their standard ability. This hinders them from providing for them and their families.

6.3 Conclusions Drawn From The Research

This research has five possible conclusions that can be drawn, and they are as follows:

1. Inadequate water and basic sanitation access put women in health, safety and income risk. The women have to leave their homes to access sanitation facilities, of which most of them are not in a satisfactory condition. Safety is the key concern when women access water and toilet facilities.

2. The local government provides both these settlement with alternative sanitation facilities and water supplies but they are not sustainable. The water tankers are not consistent, as well as the sanitation provisions. They are not reliable.

3. Development of the informal settlement is reliant on the provision of basic services. Without consistent basic services such as water and sanitation, the community members will not have the opportunity to better their lives.
4. The women in both Shawela and Wedela informal settlements are self-sufficient. However, their capabilities to produce much greater production are limited by inadequate water supply. The available water cannot be equally allocated to each household need.
5. Water is essential for everyone, but women need basic service the most because they are the primary water collectors and users. Women have a larger responsibility of running and managing the household such as cooking, cleaning, nurturing, washing and irrigation of vegetables. It becomes unfortunate when women cannot meet those needs as a result of inadequate water.

6.4. Study Implications

Study implication cannot be separated from research. It is important that the implications be addressed together with the final conclusions. The implications are listed below:

- This study applied gender segregation as it focused more on women than men. The study suggested that women are in dire need of water and sanitation resources than men. The domestic roles influenced this research to pin women as a point of focus in the informal settlements. However, the reality is that both men and women need the basic services, but because of the fact that gender perceptions are perpetuated by societal customs and traditions, women issues are then more urgent.

- It cannot be assumed that the findings of inadequate water and basic sanitation access in this case study will apply to another case study. Shawela and Wedela are settlements that are under Merafong

Municipality, and this municipality has its own budget allocation, assets and socio-economic activities than other. The accounts may be similar but the background is different.

- It is not safe to assume that the situation in both Shawela and Wedela informal settlements will remain as it is forever. South Africa is a democratic nation, consequently, should the new government take governance there could be better distribution of resources and basic services. When this occurs, development would take place in these informal settlements through new policies and regulations. Therefore, a thorough analysis and monitoring of the progress of local governance for a longer period is therefore required.

- Qualitative research study needs a study of more than the six months this research was allocated to. The picture portrayed here is the picture that shows the current situation, it does not show what the future looks like for these two settlements. Not every data can be collected with a shorter period of time, therefore a longitudinal study is required.

- Within the settlements, it could be that the community members themselves are to be blamed for the poor conditions of the alternative water and sanitation facilities. Examining how South African communities are significantly retaliated, it would be no wonder that they themselves purposefully destroy the facilities as means of demonstration.

6.5 Recommendations For Policy

In conjunction with the research results provided in chapter four and the discussions in the preceding chapter, the study suggests the following recommendations that are likely to develop the women's well-being in the

informal settlements and inclusion in Integrated Water Resources Management (IWRM):

- The community and the government could consider building a borehole to source water from the ground. Having ground water as an asset would be advantageous to the communities as it economically friendly. This does not mean it will be the primary and only source of water for the settlements, however it poses as one of the means of extracting water. It adds to the existing primary water collection method.

- The government should consider building permanent ventilated sanitation structures for each household in both of these settlements. This will reduce the movement of women leaving their home to access toilets. There will be declining numbers of assaults in the settlements. The sanitation facilities could have a tap next to them as one of the measures to implement private water access and supply.

- The women need to participate in capacity building. Some of the alternative infrastructure provided by the local government should be protected and managed. The women should have a mandate to promote alliance with the men and the youth to sustain the little and last that they have in their settlements. This includes the development of skills in sustaining income from crop production, decision-making, community participation, governance, confidence building and communications. This will prolong the quality of the facilities, while development takes place for the settlements.

- There is a need for the government to redesign the informal settlement policies. The informal settlements should be included in the budget allocations of local infrastructures. The persisting exclusion of basic

services in the informal settlements are due to the fact that the settlements are not recognised as part of the township. A new paradigm shift would prioritize that water and sanitation services reach those marginalized settlements.

6.6 Suggest For Future Research

Water and sanitation in South Africa is an urgent topic for water management scholars to research. However the angle could be, at the end of it, it is worth making a study on. Some communities are supplied with adequate water, but the quality of the water is poor. Therefore, it is suggested that the next scholar could look into examining the quality of water supplied to the marginalized communities of South Africa. It would be beneficial to the study if it is longitudinal as in-depth research would effectively highlight the current status and as well as the future.

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LIST OF APPENDICES

Appendix 1: Ethical Certificate of Approval

THE INDEPENDENT INSTITUTE OF EDUCATION

Reference: M.021220
Enquiries: [redacted]

3 December 2020

Student name: D. Korie
Student number: [redacted]
Brand and campus: IIEMSA

Approval of MPhil in Integrated Water Management Proposal

Thank you for submitting and defending your proposal titled:

Women's Vulnerability to Adequate Water and Basic Sanitation Access: The Case Study of Carletonville Informal Settlements

We are pleased to inform you that the Research and Postgraduate Committee considered and has approved your research proposal. Ethics clearance has also been granted.

The Research and Postgraduate Studies Committee made some further suggestions that can assist you with your study. These should be attended to under the guidance of your supervisor.

The Committee confirms that Linda Downsborough has been appointed as your supervisor.

If you have any questions, please feel free to contact the campus staff or your supervisor directly.

All the best with your research.

Yours sincerely,

[redacted]

Dr B. van Wyk
Dean: Research and Postgraduate Studies
The Independent Institute of Education

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Appendix 2: Explanatory Information And Consent Form

Explanatory information sheet and consent form for participants

To whom it may concern,

My name is Dintle Korie and I am a student at IIE MSA. I am currently conducting research under the supervision of Ms Linda Downsborough about how does water access influence women's livelihood vulnerability in informal settlements. I hope that this research will enhance our understanding of how are the women's vulnerability being affected by inadequate water and poor basic sanitation access in Merafong's informal settlements?

I would like to invite you to participate in my study. In order to explain to you what your participation in my study will involve, I have formulated questions that I will try to fully answer so that you can make an informed decision about whether or not to participate. If you have any additional questions that you feel are not addressed or explained in this information sheet, please do not hesitate to ask me for more information. Once you have read and understood all the information contained in this sheet and are willing to participate, please complete and sign the consent form below.

What will I be doing if I participate in your study?

I would like to invite you to participate in this research because you are a resident in this community, and you have the first-hand information to the situation prevailing. Your participation will assist add to the research already collected. If you decide to participate in this research, I would like to interview you by means of voice recording and also by video recording if you give consent.

You can decide whether or not to participate in this research. If you decide to participate, you can choose to withdraw at any time or to decide not to answer particular interview questions.

Are there any risks/ or discomforts involved in participating in this study?

Whether or not you decide to participate in this research, there will be no negative impact on you. There are no direct risks or benefits to you if you participate in this study. You might, however, indirectly find that it is helpful to talk about your current problems with regards to water and sanitation access in your community. If you find at any stage that you are not comfortable with the line of questioning, you may withdraw

or refrain from participating.

Do I have to participate in the study?

- Your inclusion in this study is completely voluntary;
- If you do not wish to participate in this study, you have every right not to do so;
- Even if you agree to participate in this study, you may withdraw at any time without having to provide an explanation for your decision.

Will my identity be protected?

I promise to protect your identity. I will not use your name in any research summaries to come out of this research and I will also make sure that any other details are disguised so that nobody will be able to identify you. I would like to ask your permission to record the interviews, but only my supervisor, I and possibly a professional transcriber (who will sign a confidentiality agreement) will have access to these recordings. Nobody else, including anybody at IIE MSA, will have access to your interview information. I would like to use quotes when I discuss the findings of the research, but I will not use any recognisable information in these quotesthat can be linked to you.

What will happen to the information that participants provide?

Once I have finished all interviews, I will write summaries to be included in my research report, which is a requirement to complete my Master of Philosophy in integrated water Management. You may ask me to send you a summary of the research if you are interested in the final outcome of the study.

What happens if I have more questions about the study?

Please feel free to contact me or my supervisor should you have any questions or concerns about this research, or if there is anything you need to know before you decide whether or not to participate.

You should not agree to participate unless you are completely comfortable with the procedures followed.

My contact details are as follows:
Dintle Korie
[redacted]

The contact details of my supervisor are as follows:

Ms Linda Downsborough

Consent form for participants

I,_____, agree to participate in the research conducted by (your name) about (insert aim of research/brief summary of exactly what you are researching).

This research has been explained to me and I understand what participation in this research will involve. I understand that:

1. I agree to be interviewed for this research.
2. My confidentiality will be ensured. My name and personal details will be kept private.
3. My participation in this research is voluntary and I have the right to withdraw fromthe research at any time. There will be no repercussions should I choose to withdraw from the research.
4. I may choose not to answer any of the questions that are asked during the research interview.
5. I may be quoted directly when the research is published, but my identity will be protected.

_____ _____

Signature Date

Consent form for audio-recording/video recording

I,_____, agree to allow (your name) to audio record my interviews as part of the research about (insert aim of research/brief summary of exactly what you are researching).

This research has been explained to me and I understand what participation in this research will involve. I understand that:

1. My confidentiality will be ensured. My name and personal details will be kept private.
2. The recordings will be stored in a password-protected file on the researcher's computer.
3. Only the researcher, the researcher's supervisor and possibly a transcriber (whowill sign a confidentiality agreement) will have access to these recordings.

_____ _____

Signature Date

Appendix 3: Interview Guide
Social Questions

1. How many are you living in the house?
2. Who collects water from the source on a daily basis?
3. How much of a distance is it from the house to the water source point?
4. How much water do you collect on a daily basis?
5. Is the water collected available daily?
6. Does the water collected meet all the household needs?
7. Are you satisfied with the quality of water you collected?
8. Have you reported water inaccessibility in your community/house?
9. How has water inaccessibility affected your household chores and responsibilities?
10. Do you have a private latrine?
11. Where do you dump all the waste?
12. Approximately how many people use the latrine?
13. What is the condition of the latrine?

Technical questions

14. What problems have you been facing regarding water access?
15. What risks do you think are there with the current water problems?
16. Are you aware about the source point of the water?
17. Have you reported the condition of the latrine?
18. Is there a board or committee that addresses your water access problems?
19. What alternatives of accessing water would you prefer besides the current one
20. What would you love to be improved in this area relating to water and sanitation supply?

Appendix 4: Survey Guide for Shawela Informal Settlement

SHAWELA INFORMAL SETTLEMENT (Khutsong)
COMMUNITY SURVEY (Research) by Dintle Korie (Masters Candidate)

TOPIC: WOMEN'S VULNERABILITY IN ADEQUATE WATER AND BASIC SANITATION ACCESS: CASE STUDY OF MERAFONG INFORMAL SETTLEMENTS.

1. **What is the Primary Source of water? (Tick applicable box)**
   □ Home Tap
   □ Communal Tap
   □ Water Tanker
   □ Nearby Stream
   □ Other:_____

2. **Is the water enough for you and your family? (Tick Yes or No)**
   □ Yes
   □ No

3. **How long does it take you to reach the source of water? (Tick applicable box)**
   □ 0 to 30min
   □ 30min to 1hr
   □ 1hr to 2hrs
   □ 2hrs and more

4. **Does your husband or any male figure help you collect water? (Tick applicable box)**
   □ Yes
   □ No

5. **How much water do you collect daily?**
   □ 1 bucket of 20L
   □ 2 buckets of 20L
   □ 3 buckets of 20L
   □ 3 bucket of 20L
   □ 4 buckets and more

6. **How many people use the water in this house?**
   _____

7. **What do you do for a living?**
   _____

8. **Is the water collected enough for you and your family needs? (Tick applicable box)**
   □ Yes
   □ No
9. **How does inadequate water limit your cooking, washing and self-care duties?**
   _____

_____
_____

10. **Do you have a garden that needs water for crops to grow? If yes, how much water does it need daily?**

    _____
    _____

11. **How will you be affected if your crops die out due to lack of adequate water?**

    _____
    _____

12. **Do you depend on your vegetables for an income?**

    _____

13. **How does inadequate water limit your cooking, washing and self-care duties?**

    _____
    _____
    _____

14. **Are you dependent on adequate water for personal development? If so How?**

    _____
    _____

15. **Do you have functional toilet? Yes □ No □**
16. **Do you have a safe toilet? Yes □ No □**
17. **Do you have a private toilet at the comfort of your home? Yes □ No □**
18. **What are the health concerns regarding the latrine you are currently utilizing?**

    _____
    _____
    _____

19. **What are the safety concerns regarding the latrine you are currently utilizing?**

    _____
    _____
    _____

20. **Approximately how many people use the same latrine you are using?**

    _____

21. **As a woman, how do you feel having to walk from your home to access latrines?**

    _____
    _____
    _____

22. **What risks are you prone to with longer distance to latrine access?**

    _____
    _____
    _____

23. **How would you like to see access to water and sanitation facilities improved for you and your family?**

_____
_____

Appendix 5: Survey Guide for Wedela Informal Settlement

WEDELA INFORMAL SETTLEMENT (Masakeng Wedela)
COMMUNITY SURVEY (Research) by Dintle Korie (Masters Candidate)

TOPIC: WOMEN'S VULNERABILITY IN ADEQUATE WATER AND BASIC SANITATION ACCESS: CASE STUDY OF MERAFONG INFORMAL SETTLEMENTS.

1. **What is the Primary Source of water? (Tick applicable box)**
   □ Home Tap
   □ Communal Tap
   □ Water Tanker
   □ Nearby Stream
   □ Other:_____

2. **Is the water enough for you and your family? (Tick Yes or No)**
   □ Yes
   □ No

3. **How long does it take you to reach the source of water? (Tick applicable box)**
   □ 0 to 30min
   □ 30min to 1hr
   □ 1hr to 2hrs
   □ 2hrs and more

4. **Does your husband or any male figure help you collect water? (Tick applicable box)**
   □ Yes
   □ No

5. **How much water do you collect daily?**
   □ 1 bucket of 20L
   □ 2 buckets of 20L
   □ 3 buckets of 20L
   □ 3 bucket of 20L
   □ 4 buckets and more

6. **How many people use the water in this house?**
   _____

7. **What do you do for a living?**
   _____

8. **Is the water collected enough for you and your family needs? (Tick applicable box)**
   □ Yes
   □ No
9. **How does inadequate water limit your cooking, washing and self-care duties?**
   _____

_____
_____

10. **Do you have a garden that needs water for crops to grow? If yes, how much water does it need daily?**

    _____
    _____

11. **How will you be affected if your crops die out due to lack of adequate water?**

    _____
    _____

12. **Do you depend on your vegetables for an income?**

    _____

13. **How does inadequate water limit your cooking, washing and self-care duties?**

    _____
    _____
    _____

14. **Are you dependent on adequate water for personal development? If so How?**

    _____
    _____

15. **Do you have functional toilet? Yes □ No □**
16. **Do you have a safe toilet? Yes □ No □**
17. **Do you have a private toilet at the comfort of your home? Yes □ No □**
18. **What are the health concerns regarding the latrine you are currently utilizing?**

    _____
    _____
    _____

19. **What are the safety concerns regarding the latrine you are currently utilizing?**

    _____
    _____
    _____

20. **Approximately how many people use the same latrine you are using?**

    _____

21. **As a woman, how do you feel having to walk from your home to access latrines?**

    _____
    _____
    _____

22. **What risks are you prone to with longer distance to latrine access?**

    _____
    _____
    _____

23. **How would you like to see access to water and sanitation facilities improved for you and your family?**