

**FACTORS AFFECTING HOUSEHOLD WATER SECURITY
IN THLABANELLO INFORMAL SETTLEMENT
IN THE CITY OF WINDHOEK**

by

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Declaration

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Abstract

Water security is defined as “*reliable access to water of sufficient quantity and quality for basic human needs, small-scale livelihoods and local ecosystem services, coupled with a well-managed risk of water-related disasters.*” Conversely, water insecurity is described as limited or lack of access to affordable, safe, and acceptable quality water, which is regarded a substantial threat to public health and overall well-being of people. Although it is a global challenge, many developing countries particularly find it difficult to sustain adequate water supplies necessary for basic use by humans at household level as well as for national economic and social advancements, which leaves large populations water insecure. This challenge is particularly grave in poor urban households residing in informal settlements where provision of basic services is not guaranteed mainly due to the illegal status of these settlements and uncontrolled population growth.

This research study therefore focused on analysing the underlying factors that affect household water security in the Thlabanello informal settlement in Windhoek, Namibia. This was done through qualitative research methodology situated in an interpretive paradigm. Data was collected through various data collection methods, namely, focus group discussions, key informant interviews, secondary data review and direct observation of the study area after which the qualitative data was analysed to formulate the study findings.

The study found that household water security in Thlabanello is affected negatively by multiple interlinked factors including, amongst others, high population growth, illegality of the settlement, low household incomes, Lack of public health information, and poor sanitation and hygiene practices at household level. Thus, the study confirms that there is a degree of household water insecurity at the settlement.

To improve household water security in Thlabanello, the study recommends that the City of Windhoek should adopt pro-active service planning strategies and approaches in addressing the water security challenges at the settlement. In conclusion, the study also recommends the formalisation of the Thlabanello settlement, involvement of the community in water supply design of the settlement, and cordoning off of the Goreangab Dam to restrict access to the public, as means to promote household water security.

Keywords

Water security, Household water security, Informal settlements, Urban water demand, Water and Sanitation

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Acronyms

ACAPS - Assessment Capacities Project

CCHE - Centre for Community Health and Evaluation

CoW – City of Windhoek

FGs – Focus groups

FGD – Focus group discussions

HDA - Housing Development Agency

KRC – Khomas Regional Council

MAWF – Ministry of Agriculture, Water and Forestry

MDGs - Millennium Development Goals

NCWSC - Nairobi City Water and Sewerage Company Ltd

NPC- National Planning Commission

NSA – Namibia Statistics Agency

SDGs – Sustainable Development Goals

SSA – Sub Saharan Africa

UN – United Nations

UN-Habitat - United Nations Habitat

UN-Water - United Nations Water

UNESCO - United Nations Educational, Scientific and Cultural Organization

UNICEF - United Nations Children's Fund

WAP - Water access points

WHO – World Health Organization

WOP - Water Operators Partnerships

WUP - Water Utility Partnership

WSUP - Water and Sanitation for the Urban Poor

1. CHAPTER ONE: INTRODUCTION

1.0 Introduction

Water is a vital resource in the ecosystem, and human livelihood highly depends on it. Hence, availability and accessibility to essential services such as water supply is a cornerstone for sustainable human development (Showkat & Ganaie, 2012; Tissington, 2011). So important is water on the global agenda that it is prioritised as one of the 17 Sustainable Development Goals (SDG). The SDGs are a plan of action that set the universal goals that are meant to embody global efforts towards sustainable and inclusive development for all. The different goals and targets represent the level of development in the different focus areas that are to be achieved by the year 2030 (Osborn, Cutter, & Ullah, 2015). The SDGs are building on the experiences and challenges of the Millennium Development Goals (MDGs) to achieve what they were unable to complete by the year 2015 (UN, 2015). Furthermore, SDG 6 is to ensure availability and sustainable management of water and sanitation for all by setting specific targets. As part of this SDG, it targets to achieve universal and equitable access to potable and affordable drinking water for everyone by the year 2030 (UN, 2015).

Historically, human settlement developments across the globe were determined by the availability of water as a resource, and to date standards and living conditions are highly determined by accessibility and availability of water as a resource to sustain life (WHO, 2010). Water supply to informal settlements inevitably tends to be unsustainable, with destructive effects on the living standards and conditions within such areas (Muzondi, 2014). In view of supply, formal settlements are water secure as they are prioritised in water policies leading to more reliable and sustainable supply of potable water, compared to informal settlements where water supply is unsustainable (Uitto & Biswas, 2006).

Water insecurity, which is described as limited or lack of access to affordable, safe, and acceptable quality water, is perceived as a substantial threat to public health and overall well-being of people. However, it is estimated that globally, about 4 billion people experience severe water scarcity for at least one month annually, and about half a billion people experience continuous severe water scarcity (Mekonnen & Hoekstra, 2016). Water security, especially in informal settlements is highly compromised due to the illegality of these settlements, as service provision to such settlements is not prioritised compared to the formalised segments of urban areas. Marginalised communities including the poor and migrants often carry the burden of water insecurity, thereby creating a distinct link between economic status and water (in)security

(Wutich & Jepson, 2019). Due to high unemployment rates in the Thlabanello informal settlement, people live in abject poverty with a high risk of household water insecurity. Therefore, ensuring household water security is imperative and highly instrumental in poverty eradication efforts and enhances economic development in the area.

Despite its importance to human life, water is very scarce in many parts of the world and access to safe drinking water is a challenge. It is estimated that billions of people face serious water problems which vary from inferior water quality, scarcity, poor sanitation as well as natural disasters related to water such as droughts or floods (Young, *et al.*, 2015). Despite worldwide and national level efforts through deliberate water policy interventions, including the 2000-2015 Millennium Development Goals (MDGs) and the 2015-2030 Sustainable Development Goals (SDGs), more than 1.8 billion people globally, the majority of them being in the Global South, live without proper access to potable drinking water (Onda, *et al.*, 2012). Ingestion of contaminated water remains the biggest cause of widespread water-related communicable diseases globally and a high burden of preventable mortality especially in low and middle-income countries (Clasen, *et al.*, 2014; Onda, *et al.*, 2012; Prüss-Ustün, *et al.*, 2014).

As a result, many developing countries may find it difficult to sustain adequate water supplies necessary for basic use by humans at household level as well as for national economic and social advancements, which leaves large populations water insecure (Boretti & Rosa, 2019). In the city of Cochabamba, Bolivia, researchers found that the insufficient and unreliable water supply system by the municipality caused uncertainty amongst its inhabitants, which further exacerbated water insecurity in some parts of the city. This effect was even more severe for those living in the informal settlements on the southern outskirts of the city with greater consequences (Wutich & Jepson, 2019). The main consequences of water insecurity and lack of sanitation services in urban setups is environmental contamination, which promotes the widespread of communicable diseases and leads to poor conditions of living, especially in densely populated areas. Public health and economic development are also directly affected by the lack of water and sanitation facilities. There is also a risk of possible contamination of domestic use and drinking water, when unsafe water is used for cleaning kitchen utensils and plates that are used to handle food.

Water security as an emerging concept encompasses various dimensions such as quality, quantity, affordability and access that are used to comprehensively describe the state of each community or household depending on the scale of measurement (Wutich, *et al.*, 2017). It has

come under the spotlight due to a combination of bio-physical and social factors such as poor rainfall, limited water sources, lack of physical water infrastructure, slow implementation of social policies, uncontrolled population growth; that pose a serious threat to it, making it necessary for international dialogue and research for a comprehensive understanding of this multi-level concept (UN, 2015). These efforts will collectively bring forth solutions to improve the state of water security at all levels, including household, by making water a more accessible and affordable resource to all through equitable policies. At household level, water insecurity occurs due to a lack of access to safe, adequate, reliable and affordable water, which often as a consequence leads to health implications such as transmission of waterborne diseases, dehydration, depression or anxiety; as well as social consequences like fear, discrimination and shame (Wutich & Jepson, 2019).

Amongst others, dynamics such as industrial growth, increasing population, and a dry climate have immensely impacted on Namibia's water supply for many years, setting an alarm for water insecurity in the country (Remmert, 2016). Windhoek with its uncontrolled growth and expanding informal settlements that are densely populated intensify pressure on the demand for water as a resource (Weber & Mendelsohn, 2017). A mismatch between demand and supply and inadequate water infrastructure in Thlabanello settlement poses a significant risk to water security. Therefore, this research seeks to study the underlying factors that affect water security in the chosen study area of the Thlabanello informal settlement. The purpose is to recognise the socioeconomic dynamics that contribute towards the state of water (in) security for the community at household level.

Thlabanello settlement was purposefully selected, as it is one of the emerging and fast-growing informal settlements on the outskirts of the city of Windhoek. The rapid growth is greatly attributed to the availability of vast vacant un-serviced land on the northwestern side of the city boundaries, on which landless people, mostly immigrants, settle illegally in search of employment opportunities (CoW, 2012). A preliminary investigation by the researcher has found that the settlement faces water and sanitation challenges amongst others, as a result of the unavailability of essential services that are provided by the City council to the formalised areas of the city. The lack of essential public services such as electricity, schools, clinics and sewerage, coupled with the poorly distributed water supply networks within the Thlabanello settlement has left the area with compromised social development and water security concerns.

Thus, this chapter introduces the research problem, focusing particularly on determinant factors of water security in the Thlabanello informal settlement. It also outlines the objectives of the study and limitations thereof in this chapter. In an attempt to achieve the research objectives, the study aims to study key social, environmental, economic and other related factors that affect the state of water security in the settlement.

The background to this chapter provides a situation analysis of Namibia's water security with particular focus on Windhoek as a city as well as informal settlements. This will provide a relevant history and general overview of the area of study, giving a basis for further arguments in analysing the research problem and additional discussions of the research findings.

1.1 Statement of the problem

Statistics on urban coverage on household water security especially in Africa overlook anomalies in supply, intra-urban variances, and other complexities as they are not a true reflection of the scale of water security in informal settlements (Smiley, 2013; Nganyanyuka, *et al.*, 2014). Hence, there is a need to systematically analyse the combination of factors that influence inadequate water access especially for urban informal settlements which inexplicably accommodates most of SSAs urban population to find solutions to these challenges.

As urban populations grow mainly as a result of an influx of people from rural areas in search of employment, access to services and improved livelihoods; urban areas fail to provide the much-needed essential services to the increasing population. In Namibia, the urban population grew from 33 percent to 42 percent of the total population between 2001 and 2011 (Namibia Statistics Agency (NSA), 2012) with the highest growth rates concentrated in urban areas. The population of the City of Windhoek increased vastly over the years and statistical projections indicate a possible growth rate of about 24 percent in most urban areas in Namibia by 2041 (NSA, 2014). The municipality is straining to meet urban land demands caused by this rapid growth in Windhoek, which ultimately led to extensive growth of unplanned squatter areas on the periphery of the city. These informal settlements continue to expand despite the lack of municipal services such as water, electricity and sanitation, thereby putting these areas at high risk of household water insecurity.

Van Rensburg (2006) in his study on water security in Windhoek found that the water demand and development dynamics in many mega cities are quite similar and if not addressed soon enough, it could lead to a water crisis in some areas. The recommendations were to artificially recharge underground aquifers around the city of Windhoek for future use and to improve water

demand management by the municipality to cater for all the residents. Although the study outlined some options that could be explored as possible solutions to water security in the entire central Namibia, it fell short in identifying the factors affecting household water security in different residential areas in the City of Windhoek.

This study will therefore focus on specific water security issues in Thlabanello, an informal settlement in the City of Windhoek. This will be done by investigating all dimensions of household water security, i.e., accessibility, quantity, resilience to water-related disasters, quality and affordability. The approach was to exhaustively investigate socio-economic factors including water collection as well as storage norms and practices of the community that have an influence on household water security. The study will further interrogate policy and planning issues and determine the stance of the local authority in safeguarding water security in the area.

There is generally sufficient literature, specifically on household water security worldwide and in the region, but no previous research or publication focused on the chosen geographical area of study. Thlabanello informal settlement is one of the most recent but fast-growing informal settlements in Windhoek without essential municipal services, which is the main driving factor for conducting this research. Thus, this research study will analyse factors to determine the extent of the problem and the possible social, technical, policy or governance issues that could be determining factors to the ongoing circumstances. The unavailability of municipal services thus potentially increases the risk of water insecurity for these households.

Rapid growth, uncontrolled population density and inadequate physical water infrastructure in informal settlements position these areas at a high probable degree of water insecurity (Chikoto, 2009). All the above-mentioned factors indicate potential shortcomings and public health concerns on household water security in informal settlements, whilst also presenting research gaps that authenticates the need for this research study.

1.2 Objectives

The overall aim of this research study is to investigate factors affecting household water security in the Thlabanello informal settlement in the City of Windhoek.

The objectives of this study are to:

- Narrate the overall status of household water security in the Thlabanello informal settlement of Windhoek.
- Identify and analyse the factors affecting household water insecurity at the area of study.
- Recommend possible solutions and contribute to the literature and scholarly understanding on household water (in) security in informal settlements.

1.3 Research questions

The following are the research questions that guided this study:

- What is the current state of water security in the Thlabanello Settlement?
- What are the factors contributing to household water insecurity in the settlement?
- What are the impacts of household water (in) security on the community's health and wellbeing?
- What recommendations can be made to improve household water security in Thlabanello?

1.4 Structure of the thesis

This thesis is arranged in five chapters. Chapter one offers a general overview of the study through a background to the research topic, a problem statement, purpose, objectives, scope and limitations of the study. The chapter also presents the general outlook on Namibia as a country and focuses on Windhoek as the area of study.

The second chapter presents a collection of literature relevant to the research topic including previous research on water security, especially in developing countries.

Chapter three outlines the research design and methodologies applied in conducting the study. It further explains how the data collected was analysed to attain the results and conclusion reached in the research.

Chapter four presents the findings of the study, starting with the state of household water security in the settlement before moving to the factors that contribute to the state of water (in) security at household level.

The final chapter of the thesis contains the conclusions of the research study and recommendations for future researchers.

1.5 Relevance of the study

Developing nations have been experiencing higher urbanisation rates compared to developed countries. The level of urbanisation in the developing world increased from 25.4 percent to 33.6 percent in 1970 to 1990, respectively. By the year 2011, the global urban population stood at 3.6 billion and it is estimated that by the year 2050 it will increase by 72 percent to 6.3 billion should the population trends continue (UN, 2012). This uncontrolled steep growth resulted in the expansion of informal settlements, also known as slums or squatter settlements, as mega-urban centres continue increasing in size (Niva, *et al.*, 2019). The obvious effects of rapid urbanisation such as high population density in the informal settlements presents large and destructive impacts on the living conditions of the urban poor hence provision of basic services such as water and sanitation are crucial in mitigating serious calamities (Liddle, 2017). As with other developing countries, Namibia is not spared of the urbanisation trend, steeply increasing the urban population in most urban centres in the country, but mostly in the capital city Windhoek (NSA, 2012).

Namibia has made great strides in the provision of water services to both urban and rural areas, already surpassing its own targets in the second National Development Plan by reaching more than 95 percent of the urban population and more than 80 percent of the rural population by the year 2006 (MAWF, 2008). Progress has however been slow to reach 100 percent coverage, with mostly the poor in remote rural areas and in informal settlements being without this essential service, which culminates into other social development issues in those communities (Remmert, 2016).

As informal settlements are some key areas prone to water insecurity issues, the research questions in this study are thus attempting to determine the underlying factors affecting water security in Thlabanello, which is an informal settlement in the City of Windhoek, Namibia. This qualitative research will investigate the social, technical, policy or governance issues that

western coast which is separated from the main inland by the stretching great escarpment. High temperatures and dry spells with inconsistent rainfall patterns experienced in Namibia are direct consequences of the semi-arid climatic conditions of the country, making it one of the driest countries in southern Africa (De Bruine & Rukira, 1997). This makes it more imperative to gauge water security issues at national, regional and local levels.

Namibia is one of the most sparsely populated countries in the world, with a surface area of a little over 824,000 km² and a population of 2.1 million people according to the National Population Census Survey of 2011, which translates into a national population density of 2.6 people per square kilometer (NSA, 2012). Due to the various terrestrial settings in Namibia, only limited areas have environmental capacity to sustain human life, with the desert and high mountainous areas being inhabitable mostly due to unavailability of water (De Bruine & Rukira, 1997).

The majority of the Namibian population is concentrated in the rural areas with few economic opportunities, this drives a vast number to move to urban areas searching for improved livelihood, with Windhoek being the main centre of attraction (Frayne, 2007). The country experienced high rural-urban migration over the years as people moved in search of employment, better services and improved livelihoods in urban areas. This phenomenon led to the mushrooming of informal settlements on the outskirts of many urban centres including Windhoek (Pendleton, Crush & Nickanor, 2014).

According to the Namibia 2011 Population and Housing Census Main Report of 2011, 98 percent of the urban population in Namibia have access to safe water. This report also reported significant achievement in the average national water coverage of 80 percent (NSA, 2012). However, this coverage measures different levels of access ranging from a connection inside the household to a prescribed walking distance of not more than 2 kilometres (MAWF, 1993). The national statistics available on water coverage in urban areas in Namibia do not reflect the reality of water insecurity in informal settlements, as the coverage in poor urban settlements is much lower than the national coverage, which can be greatly attributed to internal urban development inconsistencies (Schmidt, 2009).

Namibia as an arid country needs to jealously safeguard its water resources to ensure water security for all inhabitants. Water provision is only one of the priorities amidst other struggles of a typical developing country such as urbanisation and poverty (NPC, 2004). Water scarcity

has always been a problem in Namibia due to climatic conditions and geographic temperament of the country. Therefore, national policy developers and programme implementers need to particularly prioritise water and sanitation issues as part of ongoing development plans. Overall, poor policy execution has hampered the water sector in Namibia since independence, mostly due to low capital investment in the sector, lack of technical capacity and skills, lack of regulation and enforcement, and poor stakeholder coordination (Remmert, 2016).

Windhoek is the biggest urban centre in Namibia and the capital city of the country. Located in the Hochland Mountains in the central part of the country, the city has become the main attraction of many migrants from different parts of the country due to its opportune location.

1.7 Synopsis of the Windhoek City

This section provides a brief overview of the City of Windhoek, focusing on population growth and the subsequent expansion of informal settlements. The section also highlights water demand issues faced by the City of Windhoek considering rapid population growth.

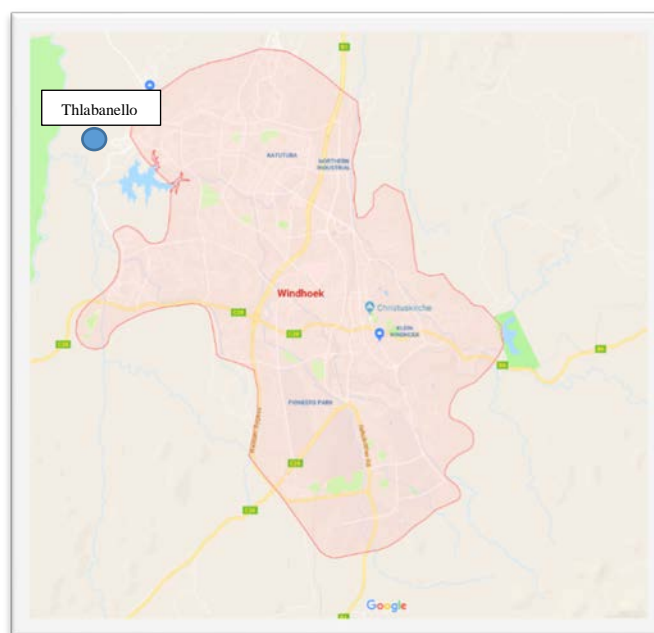


Figure 1.2: Map of the city of Windhoek

Source: Google Maps

The city of Windhoek is located in the central part of the country, to the east of the Khomas Hochland plateau engulfed by mountainous terrains with flat plains on the Northern side of the city being the only future expansion option for its boundaries (KRC, 2015). This growth

limitation negatively affects sustainable land delivery for residential or business purposes. By 2013, Windhoek urbanisation rate stood at 5.4 percent, with 3.9 percent being intra-country migration (CoW, 2013). It is further estimated that about 67 percent of migrants settle in informal settlements on the North-western outskirts of the city of Windhoek, which already accommodates more than 70 percent of the city's population (CoW, 2012).

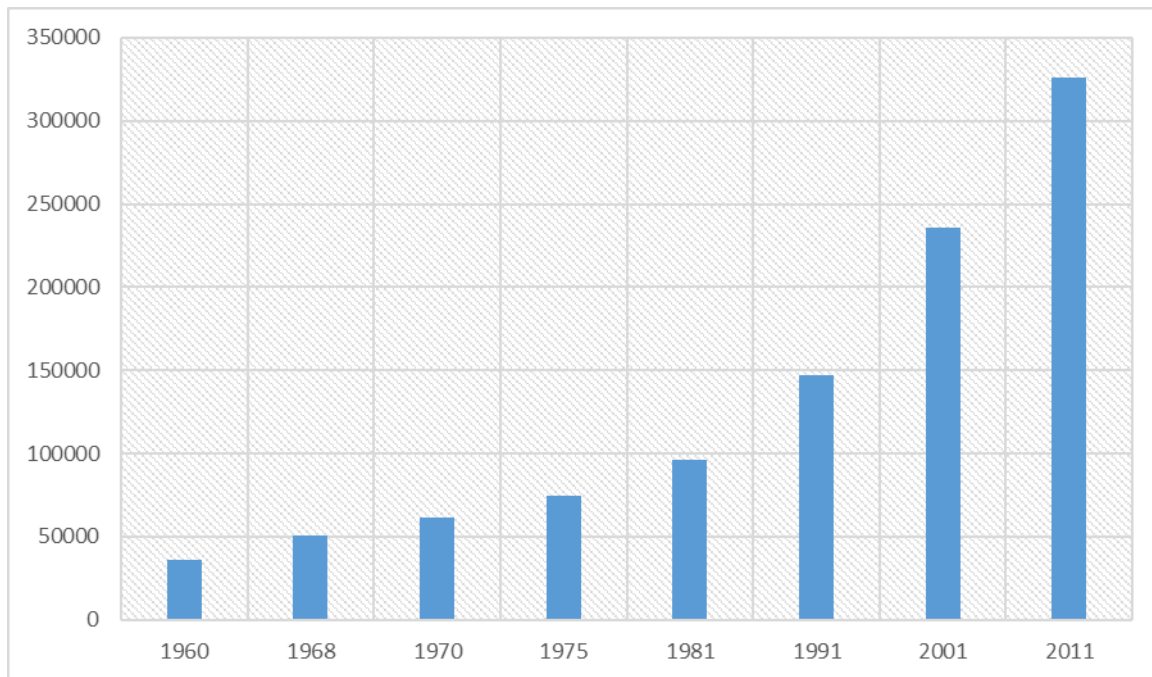


Figure 1.3: Population growth of the Windhoek from 1960-2011

Sources of data: Population Census reports of 1991, 2001 and 2011; City of Windhoek reports.

The population of Windhoek has risen sharply over the years doubling since the country's independence in 1990 to 2011, with the informal settlements absorbing the larger proportion of immigrants (NSA, 2012). The high population growth rate sharply increased water demand in the city which has limited water sources (Maanda & Vernouman, 2009).

Windhoek is a typical example of how water security in urban slums can be worsened by rapid urbanisation and population growth. Of over 320,000 inhabitants in Windhoek, the majority i.e., 64 percent live in unimproved housing structures in the informal settlements (Weber & Mendelsohn, 2017). These informal settlements are characterised by high population density, with corrugated iron housing structures erected across hills and valleys as people compete for places to live. Uncontrolled growth has driven the expansion of informal settlements in

Windhoek since the early 1990s through urban sprawl, when the so-called temporary reception areas were created to accommodate the high influx of mostly unemployed immigrants (Weber & Mendelsohn, 2017). The number of shacks in Windhoek's informal settlements increased by 92 percent from 2001 to 2011, bringing the total number of shacks to just over 26,000. The number of shacks in Windhoek is expected to rise to 51,000 by the year 2021, if the growth continues at the same rate.

The inhabitants of different informal settlements of Windhoek have limited access to potable water due to the inability to afford monthly water fees. This is greatly attributable to the high unemployment rate amongst the inhabitants, as many migrants lack skills to participate in many economic activities available in the urban set up. This situation forces some residents in informal settlements to find alternative water sources in their proximity, such as dams and rivers for household water consumption, which are usually unsafe for human consumption (CoW, 2013).

There are three different types of water access points (WAP) installed in Windhoek's informal settlements. The most common one is a public tap operated with a prepaid card that is rechargeable at the municipal offices, with which the community can access the public WAP and purchase water. The second type of WAP is a community tap installed for restricted users residing in a geographically defined community known as a housing group. Unlike the prepaid card system, these users collect water from a metered tap, and the responsible person collects household contributions to settle the water bill at the municipality. The third one is when the households pay rent to the municipality for a housing stand, where they can have access to water and the cost recouped through rental payments (CoW, 2012; CoW, 2013).

Windhoek's water demand is increasing as the population grows and economic activities expand; however, the current water sources are limited. The water supply to Windhoek is mainly through the bulk water supplier, Namwater, and it is sourced from three dams namely, Von Bach, Swakoppoort and Omatako Dams. Other sources of water are Goreangab Reclamation Plant and underground water around Windhoek (HRDC, 2007). The Reclamation Plant, which is the oldest in the world reclaims effluent water to produce very high-quality water, which is used to blend with water from the dams or underground to supply the city with potable water. Over the past years, Windhoek has been struggling to supply water to all the residents as water levels are low in the water dams that supply water to the city. It is estimated

that government needs to invest approximately N\$7 billion in water infrastructure over 5 to 10 years to guarantee water security especially for Windhoek if the durability of the current water supply system remains unclear (The Patriot, 2018)

A study conducted in the City of Windhoek found that some communities collect water from unsafe sources such as open dams for household consumption and use affordable clothing materials to improve the water quality, which was found not to be completely effective as it does not filter out all micro-organisms from the water (Claassen, *et al.*, 2015). Due to unavailability and the high cost of water purification chemicals, the community uses cheap alternative methods to improve the quality of water collected from unsafe sources. The most common purification utilised is filter cloths, where different clothing fabrics are used to filter the water from any impurities (CoW, 2012; CoW, 2013). This method is also widely used by many poor communities globally (Massoud, *et al.*, 2009).

Given the above background on Windhoek and the formation of informal settlements, this research study will focus on understanding the factors affecting household water security in the Thlabanello informal settlement.

1.8 Research Ethics

Research ethics is viewed as the application of a list of rules or pre-set standards of morals by any researcher in collecting, analysing, reporting and publication of research data. “The term ‘ethics’ is used to refer to the moral principles and regulatory conduct, which are upheld by a profession or a specific group of people” (Wellington, 2015). In social research, ethics are needed to set permissible moral boundaries and protect the participants from unethical research procedures (Seale, 2012).

For this study, the following ethical consideration were taken into account:

- i. Professional conduct was maintained during all stages of the research to avoid plagiarism, and that information obtained from secondary sources was appropriately acknowledged.
- ii. All respondents that participated in the key informant interviews and focus group discussions gave written consent prior to their participation in the study. This was done after the participants were introduced to the study, and informed that their participation would be voluntary.

- iii. The information collected for the study was treated with utmost confidentiality. The respondents remained anonymous throughout the process and no names were recorded on the data collection tools.
- iv. An introduction letter for the research obtained from the Centre of Development Support at the University of the Free State together with the Ethical clearance letter were submitted to the City of Windhoek (CoW), after which written permission was granted by the CoW to conduct the research within their area of jurisdiction.

1.9 Limitations of the study

The study investigated different dimensions of household water security and thus did not expand to other levels of water security or its effect on other sectors. Factors that affect water security at household level were also studied. However, this study was restricted to one geographical area which is the Thlabanello informal settlement, and thus the findings do not represent the situation in all informal settlements, City of Windhoek or Khomas Region in general. The time and resources available for this project was limited hence the restriction to the area and research scope.

1.10 Theoretical Framework

This research study uses the theoretical framework of dimensions of household water security developed by Thomas (2015) as basis to unravel the concept of household water security. This was instrumental in analysing the application of the framework and its adaptability in informal settlements. This study will therefore add value to the framework and will also be useful to researchers interested in water security issues. The next chapter will therefore discuss water security as a concept, introduce the framework by Thomas (2015), and factors that affect household water security according to literature.

2. CHAPTER TWO: LITERATURE REVIEW

2.0. Introduction

This chapter provides a brief overview on a collection and review of the literature and scholarly articles of previous studies that show insight on household water security in urban informal settlements. The chapter is arranged under several sub-topics including water security globally; defining water (in)security; dimensions of water security; urban and household water security; factors that affect water security; and water (in)security in Namibia.

2.1. Water security globally

Water security is vital to safeguard the availability and accessibility of clean water for drinking, washing, food production, and to sustain both environmental and human health (Mukherjee, *et al.*, 2020). Globally, household water insecurity has been a major challenge (Wutich & Jepson, 2019). Although experienced in all spheres of the globe with about half a billion people facing extreme water scarcity throughout the year, it was regarded a more serious challenge in least developed countries (Webb & Iskandarani, 1998; Mekonnen & Hoekstra, 2016). Evidence shows that even in the more developed Global North where universal water provision is perceived, a deeper screening of available data reveals that some households and communities in the United States of America experience challenges related to water provision which erases the perception of total water security (Jepson, *et al.*, 2017¹). Literature also indicates that the challenges experienced by the global north are completely different from those faced by the less developed global south (Jepson, *et al.*, 2017¹), however these facts suggest that water security at household level is a global challenge.

About 80 percent of the global population was said to be prone to high levels of water security threats, especially in rural and poor urban areas (Vörösmarty, *et al.*, 2010). Although global statistics on the populations prone to household water security threats in informal settlements are not available, Webb & Iskandarani (1998) argue that these areas are particularly expected to have high levels of water insecurity. According to Jones (2009), water insecurity which is experienced at different scales up to household levels was found to be primarily caused by factors including increasing population, high demand in irrigation water, urbanisation, and water pollution.

Statistics indicate that the world population is increasingly settling in urban areas over time for improved economic opportunities and better living standards. Brunt & Penelosa (2012)

estimate that over 50 percent of the world population is currently living in urban areas where demand for water supply is higher. The rapid increase in urban population contributes to the expansion of informal settlements which continues to increase the water demand and supply gap in these areas (Dos Santos, *et al.*, 2017). According to Webb & Iskandarani (1998) informal urban settlements are expected to have particularly high levels of water insecurity. This situation manifests due to the illegitimacy of these settlements, fast population growth, lack of services and weak local governance (UN-Habitat, 2003). The result of the combination of these factors is an increase in widespread water-related gastrointestinal illnesses mostly affecting young children, which are found to commonly exist in urban informal settlements in the global south (Neelim, 2011; Batram, *et al.*, 2014, Adams, *et al.*, 2020).

Furthermore, it is historically recorded that informal settlements in urban areas are not prioritised in water policies or development compared to core-urban areas (Uitto & Biswas, 2006). This has led to a certain disparity in levels of access to water between the informal settlements, and the formal settlements with the informal settlers significantly deprived of this important service. This scenario is confirmed by Allen *et al.* (2006) in a comparative study of peripheral areas in five cities situated in developing countries. Therefore, compared to the poor, the rich and middle-income societies living in formal settlements are mostly water secure and are able to afford sustaining their livelihoods without compromising on risks (Grey & Sadoff, 2007).

In some African countries, low water and sanitation coverage is attributed to a number of factors, such as poor water infrastructure, lack of human capacity and appropriate skills, weak institutional arrangements, poor community participation, a lack of political support, and a lack of viable policies and strategies (WUP, 2003; WOP, 2009). In South Africa, it is estimated that 1.2 million households in informal settlements have inadequate access to essential services, especially water (HDA, 2012). Sustainable water supply is still an obstinate challenge in South Africa's informal settlements which to a large extent defines the living conditions of the majority of the urban population (Muzondi, 2014). In Kenya, the population of Nairobi increased from 2.6 million people in 2000 to 3.1 million people in 2009 of which 60 percent of these people living in informal settlements of the city contributing to the daily demand for water in the city (NCWSC, 2011).

In Sub-Saharan Africa, about 71 percent of the population is projected to be living in overcrowded informal settlements, which is proportionally higher than any other region in the

world. In light of the high population growth particularly in these informal areas, increasing poverty and insufficient institutional capacity of urban centres, many of the informal settlements in underdeveloped countries are unable to provide the essential infrastructure, improved housing and work opportunities for the increasing population, as a consequence, these areas are often characterised by the absence of land tenure, poor water and sanitation systems and high poverty rates which are risk factors for water security (Ramin, 2009; UN, 2014). Therefore, as a result of the larger and increasing proportion of the urban dwellers living in informal settlements, water has become a less secure resource in these areas (Aguilar & López, 2009).

2.2. Conferences, Global Policies on water security/access to water

Guaranteeing access to water and sanitation for everyone is a fundamental human right and is essential to accomplish the sixth sustainable development goal (SDG6) on safely managed water and sanitation services (UNESCO & UNESCO i-WSSM, 2019). The ‘right to water’ for humans was initially recognised during the United Nations Water Conference in 1977 (Chenoweth, 2013; UN-Water, 2013). The conference developed an action plan specifying that all persons have a right to access adequate quantities of drinking water of good quality sufficient to support their basic needs. This was followed by the affirmation of the ‘right to clean water’ by the United Nations General Assembly in 2000 in its resolution A/Res/54/175 and its subsequent recognition of water and sanitation as a fundamental human right on July 28, 2010 through resolution 64/292 (United Nations, 2010). In this regard, Mukherjee (2020) asserts that ensuring people’s rights to clean water and sanitation is key in water security due to the fundamental linkage between these aspects.

Water security emerged as a primary development challenge across the globe in the 21st century. As a result, water security formed part of the discussions at various international water conferences such as the 7th World Water Forum in 2015, which created a platform for decision-makers and the scientific community to underline the significance of water security in sustainable development, to recognise water-related challenges that should be included in the post-2015 development agenda, and integrate the identified water-related challenges in the Sustainable Development Goals (SDGs) (World Water Council, 2015). However, the prominence of a particular focus on water security led to the First International conference on Water Security held in Toronto, Canada in June 2018 where development practitioners,

theorists and academics met to discuss and highlight key issues and refocus directions for change in all aspects and identify where knowledge gaps exist.

Aboelnga *et al.* (2019) claim that research and discussion on water security have picked up momentum over the past 20 years. However, many research studies on water security mostly focused on global and national levels which does not reflect local dissimilarities nor show seasonal differences in water supplies.

2.3. Defining water (in) security

Literature defines water security differently and Cook and Bakker (2010) established that these definitions are subjective to either environmental or human needs. Contemporary research studies have revealed the evolution of various definitions and valuation frameworks for water security over the past ten years (Allan, *et al.*, 2018). Moreover, International organisations have adopted different definitions of the water security concept that are broader and integrative such as the International Hydrological Programme of UNESCO which defines water security as “*the capacity of a population to safeguard access to adequate quantities of water of acceptable quality for sustaining human and ecosystem health on a watershed basis, and to ensure efficient protection of life and property against water related hazards – floods, landslides, land subsidence and droughts*” (UNESCO-IHP 2012; UN-Water, 2013). Contextually, The World Economic Forum defines the cross-sectional nature of water security describing it as “*the invisible link that connects the web of food, energy, climate, economic growth and human security challenges that the world economy faces over the next two decades*” (World Economic Forum Water Initiative, 2012).

Additionally, researchers have noted that multiple definitions of water insecurity exists, and the development of diagnostic methods and tools for assessing water insecurity at household level are in their early stages (Pierce & Jimenez, 2015). With some literature defining water security as a tolerable level of water-related risks, it is explicit evidence that most of the poor population in the world experience some level of intolerable water-related risk and are water insecure (Hall & Borgomeo, 2013). Conversely, water insecurity therefore encompasses insufficient water supplies in terms of quality and quantity necessary for energy and food production, household and industrial use and ecosystem sustainability, and further expands to include pressures posed by floods, droughts and water pollution. For informal settlements or squatters, Wutich & Ragsdale (2008) describe water insecurity as ‘the lack of access by all people, at all times, to sufficient amounts of water to support an active and healthy lifestyle.’”

For this research study, the definition of water security by WaterAid, an international organisation aimed at improving access to potable water for marginalised communities globally is adopted, which is “*reliable access to water of sufficient quantity and quality for basic human needs, small-scale livelihoods and local ecosystem services, coupled with a well-managed risk of water-related disasters*” (WaterAid, 2012).

The above definition is selected as it best defines the concept in context with the level of the research study by narrowing it down to the lowest relatable level in the community. The multi-spectral nature of this definition also encourages continuing debate over water security theoretical bases and provides sufficient grounds for assessing possible factors that affect household water security.

Water security is often interchangeably used with other closely related concepts such as water shortage, water stress and water scarcity which causes misperception amongst these terms. However, authors have over the years distinctly defined these interrelated concepts to avoid ambiguous reference to these terms, which is useful to enhance the understanding and distinction of these terms in relation to this research. Water shortage is defined as a temporary water imbalance including both ground and surface water over-utilisation, deterioration of water quality, often related to disturbed land use or overuse of the normal carrying capacity of the environment (Pereira, *et al.*, 2002). Therefore, the term water shortage describes a condition of absolute shortage where levels of water supply decrease to a point where it is impossible to adequately cater for the minimum obligation to meet daily basic needs (Pereira, *et al.*, 2002). This condition is triggered by various factors such as climate change, including changed weather patterns such as floods or droughts, high pollution levels, and greater human demand and above average use of water.

On the other hand, water stress is a term referring to indications or evidence of the direct presence and consequences of either water scarcity or shortage (Pereira, *et al.*, 2002). The phenomenon occurs when the available amount of water is insufficient to cater for the current demand or when the water quality deteriorates, thereby limiting its use (European Environment Agency, 2018). The term is often used to refer to drought.

Water scarcity as a concept which is often interchangeably used with water security and broadly refers to absence or limitation of access to adequate quantities of water for human

consumption and the sustainability of the ecosystem (Chris, 2012). Water scarcity may also be described as disproportion between demand and supply within the existing institutional arrangements and/or tariffs which is characterised by high consumption rates, and over demand versus under-supply of water resources (Winpenny, 1994, UN-Water, 2018). The main challenge exacerbating water scarcity in urban areas and contribution towards general water insecurity is the rapid growth of urban areas which places substantial pressure on water resources within their proximities and is further worsened by the growing effects of climate change and bio-energy demands. This concept only relates to one aspect of water security which is availability.

Although these terms are similar and often used synonymously with the term water security, they do not encompass the entire concept as all are limited to only some dimensions of water security. However, these concepts could be crucial in identifying determinant factors of water insecurity. Hence, it is important to create a distinction in finding a focus for this research .

Based on the above evidence, it is apparent that there is no definite global definition of water security as a concept, and researchers have often defined it by emphasising on their particular area of interest such as economic development, health, agriculture or human rights. Other literature define water (in)security differently generally depending on the scale of application, from global level down to household scale (Howard, 2017).

2.4. Dimensions of water security

A number of studies have acknowledged and analysed different dimensions of water security (Siwar & Ahmed, 2014). Whilst Global Water Partnerships (2012) outlines three dimensions of water security, which are; economic dimensions, environmental dimensions and social dimensions, the Asian Water Development Outlook (2013) expanded it to include five main categories of national water security, with a measurement focus directly on human lives and livelihoods, poverty reduction and governance. These key dimensions of water security are presented in a framework as seen n Figure 2.1 below.

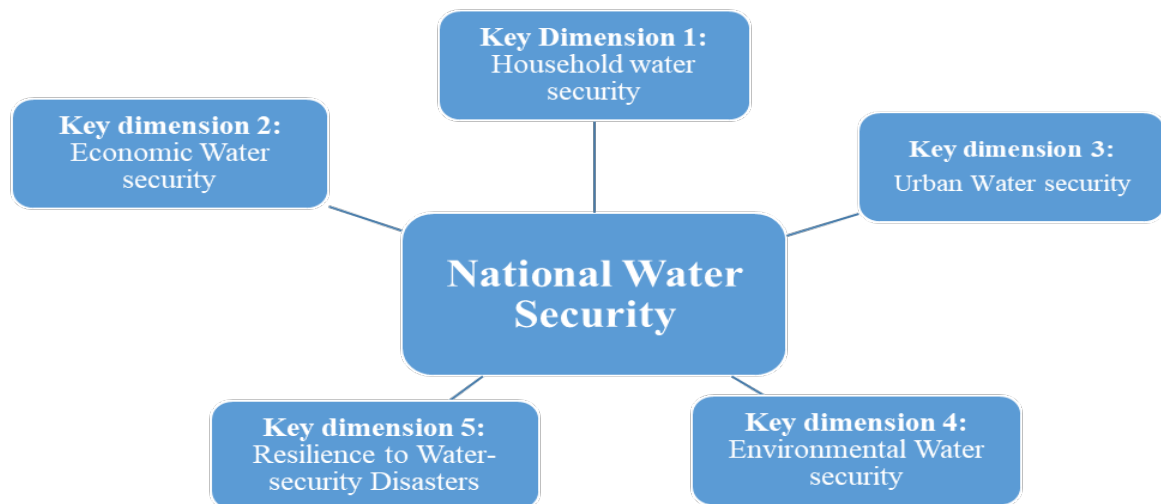


Figure 2.1: Key dimensions of water security

Source: Asian Water Development Outlook, 2013

The dimensions of water security as seen in Figure 2.1 above are household, economic, urban, environmental water securities and resilience to water-related disasters (Van Beek & Arriens, 2014). For further insight, several studies have also highlighted different elements of water security. Water access, water safety and water affordability are the three elements of water security that were ranked important for a human to live a healthy, clean and productive life, while ensuring environmental sustainability (Global Water Partnerships, 2000; Bizikova, *et al.*, 2013).

Given the different dimensions of national water security presented in the framework above, this study however focuses on exploring the household water security dimension in an informal urban settlement, and the subsequent section will dissect the concept and provide a theoretical model around it.

2.5. Urban and household security

Attaining urban water security for all inhabitants is a proving difficult for many countries (Aboelnga, *et al.*, 2019). To bring context to this research study, a working definition of Urban water security is therefore necessary. Similarly to general water security, there is no single recognised definition of urban water security (Allan, *et al.*, 2018). Based on the UN definition of water security Aboelnga *et al.* (2019) defines urban water security as

“the dynamic capacity of the water system and water stakeholders to safeguard sustainable and equitable access to adequate quantities and acceptable quality of water that is

continuously, physically, and legally available at an affordable cost for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.”

This definition incorporates the difficulties faced by urban and peri-urban areas in realising the ultimate objective of secure water for all by underscoring the principles of the UN human rights and sustainable development goals of the secure administration of water and sanitation services.

Household water security on the other hand is defined as uninterrupted availability of potable water for domestic use (Trevett, 2003). Other literature expands the definition to include the health benefit, with Chenoweth *et al.* (2013) defining household water security as safeguarding a household water supply of adequate quality and quantity to sustain the health of the household members. All these definitions generally highlight the multi-dimensionality of household water (in) security. The above definition of household water security is similar to that of domestic water security provided by Assefa *et al.* (2019), which is the capability of a population to ensure sustainable access to sufficient quantities of and tolerable quality water for the basic household essentials such as drinking, sanitation, and hygiene. Therefore, for this research study, household and domestic water security are thus regarded as the same concept.

For this study it is imperative to define household as a unit of study and to create a common understanding of the term as commonly referred to in this study. The basic definition of a household was adopted from the NSA (2012), which defines a household as a unit consisting of

“a person or a group of persons who live together in the same homestead/compound but not necessarily in the same dwelling unit. They have a common catering arrangement (cook and eat together), and are answerable to the same household head. It is important to remember that members of a household need not necessarily be related, either by blood or marriage).”

In researching water security at household level, some studies have attempted to dissect the concept to simplify the various characteristics that it encompasses. Thomas (2015) categorises five (5) different dimensions, namely: quantity, quality, access, reliability and affordability (see Figure 2.2 below).

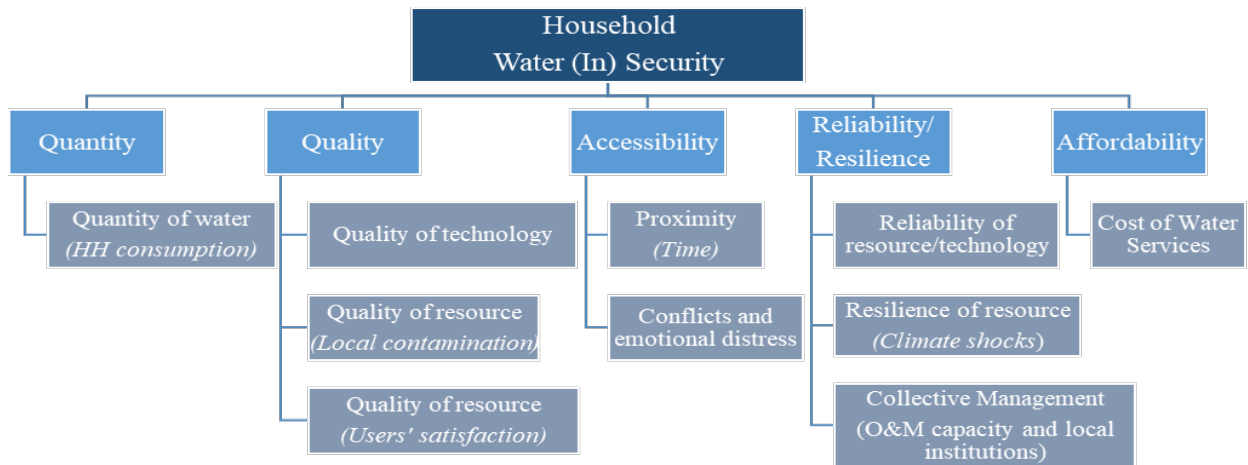


Figure 2.2: The five (5) dimensions of Household Water (In) Security

Source: Thomas (2015)

These different dimensions make up a framework upon which water security can be assessed at household level (Thomas, 2015; Assefa, *et al.*, 2019). These dimensions will be discussed in more detail below.

The quantity dimension of the framework measures the amount of water consumed at household level. It implies that every household should have enough water for personal and domestic use. According to the requirements of the World Health Organization (WHO), every individual needs between 50 and 100 L of water per day to guarantee that most basic human requirements are met and to minimise health concerns (Howard, *et al.*, 2003; Waldron, 2005). To the contrary, the United Nations International Children’s Emergency Fund (UNICEF) has set the daily minimum requirements at 20 L of water per person (WHO & UNICEF, 2012). Boelens (2013) and Chenoweth *et al.* (2013) however maintain that these international set standards do not provide sufficient amounts of water necessary to ensure all fundamental human rights which are required to maintain water security at a household level. Chenoweth *et al.* (2013) further advocate for a minimum requirement of 85 litres per capita per day for basic domestic water consumption which includes drinking, cooking and washing, at the household level, and if the household engages in some economic activities, then 120 L per capita per day would be required.

The quality of water is important as contaminations can commonly occur (Clasen & Bastable, 2003). Therefore, the quality component refers to availability of potable water, which is fit for human consumption at household level as the quality of water is critical in maintaining good

health (Azlan, *et al.*, 2012). The component includes the quality of the water technology, the quality of the water measured as per user's satisfaction, and the quality of the resource considering local contamination. According to the WHO (2000), polluted drinking water, insufficient supplies of water for individual hygiene and poor sanitation mainly contribute to about 4 billion cases of diarrhoea and cause an estimated 2.2 million deaths annually, especially among children below the age of five. Researchers argue that the quality of water can be compromised at any point from the source, during transportation, in storage within the household, and at the handling during use (Boateng, *et al.*, 2013; Copeland, *et al.*, 2009; Shields, *et al.*, 2015)

The accessibility component refers to the proximity in terms of the time it takes to collect the water from the nearest water point and security from local conflicts (between disparate groups as well, e.g., women with no access to land find it difficult to access water). This component is conventionally measured by the fraction of the population that has access to safe water sources (Adams, 2018). A household is deemed to have proper access to improved water supply when there is an appropriate amount of water for household use, at affordable tariffs, and easily obtainable to all household members (UN-HABITAT, 2005). The maximum walking distance set as a national target for access to water sources in Namibia stands at 2 km radius as specified by the Water and Sanitation Sector Policy (MAWF, 1993).

The reliability dimension includes reliability of the technology supplying water as a resource, resilience of the resource to climatic shocks such as drought and the operation and maintenance of the technology by either the community or other local institutions (Thomas, 2015). The quantity of water available at household level may also be attributed to unreliable water supply systems that may lead to water shortages resulting from breakdowns of failures of a system's physical components (Vairavamorthy, 2007; Charalambous & Laspidou, 2017). Infrastructure reliability is thus critical in maintaining a supply, of the right quantity and adequate quality at the appropriate pressure.

Affordability dimension is about sustainable water supply of water not only of an acceptable quality and sufficient quantity, but services should also be affordable by households. Water affordability is a vital element to water access because high costs make water unaffordable, posing potential health and safety risks. Affordability was highlighted in the literature as a key factor of household water security, especially for vulnerable people that are unable to afford payment for water services (Lawrence, *et al.*, 2002; Sullivan, 2002; Jensen & Wu, 2018). Thus,

affordability at household levels means the ability of households to pay for water consumption without compromising their well-being (Fankhauser & Tepic, 2007).

Globally, numerous research studies underscore the non-assessment of water security and non-application of water security measures at the local level (Cook & Bakker, 2012; Grey, *et al.*, 2013; Srinivasan, *et al.*, 2017). Thus there is limited understanding on the underlying factors that contribute to water security, especially at local and household levels.

2.6. Factors that affect water security

In order to understand the phenomenon of water (in)security, researchers have attempted to understand the underlying conditions that contribute to water insecurity at different levels, as depicted in the literature reflected in this subsection.

2.6.1 Global perspective

When investigating water security in urbanised areas most recent researches concentrated on multifaceted sets of contributing factors which includes; poor governance, unlimited population growth, social inequality, and maladministration of the water supply system (Cook & Bakker, 2012; Bakker & Morinville, 2013; Biggs, *et al.*, 2013; Goff & Crow, 2014; Ravell, 2014; Piesse, 2015; Blanca, 2017; Jepson, *et al.*², 2017). The literature further demonstrates how a combination of factors such as inadequate investment, low coverage, and poor maintenance, misappropriation of resources, inadequate development framework, and informality of some urban settlements could culminate into social challenges including inaccessible, unreliable and unaffordable costs of water which have direct undesirable effects on household water security (Kjellen, 2006). In her research to analyse how the poor investment in water services contributes to low service standards and insufficient cost recovery, Kjellen (2006) further confirms that rapid urbanisation, increasing economic growth, persistent poverty and ineffective governance are the main contributing factors to inadequate water services in low-income areas.

Informal settlements are unplanned residential areas that have developed beyond the formal urban planning guidelines of a town or city, mostly geographically located on the periphery of the formal urban centres (World Bank, 2015). Their main characteristics are illegal or undefined land tenure, nominal or lack of essential services such as water supply, electricity, and sanitation, little household incomes and casual employment, and no formal acknowledgement by authorities.

The main obstacles to water access, specifically in informal settlements, have been identified as financial, technical, political, institutional, and legal barriers such as insecurity of land tenure (Murthy, 2012). Household water insecurity in non-notified slums in Mumbai City in India which has the biggest slum population in the world, has been a direct consequence of lack of property rights in the area, which is perceived as an impediment to essential services provision (Subbaraman & Murthy, 2015). A study reveals that the main contributing factors to household water insecurity in peri-urban Mexico City were the incapability of government to secure adequate water supply and to regulate equal distribution, unequal and unaffordable water supply (Aguilar & López, 2009).

2.6.2. Africa/Sub-Saharan Africa perspective

In sub-Saharan Africa (SSA), rapid urbanisation and increased population growth has resulted in an uneven concentration of people in peri-urban informal settlements commonly referred to as slums. According to UN-Habitat (2016), if left unabated, the increasing urban population in SSA and consequent formation and expansion of slums could present serious challenges to national governments and local authorities in their strife to ensure access to reliable, potable and affordable drinking water to ensure household water security. Increased water demand in urban centres, coupled with other factors such as climate change, dilapidated water infrastructure surpassed by the speed of urban development and growth, weak institutions and poor governance further constrain the water supply capacity whose adverse effects are felt at household levels, most particularly in informal settlements (Roberts, 2008; Rouse, 2014; Adams & Zulu, 2015; Padowski, Carrera & Jawitz, 2016).

Furthermore, a study to analyse the factors contributing to household water security problems and threats in different parts of Ngamiland in Botswana, by Kujinga *et al.* (2014) found that factors such as settlement status, water governance issues, climatic and hydrological dynamics, urbanisation, population growth, dilapidated water supply infrastructure, increased demand for private household connections and management challenges all contribute to household water security problems. Similarly, in urban informal settlements of Lilongwe in Malawi, similar factors were found to be undermining water security at household level, in addition to high dependence on communal water kiosks that are quantitatively inadequate and highly dysfunctional, are exposed to damage, have irregular water supply; lack of alternative safe

water sources; and long waiting times at water collection points as a result of irregular water supply (Adams, 2018). This to a large extent indicates that there are a lot of similarities in the experiences of the urban poor in the region in relation to water provision.

Literature has noted that data on urban coverage on household water security generally, especially in Africa overlook anomalies in supply, intra-urban variances, and other complexities as they are not a true reflection of the scale of water security in informal settlements (Smiley, 2013). This was reiterated by research results from Tanzania that also indicate that local and global progress reports show inflated figures for access to improved water supply in many African cities (Nganyanyuka, *et al.*, 2014). Recommendations **by some authors** are therefore that there is a need to systematically analyse the combination of factors that influence inadequate water access especially for urban informal settlements which inexplicably accommodates most of SSA's urban population to find solutions to these challenges. Certainly, research is yet to find an appropriate framework for methodically collecting, analysing, and reporting individual and household water insecurity data (Jepson, *et al.*, 2017²). As analysed by other scholars, household water insecurity cannot be measured using existing data from surveys but a unique data matrix should be developed for information accuracy (Pierce & Jimenez, 2015).

2.7. Water (in) Security in Namibia

Many reforms have been made in the water sector in Namibia since the independence of the country to promote good governance in the water sector (Bethune & Ruppel, 2016). The enactment of the Water Act No. 2 of 2007 and the passing of the National Water Policy White Paper in 2000 were important steps in ensuring the right to water for all citizens as enshrined in the Namibian constitution placing the responsibility of urban water supply on local authorities. However, Remmert (2016) argues that not enough attention was given to governance perspective of the water sector to ensure water security in the country, including at household level.

Water is a scarce resource in Namibia due to variable, sparse low rainfall and high groundwater evaporation rates across the country, making it one of the most arid countries in southern Africa (Ruppel, 2013). The 2011 Namibia population and housing census reveals that 98 percent of the urban households in the country have access to potable water either piped inside or outside

their houses, or through communal water points or boreholes (Namibia Statistics Agency [NSA], 2012).

According to NSA (2012) Namibia's population dynamics show an increasing trend of rural to urban migration. The City of Windhoek as one of the biggest urban centres in the country attracts the biggest mass of migrants from the rural areas with an annual growth rate of 4.4 percent, which led to a rapid population growth in the city which consequently led to overcrowded informal settlements which is estimated to be growing at 9.5 percent per annum (WHO, 2013; NPC, 2013). Abderrahman (2000) notes that such trends tend to increase pressure on local authorities responsible for water services to match the escalating urban water demand. Similar to other developing countries, informal settlements in Namibia face challenges of water access and availability. The City of Windhoek as a local authority also faces challenges in ensuring potable water provision to its inhabitants (Lewis *et al.*, 2018). One of the identified factor for water insecurity in Windhoek is the strain by the municipality to adequately provide water and sewerage services to the informal areas, culminating into a water insecure situation in terms of access, quantity and exposure to water related disasters. Lewis *et al.* (2019) attributed the situation to the Windhoek population size and the City of Windhoek's limited financial resources.

According to Lewis *et al.* (2018), provision of water to the informal settlements of Windhoek has progressively declined over the years and that water accessibility is commonly poor. Water accessibility in settlements around the Goreangab Dam which also covers the Thlabanello settlement was found to be decreasing monthly due to increased water demand resulting from an influx of new migrants to the area, which consequently expanded the boundaries of the settlement and increased distances from the communal water points (Lewis, *et al.*, 2018). The settlement also faces water quality threats as it is adjacent to the Goreangab Dam, with adverse effect on the integrity and safety of its water (Benova, *et al.*, 2014). In his study on Urban Water Security in the City of Windhoek, Van Rensburg (2006) confirms that there are definitely water insecurity concerns in the city and the local and central government need to address the issue before it gets out of control.

Preceding research studies have acknowledged a degree of water insecurity that exists in the informal settlements in Namibia and Windhoek in particular. This study however will particularly focus on identifying determinant factors that are affecting water security at a

household level in Thlabanelo Informal Settlement. Given the limited literature specifically on household water security in Namibia, this study will make a significant contribution in understanding this phenomenon.

2.7. Conclusion

The selected literature provides an overall understanding on the concept of household water security and related theories as written by previous scholars. The literature unpacked the various definitions of water security and discuss common concepts associated with water security, the common factors contributing water insecurity at household level, especially in informal urban areas as well as the dimensions that make up this theory. The literature also presented good arguments on factors affecting water security from the global to household perspective, providing a sufficient theoretical framework to conduct the research study.

3. CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

The preceding chapter presented a collection of the literature related to household water security in informal settlements. This chapter outlines the research design and methodology adopted for this study. It discusses the steps that were employed to interrogate the research problem and the logical basis for selecting the specific steps. A research design refers to the organisation of methodologies to be employed by the researcher in collecting and analysing data for relevance to the purpose of the study (Bryman, 2012). To gain a comprehensive understanding of the factors that affect household water security in the Thlabanello informal settlement, a qualitative research methodology situated in an interpretive paradigm was used to reach the research aim and objectives. The data was collected through various methods including; focus group discussions (FGD), Key informants' interviews, direct observations, and a secondary data review for triangulation. Furthermore, this chapter is organised into the following sections: Section 3.1 discusses the research methods and designs, Section 3.2 describes the target population and sampling techniques used for the research, Section 3.3 provides an in-depth discussion of data collection methods and strategy used, and lastly, Section 3.4 elaborates on the methods and techniques used in analysing the data for interpretation.

3.1 Research Methods and Design

As the research topic indicates, the research focused on a single case which was meant to critically investigate the unique phenomenon being experienced at the Thlabanello informal settlement in Windhoek and sought to reveal the complex interaction of variant factors contributing to the current situation. The case study design was found to be the most suitable research approach for this research study, as it focuses on a specific area of study explicitly to answer to the research purpose and objectives. Bryman (2012) describes a case study design as a detailed and intensive analysis of a single case looking at the specific nature and complexity of the case in question; which is the most applicable to this particular study. The in-depth analysis interrogated the factors that contributed towards research results focusing on the identified location. Therefore, this study was only confined to one geographical area, which is the Thlabanello informal settlement. The case study design accommodates different data collection methods and can be employed in the collection and analysis of both qualitative and quantitative research data (Matthews & Ross, 2010).

3.2 Population

A population in a research study can be defined as the totality or collective of all the subjects, objects or participants that meet a set of the research specifications (Polit & Hungler, 1999). In this study the population was all the households in the Thlabanello informal settlement in the City of Windhoek. This is a relatively new location and has a high growth rate due to availability of vacant undeveloped land in the area. The research target population is large with about 2443 households, thus impossible to cover due to limited time and cost according to the CoW settlement records. Therefore, a sample of the population was selected to participate in the study that may give a reflection of the views or results of the whole target group.

3.3 Research Sampling techniques

Sampling is defined as a process or an activity whereby a fraction of the study population is chosen to determine the characteristics reflective of the entire population (LoBiondo-Wood & Haber, 1998; Polit & Hungler, 1999; Mugo, 2002). It is done to derive answers about a certain study area or population from a representative group assuming that the results will be signifying the existing phenomenon. Sampling is necessary in instances where there are insufficient finances or time to cover the whole population, thus a reasonable size based on the available resources was selected.

The various sampling methods used by researchers are in two broad categories; probability and non-probability sampling. The first refers to a group of sampling methods where the subjects have an equal opportunity to be selected whilst the latter refers to a random selection of participants for inclusion in the sample therefore the likelihood of selection varies across the population group (Mugo, 2002). In this study, probability sampling techniques were used to scale down on the number of households to participate in the survey.

Through a combination of cluster sampling and convenience sampling, the researcher conducted three (3) focus group discussions in various sections of the settlement through the community leaders, which is comparatively appropriate to represent the total population. Cluster sampling refers to a process where the population is first separated into clusters, and then a representative sample is thereafter selected from the different clusters at random (Showkat & Parveen, 2017). The cluster sampling method was employed to ensure that the study collected information from the different sections of the settlement through the FGDs.

According to Matthews & Ross (2010), the convenience sampling method is most appropriate as it gives the researcher ease of access to participants, in this case through the respective leaders responsible for each particular section.

The study furthermore used purposive sampling to select three key informants from the City of Windhoek (CoW) employees, purposively choosing representatives from the planning, community services and disaster management who are responsible for the target area to participate in the unstructured interviews. Purposive sampling refers to when research subjects or sources of data is purposively selected based on the researcher's discretion (Ritchie *et al.*, 2013).

3.4 Data Collection

The research objectives required a combination of data collection methods to be employed in order to comprehensively interpret and make a significant conclusion. According to Vogt *et al.* (2012) a researcher may choose to combine two or more of the above-mentioned methods to collect data if considered beneficial to the research. Combining data collection methods allows the researcher to look at the issue being investigated from different angles, looking for contradictions or affirmations.

Studying determinant factors of water security at household level required a qualitative approach to data collection. In order to get insight of the water security situation at a household level at the identified settlement, a combination of data collection methods was used and the findings were ultimately triangulated to reach conclusive findings. The triangulation of data collection methods was necessary to ensure data validity, dependability and objectivity. Method triangulation of data is a common practice of converging data from different methods to comprehensively understand a specific phenomenon (Polit & Beck, 2012). The data methods used included the following:

Focus group discussions (FGDs)

To generate rich data about experiences of water insecurity in the inhabitants' everyday lives, focus group discussions (FGDs) were convened in the three (3) sections (the lowest administrative unit in the settlement) of the Thlabanello informal settlement, in each of which a convenience sample of between 10-12 people participated. Focus Group Discussions refer to a data collection method whereby in-depth group interviews are used to collect qualitative

information from selected participants focusing on a certain topic of discussion (Rabiee, 2004). This method allows for ideas to flow and see how thoughts and discussions develop in a more natural setting, and how these are formed through an interactive conversation with other group participants (Ritchie, 2003). The focus group discussion questionnaire contained open-ended questions that directed the discussions and through further probing, detailed information was composed based on the participants' opinions.

The researcher led the group discussions, which were audio-recorded and were later translated from Oshiwambo to English. Figure 3.1 below shows the composition of the Focus Group Discussions (FGD) in terms of gender.

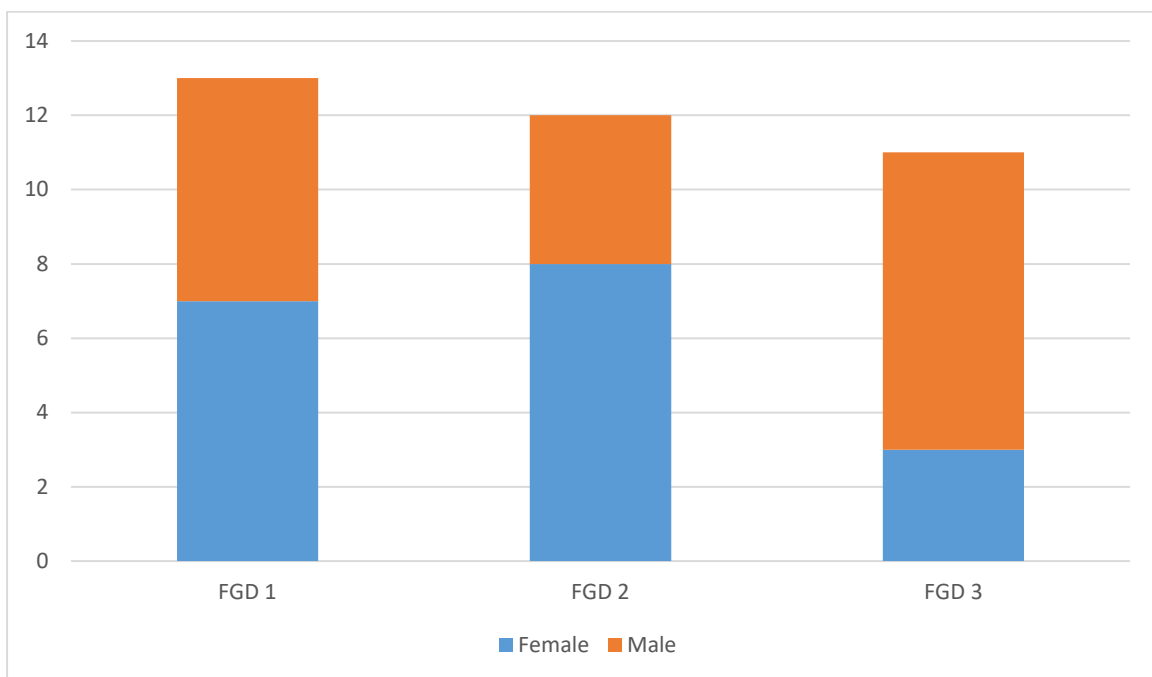


Figure 3.1: Sex composition of Focus Group Discussions (FGD)

Source: Author

Key-informant interviews

Additional to the information collected through the FGDs, supplementary details on water planning, administration and water-related disaster management were collected through open-ended in-depth interviews with key informants. Key informant interviews involve questioning specially selected individuals that can avail needed information, thoughts, and insights on a given subject (Kumar, 1989). This data collection method is suitable in obtaining high quality data in a reasonably short period of time (Marshall, 1996).

The key informants in this research study were three senior officials from relevant departments, including Community Development and Disaster Risk Management in the City of Windhoek. The aim was to have an overarching view and explanations on the situation at the two locations from a service provider's point of view, as well as to validate some data collected directly from the household interviews. The study intended to conduct Key-informant interviews with some community leaders, but this could not be done as they also formed part of the FGDs, therefore their contributions were duly captured.

Direct observation

Direct observation refers to the collection of information to document physical features and ongoing activities of a situation to make independent conclusions that can contribute towards reaching conclusive findings without entirely depending on peoples' ability to accurately respond to the research questions (CCHE, 2019). This method was used to collect information on physical water infrastructure, landscape, physical conditions of the surrounding areas and any other relevant facts around the settlement.

Secondary data review

Socio-demographic statistics on the area and other available documented facts on access to water, quality and quantity was obtained from secondary sources, such as census reports, city of Windhoek reports, settlement statistics and other research materials as cited in this study. Secondary data review is the usage of data from external sources which were initially collected for a different purpose and have undergone through at least one level of analysis already to contribute to the current research objectives (ACAPS, 2014). Unlike primary data which is first-hand data collected directly by the researcher through interviews, focus group discussions or questionnaires, secondary refers to previously collected data available to the public through journals, newspapers or other publications that a researcher may use for further analysis (Ullah, 2014; Johnston, 2017).

The combination of the data collection strategies highlighted above provided adequate information or data for analysis and bringing a conclusion to the research and to achieve the objectives and purpose of the study.

3.5 Data Analysis and Presentation

After the data collection, it is imperative to critically analyse the data to deduce findings and conclusions of the research study. Good data analysis explores the data and finds patterns to make sense of the data gathered in research through appropriate methods (Peersman, 2014). The qualitative data collected was captured and analysed on an excel spreadsheet using a thematic approach, as the researcher pre-conceptualised on the type of information required based on the research objectives and questions. The data collection tools (Annexure A) were purposively designed according to the thematic areas, and participants were asked to share their opinions and experiences around these areas. The thematic data analysis approach observed for similarities and divergent views emerging from the different focus groups and other sources. Thematic analysis can be defined as a process of breaking down, categorising and reconnecting different segments of the data before final interpretation (Mathews & Ross, 2010). Using a Microsoft excel sheet, descriptive data was tabulated for further analysis and prepared for data presentation. Expressive information collected through the FGDs and the key informant interviews were used to discuss and contextualise the research findings.

3.6 Conclusion

In summary, a case study research design was applied to analyse the unique phenomenon in the area of study. Using probability sampling, the researcher used the combination of cluster and convenience sampling methods to select participants in the study. The research study applied qualitative research methodology, using mixed data collection methods for deeper understanding into the research topic. Data was analysed using an Excel spreadsheet, and descriptive information obtained from different research methods were compared to reach conclusive results and discuss the findings of the study.

4. CHAPTER FOUR: RESEARCH FINDINGS

4.0 Introduction

The chapter presents the general description of the research area and further documents the research results and a narrative of the findings. The study focused on analysing the factors affecting household water security in the Thlabanello settlement. The research data was collected using mixed methods such as focus group discussions, key informant interviews, secondary data review and direct observations. The discussions in this chapter used the collected data to analyse the state of household water security in the research area and identify possible causal factors thereof.

4.1 Overview of the research area

This section present the overall picture of the research area based on review of existing data, the researcher's personal observations as well as information provided by the key informants through in-depth interviews.

The research area is situated in the Northwest peripheries of the City of Windhoek, in the jurisdiction of the Samora Machel constituency of the Khomas Region in Namibia. According to two key informants (2019), the Thlabanello informal settlement was formed when illegal settlers in need of residential land encroached onto municipal land for habitation. This was the result of rapid population growth in the city due to high migration rates from the rural areas and other smaller towns in search of employment opportunities and better public services in the capital city.

The municipal records show that Thlabanello covers an area of about 54.7 Hectares (see Figure 4.1 on page 44) (CoW, 2019¹). The manual database further shows that there are 2443 households registered in the settlement (CoW, 2019¹). However, this number continues to grow as new settlers flock to the area in search of land. The estimated average household size of the study area is four people (Key informant 1: 2019), which translates into an estimated population of 9772 people and a population density of 178 persons per Hectare. As with many informal settlements in the city, service provision to this settlement has been slow, consequently the community lives without most essential services such as sanitation, adequate water supply services, electricity, solid waste management, health and education facilities. As a result, the study found that the inhabitants use gas, paraffin, and firewood for cooking and heating, and

few use solar power for lighting. The housing structures in Thlabanello are mainly made of corrugated iron sheets and other recycled materials. The absence of sanitation services by the municipality widely contributes to open defecation, with only a few community members that have pit latrines at their homes. Due to safety concerns at night, the residents are forced to use plastic bags when nature calls, which will then be disposed of in the riverbed; a practice commonly known as “flying toilets.” The community collects water from communal water points installed by the City of Windhoek around the settlement in response to the Hepatitis E Virus (HEV) outbreak in the area in early 2018. The installation of water points could however not be extensive throughout the settlement due to the reduction in pressure in the water supply system (Author, 2019).

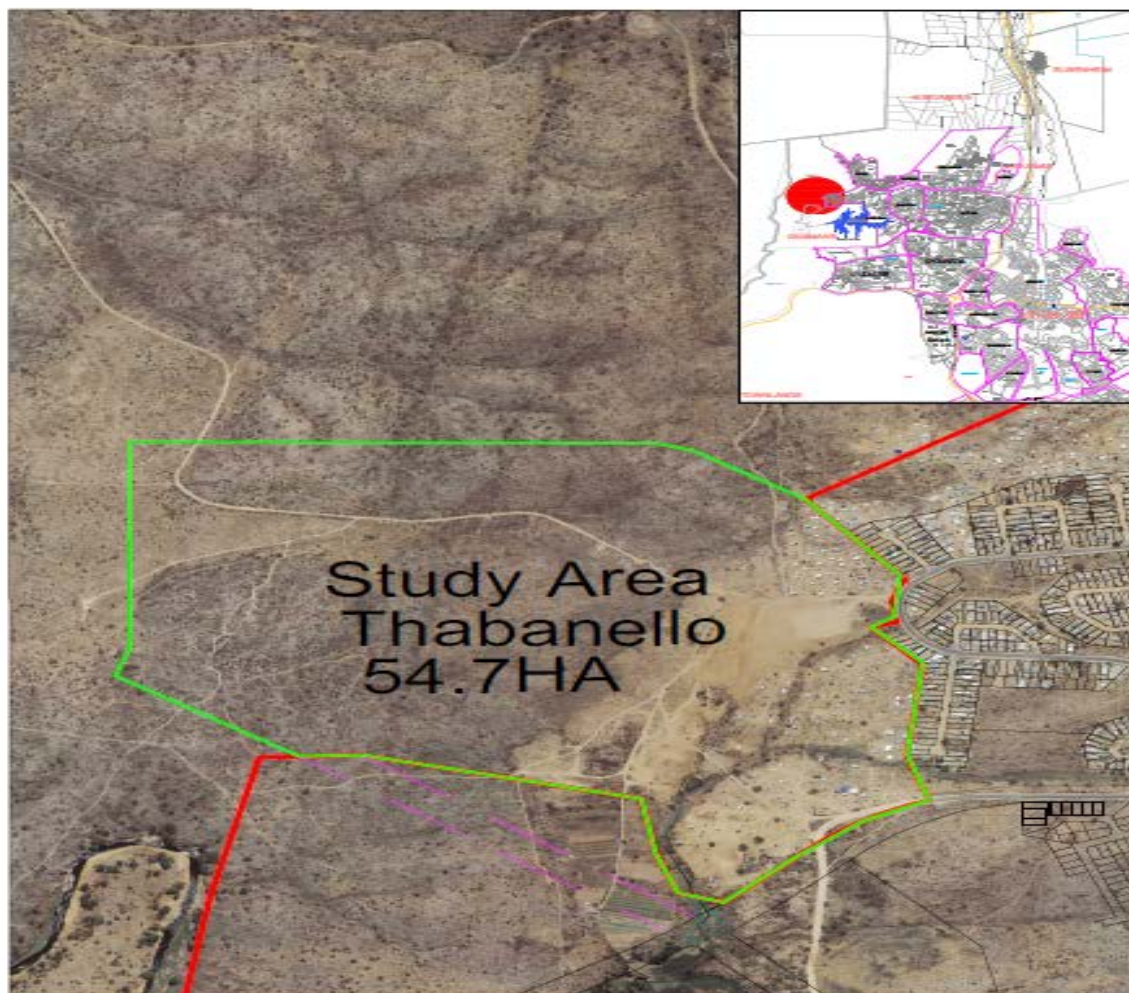


Figure 4.1. An aerial photograph showing the geographical boundaries of Thlabanello settlement

Source: City of Windhoek (2019)

Figure 4.1 above shows the geographical boundaries of the Thlabanello settlement using an aerial photograph which was captured before the illegal land occupation. The rapid growth of this settlement is attributed to the influx of settlers from outside town and other overcrowded informal settlements around the city (NSA, 2012).

4.2 Findings of the study

The literature review identified settlement status, poor governance, unlimited population growth, social inequality, and maladministration of the water supply system water governance issues, urbanisation, population growth, dilapidated water supply infrastructure and increased demand for private household connections as factors that affect water security at household level (Bakker & Morinville, 2013; Biggs, *et al.*, 2013; Goff & Crow, 2014; Kujinga, *et al.*, 2014; Ravell, 2014; Piesse, 2015; Blanca, 2017; Jepson *et al.*, 2017). This section discusses those experienced at household level in the Thlabanello informal settlement. These findings have proven that many households in the Thlabanello settlement experience water insecurity caused by various factors including high population growth, illegality of the settlement, low household incomes, and poor sanitation and hygiene practices at household level.

4.2.1 Water quality

The study revealed three factors affecting water quality at household level in the Thlabanello settlement, as per Table 4.1 below.

Table 4.1: Summary of factors affecting household water quality in the Thlabanello settlement

Factors	Description
Intra-household handling of water	Storage, handling as well as water purification practices within the household.
Sanitation practices in the settlement	Due to lack of sanitation facilities in the settlement, open defecation is widely practiced in the community, increasing the risk of faecal bacterial transmission to unprotected water stored within the house.
Proximity of unsafe water sources to the settlement	Some community members use the effluent (semi-purified) water stream close to the settlement as an alternative source of water for household use.

Participants in the focus group discussions (FGD) reported moderate satisfaction with the quality of the water supplied by the City of Windhoek (CoW) through a pipeline. The dissatisfactions were mainly expressed due to the reasons presented in Table 4.2 below:

Table 4.2: Reasons for dissatisfaction with the water quality

Reasons for dissatisfaction with the water quality
(a) Unpleasant taste.
(b) Dirt/rusty particles settling at the bottom of the containers.
(c) Water develops foul smell if kept in storage for long periods.

As reflected in the table above, the main reasons given by the participants were the unpleasant taste of the water from the taps explaining that it tastes and smells of chemicals and less natural. They also reported that dirt particles are found collecting at the bottom of water containers if the water is left to settle, and that if the water is stored in containers for long periods of time, it develops a foul smell which makes its quality questionable for consumption. These sentiments were echoed equally in all three focus group discussions, thus recording the experiences in all the sections of the settlement.

Furthermore, results indicate that 100 percent of participants collect and store water in plastic containers or buckets. When probed on whether these containers are always tightly closed to avoid contamination, all participants again answered, “Not always.” As a participant in FDG 2 narrated:

“We make use of whatever is available to collect and store water, therefore truthfully, we don’t always keep our water containers closed. Some containers don’t even have lids at all.”

Furthermore, the study found that the community is aware of different water purification methods that can be used to improve the water quality at household level such as boiling or water purification chemicals, however, the majority of the participants indicated that they do not use these methods as they are either costly or time-consuming.

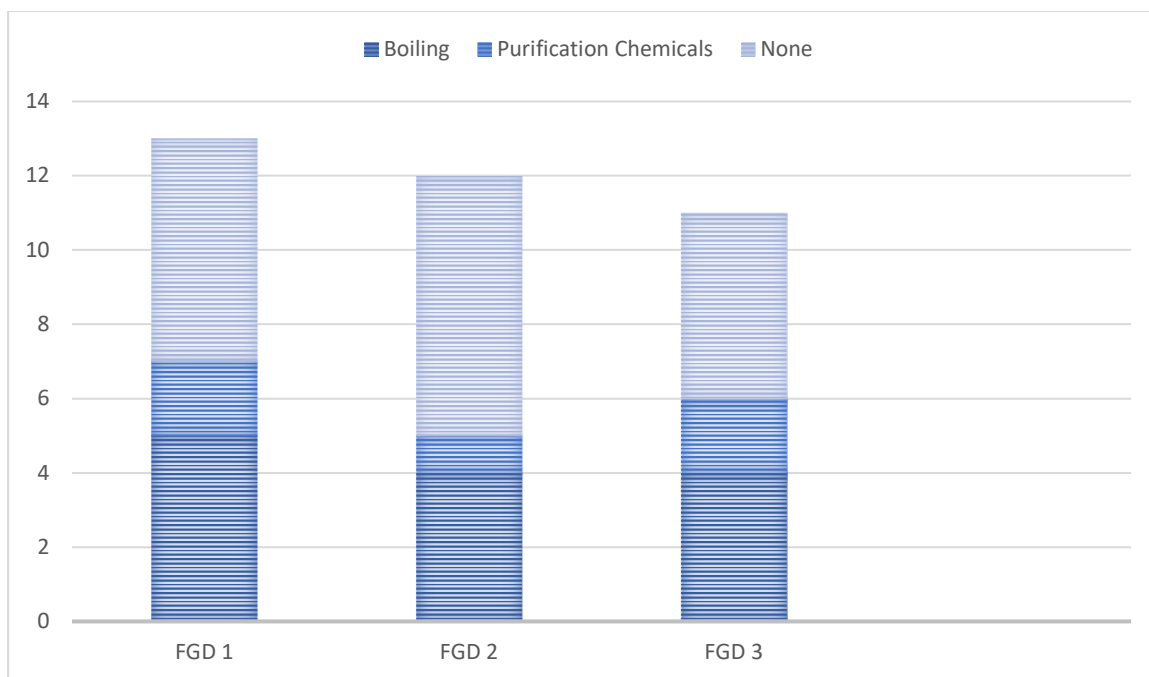


Figure 4.2: Water purification methods used

The graph above shows that the majority of the participants in all the FGDs do not use any water purification methods to treat water at household levels. It further indicates that the commonly used purification method as per the respondents is boiling of water, which is practiced by about 36 percent of the respondents. The participants explained that the absence of electrical power in the area makes the boiling process cumbersome and expensive as the community relies on gas and firewood for cooking.

When asked on the sanitation practices in the community, the respondents indicated that there are no sewerage services in their settlement, as such the community members mostly openly defecate in the riverbeds or in plastic bags, as only a few households have erected pit latrines. A participant from FGD 3 narrated:

“What other choice do we have? If your neighbour has a pit latrine, they might allow you to use it during the night, otherwise we just use the plastic bags. During the day, as there is no privacy outside the house, we use the plastic bags to defecate inside the house and later throw away in the riverbed. We know it is not hygienic, but we don’t have another option.”

Some participants explained that although they are willing to build their own pit latrines for household use, it is challenging as they have limited space to put up extra structures. Some areas of the settlement are very rocky, making it difficult to dig pits for dry sanitation facilities. Open defecation threatens water security as human excreta contains bacteria that if transmitted to the water stored in the house could cause diseases (WHO, 2000).

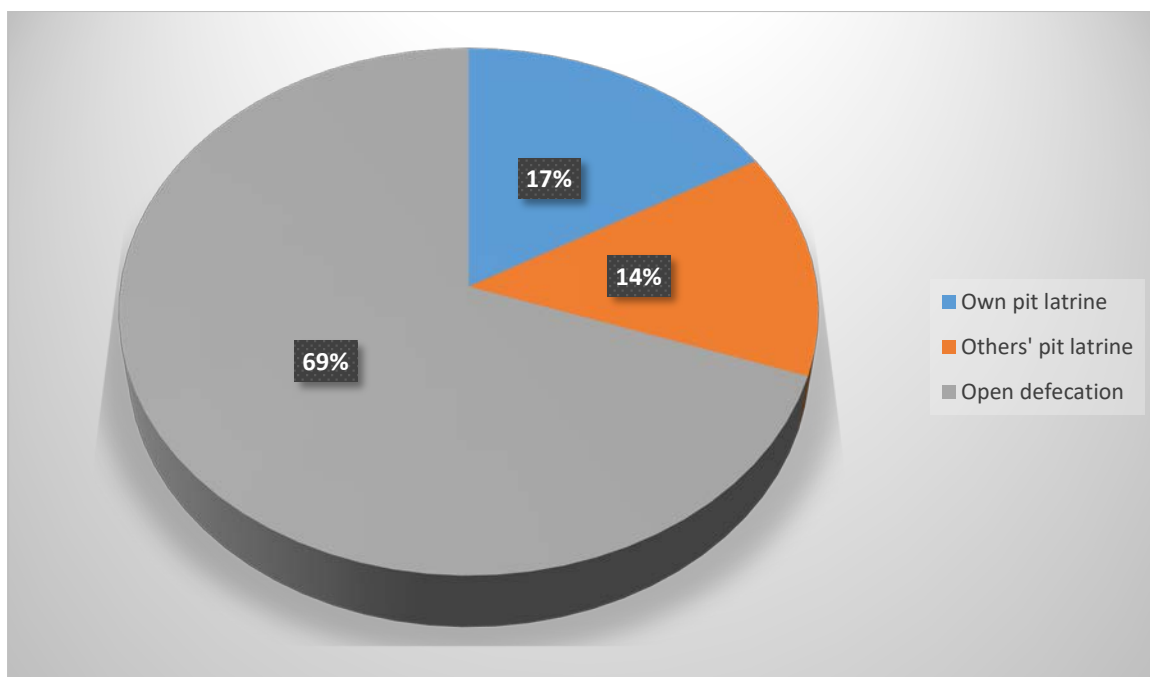


Figure 4.3: Sanitation practices amongst participants

The chart above shows that 69 percent of participants defecate in the open spaces in the riverbeds or use plastic bags which are then discarded in the open, in a practice popularly referred to as flying toilets. The rest of the participants either erected their own pit latrines or utilise their neighbours' pit latrines, the figures being 17 percent and 14 percent, respectively. When probed about how the sanitation practices affect the quality of water in the area, the participants were ignorant of the possible effects that these intra-house practices have on the water quality.

Due to the proximity of the Goreangab Dam effluent stream to the settlement, FGDs participants were questioned if they know of any community members that collect the semi-purified water for household use. All the focus groups indicated that they are aware of some neighbours who collect water from the effluent stream, however, the reasons for the practice varied in different groups. FGD 1 participants cited non-affordability of municipal water services as the main reason that some community members collect semi-purified water which is not of acceptable quality, however, FGD 2 and FGD 3 participants indicated that the main reason that some community members collect semi-purified water that is released into the open stream is due to the fact that it is closer to their houses compared to the municipal water points.

The FGDs identified some domestic routines that could compromise water quality at household level, these include handling of water by household members including children, usage of dirty

utensils such as buckets and cups in the house, and lack of purification practices such as boiling of water before immediate consumption. These practices expose the water stored in the house to contamination which poses a danger to human health if consumed.

4.2.2 Water quantity

This component of water security is crucial as it assesses whether households get adequate amounts of water for household use. Households need potable water in sufficient quantities such as drinking cooking, personal and household hygiene, gardening for food production at household level, etc. (Howard, *et al.*, 2003; Waldron, 2005).

The study findings indicate that many households collect water from the common water points once or twice a day, depending on the usage rate and the storage capacity of the containers in each particular household. Participants in FGD 1 reported a higher frequency in collecting water per day presumably because of the close proximity to the municipal water points. However, FGD 2 and FGD 3 both reported a lower frequency of collecting water per day, and the reason indicated is the remoteness of the water points from this part of the settlement. The FGDs explained that the inability to collect water often drastically reduce the amounts of water available for household use per day.

The findings of the study show that the water collected by most households is insufficient to cater for all their needs. This variation leads to households having to prioritise and compromise on some water needs. Table 4.3 on page 43 presents the main causes of variation between the water needs and water collected by households as outlined by the FGDs.

Table 4.3: Main causes of variation between the household water demands and water collected by households

Causes	Description
(a) Distance	This refers to the distance between the households and the nearest municipal water points. The longer the distance, the higher the variance.
(b) Time	It refers to the time required to collect water, including the waiting period at the water point.
(c) Household size	This refers to the number of people in a particular household. The bigger the size of the household, the higher the water needs.
(d) Storage	The storage capacity of containers within a household. Low capacity has the potential to increase the variance.

Source: Focus group discussions (2019)

As summarised in the table above, the participants described what they perceived as the main factors contributing to the variation between the household water demands versus the water collected and which is available for household consumption. According to the participants, the variance between the two leads them to compromise on personal hygiene, and it ultimately leads to poor living conditions. The FGD 3 also identified this as a driving factor which forces some community members to collect semi-purified water from the Goreangab stream to make up for the variance.

4.2.3 Accessibility to water sources

This component refers to the proximity in terms of distance to the nearest water point, as well as the time it takes to collect the water from the nearest water point. The study revealed four factors affecting accessibility to water for households in the Thlabanello settlement, as per Table 4.4 on page 44.

Table 4.4: Summary of factors affecting households' access to water points

Factors	Description
Increasing population	The continuous influx of people into the settlement in search of land, increasing demand for water and related services.
Insufficient and scattered water points	The number and location of water points in the settlement is inadequate and does not respond to the needs of the inhabitants, leading to lengthy periods of collecting water.
Lack of electrical power for lighting	The absence of electricity limits the water collection times to hours when there is sunlight only as it becomes unsafe for community members when it is dark.
Unregistered households	Households in the settlement that are not registered with the municipality have no/limited access to the communal water points as they are not eligible to buy water tokens.

As per Table 4.4 above, the study found that the biggest factor contributing to household water insecurity in the settlement is the inflow of new inhabitants into the area from other congested informal settlements as well as from outside of the city. According to Key Informant 1, the City of Windhoek has struggled to meet the water and sanitation services demands due to a lack of resources and technical limitations in terms of water pressure in the water supply system inhibiting further development of water infrastructure to the rest of the settlement.

The study found that 100 percent of the respondents have access to communal prepaid water points set up by the municipality in the area but do not exclusively rely on them for all household water supply needs. The participants of FGD 1 indicated a shorter distance to the nearest water point of between 20 – 200 metres, FGD 2 participants indicated a distance of 300m to 2.5 kilometers depending on the specific house locality, whilst FGD 3 which was the furthest from the water points indicated distances between 1.5 to 3 kilometres to and from the nearest water point. The distances reported in the different FGDs were also confirmed by the researcher through direct observation throughout the settlement. This scenario contravenes the guidelines of the CoWs' Development and Upgrading Strategy, which outlines that communal taps provided in informal settlements should be within a distance of 200 metres from the furthest household (CoW, 2019²).

All respondents indicated that accessibility to the communal water points provided by the municipality is subjective to ownership of a prepaid water token which is purchasable from the CoW at a subsidised fee. They further specified that to be able to purchase the water token, a household should have been surveyed and allocated official municipal numbers. The participants further indicated that the households that are unable to directly purchase water tokens from CoW have indirect access to water points through their neighbours' assistance for a minimal fee.

Figure 4.4 below shows the time it reportedly takes to walk to the water point to collect water and return to the house, as indicated in different focus groups. The times indicated include the waiting time at the water point.

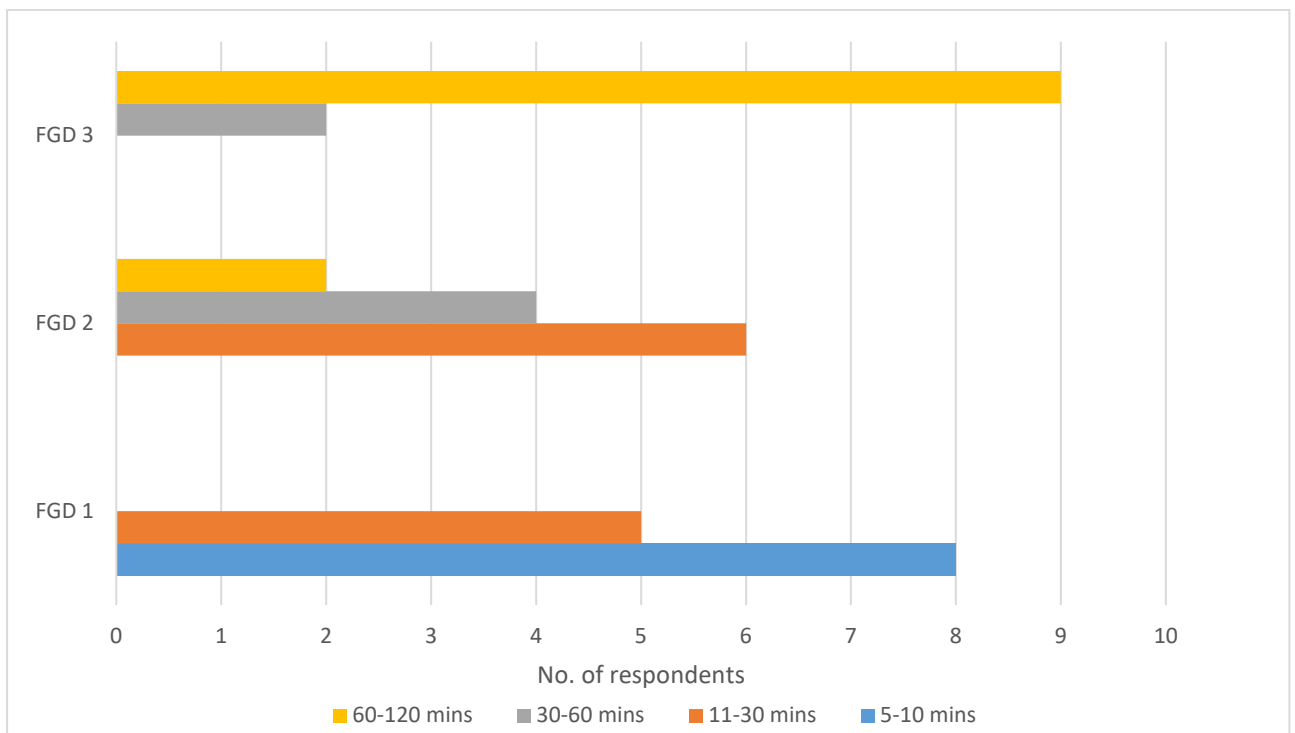


Figure 4.4: Water collection time for different households

As evident from the graph above, there is a significant difference between different sections of the settlement in terms of the total time used to collect water in one trip. The results show that the respondents in FGD 3 use the longest time to collect water for household use due to the remoteness of the water points from their section. It further shows that the FGD 2 respondents use relatively shorter time compared to FGD 3 but longer compared to FGD 1, which is in close proximity with the communal water points.

4.2.4 Affordability of water services

Affordability aspect of water security encompasses expenses incurred by the community for actual water consumption plus other related expenditures such as transportation. The study revealed three factors affecting affordability of water for households in the Thlabanello settlement, as per Table 4.5 below.

Table 4.5: Summary of factors affecting household water quality in Thlabanello settlement

Factors	Description
Low household incomes	High unemployment rate in the area leading to less economic resources available for households to spend on water.
Transportation costs	Transport services used by households to collect water from water points at a fee.
Expensive water tokens	The once-off fee for the water token from the municipality is unaffordable for some households

The study findings show that households spend on average N\$200 on the actual water consumption per month. However, respondents from FGDs 2 and 3 explained that due to the long distances to the water points, the community is forced to make use of local transport services to collect water for them for a fee, to minimise the time spent on collecting water and to ensure that there is sufficient quantity of water for household consumption. For these transport services vehicles charge N\$120-150 per trip, consequently some households spend between N\$300 – N\$500 per month in addition to the actual household water consumption cost, thereby escalating water related household expenditure.

The participants find the water related costs unaffordable to most households mainly because of the high unemployment rate and low household income in the community, which places the burden on most households and thereby ultimately compromising other needs such as food, health and power. As one participant in FGD 3 narrated her experience.

“Collecting enough water for the house has become very costly for us because, we pay for transport to travel to the municipality offices to recharge the prepaid water token, pay for the actual water consumption and then again pay for a vehicle to bring you enough water at home. It is too expensive for many of our community members.”

Similar sentiments were equally echoed in all the FGDs as participants felt that the water related fees would be significantly reduced if the water points were strategically spatially allocated to cover the entire settlement and minimise the walking distance between the households and water point. This would also eliminate the transport costs as the services would no longer be needed by the community.

The key informants’ interviews revealed that, in order to access the municipal water points, every registered household is required to purchase a prepaid water token for a once-off subsidised fee of N\$300 from the City of Windhoek. The FG participants also alluded that there are some households that completely cannot afford the once-off water token fee due to a lack of income, which makes them survive on minimal water supply through the assistance of neighbours or semi-purified water collected from the effluent of the Goreangab water reclamation plant for household use.

4.2.5 Reliability of water sources and resilience to water related shocks or disasters

The study revealed two factors affecting reliability of water sources and resilience to water related shocks or disasters in the Thlabanello settlement, as per Table 4.6 below.

Table 4.6: Summary of factors affecting reliability of water sources & resilience to water related shocks or disasters

Factors	Description
Low water pressure	Reduction in water pressure at some water points increases the waiting period at the affected water points.
Unavailability of habitable land	Due to lack of flat land, some community members have erected shacks on risky areas such as valleys and riverbeds, exposing these houses to flash floods.

The research shows that the water points in Thlabanello settlement are largely reliable. These water points were installed by the CoW for operation by the community, however the maintenance of these physical infrastructure remains the responsibility of the municipality. All the FGs concurred that the water points are accessible and reliable most of the time, with an exception of peak times when pressure at some water point reduces drastically as noted in Table

4.6. Thereby increasing waiting periods at the water collection points up to an hour per collection time and causing minor irregularities.

According to Key informant 2, due to the land terrain, the water supply system into Thlabanello settlement has shown reduced water pressure during the installation of the pipeline. This is one of the main reasons that the pipeline could not be further expanded, and the low pressure during the peak hours could also be attributed to this explanation. Overall, the water supply is reliable but a technical solution should be found to address the low pressure challenge being experienced in the settlement.

Resilience to water related shocks or disasters is another aspect of water security that assesses challenges or problems related to water such as natural disasters and the community's ability to cope with them. The participants indicated that they are faced with a challenge of periodic flash floods that occur during the rainy season. They indicated that the flash floods destroy houses especially those erected in proximity to the valley and block road networks in the settlement.

The study found that although the participants were aware of the consequences of building shacks in risky spaces such as valleys, the general perception was that they are left without a choice but to build houses on dangerous slopes in the valleys due to scarcity of land. The study found that when houses in the settlement are destroyed by the flash floods that ultimately affect human habitat and brings tragedy and trauma to those affected. These flash floods combined with the high practice of open defecation in the settlement were also identified as a public health risk, acting as transport mode of human faeces throughout the settlement, thereby increasing the risk of spreading of water-borne and vector-borne diseases across the settlement.

4.3 Discussion and analysis

The study has identified several technical, social and economic underlying factors that are directly or indirectly affecting the state of water security in the Thlabanello settlement. Like other informal settlements in Windhoek, Thlabanello is characterised by high unemployment rates and relatively low household incomes which determines the affordability of water as a resource (NSA, 2012). This section deliberates the collected data as presented above and offers further analysis on the collected data and how they translated into meaningful findings on the determinant factors affecting household water security in the settlement.

4.3.1 Rapid population growth and urbanisation

Since the emergence of Thlabanello settlement, the population and the number of households has skyrocketed according to municipal records. The number of households in the settlement that are registered with the City of Windhoek currently stands at 2443 with an estimated population of about 9772 inhabitants (CoW, 2019¹). However, the actual number of households in the settlement is higher than the number registered with the City of Windhoek as new housing structures are erected on a daily basis around the settlement. A number of literature sources have highlighted increased population as a causal factor to household water insecurity (UN-Habitat, 2003; Ramin, 2009; Kujinga, *et al.*, 2014; UN, 2014; UN-Habitat, 2016). The consequent effect of rapid population growth and urbanisation is increased demand of water services for both domestic and economic activities (Dos Santos, *et al.*, 2017). Information from the Key informant interviews suggests that the continuous population growth stems from both rural to urban migration, as well as intra-city movement of people from older and densely populated informal settlements of Windhoek in search for better residential land. Population growth in the settlement has put immense pressure on the City of Windhoek to provide the much needed water services to the settlement, which is a basic human need.

Increasing population growth and the consequent settlement expansion however continue to threaten household water security in Thlabanello. As the findings revealed that the community experience long queues and extended waiting periods at the water point particularly during peak hours when demand is high as the number of households keeps increasing whilst the number of water points in the settlement remain static. The community has also experienced increasing user ratios at water points leading to longer time spent on water collection by

households. This phenomenon has been noted by researchers to take up a lot of productive time of the community member to engage in meaningful economic activities (Adams, 2018).

According to information provided by the key informants' interviews (2019), the City of Windhoek provided 10 cubic water tanks at strategic points in the settlement in 2017 in response to the ever-growing population in Thlabanello. These tanks were filled through a mobile water tanker service by the CoW, and the water was provided for free to the community. Further information gathered indicated that the service came with challenges as the water tanks were unreliable, as they were often empty due to high water demand in the area. In an effort to provide a more permanent solution to the water crisis in the settlement, the CoW provided piped water with self-service prepaid water points distributed across the settlement in January 2018. These public water points replaced the water tanks that were initially bringing a more reliable water supply to the area.

The biggest challenge currently is that the emergence of new households has enlarged the spatial area of the settlement, thus further increasing the distance of those people from the water points. The expansion of the settlement has also developed new growth points that are even further from the communal water points that is an impeding factor to household water security. Although the CoW has made an effort to supply Thlabanello informal settlement with piped water, the mountainous landscape of the area does not allow for further extension of the pipeline to reach all the different areas of the settlement.

Population growth in this instance threatens household water security as it adds pressure on the existing water infrastructure in the settlement, as possibility of further development to accommodate the expansion is technically challenging. This could possibly increase the number of households that have to walk long distances to access safe water at the existing public water points for household use. The phenomenon increases the number of users at the water points, which eventually upsurges the time spent on collecting water.

4.3.2 Unemployment and Low household income

Windhoek informal settlements are mainly characterised by high unemployment and low household incomes. The majority of those employed are either self-employed in the informal market or employed in non-skilled or semi-skilled jobs with low wages. When asked if they

think their income levels affect household water security, all the Focus groups affirmed that the household income has a direct effect on water security at the household level. This is in concurrence with the findings of WSUP (2016) that link high poverty rates to poor basic services provision such as electricity, water, sanitation, solid waste management and primary health care, mostly as a result of poor urban planning as well as the illegitimacy of informal settlements where the urban poor reside. The explanations for the above affirmation were that the household income levels determine the ability of each household to afford water services, including ensuring access to the water sources as well as guaranteeing sufficient quantity.

The FGDs revealed that households with lower income are more prone to water insecurities. This situation is worsened by additional water-related costs that households have to spend to get potable water. In addition to the actual amounts spent on recharging the household prepaid water tokens, the majority of household spend between N\$120-150 per trip to transport water from the water points to the house which is done once or twice per week. Households also spend about N\$36 per trip to the municipal offices to recharge their water tokens. As many residents are in the informal market and have low and irregular cash flow, they make weekly trips to the municipal offices which translates to about N\$144 per month.

To reduce the water related costs, most households ration water use in the house and compromise on important activities. The study has found that many households resort to using minimal quantity of water in the house in order to decrease the transport cost as well as the actual water consumption cost. Literature suggests that insufficient supplies of water for individual hygiene and poor sanitation can lead to serious health and personal hygiene issues (WHO, 2000). By so doing, household security is highly compromised as the quantity of water is not adequate enough to qualify as water secure.

Another contributing factor is the increase in water-related costs for the households is the long distance to the municipal offices where the community recharges the prepaid water tokens. The municipal offices that offer such services are Wanaheda and Khomasdal branches that are both situated more than 6 kilometres from the Thlabanello settlement. The FGDs revealed that the transportation to the municipal offices for the sole purpose of recharging the water token adds additional financial expenditure to these low-income households.

4.3.3 Lack of electrical power

The absence of electricity in the Thlabanello settlement was also strongly raised as one of the factors that indirectly affects household water security. The contribution of this factor is two-fold; firstly, as an inhibitor to boiling water to improve the quality, and secondly as a constraint limiting access time to water points.

The study found that community members are aware of possible water contamination after collecting it from a safe source, either during the transportation process or during storage within the household. Despite this awareness, the majority of the households do not practice water purification remedies for drinking water at home. The most common and simplest purification method known in the community is the boiling method. However, the community feels that boiling drinking water is expensive as most households use wood, paraffin or gas stoves and it is costly to fill the gas cylinder and the transport costs involved. The lack of purification of water at household level thus contributes to the spread of possible water-borne diseases that may be caused by the reduced water quality.

Furthermore, the absence of electricity, especially street lights, generally restricts accessibility to water sources as they are situated a distance from the houses. There is a general concern for safety, hence community members avoid collecting water before sunrise or after sunset. That means that the community access water points freely only between 6h00 and 19h00 every day. Therefore, if there is insufficient water quantity in the house, household members would rather compromise on the available quantity of water, thereby causing temporal water stress within the household. These circumstances affect more specially the households where all household members are employed or engaged in some economic activities during the day, thus they usually leave home before sunrise and only return at night.

4.3.4 Status of the settlement

The City of Windhoek has no specific policy in service provision to informal settlements. Although specific on water and sanitation services management in the rural and formal urban areas, the national Water and Sanitation Sector Policy (WASP) is also silent on how water and sanitation services should be rolled out to benefit the urban poor that are concentrated in different informal settlements in the country. Settlement status has been found to be a contributing factor to household security as absence of land rights, water service provision is

hampered (Kujinga, *et al.*, 2014; Subbaraman & Murthy, 2015). Research has found that informal settlements in urban areas are historically not prioritised in water policies or development compared to core-urban areas, as they are considered illegal by authorities (Uitto & Biswas, 2006; Das & Safini, 2018). The illegality of the Thlabanello settlement places the inhabitants in a challenging position when demanding for essential services for the area including water. In the absence of a policy to direct the transformation of informal settlements and provision of basic services, household water security in such settlements shall remain compromised for a very long time.

4.3.5 Lack of public health information

As part of their community development programmes and Disaster risk management initiatives, the City of Windhoek conducts community outreach meetings to share important information with the community, including topics such as public health, water and hygiene amongst others. Meetings of this nature are often poorly attended by the community members, according to one of the key informant interviews. The FGDs have also confirmed the statement that community members are not interested to attend the public meetings arranged by the CoW. The explanations given were that the meetings are held at an open space on the borders of Thlabanello informal settlement and Goreangab proper, which is far for most community members. It also emerged from the FGDs that the community has lost trust in the authority, claiming that the CoW only wants to speak to the community on selective matters but slow in providing them with the essential services needed in the settlement. The community further aired that the public or community meetings are not engaging platforms so that the community is given an opportunity to also contribute to the discussions, but it is mostly one-way flow of information.

The study has however found that there is little awareness and knowledge on basic water handling, sanitation and general hygiene amongst the community. This is evident from poor hygiene and sanitation practices within the Thlabanello settlement that could directly lead to intra-house water contamination, which affects the water quality after collection from the water source (Clasen & Bastable, 2003). Community sensitisation on public health issues is essential to encourage households to purify drinking water as the quality of water is critical in maintaining good health (Azlan, *et al.*, 2012).

4.3.6 Lack of sanitation of facilities and poor hygiene practices

Proper sanitation practices are necessary to properly manage and safely dispose of human waste. The Thlabanello settlement is not connected to the central sewerage system of the CoW, mainly due to the difficulty involved in connecting such informal areas without following proper town planning procedure, which includes mapping for such infrastructure. Therefore, in this settlement, only about 1 out of 20 houses have constructed dry sanitation systems (pit latrines) within the yard in the absence of municipal sewerage management systems. The majority of households either practice open defecation in the river beds or unoccupied spaces in the proximity, whilst others defecate in plastic bags inside the house which are later disposed of in the open at dumping grounds within the settlement or in river beds.

This situation is a potential threat to water security as it exposes the community to various water-borne and vector-borne diseases which are especially dangerous for children. The risk of transmission for these diseases in Thlabanello is high as the community has poor hygiene practices. This situation coupled with the fact that many households do not strictly store water in closed containers could expose stored water to contamination with faecal matters by insects or flies, which if ingested could transmit diseases (Clasen & Bastable, 2003).

Poor hygiene practices are common in the community, with very few households that practice hand-washing before and after eating, and after defecation. Failure to wash hands after defecation and handling water thereafter may affect the quality of water within the household (Palamuleni, 2002). It was also found that despite the risk of contamination of water during storage or handling within the house, most households do not purify water before drinking. When further probed on the use of purifying chemicals to improve the water quality, the participants of the FGDs expressed that it is not a norm to use them as they are unavailable locally.

4.3.7 Inadequate physical water infrastructure and distance to municipal water points

The state of water infrastructure in Thlabanello settlement is in a very good condition, with newly installed piped water supply connections to the settlement done in the year 2018 after the Hepatitis E outbreak in the area. However, the communal access water points provided within the settlement are insufficient to adequately cater for all households in the settlements.

The pipeline supplying water to the Thlabanello settlement only reasonably covers some sections of the settlement. Whilst some households are relatively close to the water points, some community members walk up to 2 kilometres to the nearest water point to collect water for household use. Due to these long walking distances to water points, households are unable to collect sufficient quantities of water necessary for their daily water needs. These factors lead to a chronic imbalance between daily household water demand and actual water supply.

The CoW discovered during the first phase of connecting the pipeline that there is low pressure to cover the entire settlement with public water points, as a result, the water points only cover some areas of the settlement. According to the key informant interviews, it is technically impossible to expand the pipeline to the rest of the remaining sections of the settlement as it is increasingly going against the natural flow of the water supply system of the CoW from the current water supply redistribution points.

4.3.8 Proximity to unsafe water sources

The Thlabanello settlement is located in close proximity to the Goreangab Dam that holds effluent water running from the Goreangab water reclamation plant that collects and recycles used wastewater from the City of Windhoek Municipal area for re-use. The effluent water in the dam is semi-purified and contains harmful micro-organisms, making it unfit for human consumption (Claassen, *et al.*, 2015). If consumed, the micro-organisms in the water pose a great public health risk, as it could lead to some ailments especially diarrhoea related diseases which are dangerous particularly for children. The WHO (2000) suggests that polluted drinking water and inadequate supplies of water for personal hygiene and poor sanitation are some of the main contributors to approximately 4 billion cases of diarrhoea and causes an estimated 2.2 million deaths annually, especially among children below the age of five. The study has established that there are some residents that collect the semi-purified water from the Goreangab Dam for household consumption. This practice is more common on the western to the southern sections of the settlement, which are in closer proximity to the dam. As a result of unhygienic practices and usage of unsafe water from the Goreangab effluent, an outbreak of Hepatitis E was recorded in the area in 2017 and some community members were affected and consequently, around 48 deaths were recorded across Windhoek informal settlements from 2017 to 2019 (The Namibian, 2019).

When the participants of the focus group discussions were asked what they thought the reasons were, regarding some households collecting unsafe water from the open dam for their use, the main reasons provided were that; the water from the dam is free, thus it reduces water related expenditure for those specific households, the dam is relatively closer to some households compared to the municipal water points that can be up to a radius of two kilometres distance away from these households. Another reason given for the above mentioned practice is the illegitimacy of some households that are not allocated with house numbers as part of municipal records and administration. This prevents the affected households from purchasing the prepaid water tokens from the municipality that will give them access to potable water at the public municipal water points. As a result, the households without water tokens are forced to either utilise the neighbours' tokens to access the water point or to collect the freely accessible water in the dam. Thus, access to water as a resource for those households is therefore limited, thereby contributing to household water insecurity.

Therefore, the existence of the dam and free access thereof provides an alternative source of water for some households in the settlement despite the poor water quality, which negatively contributes to household water insecurity in the settlement.

4.4 Conclusion

The chapter summarises the main findings of the research study. It outlines the common factors that are contributing to household water security or insecurity in the Thlabanello informal settlement. These factors show similarities to findings of previous studies on household water insecurity globally and regionally. The research findings as described above were used for discussion and to reach concrete conclusions of the research study.

5. CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The research study was aimed at understanding the diverse factors affecting household water security in the Thlabanello settlement. In this chapter, the major conclusions from the research findings were drawn derived from the findings in Chapter 4, and further recommendations are made for both policy-making purposes and also for directing further research themes.

5.1 Summary of findings based on the research questions

Research question 1: What is the current state of water security in the Thlabanello Settlement?

The Thlabanello informal settlement has over the years struggled with inadequate water supply. As an informal settlement, service provision is not a priority to the local government as policies are mainly focused on providing municipal services to the formal areas of the city. As a result, households in Thlabanello have insufficient water supply for consumption, and water related costs are increased by private transport service providers due to long distances to the communal water points. Therefore, using the dimensions of household water security, this informal settlement can be affirmed as water insecure in terms of access, quality, quantity, affordability and some houses are prone to water related natural disasters in a form of seasonal flash floods during the rainy season.

Research question 2: What are the factors contributing to household water insecurity in the settlement?

The main factors contribution to household water insecurity in Thlabanello informal settlement include rapid population growth and urbanisation, unemployment and low household income, lack of electrical power, status of the settlement, lack of public health information, lack of sanitation facilities and poor hygiene practices, inadequate physical water infrastructure and long distances to municipal water points, and proximity to unsafe water sources.

Research question 3: What are the impacts of household water (in)security on the community's health and wellbeing?

The main social and economic impacts of household water insecurity that have been identified by the study and include loss of valuable time to participate in income-generating activities or

executing important household chores, reduction in household buying power, compromised community health, and poor personal and household hygiene.

Research question 4: What recommendations can be made to improve household water security in Thlabanello?

The major recommendations from the study are to finding a lasting solution to the technical challenges that are inhibiting further expansion of the pipeline into the settlement. The much needed expansion is required to reduce the walking distance to and from the nearest water points, as well as decrease the user ratios at the water points in the area, thereby improving household water security. The City of Windhoek should also provide sanitation services to curb the spread of water related communicable diseases in the settlement. Intensive public health promotion or sensitisation activities should reach the different areas of Thlabanello to encourage participation in such initiatives.

5.2 Conclusion

The findings of the study indicate serious factors that could potentially negatively affect water security at the household levels in the Thlabanello informal settlement. It has emerged from the analysis that the status of household water security in the area of study could be attributed to a combination of underlying factors including; rapid population growth and urbanisation, unemployment and low household income, lack of electrical power, status of the settlement, lack of public health information, lack of sanitation facilities and poor hygiene practices, inadequate physical water infrastructure and long distances to municipal water points, and proximity to unsafe water sources. These factors reflect similar results to studies conducted in other SSA countries such as Malawi, Botswana and South Africa (Harrington, 2014; Kujinga, 2014; Adams, 2018).

The study further highlighted the detrimental effect of household water insecurity on the health and well-being of the community. These impacts include; compromised health with the risk of transmission of water-borne disease and poor sanitation, reduced buying power as a significant proportion of household income is spent on water services, increased energy and time demands by carrying heavy water containers over long distances. These findings are consistent with some scholarly findings globally and in SSA (Webb & Iskandarani, 1998; Boateng, *et al.*, 2018). Literature further demonstrates that water-related waste and sanitation challenges experienced by the economic marginalised population leads to unsanitary and poor living

conditions (Kumar, *et al.*, 2012). These findings highlight the need to find permanent solutions to household security in the settlement. They further underscore the importance of addressing water insecurity in many urban informal settlements, as they reflect the main difficulties that underlie water insecurity in many urban informal settlements across Sub-Saharan Africa (SSA) (UN-Habitat, 2016).

The study presented an interesting phenomenon connecting lack of electricity supply as a hindrance to household water security. Although traditionally considered important for lighting and cooking, these study findings indicate that electricity was perceived crucial for maintaining unlimited access and provides for improvement of water quality within the household by the residents of Thlabanello. The time limitation of water collection which is currently limited to daylight as it becomes unsafe for community members to collect water in the evening, as this could expose them to criminal elements. The second explanation is that the absence of electricity makes the process of boiling drinking water cumbersome and expensive, hence, households risk their health by consuming water that has been stored in the house with compromised quality. This phenomenon and its consequent effect is not properly documented in the extant literature; thus it provides a new direction for future researchers in the field of water security.

5.3 Recommendations of the study

Addressing water security challenges requires the adoption of pro-active service planning strategies and approaches by the City of Windhoek, considering variant factors that have the potential to improve the effectiveness of water provision in informal settlements. Strategies should sufficiently consider demographic dynamics including; economic growth, the current population size, future population projections, population growth rate, the number of households in the area, household incomes, technical requirements for water infrastructure, the different viable water service levels necessary to supply sufficient quantities for household needs. These above-mentioned factors amongst others, determine the degree of accomplishments in sufficient water provision and should be highly considered during planning, especially for upgrading of informal settlements as they develop.

In an effort to address the water security challenges as identified by the study, the following recommendations for both policy-makers and local authority administration are proposed to improve the state of household water security in the Thlabanello informal settlement.

- a. The focus group discussions recommend that the CoW should find a technical solution to enable it to expand the water supply to all the areas of Thlabanello settlement. Although this may be costly to the CoW, it is necessary to avert a water crisis or possible public health issue in future. The expansion of the water infrastructure will also make water services more affordable to the community as it will eliminate the expenditure on water transportation that the households currently incur. It will also furthermore improve water security by reducing the distance to water points, which will allow households to collect sufficient quantities of water for household consumption.
- b. The focus group discussions further recommend that the City of Windhoek should make provision for sanitation facilities in the settlement to ensure safe disposal and management of human waste. Sanitation facilities are crucial in preventing faecal contamination of water and transmission of water-borne diseases in the community.
- c. The Goreangab Dam should be totally condoned off and access to it be limited for the general public. The flowing streams with effluent water that are passing close to the settlement should be channelled through underground pipes and be disposed of at a safer distance from the community. This is to prevent the collection of unsafe water as the current practice has detrimental effects on human health.
- d. The Key Informants agreed that formalisation of the settlement and ensuring their security of tenure will definitely go far in achieving water security in Thlabanello and other informal settlements in the City of Windhoek, as such formalisation processes are usually accompanied by the provision of essential services as per the mandate of the City council. This coupled with provision of other essential services such as electricity will greatly contribute to water security in the settlement. For example, if the settlement is provided with electricity, which the community feels is relatively cheaper to use compared to gas energy, that households can use for cooking, it would bring convenience and promote safe water purification practices at household level.
- e. As the settlement awaits the eventual formalisation process, the CoW should hasten the administration process to mark and allocate house numbers for the current inhabitants to ensure all households have rights to purchase the prepaid water tokens, which grants equitable access to public municipal water points for safe and clean water.

- f. The community is of the opinion that their participation and involvement is crucial from the planning stages of water supply design and development, thus, the community members should in future be consulted especially on positioning of water collection points in the area.

5.4 Recommendation for Further Research

The study found that the framework by Thomas (2015) on the five dimensions of Household water security is easily adaptable and recommendable for use by other researchers. Further research activities in the area should explore the viable options that can be implemented to address water security problems in informal settlements of Windhoek. Additional research could also investigate the linkage between urban poverty and water security in informal settlements. Another thought-provoking research area worth exploring is; the analysis of social impacts caused by water insecurity in poor urban areas.

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APPENDIX 1: DATA COLLECTION TOOL

QUESTIONNAIRE FOR THE FOCUS GROUP DISCUSSION FOR THE STUDY:

Factors affecting household water security in Thlabanello informal settlement in the City of Windhoek

I. OPENING: I am Vistorina Kaunahafo, a master's student at the Centre for Development Support (CDS) at the University of the Free State. I would like to invite you to take part in my research project entitled: Factors affecting household water security in Thlabanello informal settlement in the City of Windhoek. As a member of the Thlabanello settlement, I thought it would be a good idea to discuss with you as a group, so that I can research on underlying factors that are affecting water security at household level in your community.

II. BODY: Guiding questions for in-depth discussion with community members and leaders (*Further probing questions to be asked after each leading question according to the flow of responses to enrich the discussions*)

1. Water Quality

- 1.1. What do you think of the quality of the water supplied by the municipality?
- 1.2. What type of containers are mainly used to store water? Are they kept tightly closed at all times?
- 1.3. What water treatment remedies are practiced in the community to improve the quality of the water at home after storage?
- 1.4. What sanitation practices exist in the community? How do these affect the quality of water?
- 1.5. Do some members of your community collect water from alternative sources other than the municipality water points? If yes, what are the reasons?
- 1.6. What domestic routines could compromise water quality at household level?

2. Water Quantity

- 2.1. How often do you have to collect water for the household and whose responsibility is it? (*in terms of gender*)
- 2.2. How much water do you need to use daily and what is the water used for?
- 2.3. Is the water you collect sufficient for all household needs? If not, which needs are prioritised?
- 2.4. How does the needs-supply variance affect the community's way of life?

3. Accessibility to water sources

- 3.1. Where do you collect water for household use from?
- 3.2. How many water points exists in your community?
- 3.3. What is the distance to the nearest water point from your houses?
- 3.4. What is the waiting time at the water point?

- 3.5. How long does it take to walk to the water point and how does this affect your daily routine?
- 3.6. Are the water points accessible all the time? Why not?
- 3.7. Are there restrictions on who can access the water points? How does these affect the community?

4. Affordability of water services

- 4.1. How much do you spend on water per month on average per household? (*Including related costs such as transport where applicable*)
- 4.2. Is it affordable for many members of the community? Explain why or why not.
- 4.3. What rates could be more affordable to the community? Why?

5. Reliability of water sources and resilience to water related disasters

- 5.1. Are the water points reliable? How often do you get water disruptions in the area?
- 5.2. Do you experience problems related to rainwater during the rainy seasons? What type and what is the cause?

6. General

- 6.1. What is the average household size in the area?
- 6.2. What do you think of the water related services provided by the municipality?
- 6.3. What challenges do you experience related to water provision?
- 6.4 Suggest recommendations to authorities related to water services

III. CLOSING: I appreciate the time you took for this focus group discussion. Is there anything else you think would be helpful for me to know that enrich the findings of this study?

In the absence of further questions, I thank you all for coming.

APPENDIX 2: INFORMED CONSENT FORM FOR FGDS

28 November 2018

Dear Participant,

RE: INFORMED CONSENT FOR RESEARCH PROJECT

I am a master's student at the Centre for Development Support (CDS) at the University of the Free State. I would like to invite you to take part in my research project entitled: Factors affecting household water security in Thlabanello informal settlement in the City of Windhoek.

The study is aimed at understanding what factors are contributing to water (in)security in the aforementioned settlement.

Study procedures: The study has three main phases. The first involves conducting focus group discussions with community members in all different sections of the settlement. The second phase involves conducting in-depth interview with community leaders and officials from the City of Windhoek as key informants to the study. The final step involves observation and secondary data reviews.

Benefits: There are no direct benefits for participating in this study, however the information that you give could contribute towards an understanding of the complex issue of water security in households in informal settlements.

Confidentiality: The information that I will obtain from you will be stored safely, although it will be shared with my supervisor and co-supervisor who are involved in this study. Citations from the focus group discussions may be included in the final dissertation and may also be published in journals. Furthermore, the study does not require you to disclose or name any specific individuals and you do not have to discuss any personal information that you do not feel comfortable talking about.

Risks: There is no major anticipated risk that will be encountered by your participating in this study.

Voluntary participation: Participation in this study is voluntary and you are under no obligation to take part in the focus group discussions. If you have any concerns with the way the research is being conducted, please feel free to contact and discuss it with my supervisor, whose contact details are given below.

Please feel free to ask any questions on any aspect of this study that is unclear to you.

Yours sincerely,

Vistorina K. Aihuki
Supervisor: Ms. Kholisa Rani
Email: kaunah@gmail.com
Email: sigenuk@ufs.ac.za

Focus Group Informed Consent Form

Research Topic: Factors affecting household water security in Thlabanello informal settlement in the City of Windhoek

Researcher: Vistorina K. Aihuki

By signing below, I agree to the following statements:

- I agree to participate in the focus group conducted by Ms. VK Aihuki of the University the Free State, to assist with the above-mentioned research.
- I have read and understood the attached information sheet furnishing details of the project.
- I have had the opportunity to clarify issues with the researcher that I had about the project and how my involvement in it will happen, and I understand my role in the project.
- My decision to consent is entirely voluntary, and I understand that I am free to withdraw at any time without giving a reason.
- I understand that data gathered in this project may form the basis of a report or other form of publication or presentation.
- The interview will be recorded to make the interviewer's job easier. However, the recording will be destroyed immediately after transcription.
- I understand I will remain anonymous throughout data report, publication or presentation and that every effort will be made to protect my confidentiality.
- I am fully aware that data collected will be stored securely, safely to maintain confidentiality and anonymity.
- I am aware that I can make any reasonable changes to this consent form should there be grounds to do so.

Participant's Signature¹: _____ Date: _____

Researcher's Signature: _____ Date: _____

Please fill in and return this page. Keep the letter above for future reference.

Please only sign this form if you agree to participate in the study.

Person to contact for further enquiries:

Ms. Vistorina K. Aihuki on 0851272846

¹ Please do not write your name to maintain anonymity