AN ANALYSIS OF THE IMPACT OF WATER SCARCITY ON BEVERAGES PRODUCTION IN NAMIBIA: A CASE STUDY OF NAMIBIA BREWERIES LIMITED-BEER PRODUCTION, WINDHOEK, NAMIBIA

A THESIS SUBMITTED IN PARTIAL FULFILMENT

OF THE REQUIREMENTS FOR THE DEGREE OF MASTER

OF BUSINESS ADMINISTRATION NATURAL RESOURCES MANAGEMENT

OF

THE UNIVERSITY OF NAMIBIA

BY

PINEHAS NYANYUKUENI UUPINDI

201310829

APRIL 2019

SUPERVISOR: DR. STEWART KAUPA (NAMIBIA UNIVERSITY OF SCIENCE AND TECHNOLOGY)

ABSTRACT

The aim of the study was to analyse the impact of water scarcity on the production capacity of Namibia Breweries Limited for a period of 5 years (2013 – 2017). This was with a special focus on beer production capacity, sales, revenue and the likely potential threats it poses to the country's GDP. It intended to explore the long-term sustainable approaches to fight against water scarcity faced by the country in order to place NBL in a competitive sustainable business position during drought events. The study was limited by the sensitive technical in-house information that could not be disclosed to the researcher so as to present a complete picture of the investigated problem. The study used a mixed of exploratory and descriptive research methods. Simple random sampling method was used. Participants were approached to partake in the study and a questionnaire was administered to 134 employees. Quantitative data was analysed using Statistical Package for the Social Sciences whilst qualitative data was analysed using ATLAS.ti software. The major findings of this study were that beer production uses water intensively for processing than other beverages produced by NBL. The company was most hard hit by water shortages that interrupted production during the brewer's peak season in the 2016 financial year. That shortage led to a decline in revenue, high employee turnover and subsequently affected NBL's contribution towards the country's GDP. Hence, the study explored long term sustainable approaches to fight against water scarcity. The water supply options included relocation of the production plant to areas with reduced water risk, drilling of more boreholes and tapping of water from the Kavango River. The study recommended that NBL continuously engage with strategic partners such as Government and the City of Windhoek to find and support solutions to ensure sufficient water supply in order to enhance a favourable business competitive environment. Else, NBL should consider investing in a new packaging line or production plant within the country which is subjected to strategic, cost implications and long-term availability of water.

Key words: *Water scarcity, production capacity, water ratio, sales, revenue, GDP, water sources, climate change, drought, NamWater dams, boreholes reclamation plant, water footprint, water stewardship.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONMYS

BIER	Beverage Industry Environmental Roundtable
CDP	Carbon Disclosure Project
COW	City of Windhoek
ENWC	Eastern National Water Carrier
FAO	Food Agriculture Organisation
GDP	Gross Domestic Product
IEA	International Energy Agency
IHE	Institute for Water Education
IWRM	Integrated Water Resources Management
NBL	Namibia Breweries Limited
NSX	Namibian Stock Exchange
NamWater	Namibia Water Corporation
OECD	Organisation for Economic Cooperation and Development
SADC	Southern Africa Development Countries
SME	Small and Medium Enterprises
SPSS	Statistical Package for the Social Science
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNWWD	United Nations World Water Development
USA	United State of America
WHO	World Health Organisation
WWF	World Wide Fund

ACKNOWLEDGEMENTS

DEDICATION

This study is dedicated to my mother, Maria T Uupindi, without your caring and support it would not have been possible. The study is also dedicated to the memory of my late father Jacob Uupindi, Papa you taught me how to read and write, unfortunately you departed this world without rejoicing in the fruits of your labours, Papa give me your signal.

DECLARATION

I, Pinehas Nyanyukueni Uupindi, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

No part of this thesis/dissertation may be reproduced, stored in any retrieval system, or transmitted in any form, or by means (e.g. electronic, mechanical, photocopying, recording or otherwise) without the prior permission of the author, or The University of Namibia in that behalf.

I, Pinehas Nyanyukueni Uupindi, grant The University of Namibia the right to reproduce this thesis in whole or in part, in any manner or format, which The University of Namibia may deem fit.

Pinehas Nyanyukueni Uupindi

…………………   …………..

Signature   Date

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

Established on 29 October 1920, Namibia Breweries Limited (NBL) is one of the leading beverage manufacturing companies in Namibia and Southern Africa. In May 1996, the company was listed on the Namibian Stock Exchange (NSX) and became a publicly owned company. The Ohlthaver & List Group of Companies is the controlling shareholder of NBL with revenues contributing about 4% to Gross Domestic Product (GDP). In 2003 NBL restructured its operations in Namibia and South Africa in agreement with leading drinks company Diageo and brewer Heineken. These two became NBL's strategic partners. Today, NBL leads the domestic beer market with 87% and has a significant share of 34.5% of the premium beer market in South Africa (IJG Securities, 2016). The company's workforce comprises of about 802 employees (NBL Annual Report, 2017).

NBL produces a variety of non-alcoholic products, for all consumers, and alcoholic products for a wide range of adult consumer segments, particularly the middle-aged group at a spread of price points. Although, NBL produces a variety of alcoholic beverages, beer is the most significant. It accounts for 67% of the total beverages consumption locally (WHO, 2014). The company reported that, Beers constitute 93% of all volume produced and continues to be the most significant contributor to revenue, making up 93.1% of the total revenue. According to IJG Securities (2016) NBL is the biggest industrial consumer of water in Windhoek. IJG securities (2016) further stated that, NBL receives more than 75% of water for operations and production from the City of Windhoek, whereas 25% is extracted from the company's boreholes. With a sustained regional drought across southern Africa, the central region of Namibia (which includes Windhoek) has been one of the worst hit areas (Biggs & Williams, 2013). The country's rainfall is quite low, ranging from more than 50mm to less than 700mm

a year with a long-term average of about 250 millimetres per year (Reid, Sahlen, Macgregor & Stage, 2007). Rainfall is not only low but extremely variable over much of the country and drought is a common occurrence. As a result of the extremely arid hydroclimate, it is estimated that only 2% of the precipitation ends up as surface runoff while 1% contributes to groundwater recharge (Crovello, Davidson, & Keller, 2010).

According to Biggs & Williams (2013) the traditional water supply to Windhoek has come from groundwater in the Windhoek locality. Whilst Windhoek still gets some of its yearly supply from groundwater, boreholes and the reclamation plant, the main source of water supply to the City of Windhoek is from three dams' system north of Windhoek namely Swakoppoort, Von Bach and Omatako. According to Uhlendahl, Ziegelmayer, Wienecke, Mawisa, & Du Pisani (2010) the total storage capacity of the three dams which supply water to Windhoek is 155.6 million cubic meters. The dams are normally sized to capture approximately half of the average annual run-off (Crovello *et al.,* 2010). This implies that if these dams were all filled to capacity, the availability of water resources from dams would be quite high compared to Windhoek's current water demand or consumption for economic purposes which currently stands at 25.6 Mio m³ per annum. The figure below illustrates the dam's water content in cubic meters as recorded in the past five years.
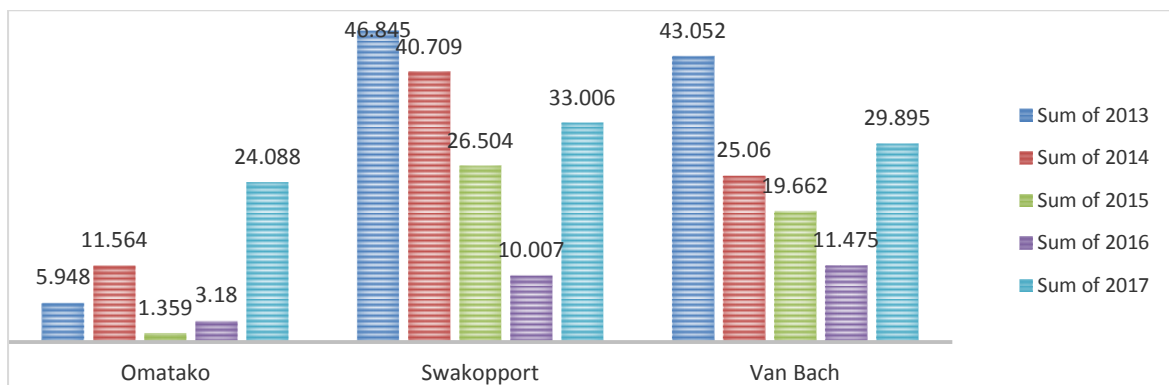
Figure 1.1: Dam's volume water content

Source: NamWater Weekly Dam bulletins, 2018.

However, this figure of 155.6 Mio m³ of water is unlikely to be available at one point in time especially in the past four years. This implies that, limited water inflows into the key national dams due to lack of rainfall have a severe impact on NBL as they are heavily reliant on water supply to produce their products. Shortages of water therefore place Namibia's strong GDP growth rate in jeopardy.

1.2. Statement of the Problem

According to IJG Securities (2016) Namibia Breweries Limited's water-to-beer ratio in litres currently stands at about 4.4:1. On estimates, the company produced about 1.6 million litres of beer annually, requiring about 7.0 million litres of water each year. NBL's total revenue for the 2016 financial year decreased by 0.3% from the previous period as a result of water scarcity and increases of water saving methods introduced by the City of Windhoek in May 2016 (IJG Securities, 2016). As an intermediate solution to water scarcity, NBL has drilled boreholes on its premises resulting in 26% self-sufficiency, however this has not been sufficient for production volumes in the event of drought (IJG Securities, 2016).

Given this background, this study's main objective was in analysing the impact of water scarcity on the production of Namibia Breweries Limited for a period of 5 years (2013 – 2017). This was with focus on beer production capacity, sales, revenue and the likely potential threats it poses to the country's GDP. Hence, the study explored the long-term sustainable approaches to place NBL on a competitive sustainable business position during drought.

1.3. Research Objectives

The main objective of the study was to analyse the impact of water scarcity on the beer production of Namibia Breweries Limited for a period of 5 years (2013 – 2017).

More specifically, the study intended to achieve the following objectives:

i) To analyse the impact of water scarcity on Namibia Breweries Limited beer production capacity;

ii) To determine the impact of water scarcity on NBL's contribution to the country's GDP;

iii) To explore long term sustainable approaches of supplying water to NBL.

1.4. Significance of the study

The findings from this study will be useful to inform NBL's management and decision makers on the important roles of water within the value chain of the beverage industry. They should help in understanding the trends in water sourcing, treatment, wastewater discharge and the impact or potential threats of drought on the production of the brewing industry. The study identifies the gaps in NBL's existing water to beer ratio and provides a framework to build new technologies to buffer water shortages in Windhoek. This should help to address issues of water scarcity and quality. It is also useful to academics and researchers who want to explore more on the topic in future.

1.5. Limitation of the study

The study was limited by the sensitivity of the technical in-house information as respondents were cautious to divulge the intricacies of their processes. The study was also limited by the number of participants. The researcher could not collect data from the entire recommended sample due to availability constraints. As a result, some questionnaires were returned from

participants uncompleted. However, other secondary materials such as NBL's annual reports and audited financial statements were used to overcame and avoid the aforementioned drawback.

1.6. Delimitation of the study

The study was limited to Namibia Breweries Limited in Windhoek with a special focus on beer production. In specifying the scope of the study, several NBL beverage products were excluded from the study. These beverage products were considered to be immaterial based on preliminary research of how much water is consumed by each of these beverage products.

1.7. Conclusion

This chapter presented the problem investigated. It also covered the purpose, relevance and the scope of the study. The study aimed at analysing the impact of water scarcity on the production of Namibia Breweries Limited during the past 5 years; specific to the production of beer. It also looked at the likely potential threats it poses to the country's national Gross Domestic Product. The chapter then generated research objectives to address the problem. The significance of the study as a necessary tool to inform NBL's management and decision makers; the roles of water within the value chain of the beverage industry and the impact of water scarcity on beverage production. Finally, the chapter presented the limitations expected and delimitation of the study. The next chapter presents information from various literature reviewed and theories regarding water scarcity on beverage production locally and internationally.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter seeks to analyse relevant literature and findings that are important to this study. The theoretical literature presents and seeks to attempt to explain the theories related to the subject matter: an analysis of the impact of water scarcity on Namibia beverages production in relation to beer production. Literature review is a description and critical analysis of what other authors have written, through focusing on the research questions and objectives (Saunders, Lewis and Thornhill, 2016). Bak (2009) states that literature review includes scholarly journals, scholarly books, authoritative databases and primary sources that comprise of newspapers, films, audio, video tapes and other secondary sources.

2.2 Impact of water scarcity on the beverage industry and other industries in Namibia

According to Hastings & Pegram (2012) water is becoming an increasingly scarce global resource, Namibia is not an exception. IJG Securities (2015) claimed that, water scarcity in Namibia directly affects economic activity, impacting water-dependent industries such the brewing industry and placing Namibia's strong GDP growth rate in jeopardy. IJG Securities (2016) further argued that, with a sustained regional drought across southern Africa, the central region of Namibia (which includes Windhoek) has been one of the worst hit areas.

However, Cumming, Kuschke & Nanghonga (2015) claimed that, water shortage in Windhoek, which is the central and most significant business hub in the country, from which most business activities and income originate, is likely to have a significant impact on all businesses, and not only water-dependent industries. Cumming *et al.,* (2015) further warned that a water shortage or restriction in the region will have spill over effects and affect

economic activity across the country, severely impacting water-dependent and water-intensive industries and placing Namibia's strong GDP growth rate in jeopardy.

IJG Securities (2015) argued that any drought has an enormous impact on the agricultural sector. Businesses that depend on the farming sector like Agra, Meatco, Namibia Dairies, Namib Mills and other companies are likely to suffer too. Contrary, Kagabi & Mashauri (2014) claimed that, in a water shortage scenario, supply preference will be given to households as water is required to sustain life. Public and essential services such as schools, hospitals, government, police and the army will be second in line, while business, industry and construction will come last.

Kagabi & Mashauri (2014) argued that, although not yet a problem, this has wider implications for the government's poverty eradication and industrialisation vision, industrialisation needs water and plenty of it in order to develop. Kagabi & Mashauri (2014) further stressed that, government should take proactive steps to develop infrastructure to ensure sufficient water is supplied where needed.

2.2.1 Current sources of water supply to Windhoek

According to Biggs & Williams, (2013) traditional water supply to Windhoek has come from groundwater in the Windhoek locality. Whilst Windhoek still gets some of its yearly supply from groundwater, its main source is from the 3-dam system north of Windhoek. According to Crovello, Davidson, & Keller (2010) the area of intervention for Windhoek's water supply concentrates on both supply and demand side measures. However, Maanda & Vernouman (2011) argued that with a population growth of over 3% annually and a growing economy, water supply is becoming an increasing constraint for Namibia, specifically in Windhoek.

2.2.1.1 Integrated three dam system

The 3-dam system was developed between 1970 and 1982 (Biggs & Williams, 2013). According to Uhlendahl *et al.,* (2010) water from Swakoppoort Dam (storage capacity 63.5Mio m³) bypasses Von Bach Dam (48.6 Mio m³) and is pumped straight to the water treatment plant and used directly for Windhoek. Uhlendahl *et al.,* (2010) further indicated that, Omatako Dam (43.5 Mio m³), the smallest of the 3 dams and also the least efficient, is intended to store only a minimum amount of water and is used primarily for surface water catchment and replenishing the Von Bach Dam.

According to Uhlendahl *et al.,* (2010) the total storage capacity of the three dams which supply water to Windhoek is 155.6 Mio m³. Crovello *et al.,* (2010) stated that, the dams are normally sized to capture approximately half of the average annual run-off. Similarly, Biggs & Williams (2013)'s assumption, implies that if these dams were all filled to capacity, the availability of water resources from dams would be quite high compared to Windhoek's current water demand for consumption and economic purposes. However, Uhlendahl *et al.,* (2010) argued that, this figure of 155.6 million cubic meters of water is unlikely to be available at one point in time.

2.2.1.2 Reclaimed and reused water

According to Biggs & Williams (2013) Windhoek was the first city in the world to reclaim its water back to potable water quality for use in the reticulation system. The first pilot plant, commissioned in 1959, was followed by a full-scale plant in 1960. As a cost-effective way of augmenting supply, the City of Windhoek constructed a new Reclamation Plant at Goreangab to increase the capacity from 3.6Mm³ to 7.5Mm³ of water per annum (Crovello *et al.,* 2010).

2.2.1.3 Groundwater

According to Biggs & Williams (2013) groundwater is Windhoek's traditional source of water. When settlers first moved into what is now Windhoek, there were springs in a number of places. However, Van der Merwe (2010) argued that, Windhoek Aquifers have been depleted to the point where there are no longer springs. Over the long term the aquifer can sustainably supply 2 Mm³/a of Windhoek's total water consumption through Windhoek drilled boreholes (Crovello *et al.,* 2010).

2.2.2   Alternative sources of supply of water to Windhoek

According to Lahnsteiner, Lempert, Kim, Cho, & Kim (2007) Windhoek is located in central Namibia, 500 km away from any substantial body of water, thus the distance from reliable water sources makes transportation of water from these sources into the City economically unreasonable. Consequently, another system is needed to give the City a reliable, clean water source considering supply options such as Kavango River/Karst Aquifer pipeline schemes Congo River transfer scheme, artificial recharge reduction in unaccounted for water levels and Desalination of sea water.

2.2.2.1 Kavango River/Karst Aquifer Pipeline schemes

According to Lahnsteiner *et al.,* (2007) investigations into conventional ground and surface water supply augmentation has been done and focused on two main schemes: water transfer from the Karst Aquifer, north east of Windhoek and from the Kavango River. The Karst Aquifer is divided by a natural ridge. This argument is supported by Biggs & Williams (2013) that, the south eastern section is already in production with water drawn from Kombat and Berg Aukas mines and transported along the Eastern National Water Carrier (ENWC) into the Windhoek supply system via the Omatako Dam. Biggs & Williams (2013) further claimed that, the north western section is under investigation and would follow the same

route with little extra infrastructure required. Conversely, Haimene (2012) claimed that, the Kavango scheme would involve the construction of a 250km pipeline also feeding into the ENWC. Because of their geographical situation these two supply augmentation schemes complement each other. However, Vushe, Haimene & Mashauri (2014) argued that, both options are seen as expensive in comparison to other Integrated Water Resources Management (IWRM) options, involving water transfer over 350km and 600km respectively.

2.2.2.2 Congo River Transfer scheme

Due to sensitivities regarding the use of water from the Kavango River and the potential environmental impact on the Okavango Delta, alternatives that avoid influencing water flow to the Delta are being investigated as well (Lahnsteiner *et al.,* 2007). Many Southern African Development Community (SADC) countries experience or at least anticipate a shortage of water. However, Merrey (2009) claimed tapping water from the perennial sources is a trans-boundary issue that is subjected to international agreements among the countries sharing the perennial rivers due to the SADC Protocol.

2.2.2.3 Artificial Recharge

According to Biggs & Williams (2013) artificial groundwater recharge is considered a potentially important part of IWRM for Windhoek. To cancel the effects of evaporation, groundwater can be an efficient way of storing water. Van der Merwe (2010) estimated that, 35Mm³ evaporates every year from the 3-dam system there could be great benefit in preventing evaporation of even some of the water that is stored. Crovello *et al.,* (2010) argued that, a research is being conducted into the financial feasibility of artificial recharge in the Windhoek locality and the suitability of certain aquifers for water storage. Crovello *et al.,* (2010) further stressed that, initial results suggest that artificial recharge of the Windhoek Aquifer is a feasible alternative to storing water above ground. This alternative for water

storage could certainly postpone alternative, more expensive supply augmentation schemes, some perhaps indefinitely.

2.2.2.4 Reduction in unaccounted for water levels

According to Crovello *et al.,* (2010), an additional water conservation measure on the supply side is to reduce unaccounted for water levels that have traditionally accounted for a disproportionately high level of the total water supply in Namibia. Crovello *et al.,* (2010) claimed that, Windhoek loses an estimated 10%, a loss of 1.7Mm³/4, of its total water supply through leakages and poor maintenance of its reticulation system. This is relatively low in comparison to other municipalities in Namibia but is still a cause for concern.

2.2.2.5 Desalination of Sea Water

Windhoek is placed between 1625 and 1725m above sea level in the centre of Namibia. It is surrounded by Eros-mountains in the east, Auas-mountains in the south and Khomas-highland in the west and north (Du Pisani, 2006). Hence, Crovello *et al.,* (2010) argued that desalinisation of groundwater from the northern water table or sea water is considered as an expensive measure and likely to have negative environmental impact. Crovello *et al.,* (2010) suggested other options would be trucking water into Windhoek. Fog-harvesting is also another option available to increase the water supply for Windhoek. However, according to Vushe *et al.,* (2014) as with many large-scale investments, capital and operating costs heavily influence the adoption of various options, and in the end these solutions were not deemed economically feasible. Vushe *et al.,* (2014) further argue that, despite having reached the limits of many domestic sources of water, water demand will continue to grow as the economy and population grows and competition for water intensifies.

2.3 Impact of water scarcity on the beverage industry in the Southern African Development Cooperation (SADC)

According to Swatuk (2008) Southern Africa is a region characterised with extensive socio-economic underdevelopment. Given water's key role in social organisation, water allocation, use and management in Southern Africa is embedded in deep historical and structural processes of regional underdevelopment. Swatuk (2008) further stated that, water is recognised as an important contributor to socio-economic development within the SADC region. As a result, the coordinated, sustainable and integrated development and management of the region's water resources will contribute to the SADC's goal for "the attainment of an integrated regional economy on the basis of balance, equity and mutual benefit for all Member States". Water management, particularly supports the SADC objectives of poverty reduction, food security, energy security and industrial development, as well as being an instrument to promote peace and cooperation amongst Member States (Swatuk, 2008).

However, Msangi (2014) argued that, water is a finite and scarce resource in many parts of Southern Africa. This argument was supported by Hoekstra (2014) who stated that, whilst in other parts of the region there is seasonal water abundance, in other parts there is a perpetual deficit. Olajide (2012) claimed that "water is a strategic natural resource which, by virtue of its fundamental physics and chemistry, is fugitive in nature" (p. 52). This means that unlike any other natural resource (gold, coal, oil and iron ore), it is not a stock, but rather a flux. According to Msangi (2014) the SADC regional approach has shown great success in facilitating negotiations on river basin management. All shared river basins (13) located fully within the SADC region have adopted cooperation on framework in compliance with the SADC Protocol on Shared Watercourses.

Water plays a critical role in both the operations process and produce of beverage industry (Dolder, Hillman, Passinky & Wooster, 2012). As a result, water quality, water scarcity, water pricing mechanisms, regulations for wastewater disposal, and community perception all pose a material risk to the business model and growth prospects of companies in the beverages sector. Dolder *et al.,* (2012) further stated that, the beverage industry consists of two major categories and eight sub-groups. Alcoholic beverage categories include distilled spirits, wine and brewing. The non-alcoholic category is comprised of soft drink syrup manufacture; soft drink and water bottling and canning; fruit juices bottling, canning and boxing; the coffee industry and the tea industry. Although many of these beverages, including beer, wine and tea, have been around for thousands of years, the industry has developed only in few centuries (Dolder *et al.,* 2012).

Hoekstra (2010) claimed that, the beverage products industry, viewed as an aggregate group, is highly fragmented. This is evident from the number of manufacturers, methods of packaging, production processes and final products. However, Olajide (2012) urged that, the soft drinks industry is the exception to the rule, as it is quite concentrated. Olajide (2012) further stated that, since the early 1900s beverage companies have evolved from regional firms that mainly produced goods for local markets, to corporate giants that make products for international markets. Gardiner (2011) stressed that, this shift began when companies in this manufacturing sector adopted mass production techniques that let them expand. Also, during this time there were advances in product packaging and processes that greatly increased product shelf life. In addition, the advent of refrigeration equipment enabled lager beers to be brewed during the summer months (Gardiner, 2011).

According to Msangi (2014), "water scarcity can have very serious effects on some major industrial sectors in Southern Africa and Africa at large" (p. 37). Consequently, it severely

impacts on the beverage industry as it is heavily reliant on water supply. Hastings & Pegram, (2012) claimed that, the massive quantities of water poured into the production of sodas, beers, juices and other drinks make beverage companies a high-visibility example of a thirsty industry, as worries about water use move up the global agenda. Hoekstra (2010) states that, "the vast majority of the water the sector consumes, though, is used not in its factories or bottling plants, but in the fields where ingredients like sugar, barley and tea are grown" (p. 37). Because its end product is liquid, the beverage industry has symbolic importance as a water user, although it is just one of many water-intensive sectors.

For instance, it takes 170 to 310 litres of water, or 45 to 82 gallons, to produce a half litre of soda, 300 litres to make a litre of beer, and 140 litres to produce the ingredients that go into one cup of coffee (Hastings & Pegram, 2012). According to Msangi (2014), the Water Program of the Carbon Disclosure Project (CDP) reported that 53% of industrial respondents, reported water risks in direct operations and 26% in supply chains (CDP, 2014). Msangi (2014) further claimed that, employment figures for the industry have decreased dramatically from 140 million to 1 million people between 2000 and 2014, accounting for just less than 45% of the African active workforce.

2.4   Cause of water Scarcity in Southern Africa

Msangi (2014) state that, "water scarcity is a recognized norm in a large part of the Southern African Region" (p. 38). The region has very arid conditions in the south-centre and south west of the continent, and is subjected to high climatic variability and highly unreliable rainfall regime which worsens the region's vulnerability to recurring drought. Msangi (2014) further argued that, the region has unevenly distributed water resources (both temporal and spatial). This unevenness extends to both surface and groundwater resources. However, Swatuk (2008) claimed that the bulk of the regional water resources are found in 15 trans-

boundary water sources. In 1991–1992 the region experienced one of its most debilitating droughts; this experience appears to have been instrumental in speeding up the implementation of regional integration and water resources management strategies (Msangi, 2014). The following are in terms of literature reviewed the natural causes of water scarcity in most Southern African areas, namely, drought, climate change, surface runoff, as well as evaporation and transpiration.

2.4.1   Persistent Drought

According to Smakhtin & Schipper (2008) draught can be defined as a prolonged period of unusually dry weather in an area; low rainfall leads to low water in aquifers and the pattern may lead to water shortages even for the households. Southeast and Southern Africa for example, experienced shortages of water since 2004. The water levels in several catchments drop due to rainfall that is below average (Fabriz, 2008-2009). A balance must be maintained between the water supplied and the surface run-off to replace it. Fabriz (2008-2009) argued that when there is a dry winter the expected excess of water does not occur, and results with reservoirs not adequately filled at the beginning of summer. On the contrast Smakhtin & Schipper (2008) stated that, water shortage results under these circumstances even when summer is not excessively dry.

2.4.2   Climate Change

According to Stern (2008), climate change is the cause of change in the distribution of world's water. This conclusion boils down to the fact that water availability is also dependent on climatic conditions. Smakhtin & Schipper (2008) argued that scarcity of water for economic domestic use may further be linked to low flow periods during summer. High temperatures during this period call for more water for industrial purposes (Stern, 2006).

From this article, it is salient that scarcity of water may also be linked to the rising heat or hot temperatures (Dirk, Hager, Tadross, Bethune & Curtis, 2008).

According to Reid, Sahlén, Stage MacGregor (2008), the above findings resulted from a project on assessment of the impact of climate change on the river flow conditions. Reid, *et al.,* (2008) further argued that common knowledge may support the above information as most people possibly know that the water sources dry up after a prolonged period of less or no rainfall combined with a lot of heat. Similarly, Eriksen, O'Brien and Rosentrater (2008) concur that, the increasing droughts in Southern African dry land will further increase due to high temperatures and decreased rainfall. According to Van Rooyen, Van Niekerk and Versfeld (2009) the planning of water resources needs to be done considering many factors including rainfall and run off.

2.4.3 Surface Runoff

Biswas (2011) stated that, surface runoff is also a course for drinkable water shortage. According to De Wit & Stankiwicz (2006) rivers, fountains and dams that normally provide water to the industry may be rendered unusable during heavy floods and also for some days or weeks after the flood. De Wit & Stankiwicz (2006) further stated that at times, a river which may be a sole source of clean water for the community may also become a source for flood. This may lead to a situation whereby the community is left without water for household use (De Wit & Stankiwicz, 2006). Similarly, Twort, Ratnayaka and Brandt (2008) agree that, the peak runoffs are difficult to estimate as a result of the damage occasioned by the debris and sediment brought down by the floods. Biswas (2011) stressed that runoff has been shown to be a major loss of water. When rainfall is high and infiltration rate is low because of steep slopes runoff becomes high and a high quantity of water is lost (Biswas, 2011).

2.4.4 Evaporation and Transpiration

According to Lawrence, Thornton, Oleson, & Bonan (2007) evaporation is the key part of hydrological cycle as seventy five percent of the annual precipitation returns to the atmosphere due to evaporation and transpiration. Lawrence *et al.,* (2007) further claimed that, a lot of water goes back to the atmosphere as a result of evapotranspiration which is a combination of the two processes, namely, evaporation and transpiration. Peterson & Klepper (2007) stated that, it is difficult to measure the loss of water through these processes with certainty. Through these processes water is lost from any open water source, e.g. dams, reservoirs, rivers and the vegetation (Lawrence *et al.,* 2007).

2.5 Strategic challenges to the beverage industry in Southern Africa

According to Msangi (2014), despite the significant progress made, there are several strategic challenges that require further work. Swatuk (2008) argued that water scarcity rampant in some parts of the region and competing developmental requirements between member states may result in disputes and tension over water. However, Msangi (2014) claimed that, other challenges arise from a variety of facts including the fact that rainfall in the SADC region is highly variable, with the resulting impact on reliability and disaster associated with droughts.

Dolder *et al.,* (2012) argued that the available water resources are unevenly distributed across the region and water availability and demand are not matched. Dolder *et al.,* (2012) further indicated that beverage industry can expect to have increased risks associated with water as an industrial input. According to Gardiner (2011) reduced water quality as a result of the loss of the natural dilution capacity of rainfall events driving stream-flow. This will require increased investment in upstream water treatment plant in order to maintain a product of acceptable quality. Gardiner (2011) further claimed that, the reduced assurance of supply as infrastructure investment is either outstripped by demand, or stunted as a result of insufficient

investment in maintenance, will translate into the risk of unproductive down-time for industrial plant.

This will require investment in bulk upstream storage needed to maintain the assurance of supply level consistent with efficient industrial processing (Hastings & Pegram, 2012). According to Swatuk (2008) the increased cost of water as economic incentives is introduced by regulatory authorities in an effort to improve overall efficiency of water-use will impact on bottom-line profits. However, Gardiner (2011) claimed that this will require investment at the level of the factory designed to get the best possible yield from each unit of water used as a production input. This is known as End-Use Efficiency and it will need to be managed at the level of the individual production unit (Dolder *et al.,* (2012).

2.6 Impact of water scarcity on beer production in Southern Africa

According Gardiner (2011), brewing is one of the oldest industries, beer in different varieties was drunk in the ancient world, and the Romans introduced it to all their colonies. However, Bleier, Callahan, Farmer & Min (2013) claimed that beer is brewed and consumed in almost every country, particularly in Europe and areas of southern Africa. According to Pattinson (2010) beer is the most consumed alcoholic beverage in the world and third most popular beverage after water and tea. According to Smith (2012) breweries has a long history in the Southern African nation. According to Shelves (2012) Zambia has enjoyed some of the continent's fastest economic growth rates over the past decade and Zambians enjoy a beer.

On contrary Bleier, Callahan, Farmer & Min (2013) claimed that, Africa constitutes a small percentage (6.8%) of global beer volumes, yet, it is the fastest-growing global beer market. According to Canadean's Global Beer Trends report, published in October 2015, Africa is

predicted to achieve an average growth rate of 5% per year from 2015 to 2020. This is ahead of Asia, which is expected to grow at an average rate of 3% per year during the same period.

According to Dolder *et al.,* (2012) over the past eight years, SABMiller's beer volume growth in the Southern Africa has been 7.1 percent more than double its African total. Yet for all the positives, Zambia is considered high risk in one critical area, the availability of water, the lifeblood of the brewing industry. According to Gardiner (2011) for brewers it is particular crucial for every litre of beer produced on average, SABMiller uses 3.3 litres of water, while in Zambia the brewery uses about 4 litres. "The direct impact of water shortages at the moment really is around direct supply breweries (Dolder *et al.,* 2012, p. 27)". However, to mitigate this risk, Heineken South Africa is focused on reducing its water consumption, increasing its access to water, as well as increasing Sedibeng's water capacity to ensure the brewery is less vulnerable to water shortages (Gardiner, 2011).

According to a report presented to World Water Week by major brewer SAB Miller and leading global environment organization WWF, beer is big business in Africa and the continent boasts the second-biggest player in the industry worldwide, in the form of SAB Miller. The total water involved in producing beer is overwhelmingly used on the farm rather than in the brewery. On the same note Stant (2012) claimed that, the production of beer has declined in the past two years in Southern Africa due to water scarcity, affected the agricultural land where barley is grown as raw material for beer production.

2.6.1   Contribution to GDP

According to to Stanley (2010) drought which had been hitting parts of southern Africa for the past three years had already diminished the region's GDP, given its severity and prolonged nature, the economic effect will be, and is already severe. According to Bains (2012) the industry represents one-third of the manufacturing sector's contribution to Gross

Domestic Product (GDP). However, Dolder *et al.,* (2012) claimed that, there is little doubt that consumption is going to become more important part of African GDP over the next 20 years. The growing middle classes that are evident in many countries are consuming more in terms of volume and consuming more selectively.

2.7   Applicability of water footprints and stewardship on beverage

industry in Africa

According to Hastings & Pegram (2012) the water footprint concept was introduced in 2002 by Arjen Hoekstra at UNESCO-IHE, and has been further developed at the University of Twente and by the Water Footprint Network. Water footprint is an indicator of freshwater use that considers the direct and indirect water required to produce a product, measured over the full supply chain (Hoekstra 2010). Hastings & Pegram (2012) further alluded that, water footprint builds on both the virtual water concept and ecological and carbon footprints, and thus has similarities and differences to both. However, Dolder *et al.,* (2012) claimed that the concept of a water footprint is relatively nascent compared to that of a carbon footprint. A water footprint is conceptually similar to virtual water in that both represent the water required to make a product considering all inputs in the supply chain.

However, Hastings & Pegram (2012) stressed that, a water footprint adds to virtual water in that it also describes the characteristics of the water used, including whether the water was rainwater or surface water, as well as the place of origin of the water and the time of use. Equally, Gerbens & Hoekstra (2008) stated that understanding the nature of the water used in a product's supply chain is necessary to understand water dependencies and risks, as water is a resource which must be understood in its local context

Water footprint was also introduced as an analogy to the ecological footprint and carbon footprint family (Hoekstra, 2010). Where a carbon footprint is the amount of carbon emitted throughout the supply chain for the production of a product, a water footprint is the volume of water required throughout the supply chain to make a product. However, Hastings & Pegram (2012) argued that, a fundamental distinction between water footprint and carbon footprint exists in that water is a local resource whereas carbon can be viewed at a global level. Conversely, water use must be understood in its local context (Hastings & Pegram, 2012). Gerbens & Hoekstra (2008) also argued that, use of water in a water abundant location is very different than use of water in a water scarce location, and use of rainwater in a water scarce location is also very different than use of surface water in that same location.

Hastings & Pegram (2012) stated that in Southern Africa and other water-scarce countries, tools which can inform efficiency and raise awareness and create dialogue with people not previously involved in water debates are potentially very useful. Hastings & Pegram (2012) further argued that, water footprints have the potential to contribute in this way, bringing new and important decision-makers into the water debate in a way that is intuitive and cuts across sectors. Additionally, water footprints create an opportunity for companies to join a global process of disclosure, understand risk and integrate an understanding of water into planning decisions (Dolder *et al.,* 2012). With this potential, the concept of water footprint has gained significant traction in the past 10 years in the private and public spheres across a variety of sectors (Franke, 2011). However, Hoekstra, Chapagain, Aldaya & Mekonnen (2011) claimed that water footprint as a tool is still developing and many conceptual and methodological questions remain.

According to Hastings & Pegram (2012) water footprint studies have been completed for a variety of entities, including countries, products, commodities and river basins. Conversely,

Dolder *et al.,* (2012) claimed that, the country and river basin footprints focus on informing policy, whereas the product and commodity water footprints focus on understanding supply chain risks. Hasting & Pegram (2012) indicated that, in South Africa, the total water footprint is equivalent to 155 litres of water for every 1 litre of beer such as Castle lager and Carling Black Label, with the vast majority of water use (98.3%) associated with crop cultivation, both local and imported. In comparison with other beverages, beer's water footprint is relatively small, with a recent Pacific Institute study finding that coffee, wine and apple juice all have water footprints more than three times that of beer. According to Hasting & Pegram (2012) "the water footprints of SABMiller's beers in South Africa and the Czech Republic are the first detailed corporate water footprints to be published and are progressive in the way they examine the impact of water use within these countries" (p. 30).

Hasting & Pegram (2012) further argued that, in South Africa, SAB Ltd is working with barley farmers to improve irrigation and yields, and with WWF the company is now considering how to develop this further to protect the watersheds within which it operates. "Water foot printing enables SABMiller to understand which parts of the supply chain might face water scarcity, or poor water quality, in the future, and means that we can plan now to deal with these future challenges (Hoekstra *et al.,* 2011, p. 52)." According to Hasting & Pegram (2012) SABMiller strengthen the existing partnerships with WWF in South Africa, Colombia, and Honduras to create further local watershed protection projects to reduce risk whilst protecting the environment.

Hastings & Pegram (2012) stated that, WWF in collaboration with SABMiller has computed its water footprint in five countries, mapping out how much water its suppliers and breweries use. Similarly, Water Footprint Network (2012, p. 43) "The water footprint enables the

brewing industry to pinpoint where the problem is or may in the long term and what can be done to ensure that the situation does not pose a risk to the industry in the future".
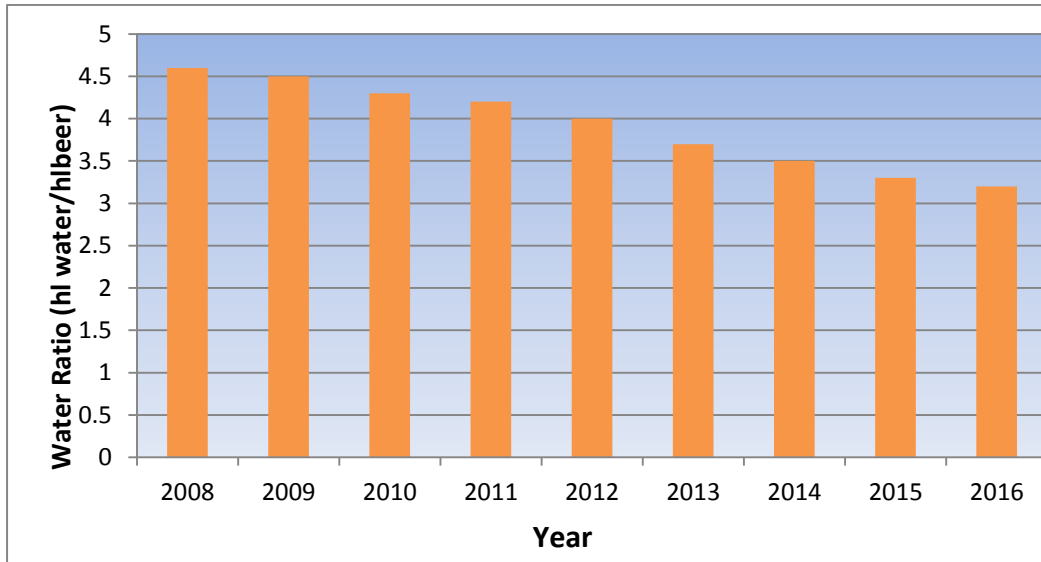
Figure 2:1 Water consumption for "Medium and Large" breweries in South Africa

Source: SABMiller (2008-2016)

2.7.1 Water Stewardship

According to Gardiner (2011) managing water risk is generally confused with good water stewardship. However, Hoekstra *et al.,* (2011) argued that the former can contribute to the latter, but water stewardship entails more than managing water risk. Water stewardship includes the evaluation of the sustainability of water use across the entire value chain, the formulation of water consumption and pollution reduction targets for both the company's operations and supply chain, the implementation of a plan to achieve these targets and proper reporting on all of this (Hoekstra *et al.,* 2011).

According to Hoekstra (2014) for most companies, moving towards a sustainable supply chain is a much bigger challenge than greening their own operations, because the water footprint of the supply chain is often up to a hundred times bigger than the company's

operational footprint and can be influenced only indirectly. Dolder *et al.,* (2012) claimed that, common reduction targets in the beverage industry, such as going from 2 to 1.5 litres of water use in the bottling plant per litre of beverage, have little effect on the larger-scale given that the supply-chain water footprint of most beverages is of the order of 100 litres of water per litre of beverage, or even more.

Hastings & Pegram (2012) urged companies to strive towards zero water footprint in industrial operations, which can be achieved through nullifying evaporation losses, full water recycling and recapturing chemicals and heat from used water flows. Furthermore, companies should set reduction targets regarding the water footprint of their supply chain, particularly in areas of great water scarcity and in cases of low water productivity (Hastings & Pegram, 2012).

Hoekstra (2014) stated that too many producers have focused on cutting water use at their bottling plants and working with environmental groups on local projects that make a tiny dent in a huge water problem. However, Hoekstra (2014) argued that "these are good things to do, but as far as water goes it makes no difference" (p. 41). However, Hoekstra (2014) continue arguing that, the well-being of water-intensive industries depended on working with locals to set up clear, effective rules for water management.

Gardiner (2011) indicated that, widely publicized criticism of a Coca-Cola subsidiary's water use at an Indian plant in 2004 jarred the beverage industry into realizing that its public image can be on the line when anger over water shortages mounts. Gardiner (2011) further claimed that, environmentalists and many scientists predict that water is going to get scarcer, for several reasons: a growing global population, increasing wealth in the developing world and climate changes that could create more severe weather and disrupt rainfall patterns.

According to Hoekstra (2014) water demand in 2030 is expected to exceed current supply by 40 percent, the 2030 Water Resources Group, a World Bank-backed panel of businesses, predicts. This could present a major challenge to the industry. Similarly, Chapagain & Tickner (2012, p. 25) claimed that "Almost regardless of the hydrological truth, if water is scarce in an area and people perceive that companies are big users of water that carries reputational risk". On the contrary, Gardiner (2011) stated that, in an effort to counter the water threat, SABMiller has taken measures to slash its breweries' water usage by more than a quarter compared with 2008 volumes, including improved metering and recycling waste water. In the past year, it reduced its water use by 29m hectolitres the equivalent to the water used by more than 116,000 Africans each year. It has now set the target of cutting it about 20 percent further, to 31 of water per litre of beer, by 2020 (Gardiner, 2011).

Hoekstra (2014) argued that in South Africa, where SABMiller traces its roots, the brewer works with the World Wildlife Fund on initiatives with hop farmers, and supports the Strategic Water Partners Network, a Partnership between the government and private sector. Hoekstra (2014) further argued that, South Africa is the continent's most advanced economy and it faces severe water shortages; demand is expected to rise 52 percent within the next 30 years. Whilst, Coca-Cola Company globally has set a goal by 2020, to improve water efficiency in manufacturing operations by 25 percent compared with a 2010 baseline (Muller, 2015).

Muller (2015) indicated that in 2015, the company improved water efficiency 2.5 percent, marking the first time the Coca-Cola system has achieved a water-use ratio less than 2.0, this is a total improvement of 12 percent since 2010 and 27 percent since 2004 when the company started reporting efficiency progress as a global system. Muller (2015) further alluded that when Coca Cola started this journey in 2004, the company was using 2.7 litres of water to

make 1 litre of product. However in 2015, the company uses 1.98 litres of water to make 1 litre of product and the company is still working hard to reduce it to 1.7 litres of water per litres of product (a 25 percent improvement) by 2020 (Muller, 2015).

Hoekstra (2014) argued that, despite good efforts undertaken by several companies, it is unlikely that the business sector as a whole will sufficiently regulate itself. However, GWP (Global Water Partnership) report (2014) stated that, there is an urgent need for governmental regulation and international co-operation, establishing water footprint benchmarks for water-intensive products such as food and beverages. Hoekstra (2014) further claimed that, the benchmark for a product will depend on the maximum reasonable water consumption in each step of the product's supply chain, based on best available technology and practice.

2.8 The general world outlook of water scarcity on beverage industry

According to Dolder *et al.,* (2012) claimed that, the concern of water as a critical natural resource has been increasing globally. Dolder *et al.,* (2012) further claimed that, beverage industry has a distinct physical and reputational reliance on water for two key reasons. First, the beverage industry's ultimate product is a liquid of which water is the single largest ingredient. Second, most of the non-water ingredients used by the beverage industry (such as sugar, oranges, wheat, barley, or tea) are products of the agricultural industry, which as an industrial sector is the single largest consumer of water.

However, Hastings & Pegram (2012) argued that, a number of beverage companies have joined forces and established the Beverage Industry Environmental Roundtable (BIER), which defines itself as a partnership of global beverage companies who are working together on environmental stewardship issues. In addition to BIER some beverage companies have made extensive efforts to assess, minimize, and manage their water use (Dolder *et al.,* 2012). According to Gardiner (2011) Coca-Cola Company has even begun publishing an Annual

Replenishment Report to document their efforts in partnership with local organizations and larger groups like the World Wildlife Fund. Gardiner (2011) argued that, one AB-InBev bottling plant in Cartersville, Georgia already boasts a water efficiency ratio of 3.04.

According to the United Nations World Water Development Report (2016), water scarcity emerges from a combination of hydrological variability and high human use, which may in part be mitigated by storage infrastructure. The UNWWD (2016) further elaborated that, while the risks of monthly water shortages are most severe in South Asia and Northern China, some significant risks of seasonal water scarcity appear on all continents. Alexandratos and Bruinsma (2012) predicted that between 2011 and 2050, the world population is expected to increase by 33%, growing from 7.0 billion to 9.3 billion.

According to the Organisation for Economic Co-operation Development's 2012 Global Environmental Outlook's Baseline Scenario projects increasing strains on freshwater availability through 2050, with an additional 2.3 billion people expected to be living in areas with severe water stress, especially in North and South Africa and South and Central Asia. UNWWD (2016) predicts the world could face a 40% global water deficit by 2030 under a business-as-usual scenario. Consequently, UNEP (2011) water-use efficiency improvements are considered instrumental to address the projected 40% gap between demand and supply and mitigate water scarcities by 2030.

UNWWD (2016) estimated that improving water productivity to close the worldwide gap between supply and demand for water will cost US$50-60 billion annually over the next 20 years. However, Alexandratos and Bruinsma (2012) claimed that, with private sector investment comprising about half of those spending, positive returns could be expected in just three years. OECD (Organisation for Economic Co-operation and Development) report

(2011) alluded that, the water services sector is a significant provider of employment globally. In the EU, it includes 9,000 small- and medium-sized enterprises (SME) and provides 600,000 direct jobs in water utilities alone (International Energy Agency, 2012). However, IEA (2012) claimed that the number of people employed by water supply, wastewater treatment facilities and water dependent industry has consistently decreased, while the level of education and specialization of personnel has increased.

OECD report (2011) further claimed that half of the global workforce is employed in water and natural resource-dependent industries. According to Gollin, Lagakos & Waugh (2014) employment in the agriculture sector dropped from just over one billion people in 2000 to 930 million in 2014, accounting for just under 30%. On the contrary, FAO (2014) stated that, food and beverage industry depend on agriculture which is the primary employment sector in most developing countries accounting for 60% of all jobs in Sub-Saharan Africa.

According to Briscoe (2012) water and world trade Water is also related to international trade. Briscoe (2012) further argued that, while water is hardly traded directly, it is traded indirectly through trade in more or less water intensive goods. However, UNWWD (2016) also argued that for regions, where water is scarce and expensive, it is responsible for the import of water intensive goods and for exports of goods with low water content, in this sense there is trade in the water used in the process of the product. Dolder *et al.,* (2012) indicated that, in the past 40 years international trade in virtual water has continuously increased. Today, approximately 1,000 km³ of virtual water are traded internationally each year (Dolder *et al.,* 2012).

UNWWD (2016) further claimed that the technology required to use water resources more efficiently is available and the costs involved are not prohibitive on the macroscale. Gollin *et al.,* (2014) estimated that by the year 2030 the global incremental capital investment needed to close the water resource availability gap would be less than 0.1% of the current gross world product. However, UNEP (United Nations Environment Programme) report (2014) argued that, water-scarce regions like western USA, northwest India, north China, southern Africa and southeast Australia still apply great volumes of water to producing export commodities, whereas water-abundant northern Europe imports a lot of its water-intensive commodities. UNEP (2014) further emphasised that changing patterns of water availability will influence the future spatial patterns of production of, and trade in, food, beverage create new geographic water resource dependencies. However, Muller (2015) concluded that water availability will be at the forefront of any new plans, however breweries across the world strive to decrease beer's water footprint.

2.9   Conclusion

This chapter presented information from various literature sources regarding the impact of water scarcity on beverage production locally and internationally. The chapter highlighted the impact of water scarcity on the beverage production/industry specific to beer production, causes and strategic challenges, potential threats posed to National GDP and potential applications. In this chapter, the study explained the major tenants of the literature and how it relates to the study. From the literature, the researcher formulated the statement of the problem, the purpose and the objectives of the study. The next chapter sequential presents the research methods, data gathering instruments and analysis of data for this research project.

CHAPTER THREE

RESEARCH METHODS

3.1. Introduction

This chapter presents the research approach and the methods followed in this study. The research methods presented were used to gather information required to fulfil the objectives of this research. Thus, the chapter outlines the research design, target population, sampling techniques, data analysis and ethical considerations.

3.2. Research design

Creswell (2014) stated that research design is useful because it provides specific directions for procedures to properly plan research methods to use for studies and to systematically collect and analyse data. This study adopted a combination of exploratory and descriptive research design. A qualitative approach in the form of an exploratory case study was regarded as suitable to describe and analyse the employees' perceptions on the impact of water scarcity on the production of beer. Hence, non-structured questions in a questionnaire were used. According Baškarada (2014) the primary objective of exploratory research is to explore a problem to provide insights into and comprehension for more precise investigation. The exploratory research design was suitable for this study to provide an opportunity for considering all the aspects of the problem.

A quantitative approach in form of a descriptive case study was also regarded as suitable for descriptive statistics. According to Creswell (2014) descriptive research aims at obtaining complete and accurate information for the study. Hence, the method adopted for this study was carefully planned. The descriptive research methods used in this study were quantitative analysis of secondary data and questionnaire with structured questions. Therefore, a mixed

research method was appropriate as it assisted the researcher to get to the bottom of the problem by employing different methods of data collection instruments and data analysis techniques. A mixed research method was also appropriate in order to establish the validity and reliability of the findings of this study.

3.3.   Population

The company workforce comprised of 802 employees, hence the total population of the study was 802 employees of NBL.

3.4.   Sample Size

A sample size is a proportion of the target population that is representative of the whole population from which it is drawn in order to generalize the research findings (Orodho 2003). Thus, the sample size of this study was 134 employees. These employees were picked from three different departments (Supply Chain or Production, Marketing and Sales) using simple random sampling method. This departments were chosen because they are directly involved in the beer production process until the final products reach the end users.

3.5.   Research instruments

The research instrument used to gather information for this study comprised of a questionnaire with a combination of structured and non-structured questions. Structured questions were used to collect quantitative data whilst non-structured questions were used to collect qualitative data. Secondary data was also used for this research to complement the primary data.

3.6. Procedure

The researcher presented a consent letter to the NBL from the University of Namibia to conduct a study and permission was granted. The following procedures were used to collect data:

3.6.1 Questionnaire

A questionnaire with both structured and non-structured questions together with a cover letter explaining the background & purpose of the study was distributed to 134 employees from 3 different departments. The questionnaires were collected from 90 respondents a month later for analysis. Forty-four (44) participants did not return the questionnaire due to various reasons such as leaves, field trips and night shifts. Thus, the actual sample size was 90 employees.

3.6.2 Secondary data sources

The study also employed desk research from various existing literature such as research papers, audited financial statements, journals on the impact of water scarcity on beverages production: specific to beer production. According to Cohen, Manion and Morrison, (2005) secondary data analysis saves time that would otherwise be spent collecting data and, particularly in the case of quantitative data, provides larger and higher-quality databases that would not be feasible for any individual researcher to collect on their own. Secondary data is considered to be essential especially in capturing past changes and developments.

3.7. Data analysis

Given that the study collected both qualitative and quantitative data, various statistical analysis methods were used to analyse the data. The qualitative data obtained was analysed after grouping and coding the data in particular analytical categories using ATLAS.ti software. According to Friese (2013) ATLAS.ti was meant to contain all the data such as text

document (primary documents), codes, quotations, memos and conceptual linkages (networks and families) under a single name called "Hermeneutic Unit" (HU). The HU therefore serves as the home page of the entire processes in ATLAS.ti and keeps all the documents within reach. Quantitative data was grouped and then prepared for entry in the Statistical Package for the Social Sciences (SPSS) programme. The data was analysed by using descriptive statistics and presented in the, frequency tables, graphs and charts.

3.8.   Validity and reliability

Saunders *et al.,* (2016), note that the strength of any research is based upon the reliability and validity of the research findings. According to Creswell (2014) the issue of validity and reliability is more a credibility issue to demonstrate that data collected is accurate and appropriate. For this reason, a pilot study was administered to 5 individual participants within the population to ensure the reliability and validity of the questionnaire.

3.9.   Research ethics

Cohen, Manion & Morrison (2009) stated that "although researchers know who has provided the information or are able to identify participants from the information given, they will in no way make the connection known publicly; the boundaries surrounding the shared secret will be protected" (p. 76). Hence, the researcher observed the highest possible ethical standards and maintained the highest integrity throughout the entire study process. The researcher outlined to the participants information relating to purpose, importance and benefits of the study as well as the length of time the participant is expected to take to fill-out the questionnaire. Participants were also informed that they can withdraw at any stage of study. It was stipulated in the study that information so given by the participants would remain confidential in order to ensure anonymity. Accordingly, the ideas borrowed from other

scholars were appropriately acknowledged. The information and data collected was kept in a lock safe cabinet in the researcher's office, to be destroyed after years.

3.10. Conclusion

This chapter discussed the methodology and techniques used by the researcher to collect data. Specified the research design, explicitly defined the targeted population and sampling method used, data collection instruments and procedures. This chapter further discussed the analytical tools used for data analysis, validity and reliability of the study as well as compliance with ethical issues and dilemmas. The next chapter presents the findings of the study and an analysis of the results and discussion.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1.   Introduction

This chapter discusses the data analysis and findings of this study. The chapter begins by

presenting the demographic characteristics of the employees. This is followed by the

presentation of the views of the employees on NBL's beer production capacity, sales trends

and revenue and lastly views on the long-term sustainable approaches or mitigation measures

to fight against water scarcity. The findings in the demographic characteristics are presented

in numbers and/or in percentages, to allow for better comprehension. The remainder of the

presentation was discussed based on the descriptive statistics.

4.2.   Presentation of results

4.2.1   Demographic characteristics of Employees

There were 55 (61%) males and 35 (39%) females in the sample size of 90. This shows that,

in terms of gender composition, there were more males compared to females at NBL under

the three departments who responded to the study.

Table 4.1: **Age group of employees**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30	16	18	18	18
	31-40	47	52	52	70
	41-60	27	30	30	100.0
	Total	90	100.0	100.0	

Source: Research Data

The ages of employees were analysed. Table 4.1 illustrates that out of a total of 90 respondents,

the majority that contributed to the study were those aged between 31-40 years who were 47

(52%) respectively, followed by those aged between 41-60 years with 27 (30%) while the

lowest number of respondents were aged between 18-30, 16 (18%), and with no respondent in the age category of over 60 years.

Table 4.2: Employees level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Grade 8 -10	4	5	5	5
	Grade 11 – 12	30	33	33	38
	Tertiary/Vocational	56	62	62	100
	Total	90	100	100	

Source: Research Data

The findings, as depicted in Table 4.2 above, shows that 56 (62%) had either tertiary or vocational training, while 30 (33%) had grade 11 or 12 level of education. Only 4 (5%) of the respondents had a grade 8-10 level of education. There was no respondent recorded without a level of education.

Table 4.3: Positions of employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Rank	Middle Management	16	18	18	18
	Below Management	65	72	72	90
	Others	9	10	10	100
	Total	90	100	100	

Source: Research Data

The table above indicates that the majority of the respondents were below the management level with 65 (72%), followed by middle managers who recorded 16 (18%). Whereas, casual workers were then classified or formed a category of others with 9 (10%). There was no response from the executive level, due to their busy schedules.

Table 4.4: Employee's serving period at NBL

		Frequency	Percent	Valid Percent	Cumulative Percent
Number of Years	≥ 1yr	12	13	13	13
	1-5 yrs	30	33	33	46
	6-10yrs	33	37	37	83
	11-15	15	17	17	100
	Total	90	100	100	

Source: Research Data

As illustrated in Table 4.4 above, the majority of respondents who have served in NBL for a duration between 6-10 years were 33 (37%) followed by 30 (33%) who have been employed for a period between 1-5 years. A total of 15 (17%) respondents had served NBL for a period between 11- 15 years and 12 (13%) having served for less than 1 year.

### 4.2.2 Quantitative results on beer production capacity

The purpose of this section on this study was to analyse the employees' s views on beer production capacity in relation to water scarcity. This section therefore, presents the quantitative results as they were analysed using the SPSS software.

Table 1.5: Current water to beer ratio

		Frequency	Percent	Valid Percent	Cumulative Percent
Water/beer ratios	1.1:1-2.5.1 lit	11	12	12	12
	2.6:1-4:1lit	5	6	6	18
	4.1:1-5.4:1lit	56	62	62	80
	Over5.5:1lit	18	20	20	100
	Total	90	100	100	

Source: Research Data

Employees were asked to state the current volume of water in litres used to produce one litre of beer. The findings reveal that, the highest current water to beer ratio is between 4.1:1 – 5.4:1 litre with 62% of respondents. Whilst, 20% of respondents indicated that the current water to beer ratio is over 5.5:1 litre. An, 12% of respondents indicated that the ratio is between 1.1:1 – 2.5:1 litre, whereas 6% indicated that the ration is between 2.6:1 – 4:1 litre.
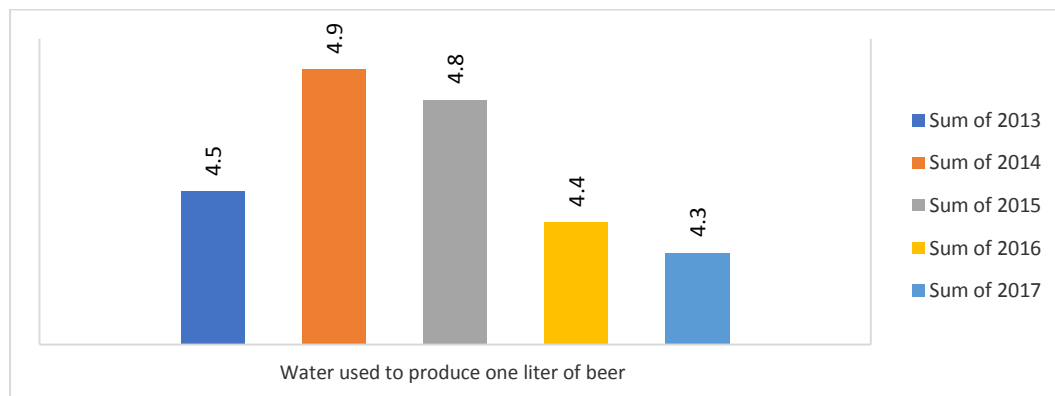
Figure 4.1: Volume of water used to produce one litre of beer in the past five years

Source: NBL Annual Report, 2017.

The figure above shows the amount of water (litres) NBL used on average to produce one litre of beer in the past five years.
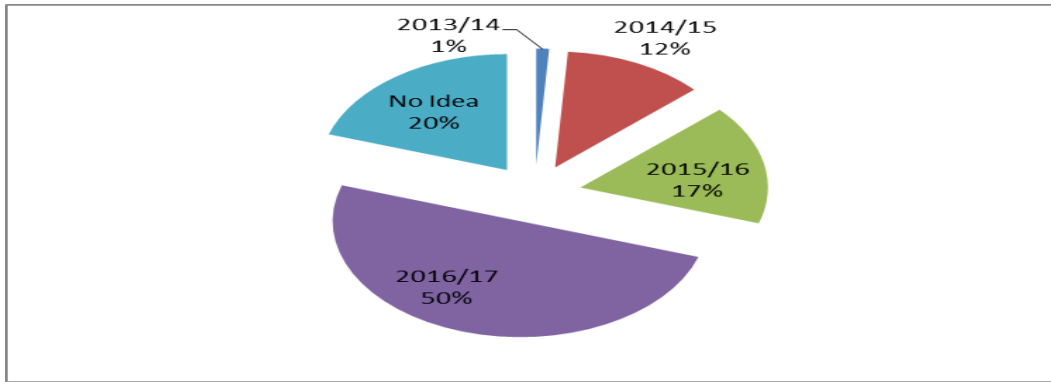
Figure 4.2: Financial years recorded notable reduction in water to beer ratio

Source: Research Data

Employees were asked to indicate the financial year that recorded a notable reduction in water to beer ratio in the past four financial years. As demonstrated in Figure 4.1 above, 50% of the respondents indicated that the notable reduction in the ratio was experienced in 2016/17 financial year, whereas 20% of respondents had no idea, 17% of respondents indicated that a notable reduction was recorded in 2015/16 financial year, followed by 12% in 2014/15 and 1% in 2013/14 respectively.
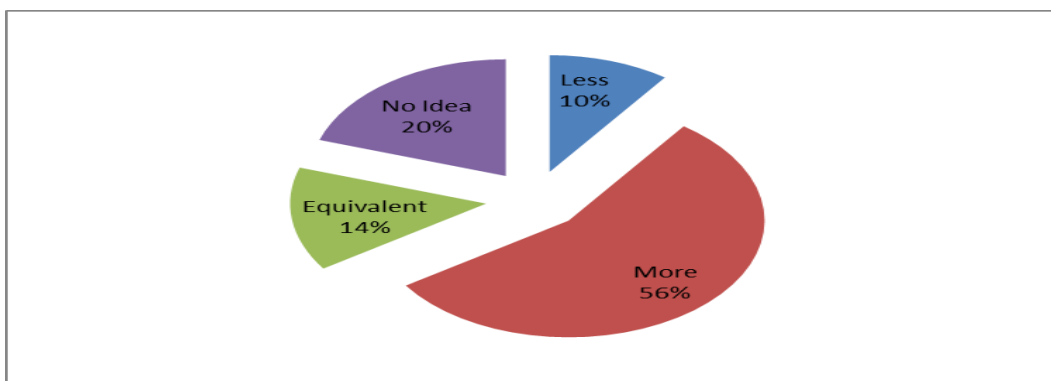
Figure 4.3: NBL's water to beer ratio compared to other beverage products

Source: Research Data

Employees were asked to express their views or opinions on the water to beer ratio in comparison with other NBL beverage products. It appears that beer production uses more water intensively for processing than other beverages. This is illustrated in Figure 4.2 above, as it shows that 56% of respondents strongly indicated that, NBL's water to beer ratio is more

compared to water used to produce other beverages, however 20% of the respondents had no idea while 14% viewed the ratio as equivalent, and 10% of the respondents indicated that the water to beer ratio is less compared to other products of NBL.
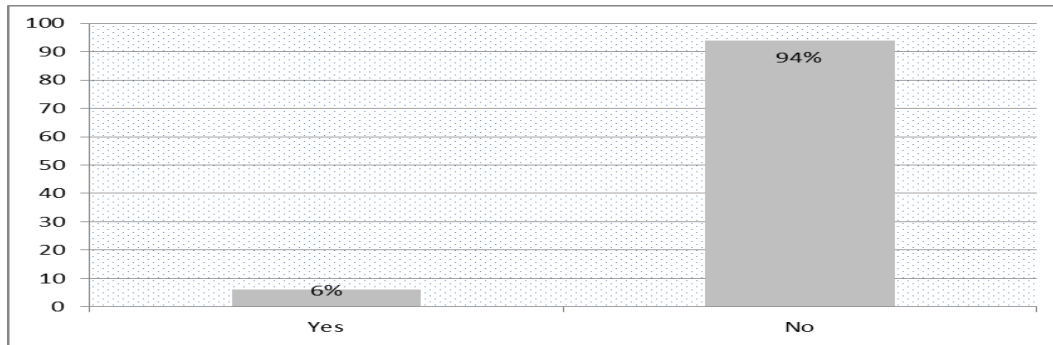
Figure 4.4: Beer production capacity merely depend on water allocated by CoW

Source: Research Data

The Figure above depicts that, 94% of respondents strongly disagreed that beer production merely depends on the amount of water allocated by the City of Windhoek, while, 6% of the respondents agreed with the statement.

However, it appears that the alternative source does not supply sufficient water in events of prolonged drought to meet beer demand in the market. As demonstrated in Figure 4.4 below, it shows that 82% of the respondents disagree with the statement whilst 18% agreed with the statement.
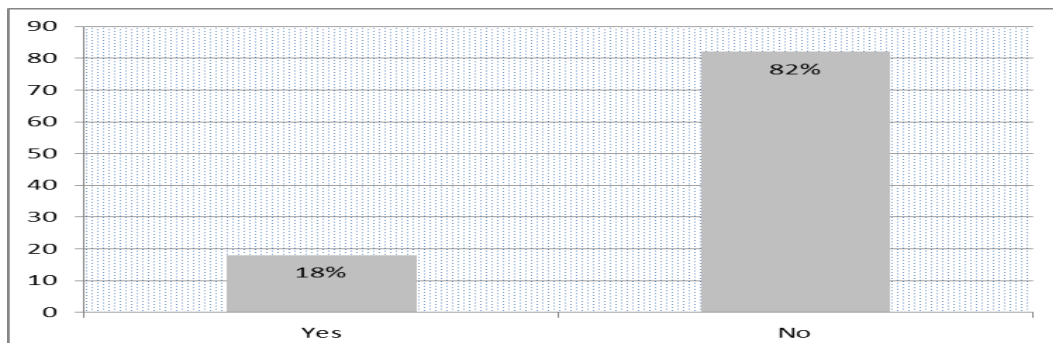
Figure 4.5: Alternative source of supply of sufficient water

Source: Research Data
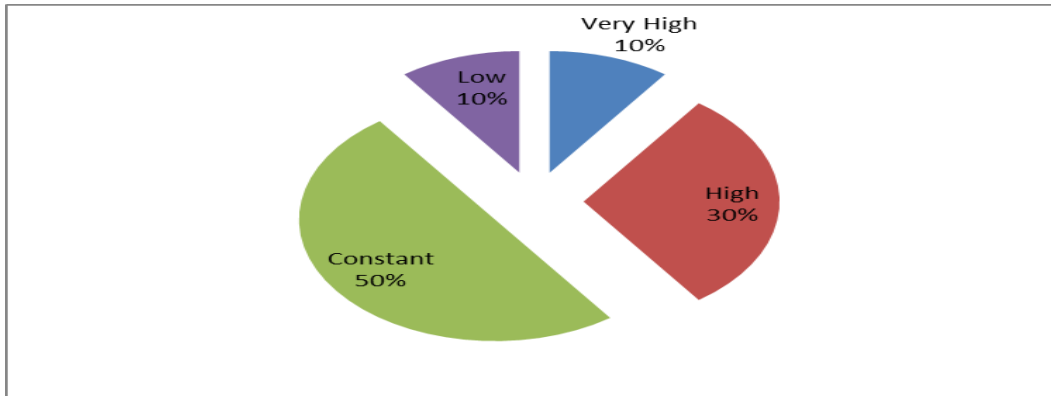
Figure 4.6: Beer production capacity

Source: Research Data

Employees were asked to rate the beer production capacity for the past five years. Hence, Figure 4.5 above shows that, 50% of respondents indicated that the production capacity for the past five years was constant. While 30% of respondents indicated that the production was low. However, 20% of the respondents equally indicated that the production was high or very high.

4.2.3 Quantitative results on sales trends and revenue

The purpose of this section on this study was to determine the impact of water scarcity on NBL's sales, revenue and the likely potential threats it poses to the country's GDP.
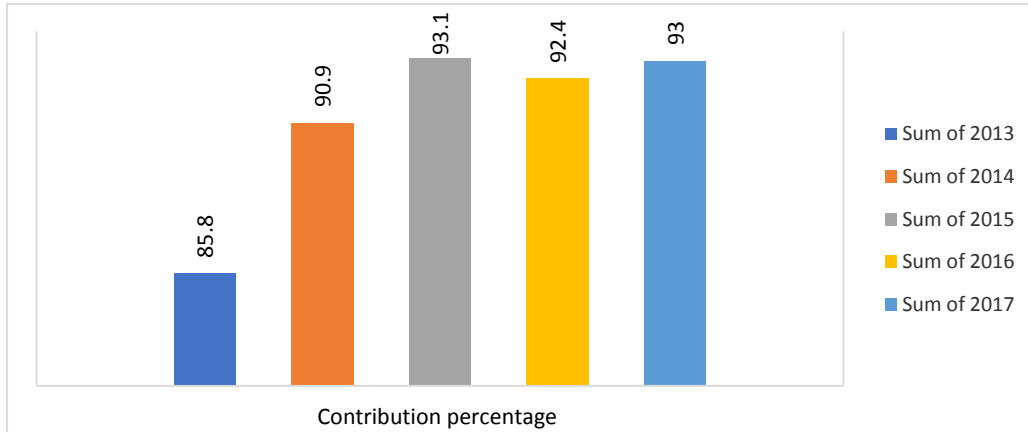
Figure 4.7: Financial year recorded highest beer revenue

Source: NBL Annual Report, 2017.

The figure above shows the records of revenue generated from beer in the past five years. The figure depicts that in 2015 NBL recorded the highest beer revenue with 93.1 %, with a slightly difference to 2017 which recorded 93%, dropped in 2016 to 92.4%, while the lowest was recorded in 2013, 85.14 and picked up in 2014 with 90.9%.
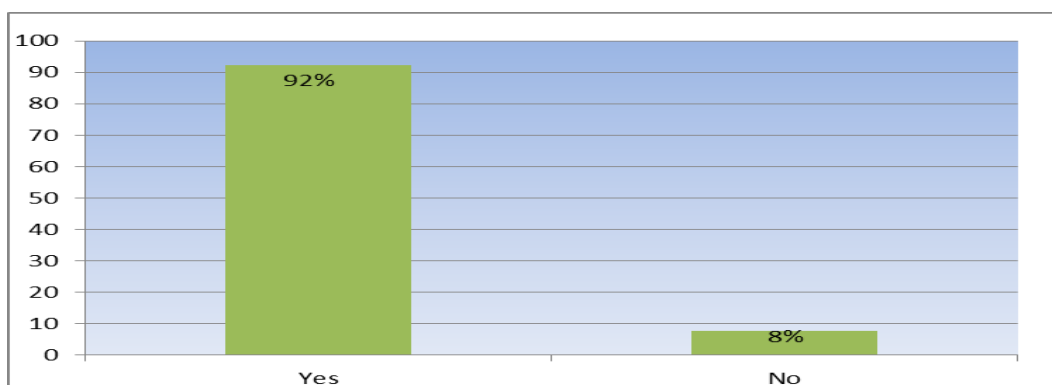
Figure 4.8: Decline in beer revenue

Source: Research Data

Employees were asked whether there was any decline in revenue generated from beer and factors attributed to such decline. This result is illustrated in Figure 4.7 above, as it shows

that 92% of the respondents strongly agreed that there was a decline in beer revenue in the past five years. Whereas, only 8% of respondents disagreed with the statement.
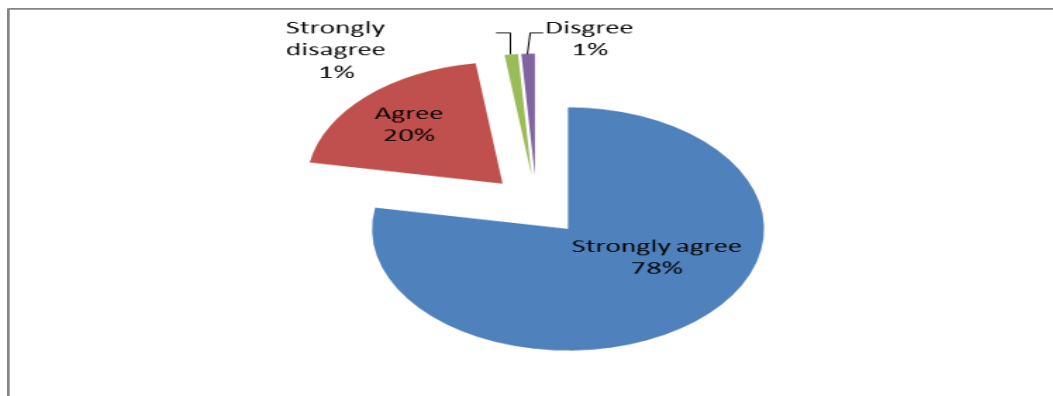
Figure 3.9: Effects of decline in revenue to the country's GDP

Source: Research Data

Employees were asked whether the decline in revenue experienced in 2016 has effects on NBL's contribution to the country's GDP. The figure above depicts, that a decline in NBL's revenue has affected the percentage contribution towards the country's GDP, these was demonstrated by majority of the respondents, over 98% agreed with the statement leaving only 2% of the respondents who were not in agreement with the statement.

4.2.4 Quantitative results on long term sustainable approaches

The purpose of this section on this study was to explore long term sustainable approaches to fight against water scarcity faced the country in order to place NBL on a competitive sustainable business position during drought events.
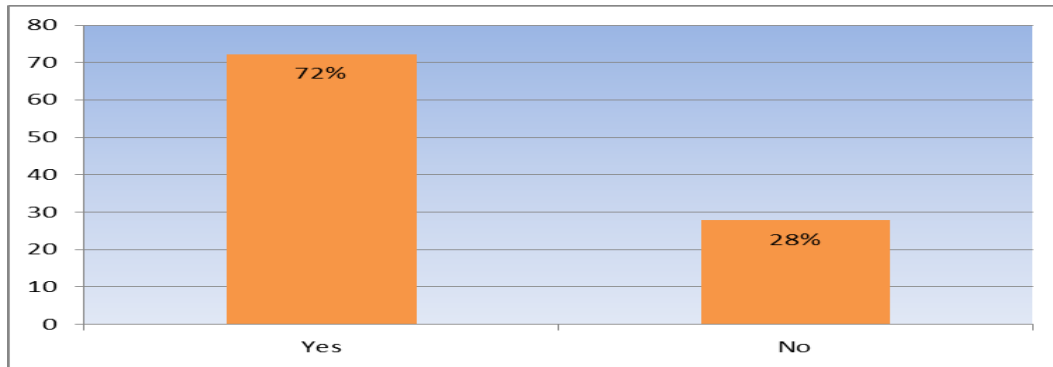
Figure 4.10: NBL anticipated water scarcity

Source: Research Data

Employees were asked whether NBL foresee water scarcity in Windhoek. Figure 4.9 above illustrates that 72% of respondents agreed that the company anticipated the water shortage in Windhoek as its production heavily relies on water, whereas 28% of the respondents disagreed with the statement. In relation to Figure 4.10 below, it appears that NBL was aware of the water shortage as mitigation measures were put in place as indicated by 70% of the respondents, while only 30% of the respondents were in difference.
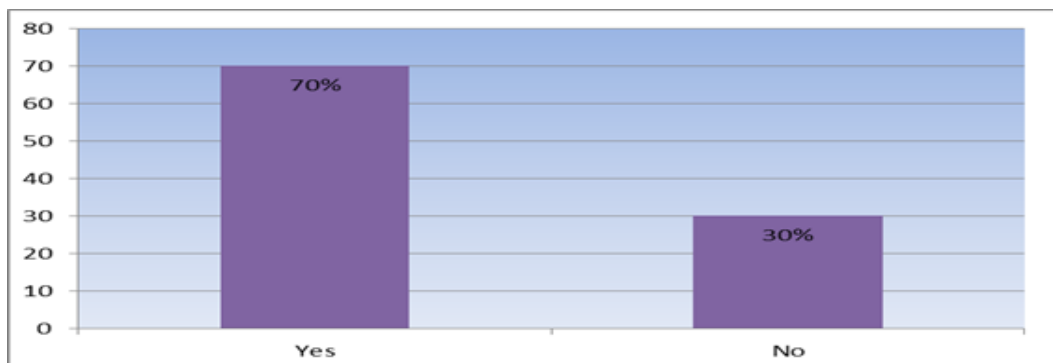
Figure 4.11: Mitigation measure

Source: Research Data
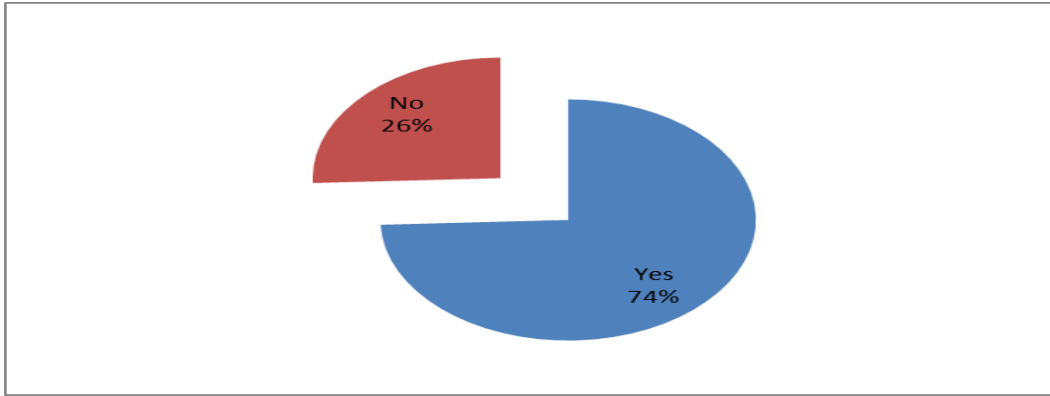
Figure 4.12: Efforts to conserve water

Source: Research Data

Employees were asked whether the company has made efforts to conserve water to adhere to the water saving method introduced by the City of Windhoek as a measure to control water. Figure 4.11 above illustrates that 74% of the respondents strongly agreed with the statement that NBL made effort to conserve water. While, a 26% of the respondents disagrees with statement.
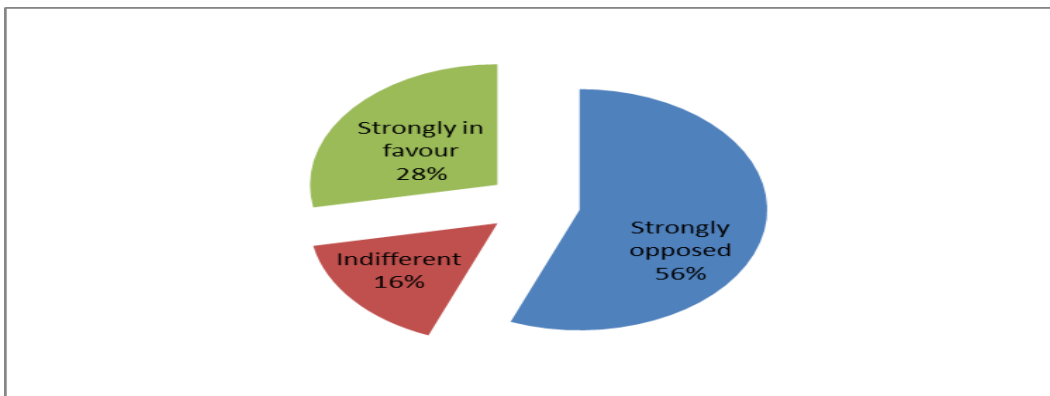
Figure 4.13: Restrictions on water use by institutions

Source: Research Data

Employees were also asked to express their views or opinions with regards to proposed water restrictions on the volume of water an institution is allowed to use on daily basis by the City of Windhoek. As demonstrated in Figure 4.12 above, 56% of the respondents strongly opposed putting restrictions on the amount of water an institution is allowed to consume on a

daily basis. While, 28% of the respondents were strongly in favour of the restriction. However, 16%, of the respondents were indifferent to the proposal.
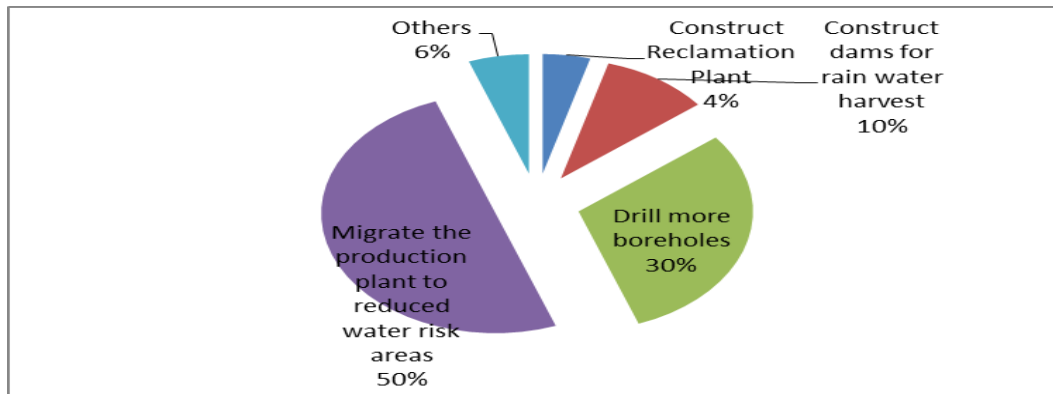
Figure 4.14: Long term sustainable approaches for supplying water to NBL

Source: Research Data

Employees were given options to indicate their choices on the explored long-term sustainable approaches. Figure 4.13 above depicts that, 50% of the respondents perceived migration or moving of the production plant to reduced water risk areas for instances to Zambezi and Kavango Regions as a long-term sustainable approach to supply sufficient water for NBL's production specific beer production that requires high volume of water. Whereas, 30% of the respondents indicated that the company should drill more boreholes, 10% of the respondents stated that the company should construct dams for rain water harvesting and 4% indicated that the company should construct reclamation plant or effluent treatment plant for wastewater treatment.

However, 6% of the respondents proposed other alternatives such as construction desalination of sea water, tapping of water from Kavango River, improve efficiency and strictly regulations, trucking water into Windhoek, and even fog-harvesting.

4.2.5 Qualitative results on beer production Capacity

This section presents the qualitative results on the employees' s views on beer production capacity in relation to water scarcity. The qualitative results were all analysed with ATLAS.ti software version.
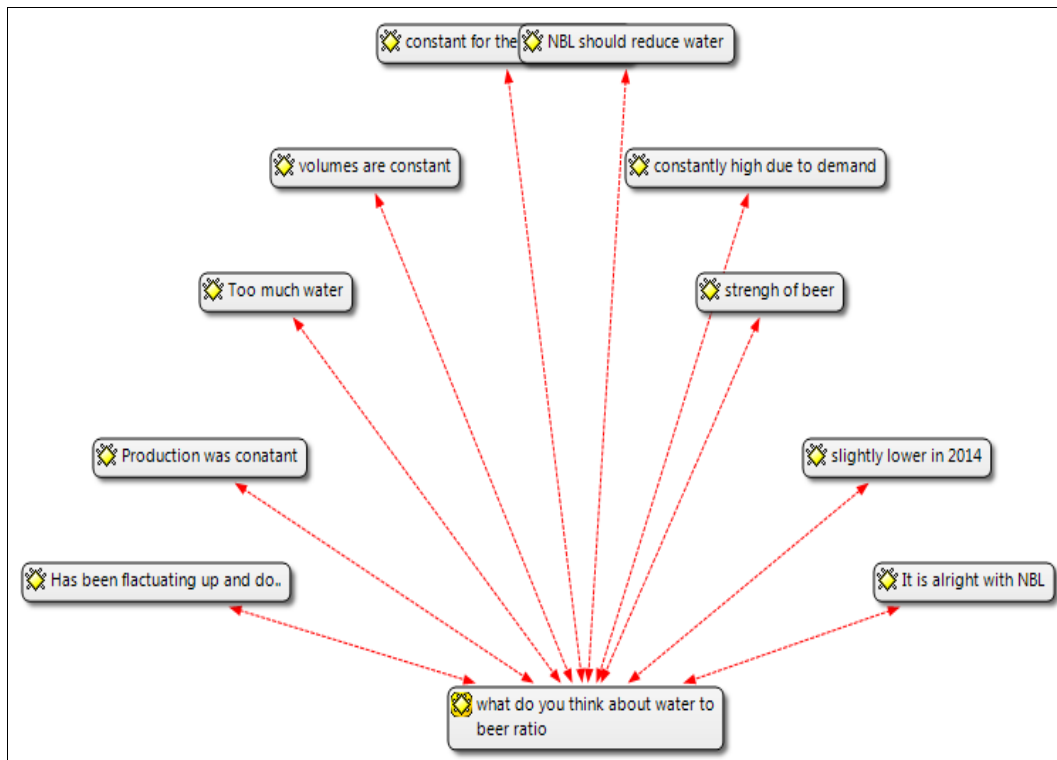
Figure 4.15: Views on water to beer ratio

Source: Research Data

The Figure above illustrated the codes on how respondents perceive the water to beer ratio as demonstrated in the snippet above. It appears that beer uses more water as it needs to be intensified unlike softy drinks with less ingredients and materials this was indicated by the majority of respondents.
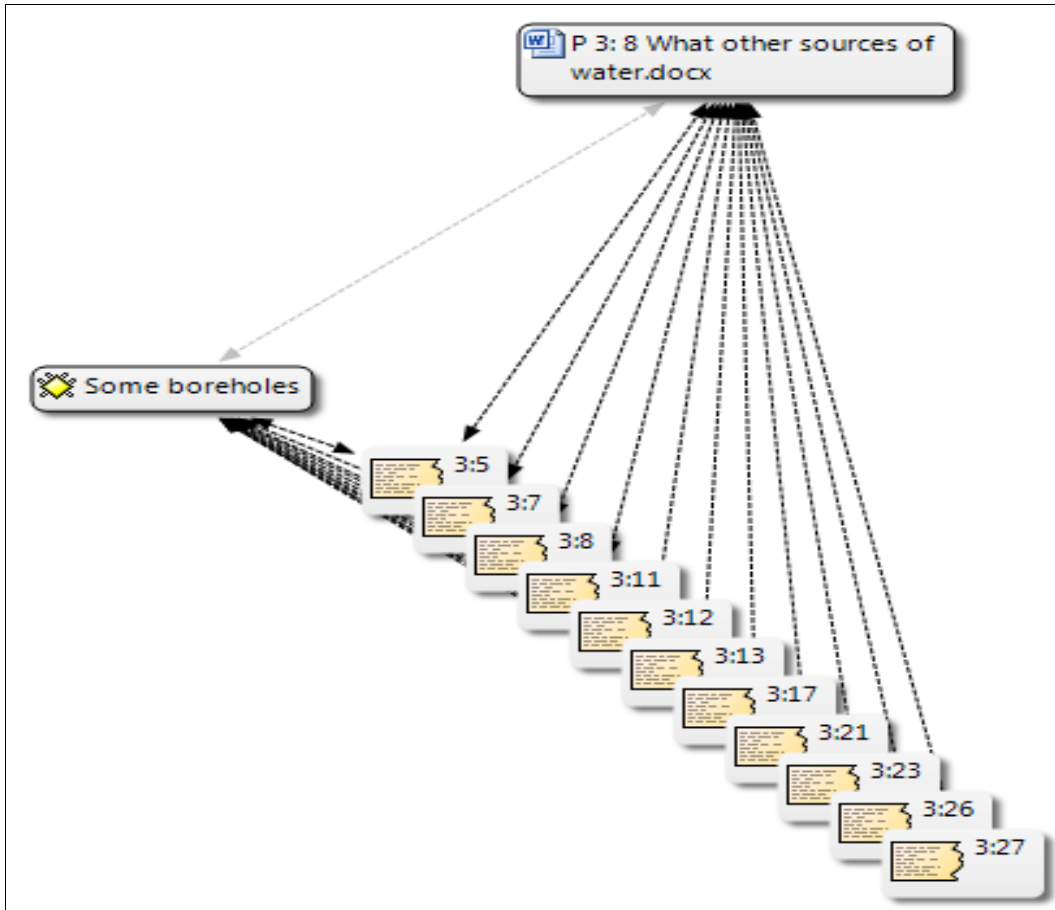
Figure 4.16: NBL alternative source of water supply

Source: Research Data

The Figure above illustrates the codes on the alternative source of water supply to NBL for production apart from water allocated by the City of Windhoek. It appears that boreholes were perceived as the alternative source of water supply to NBL in the events of droughts as illustrated by the majority of the respondents in the snippet above. The majority of respondents indicated that the company has five drilled boreholes on site with 26% to 28% supply capacity.
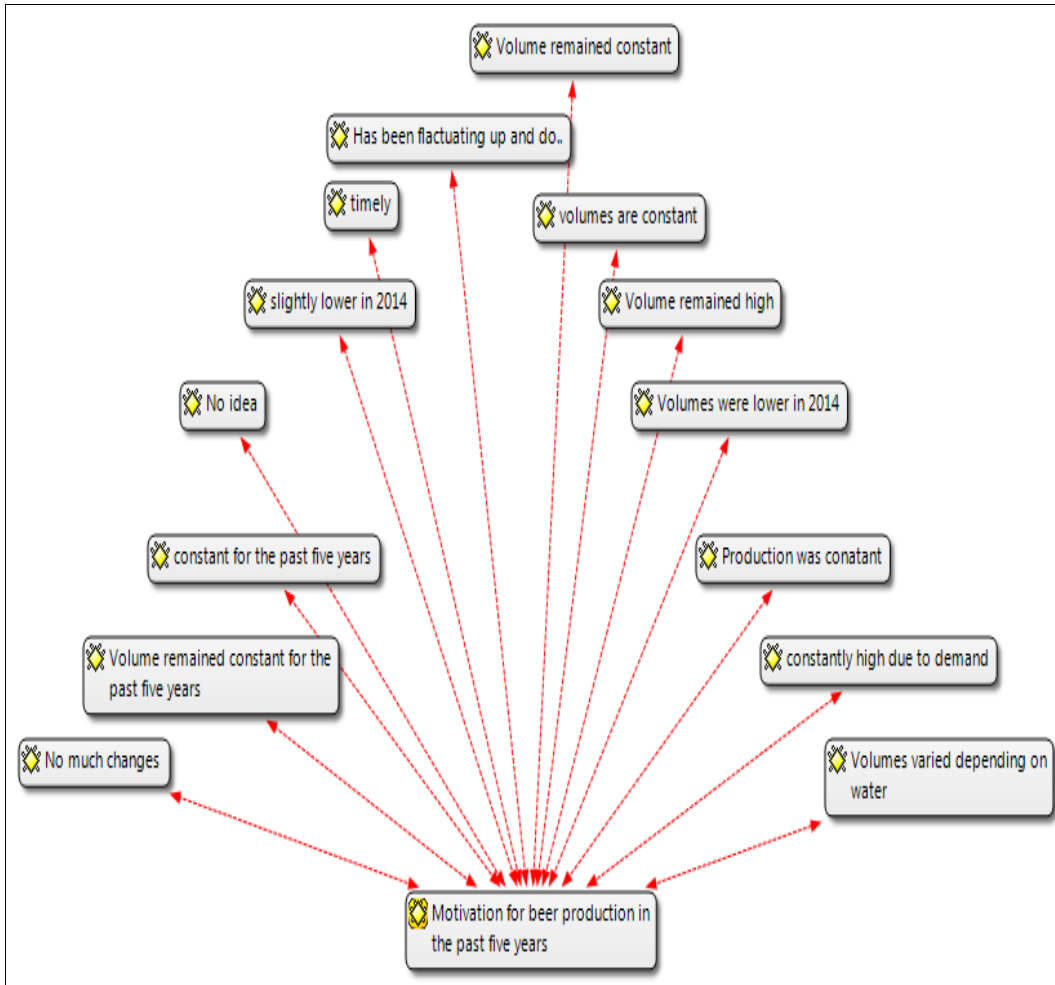
Figure 4.17: Motivations for beer production capacity for the past five years

Source: Research Data

The Figure above illustrated the coding on how employees perceived the beer production capacity for the past five years as demonstrated in the snippet above. It appears that the production volume of beer was maintained at a constant level in the past five years as it was indicated by the majority of respondents in the snippets above. However, production volume was slightly low in 2014 as indicated.

4.2.6   Qualitative results on sales trend and revenue

This section presents the qualitative results on the impact of water scarcity on NBL's ultimately sales, revenue and the likely potential threats it poses to the country's GDP.
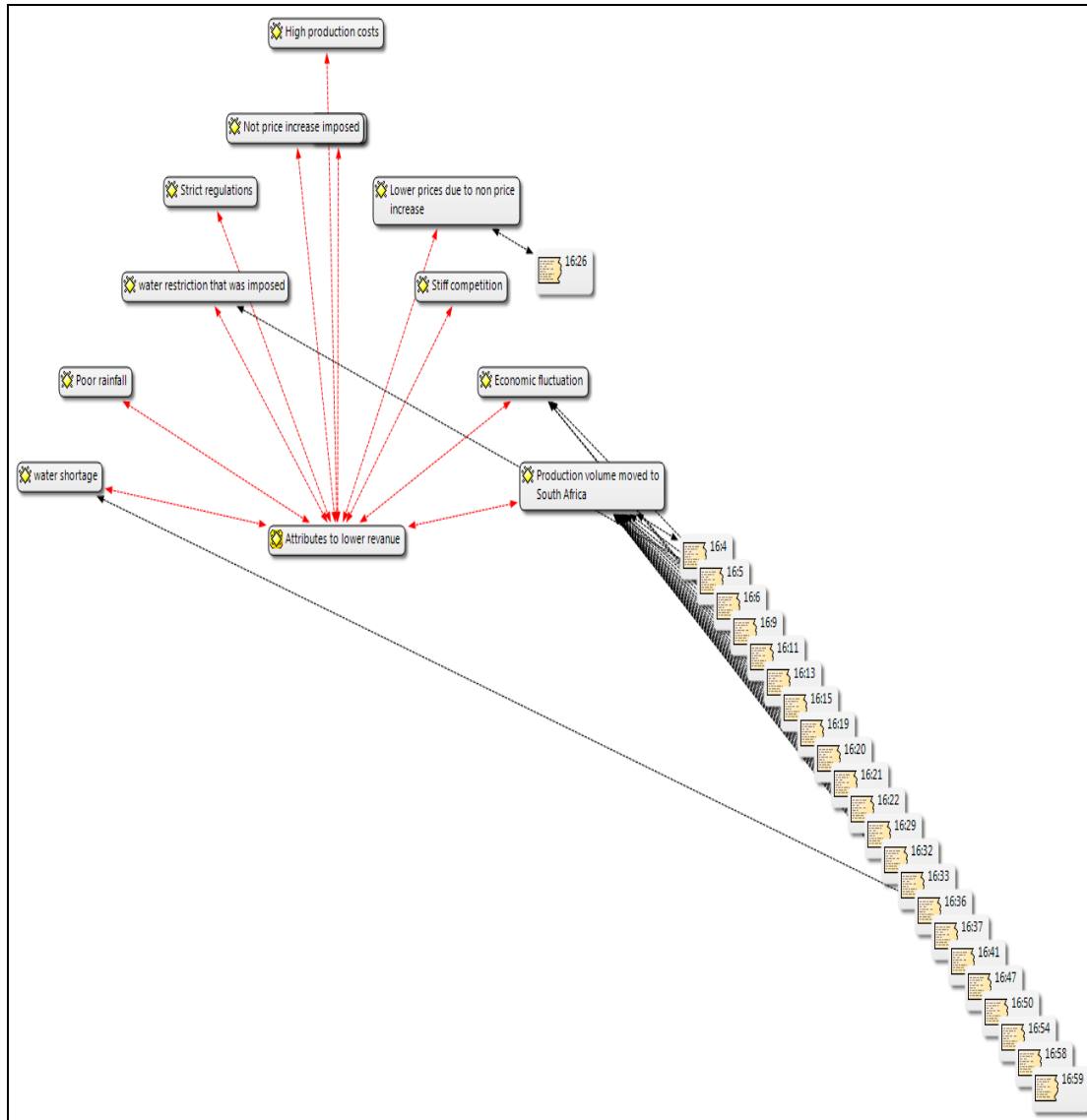
Figure 4.18: Factors attributes to lower revenue

Source: Research Data

The Figure above illustrates the coding on factors attributing to low revenue as indicated in the snippets above. It appears that production volume migration to South Africa, water shortage, imposed restrictions to water use, as well as economic fluctuation were the

prominent factor attributed to decline revenue in the 2015/16 financial year as indicated in the figure above.
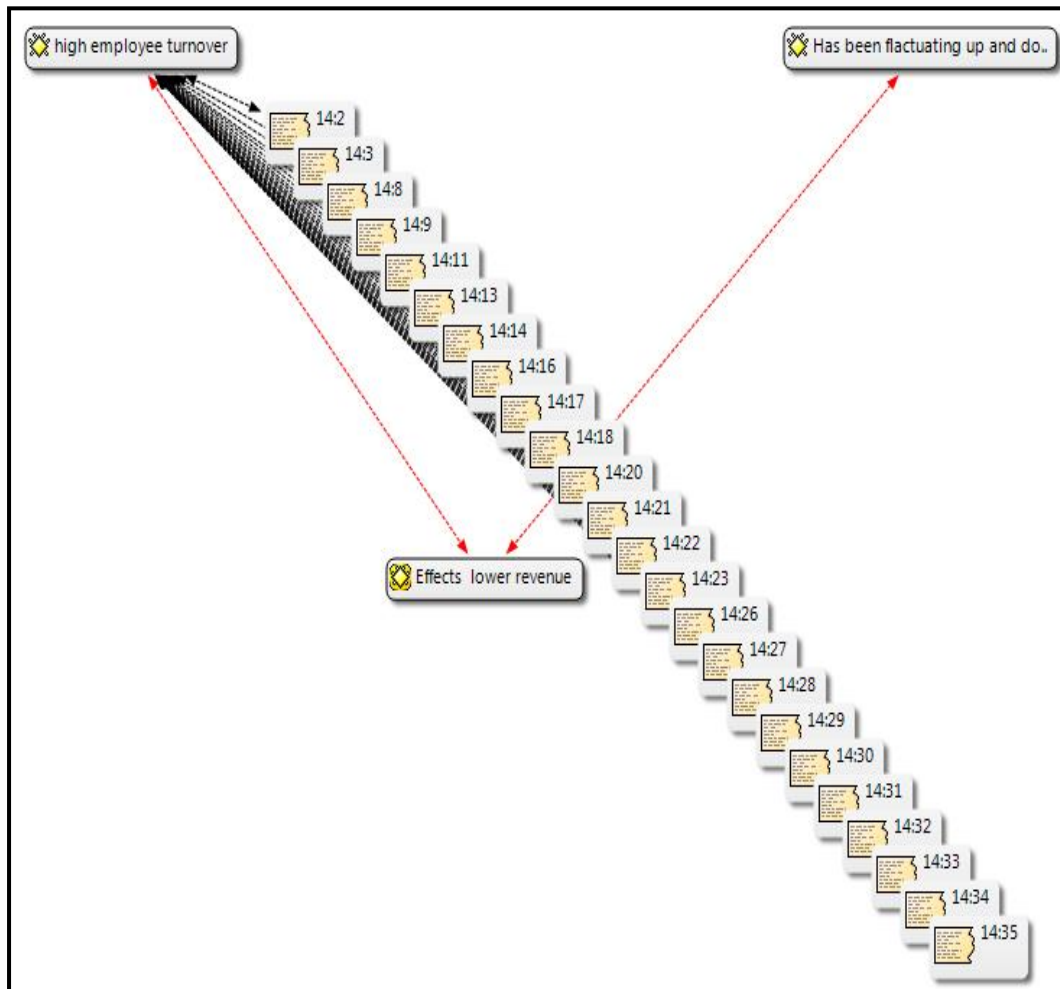
Figure 4.19: Effects of lower revenue on employees

Source: Research Data

The Figure above illustrates the coding on how employees perceived the impacts of a decline in revenue on employees' and or / contractors' job security. It appears that, the declined revenue experienced in the 2015/16 financial year resulted in high employee turnover as in indicated in the snippet above. Respondents indicated that revenue declined in 2015/2016 financial year resulted in high employee's turnover of 6.5%. The supporting data for this finding is referred to appendices 5 attached on this document.

4.2.7 Qualitative on long term sustainable approaches

This section presents the explored long-term sustainable mitigation measures to fight against water scarcity faced the country in order to place NBL on a competitive sustainable business position during drought events.
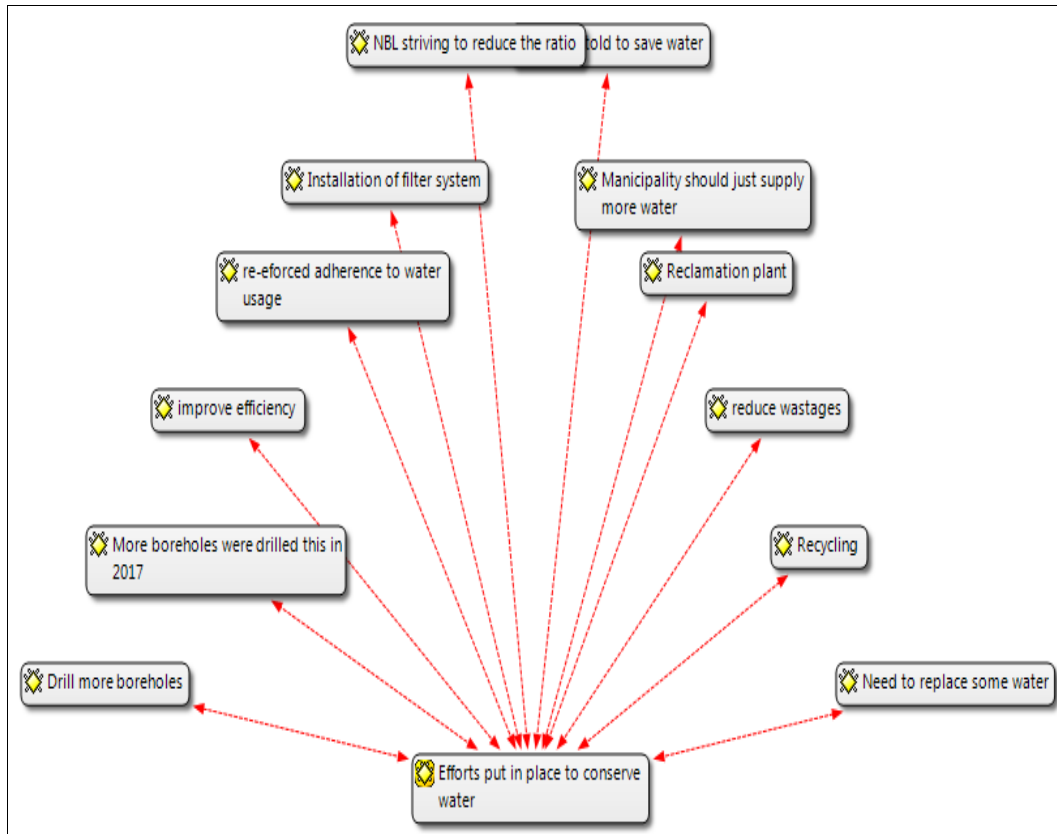
Figure 4.20: Efforts put in place to conserve water

Source: Research Data

The Figure above demonstrated the employee's views on the efforts put in place to conserve water. The Figure depicts that successful installation of reclamation plant in the brewing and packaging plant or filter system happen to be the most effective effort made by NBL to conserve water however there were other efforts put in place as indicated in snippet above.
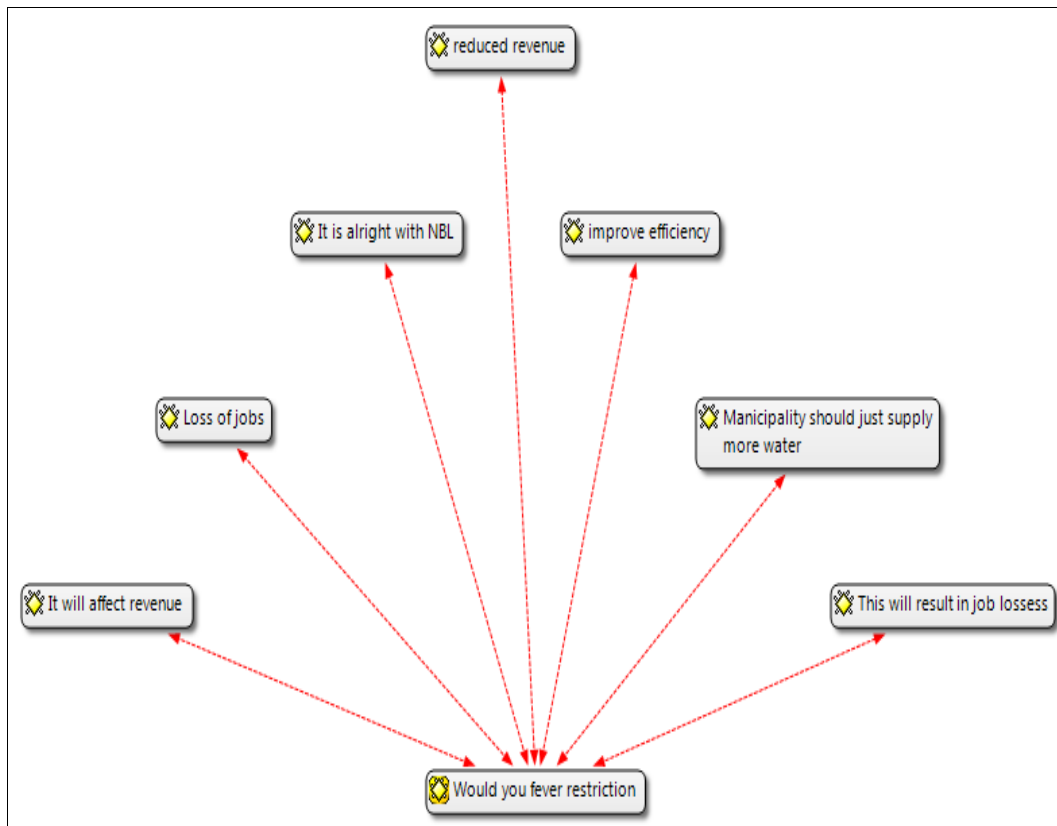
Figure 4.21: Restrictions on amount of water use

Source: Research Data

Figure 4.20 above demonstrated the coding on how employees perceive the consequences of putting the proposed water restrictions on the volume of water an institution is allowed to use on daily basis by the City of Windhoek. Respondents stated that proposed water restrictions will force NBL to scale down production that will lead to loss of revenue and result in job losses, as demonstrated in the figure above.

4.3.   Discussions

4.3.1   Demographic characteristics of Employees

It was important to analyse the background characteristics of the different employees of the study, at the respective three departments (Supply Chain, Marketing and Sales) of the NBL. Their characteristics have a slight effect on the study's findings relating to the research objectives.

A study by Rad & Yarmohammadian (2006) revealed that the relative importance of some factors will differ for younger and older employees due to the effects of life stage development, particularly as they relate to marriage, family, level of education and work considerations. Hence, the study included the gender of employees in order to establish the composition of sexes employed by NBL and specifically under the three departments. Overall, males constituted sixty-one (61%) of the employee respondents in the study and thirty-nine (39%) females. The low percentage of females can be attributed to the circumstance of the work-load especially at the supply chain department which requires more muscle-power.

The age of the employees was also analysed. The findings revealed that the majority of the employees at the three departments were between the age categories of $31 - 40$ and $41 - 60$ years, that is 52% and 30%, respectively. According to the 2011 Namibia Population and Housing Census, these age groups are considered to be actively in the job market or are currently employed. Consequently, the age category $18 - 30$ years was represented by 18%. This could be due to the fact that this age category is considered to be comprised of students at tertiary/vocational institutions, graduates that are actively looking for a job, whereas the category of below 60 has reached retirement.

Employees' level of education was established. The study revealed that sixty-two (62%) had either tertiary or vocational training, while thirty-three (33%) had a grade 11 or 12 level of education. In one of the study's findings, one of the reasons that employees improved their level of education was to remain competitive in their professions. This motivation could explain the high representation of these employees' level of education.

The findings also revealed the position of the employees who had partaken in this study with the majority of respondents being below management, representing seventy-two (72%) followed by eighteen (18%), the category of respondents serving in middle management positions. The latter's contribution in the study was valued to represent the executives who could not make time for the study due to various commitments. The ten (10%) of respondents fell in the categories of others which was constituted of casual workers.

The study also revealed the extent of the employees' working period or duration at NBL. The majority of the respondents served in NBL for a period between 6-10 years and accounted for thirty-seven (37%). Employees who served for a period between 1-5 years were represented by thirty-three (33 %), whilst employees who served for periods between 11-15 years were represented by seventeen (17%) of the respondents. Thirteen (13%) of the respondents had served less than a year. Many earlier studies indicated that in the corporate world the contribution of the long serving participants can be meaningful to attain the study's research objectives. However, Rad & Yarmohammadian (2006) indicated that, the relationship between length of service and employee performance ratings in three separate studies showed a direct, an inverse and no relationship between the variables. As a result of recent legislative changes to mandatory retirement ceilings, the need for a better understanding of this relationship has become extremely important to the corporate personnel function.

4.3.2 Beer production capacity

This section of the study discusses the production capacity of beer in relation to water use at NBL. Generally, it is assumed that NBL is the biggest industrial consumer of water in Windhoek. The study by IJG Securities (2016) revealed that NBL uses on average 4.4 litres of water to produce one litre of each final product of beer. On estimate, NBL produced about 1.6 million hectolitres (160,000,000 litres) of beer annually, requiring about 7.0 million hectolitres (700,000,000 litres) of water each year.

The study revealed that NBL's current water to beer ratio on average is between 4.1:1 to 5. 4:1 litre as was indicated by more than half (62%) of the respondents. This finding is consistent with a study by IJG Securities (2016) that NBL uses 4.4 litres of water on average to produce one litre of beer. Contrary, in South Africa, SAB's water-to-beer ratio stands at about 4.2, that is down from 4.6 in 2008 and the company promised a 3.5 ratio in 2015 (Hastings & Pegram, 2012). Whereas, in One AB-InBev bottling plant in Cartersville, Georgia it already boasts a water efficiency ratio of 3.04 (Gardiner, 2011). However, some respondents clearly stated that NBL's water to beer ratio currently stood at 4.3 litres of water to produce one litre of beer as indicated in NBL Annual Report (2017), this result shows a reduction of 0.1 litres compared to 4.4 litres as was revealed in 2016. This notable reduction in water to beer ratio was experienced in 2017 attributed to water saving initiatives and measures that were put in place.

The study revealed that beer production uses more water intensively for processing than other beverages. This was demonstrated by 50% of respondents who strongly indicated that, NBL's water to beer ratio is more compared to water used to produce other beverages. Furthermore, the study reveals that beer production capacity has been constant for the past five years as illustrated by 56% of the respondents.

The study also disclosed that, employees are of the opinion that NBL's beer production merely depended on the volume of water allocated by the City of Windhoek. NBL drilled three additional boreholes in 2017, bringing the total to five boreholes on-site after it obtained licenses from the City of Windhoek Department of Water Affairs. This finding was also discovered in the study by IJG Securities (2016) that NBL has drilled boreholes with 26% self-sufficiency on its premises as an intermediate solution to water scarcity. Hence, NBL's beer production does not merely depend on the volume of water allocated by the City of Windhoek. This finding was strongly indicated by the majority of respondents totalling 94%. However, it appears that in the event of a prolonged drought, the boreholes do not supply sufficient water to meet beer demand in the market as indicated by 82% of the respondents. This finding was also discovered in the study by Van der Merwe (2010) who indicated that, Windhoek Aquifers had been depleted to the point where there are no longer springs.

Disappointingly, the study could neither disclose the volume of water allocated to NBL by the City of Windhoek nor did it reveal a convincing result on the volume of beer produced annually. This was attributed to confidentiality or secrecy as the majority of respondents indicated to have no clue and to a certain extent stated that this information cannot be disclosed to the public.

4.3.3 Sales trends and Revenue

This section of the study discusses NBL's sales trends and revenue generated from beer production in relation to water scarcity. The study revealed that NBL experienced decline revenue in the 2016 due to high volume production to South Africa as a result of water shortages in Windhoek. These findings are consistent with a study by IJG Securities (2016) who cited the following reasons as common reasons why NBL's total revenue for the 2016

financial year decreased by 0.3% from the previous period (2015): the lower revenue figure was largely a product of the contractual migration of production volumes from Windhoek to the Sedibeng brewery in Johannesburg and increased percentages of water saving methods from 30% to 40% imposed by the City of Windhoek. This popular perspective can be connected to the point that the majority of the respondents who indicated that production volume migration to SA was the prominent factor. This was as a result of water shortages in Windhoek as well as economic fluctuations.

In addition, similar results were reflected by Swatuk (2008) in a study on beverage industries in Southern Africa where the following six factors causing water shortages were cited: drought, climate change, surface runoff, evaporation and transpiration. These factors further influence the water inflow and volume content into the three key national integrated dams systems which supply water to Windhoek and the central parts of Namibia.

Also revealed that a decline in revenue in the 2016 financial year caused high employee turnover contributing to 6.5% due to contractual migration of production volumes from Windhoek to the Sedibeng Brewery in Johannesburg. Similarly, in the study by IJG Securities (2016) they found that the production volumes of 320,000 hectolitres of beer was migrated in the 2016 financial year, bringing the cumulative migration figure to 560,000 hectolitres since the 2014 financial year. As result, total volumes produced in Namibia decreased by 9% and exports revenue to South Africa fell by 41.7%, concluding the contractual migration. Any further transfers would be at the discretion of management and would likely be dependent on the availability of water locally. These sentiments forced NBL to lay off some employees from 786 to 740 which significantly impacted the social well-being for the employees.

The study further revealed that the decline in revenue highly affected NBL's contribution to the country's GDP. Generally, it is presumed that NBL contributes much to the country's GDP. This was revealed in the study by IJG Securities (2016) that NBL's revenue contributed about 4% to the country's GDP. This finding was as well revealed in a study by Turton (2009) that the beverages industry represents one-third of the manufacturing sector's contribution to Gross Domestic Product. However, findings in a study by Cumming *et al.,* (2016) revealed that water shortages and restrictions in Windhoek would have spill-over effects and affect economic activity across the country, severely impacting water-dependent and water-intensive industries and placing Namibia's strong GDP growth rate in jeopardy. This presumption is also perceived in this study, as over 90% of the employees indicated that the decline in revenue experienced in 2016 had effects on NBL's contribution to the country's GDP.

4.3.4   Long-term sustainable approaches

This section of the study discusses the long-term sustainable approaches or mitigation measures to fight against water scarcity faced by the country. This should help to place NBL on a competitive sustainable business position during drought events. Generally, it is assumed that NBL's long-term sustainability is intrinsically linked to the availability of the natural resources used in its production processes. This presumption was also perceived in the study by Cumming *et al.,* (2015) that NBL has a responsibility to protect the environment in which it operates for the benefit of all who depend on it by making responsible decisions that will reduce NBL's negative impact on the environment. This alleviation of NBL's environmental impact includes reducing water and energy consumption, and the amount of waste from production processes.

The study revealed that NBL's business was most hard hit by water shortages that interrupted production during the brewer's peak season in the 2016 financial year. This was depicted by more than 72% of the respondents who stated that the company anticipated water shortages in 2016 as its production heavily relies on water. The study further revealed that NBL has put mitigation measures in place and efforts to conserve water as per the City of Windhoek water saving initiatives of 30% to 40%. This is also evident from the high percentage (74%) of the respondents who indicated that NBL's water saving initiatives include reclamation in the brewing and packaging plants, which reduced water consumption by 0.84% in 2016. Currently, 4.3 litres of water are used to produce one litre of beer on average. The 3.3 litres beyond the actual water for the product do not go to waste, the majority is reclaimed and transferred into the city's effluent system, where it gets recycled.

The study further revealed that water reduction achieved in the production process over the last two years will bring the litres of water used to produce a litre of beverage to approximately 3.5 litres in future. Similar findings were also revealed in a study by Swatuk (2008) in South Africa that, to mitigate water risk, Heineken has focused on reducing its water consumption, increasing its access to water, as well as increasing Sedibeng's water capacity to ensure the brewery is less vulnerable to water shortages. The business is furthermore engaging local authorities to find and support solutions.

Contrary to the above, the study revealed that employees are of the opinion regarding restrictions imposed by the City of Windhoek on the volume of water an institution is allowed to use on a daily basis. This was demonstrated by more than 56% of the respondents who argued that, imposed restrictions on water use would force NBL to scale down production, retrenchment, loss of revenue and subsequently affect the company's contribution to the country's GDP.

In addition, the study explored long-term sustainable approaches to mitigate the risk of water shortages at NBL. Literally, environmental sustainability is one of the foremost topics world-wide, as people are realising the full impact that businesses and individuals have on the environment. Presently, this issue receives highly focused attention in Namibia, from the media and from various Government Offices, Ministries and Agencies. Consequently, NBL has a responsibility to practice responsible water stewardship.

The study revealed that the majority of the employees perceive migration of the production plant to areas with reduced water risk in the country as the preferable alternative or long-term sustainable approach to fight against the water crisis that hampers the production processes at NBL. This is evident in that, 50% of the respondents depicted that migration of the production plant to areas with reduced water risk for instance, in the Zambezi and Kavango Regions that have abundant water would help increase production volumes. Furthermore, the study explored a numbered of sustainable approaches or water supply options such as construction of reclamation plants, construction of dams for rain water harvesting, drilling of more boreholes, tapping of water from the Kavango River, desalination, trucking water into Windhoek, and even fog-harvesting.

These findings are consistent with a study by Lahnsteiner *et al.,* (2007), who cited the following as alternative water supply options to Windhoek to give the City a reliable, clean water source: Kavango River/Karst Aquifer pipeline schemes, Congo River transfer scheme, artificial recharge reduction in unaccounted for water levels and Desalination of sea water.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1.   Introduction

This chapter presents the summary of the findings of the study, conclusion and recommendations of the study. The purpose of this study was to analyse the impact of water scarcity on the production of Namibia Breweries Limited for a period of 5 years (2013 – 2017); specific to beer production capacity, sales, revenue and the likely potential threats it poses to the country's GDP. In particular, it intended to explore long-term sustainable approaches or mitigation measures to fight against water crises or shortages faced by the country in order to place NBL on a competitive sustainable business position during drought events.

The study addressed the following objectives

i.   To analyse the impact of water scarcity on Namibia Breweries Limited's beer production capacity;

ii.   To determine the impact of water scarcity on NBL's contribution to the country's GDP;

iii. To explore long term sustainable approaches of supplying water to NBL.

In order to find answers to the stated objectives, this study utilised a mixed-method approach. A questionnaire was designed to collect data from the sampled employees. Simple random sampling was used to select participants. The literature review provided a scope through which the study could best be understood. In this case, attention was paid to understand the impact of water scarcity on beverages production, specifically to beer production. Lastly, an analysis and discussion of every finding was presented according to the order of the research objectives.

5.2.   Major findings and conclusions

Namibia has experienced a persistent drought over the past four years. As such, the water supply to Windhoek and its surrounding settlements is increasingly strained. Water is vital to NBL's business operations: it is the primary ingredient in NBL's products and is used in its manufacturing processes. However, a generous seasonal rainfall at the start of 2017 provided some alleviation from water shortages. Following are some of the major findings of this study.

The following major findings answer objective (1) one: To analyse the impact of water scarcity on Namibia Breweries Limited's beer production capacity;

Firstly, the study found out that NBL's current water to beer ratio stood at 4.3:1 litre, in other words NBL uses 4.3 litres of water on average to produce one litre of beer. The 3.3 litres beyond the actual water for the product do not go to waste; the majority is reclaimed and transferred into the city's effluent system, where it gets recycled. This notable reduction in the water to beer ratio was experienced in 2017.

Secondly, the study revealed that beer production uses water intensively for processing than other beverages produced at NBL.

Thirdly, NBL obtained licences from the City of Windhoek, Department of Water Affairs for five boreholes which have since been drilled on its premises. Currently, NBL is able to extract 26.92% of its water requirements from its own water sources.

Lastly, beer production capacity has been constant for past five years.

The following major findings answer objective (2) two: To determine the impact of water scarcity on NBL's contribution to the country's GDP;

Firstly, NBL experienced a decline revenue in the 2015/2016 financial year due to the movement of high volume production to South Africa as a result of water shortages in Windhoek.

Secondly, a decline in NBL's revenue in 2016 caused a high employee turnover contributing to 6.5%.

Lastly, a decline in revenue experienced in 2016 impacted on NBL's contribution to the country's GDP.

The following major findings answer objective (3) three: To explore long term sustainable approaches of supplying water to NBL.

Firstly, NBL was most hard hit by water shortages that interrupted production during the brewer's peak season in the 2016 financial year.

Secondly, NBL has invested in water-saving initiatives. These include water reclamation successfully installed in brewing and packaging plants, which has reduced NBL's water consumption by 0.84%.

Thirdly, the proposed water restrictions by the City of Windhoek on volume of water an institution is allowed to use on a daily basis will force NBL to scale down production, retrench, loss of revenue and subsequently affect the company's contribution to the country's GDP.

Lastly, the majority of the employees perceive migration of the production plant to areas with reduced water risk in the country preferable. This could be to the Zambezi and Kavango Regions

that have abundant water resources. This alternative is perceived as a long-term sustainable approach to fight against water scarcity that hampers the production process at NBL. Other alternative supply options include, construction of reclamation/effluent treatment plants, construction of dams for rain water harvesting, drilling of more boreholes, tapping of water from the Kavango River, desalination, trucking water into Windhoek, and fog-harvesting.

5.3.   Conclusions

Namibia has experienced a persistent drought over the past four years. As such, the water supplied to Windhoek and its surrounding settlements is increasingly strained. Water is vital to NBL's business operations: it is the primary ingredient in NBL's products and is used in its manufacturing processes. Therefore, the Company has a responsibility to practice responsible water stewardship. Such measures should include a commitment to making responsible strategic decisions related to water consumption. Generous seasonal rainfall at the start of 2017 provided some alleviation from water shortages. However, in order to address critical shortages and work towards a sustainable supply of fresh water, there is a need for strategic engagement with partners such as Government and the City of Windhoek to find and support longer term solutions.

5.4.   Recommendations

NBL's long-term sustainability is intrinsically linked to the availability of the natural resources used in its production processes. Hence, the company has a responsibility to practice water stewardship. The following recommendations were drawn from the major findings of the study:

- NBL should continuously invest in water-saving initiatives to bring the litres of water used to produce a litre of beer to approximately 3.5 litres on average to achieve

international standards and global water stewardship as well as enhance global market competitiveness.

- NBL should continuously optimise water usage so as to reduce consumption. Thus, the company should not only be concerned about reducing the amount of water consumption, but should also attempt to develop processes that will lead the business to become entirely sustainable in the future while reducing and even eliminating any negative environmental impact.

- Develop water footprint or automatic water balancing tool that, checks water consumption in real time. Produce daily, weekly and monthly reports and trends. Flag high consumption leakages and install fault meters immediately.

- Development of a new data management system for the packaging plant, including, dashboards and constantly updated reports on productivity and the consumption of water.

- NBL should enforce the concept amongst employees that the state of the environment is influenced by their behaviour, and that the company has the opportunity to make a positive impact on the future. Consideration should be taken in various areas such as water conservation, energy efficiency, waste reduction and reducing the carbon footprint in order to lessen any negative impact on the environment.

- NBL should look beyond making short-term gains and consider long-term impact on the natural world. In respect of brewing beer, therefore, the company should take the environmental impact of the product's entire life cycle into account, from the development to the disposal of the product and its materials.

- Longer-term sustainable supply depends on plans to connect the centre of Namibia to other sources of water, which will reduce the dependency on rainfall and dams. Supply options include, tapping of water from the Kavango River, Congo River transfer scheme and desalination. Hence, NBL should continuously engage with strategic partners such as the Government and the City of Windhoek to find and support solutions to ensure sufficient water supply in order to enhance a favourable business competitive environment.

- Else, NBL should consider investing in a new packaging line or production plant within the country which is subjected to strategic, cost implications and long-term availability of water.

REFERENCES

Alexandratos, N., & J. Bruinsma. (2012). World agriculture towards 2030/2050. *ESA Working paper*, 12-03. Rome, FAO.

Asano, Takashi (2007): Water reuse. Issues Technology and Applications. 1. ed. New York, NY: McGraw-Hill.

Asano, T., & Cotruvo, J. A. (2004). Groundwater recharge with reclaimed municipal wastewater: health and regulatory considerations. *Water Research Commission,* 38 (8), 1941-1951.

Arnell N.W., (2004), Climate change and global water resources: SRES emissions and socioeconomic scenarios. Global Environmental Change Bank of Namibia 2006 Annual Report.

Baškarada, S. (2014). Qualitative Case Study Guidelines. The Qualitative Report, 19(40), 1-18. Retrieved from http://nsuworks.nova.edu/tqr/vol19/iss40/3

Biggs, D., & Williams, R. (2013). A case study of Integrated Water Resource Management in Windhoek, Namibia.

Biswas, A. K. (2011). Cooperation or conflict in transboundary water management: case study of South Asia. *Hydrol. Sci. J,* 56 (4), 662–670.

Blake, B., Callahan, A., Farmer, S., & Min, H. (2013). "Craft Beer Production". *Senior Design Reports* (CBE). 53. Retrieved from http://repository.upenn.edu/cbe_sdr/53

CDP (Driving Sustainable Economy). (2015). Thirsty business: Why water is vital to climate action. *2016 Annual Report of Corporate Water Disclosure*.

Chapagain, A.K., & Tickner, D. (2012). Water footprint: Help or hindrance? Journal on Water Alternatives, 5 (3), 563-581.

Creswell, J. W. (2014). *A concise introduction to mixed methods research*. Thousand Oaks, CA: Sage Publications.

Crovello, S., Davidson, J., & Keller, A. (2010). Perception and Communication of water Reclamation for the Sustainable Future of Windhoek. City of Windhoek, Namibia.

Cumming, J., Kushle, A., & Nanghonga, I. (2015). The economic effects of a water shortage in Central. *Simonis Storm Securities (Pty) Ltd*. Windhoek, Namibia.

Daughton, C. G. (2004). Ground Water Recharge and Chemical Contaminants: Challenges in Communicating the Connections and Collisions of Two Disparate Worlds. *U.S. Environmental Protection Agency Papers,* 127.

De Wit, M., & Stankiwicz, J. (2006). Changes in Surface Water Supply Across Africa with Predicted Climate Change Science, 311, (5769), 1917-1921.DOI: 10.1126/science.1119929

Dirk E., Hager C., Tadross M., Bethune S., & Curtis B. (2008). Climate change vulnerability and adaptation Assessment. *Desert Research Foundation of Namibia and Climate Systems Analysis Group.* Prepared for the Ministry of Environment and Tourism.

Dolder, S., Hillman, A., Passinky, V., & Wooster, K. (2012). Strategic Analysis of Water Use and Risk in the Beverage Industry. Natural Resources and Environment, University of Michigan.

Du Pisani, P. L. (2006). Direct Reclamation of Potable Water at Windhoek's Goreangab Reclamation Plant, Desalination, 188, 79–88.

Eriksen, S., O'Brien, K., & Rosentrater, L. (2008). Climate change in Eastern and Southern Africa: impacts, vulnerability and adaptation. *Journal on Climate Change Adaptation*, (29), 27.

Frenken, K. (2005). *Irrigation in Africa in figures*: AQUASTAT survey, 2005 Food & Agriculture. FAO Water Reports.

Friese S. (2013). Qualitative Data Analysis with ATLAS.ti. SAGE publication Ltd.

Gardiner, B. (2011). Beverage Industry Works to Cap Its Water Use. *The New York Times*. London. Retrieved 1 April 2012, http://www.nytimes.com/2011/03/22/business/energy-environment/22iht-rbog-beverage-22.html.

Gollin, Douglas, David Lagakos, & Michael E. Waugh. (2014). "Agricultural Productivity Differences across Countries." *American Economic Review,* 104 (5): 165-70.

Government Gazette of the Republic of Namibia. (2013). Promulgation of Water Resources Management Act, 2013 (Act No. 11 of 2013). No. 5367.

Gravetter, F. J., & Forzano, L. B. (2011). Research Methods for the Behavioural Sciences" Cengage Learning, 146.

GWP (Global Water Partnership). 2014. About GWP – History. www.gwp.org/en/About-GWP/History/ (Retrieved in December 2014).

Haimene E. P. (2012), *The Land Use Changes Effects on the Water Quality of Okavango River-Namibia.* Masters of Integrated Water Resources Management Thesis, University of Dar es Salaam.

Hastings, E., & Pegram, G. (2012). Literature Review for the Applicability of Water Footprints in South Africa. *Water Research Commission*, 2099, 11. Cape Town, South Africa.

Heyns P. (2005), Water institutional reforms in Namibia, Water Policy, 7, 89–106.

Hoekstra, A. (2010). The water footprint: water in the supply chain. *Water Footprint Network,* 93. University of Twente, Director of the Water Footprint Network, Netherlands.

Hoekstra, A. Y. (2014). Water scarcity challenges to business. *Journal on Nature Climate Change, 4, 318–320.*

Hoekstra, A.Y., & Chapagain, A. K. (2007). The water footprints of Morocco and the Netherlands: Global water use as a result of domestic consumption of agricultural commodities. Ecological Economics 64(1): 143-151.

Hoekstra, A.Y., & Chapagain, A.K. (2008). Globalization of water: Sharing the planet's freshwater resources. Oxford, UK: Blackwell Publishing Ltd.

Hoekstra, A. Y., Chapagain, A.K., Aldaya, M. M., & Mekonnen, M. M. (2011). The water footprint assessment manual: Setting the global standard. London. Washington, DC: Earthscan.

Hoekstra, A.Y., & Mekonnen, M.M. (2012). The water footprint of humanity. Proceedings of the National Academy of Sciences 109(9): 3232-3237.

IEA (International Energy Agency). (2011). The IEA Model of Short-term Energy Security (MOSES) Primary Energy Sources and Secondary Fuels. *Working Paper*. Paris, OECD/IEA.

IJG Security. (2015). Namibia Breweries Limited FY 2016 Results Review. *IJG Security (Pty) Ltd.* Windhoek, Namibia.

IJG Security. (2016). Namibia Breweries Limited FY 2016 Results Review. *IJG Security (Pty) Ltd.* Windhoek, Namibia.

Kaupa, S., & Govender, K. (2015). The relationship between premium beer brand attributes and brand loyalty −An exploratory South African study. *British Journal of Marketing Studies,* 3 (9), 27-34.

Kgabi, N., & Mashauri, D. (2014). Sustainable Domestic and Industrial Water Utilisation in Namibia. *European Journal of Scientific Research,* 127 (1), 46-57.

Kibaara, J. M. (2016). Influence of green supply chain management on supplier selection criteria: *International Journal of Human Resource & Procurement (IJHRP)*, 2 (9), 406-420.

Lahnsteiner, J., & Lempert, G. (2007). Water management in Windhoek, Namibia. *VA TECH WABAG GmbH, Siemensstrasse* 89, 1210 Vienna, Austria.

Lahnsteiner, J., Lempert, G., Kim, I., Cho, J., & Kim, S. (2007). Water management in Windhoek, Namibia. *Water Science & Technology*, 55(1-2), 441–44. doi:10.2166/wst.2007.022

Lange, G. (1998). An approach to sustainable water management in Southern Africa using natural resource accounts: the experience in Namibia. *Ecological Economics*, 26(3), 299-311.

Lange, G. & Hassan, R. (2006). The Economics of Water Management in Southern Africa: An Environmental Accounting Approach. *Edward Elgar*: Cheltenham, UK.

Lawrence, D. M., Thornton, P. E., Oleson, K. W., & Bonan, G. B. Partitioning of evaporation into transpiration, soil evaporation, and canopy evaporation in a GCM: impacts on land-atmosphere interaction. J. Hydrometeorol. 8, 862–880 (2007).

Maanda, F., & Vernouman, E. (2009): "Sustainable alternative technologies" Where to now? Creating a sustainable community: Case of Windhoek. *City of Windhoek, Department of Planning,* Windhoek, Namibia.

Matongela, A. M., & Karodia, A. M. (2015). An evaluation of factors contributing to the stock market liquidity constraints or companies listed on the Namibian stock exchange. *International Journal of Accounting Research (IJAR),* 2 (8).

Ministry of Agriculture, Water and Forestry. (2008). Water Supply and Sanitation Policy. *Approved by Cabinet:* Decision 18th / 30 /09/08 / 006.

Mendelsohn, J. & El Obeid, S. (2004). Okavango River – The flow of a lifeline. Struik Publishers, Cape Town

Merrey, J. D. (2009). African models for transnational river basin organisations in Africa: An unexplored dimension. *Journal on Water Alternatives,* 2 (2), 183-204. Pretoria, South Africa.

Msangi, J. P. (2014). Managing Water Scarcity in Southern Africa: Policy and Strategies, Springer Briefs in Environmental Science, DOI: 10.1007/978-94-007-7097-32.

Muller, M. (2015). The 'nexus' as a step back towards a more coherent water resource management paradigm. *Water Alternatives* 8 (1), 675-694.

Namibia Breweries Limited (Pty) Ltd. (2013). *Annual Report 31 August 2013*. Windhoek, Namibia.

Namibia Breweries Limited (Pty) Ltd. (2014). *Annual Report 3 September 2014*. Windhoek, Namibia.

Namibia Breweries Limited (Pty) Ltd. (2015). *Annual Report 9 October 2015*. Windhoek, Namibia.

Namibia Breweries Limited (Pty) Ltd. (2016). *Annual Report 6 September 2016.* Windhoek, Namibia.

Namibia Breweries Limited (Pty) Ltd. (2017). *Annual Report 5 September 2017*. Windhoek, Namibia.

Namibia Stock Exchange (2016). *Daily Report 12 June 2015*. Windhoek: Namibian Stock Exchange.

Namibia Water Corporation (2018). *Weekly Dam Bulletins 30 January 2018*. Windhoek, Namibia.

OECD (Organisation for Economic Co-operation and Development). 2011. Green Growth Strategy Preliminary report. Paris, OECD

Olajide A. A. (2011). The brewing industry and environmental challenges. *Journal of Cleaner Production*, (201), 1-21. Ogbomosho, Oyo, Nigeria.

Orodho, J. (2003). *Essentials of educational and social sciences research methods*: Qualitative and Quantitative Approaches. Nairobi Acts press.

Pazvakawambwa, G. T., Tjipangandjara, K. F., & Chulu, E. (2012) Management of the Upper Swakop Basin Key: Water Security to the Central Area of Namibia. Windhoek, Namibia.

Peil, L. D. (2008). Research Methodology and Design, 5 th Edition, Macmillan. Publishers, New York, U.S.A

Rad, A. M. M., & Yarmohammadian, M. H. (2006) "A study of relationship between managers' leadership style and employees' job satisfaction", Leadership in Health Services, 19 (2), 11-28. https://doi.org/10.1108/13660750610665008.

Ramukhwatho, F., Seetal, A., & Pienaar, H. (2016). Water and Wastewater Management in the Malt Brewing Industry. *Water Research Commission.* Natural Resources and the Environment, CSIR, Pretoria, South Africa.

Reid, H., Sahlén, L., Stage, J., & MacGregor, J. (2007). The economic impact of climate change in Namibia: How climate change will affect the contribution of Namibia's natural resources to its economy. *International Institute for Environment and Development. Environmental Economics Programme. Discussion Paper,* (07-02).

Reid, H., Sahlén, L., Stage, J., & MacGregor, J. (2008) Climate Change Impacts on Namibia's Natural Resources and Economy. *Climate Policy 8: 452-466.*

SADC (SADC (2010b). Revised protocol on shared watercourses. Retrieved 27 July 2012

from http:// www.sadc.int/files/4513/5333/8265/SADC_guideline_establishment.pdf.

Saunders, M., Lewis, P., & Thornhill, A. (2016). Research Methods for Business Students. 7.

painos.

Essex: Pearson Education.

Simonis Storm Securities (Pty) Ltd.   (2016). Water crisis: Is the concept of sustainable

development adequately embrace? Windhoek, Namibia.

Smith, Gavin. (2012) Beer Manufacturing Industry Market Research Report Now Available

from IBISWorld. Retrieved http://www.prweb.com/releases/2012/4/prweb9419529.htm

Shajahan, S. (2009). *Introduction to Business Research   Methods.* Mumbai: Jaico Publishing

House.

Smakhtin, V., & Schipper, E.L.F. (2008). Droughts: the impact of semantics and perceptions.

Journal on Water Policy, 10, 131-143

Stanley, S. (2010). What are the Determinants of Financial Development in Sub-Saharan

Africa? Public Sector and Development, 5: 17-19.

Stant, M. (2012). After long downturn, beer sales are back. Retrieved from

http://online.wsj.com/article/sb1000087963904440833547183.html

Stern, N. (2008). "The Economics of Climate Change," Richard T. Ely Lecture, American

Economic Association Meetings, New Orleans, Louisiana (January 4). Stern, Nicholas,

and others, 2007, *The Economics of Climate Change*: The Stern Review (London: HM

Treasury).

Swatuk, L. A. (2008). A Political Economy of Water in Southern Africa. Programme on Environment and International Development. *Journal on Water Alternatives,* 1 (1), 24-47. University of Waterloo, Canada.

Uhlendahl, T., Ziegelmayer, D., Wienecke. A., Mawisa, M. L., & Du Pisani, P. (2010). Water consumption at household level in Windhoek, Namibia. *Institute of Cultural Geography,* Albert- Ludwigs University of Freiburg.

UNEPFI. (2004) Challenges of water scarcity: A business case for financial institutions. Retrieved 11 May 2012 from www.siwi.org

UNEP/UNEP-DHi/IUCN/TNC (United Nations Environment Programme/ UNEP-DHi Partnership – Centre on Water and environment/ international union for Conservation of nature/the nature Conservancy). (2014). *Green Infrastructure Guide for Water Management: Ecosystem-based management approaches for water-related infrastructure projects.* Nairobi, UNEP.

UNWWAP (United Nations World Water Assessment Programme). (2015). The United Nations World Water Development Report 2015: *Water for a Sustainable World*. Paris, UNESCO.

Van Rooyen, J., Van Niekerk, P., & Versfeld, D. (2009). Strategic planning for water resources in South Africa: Water Engineering. South Africa Institution of Civil Engineering, 17 (5), 5.

Vushe, A., Haimene, E. P., & Mashauri, D. (2014). Namibian Land Use Changes and Nutrient Water Quality of the Okavango River. *Journal of Agriculture and Environmental Sciences,* 3 (2), 219-239.

Water Footprint Network. (2012). Water Footprint Network. Retrieved 2012, from Water

Footprint Network: http://www.waterfootprint.org/?page=files/home.

APPENDICES

APPENDICE: 1

Research permission letter

NBS
NAMIBIA BUSINESS SCHOOL
UNIVERSITY OF NAMIBIA

23 August 2017

TO WHOM IT MAY CONCERN

Mr Pinehas Uupindi of Student Number: 201310829 is registered for a Master in Business Administration – Natural Resource Management at the University of Namibia through the Namibia Business School.

This letter serves to inform you that his research proposal was reviewed and met the University of Namibia requirements.

The student has been granted permission to carry out postgraduate studies research. The University of Namibia has approved the research to be carried out by the student for purposes of fulfilling the requirements of the degree being pursued.

If you have any queries please do not hesitate to contact the Business School at the University of Namibia.

Thank you so much in advance and many regards.

Yours sincerely

Greenfield Mwakipesile, PhD
Research Coordinator
Namibia Business School
University of Namibia
Tel: +246 61 413 500
Fax: +246 61 413 512
Email: mwakipg@nbs.edu.na

340 Mandume Ndemufayo Ave. – Private Bag 16004 – Pionierspark – Windhoek – Website: www.nbs.edu.na
Tel: + 264 (61) 413500 – Fax +264 (61) 413512 – E-mail: info@edu.na – Trust reg. no T263/05

APPENDICE: 2

Request letter for authorisation

University of Namibia. Private Bag 13301, Windhoek, NAMIBIA. 340 Mandume
Ndemufayo Avenue. Tel: +264-61 206 3111

Mr. Erastus Shanghala
Manager: HC Service Delivery
Namibia Breweries Limited LTD
P O Box 206
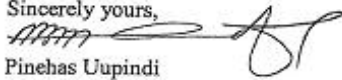Iscor St Northern

18 September 2017

Dear. Shanghala

RE: REQUEST FOR AUTHOURIZATION TO CONDUCT A STUDY WITH NBL

My name is Pinehas Uupindi, master student (**Master of Business Administration: Natural Resources Management**) at the University of Namibia, Namibia Business School. I have completed my course work in 2015 and I am currently doing my research project, focusing on water scarcity in Windhoek. My research topic: **An Analysis of the Impact of Water Scarcity on Namibia Beverages Production: A case study of Namibia Breweries Limited-Beer Production, Windhoek, Namibia.** I have chosen Namibia Breweries Limited (NBL) because of its good reputation. I anticipate that, the study will explore alternative water supply method that will serve as a long term solution to the water scarcity problem in the event of drought which will help NBL to remain a leading beverage manufacturing company in the Southern African Regions.

Information obtained will be treated confidential and used for school purpose only as per curriculum, towards the fulfillment of my **Master of Business Administration: Natural Resources Management**, at the University of Namibia, Namibia Business School. Data will be stored in a lockable safe and destroyed after the report has been produced.

Thanking you in advancing for considering my request.

Sincerely yours,

Pinehas Uupindi
0813042946
Email pnauupindi@yahoo.com or pnuupindi@gmail.com

APPENDICE: 3

Consent Document/ Permit to collect data from Namibia Breweries Limited

ORGANIZATION CONSENT

I *Erastus Shanghala*

of *Namibia Breweries Limited*

understand that *Pinehas Uupindi ID 8604/8002/7*

is a student at University of Namibia, Business School.

I further understand that the student has to complete a research project as part of the student's studies with University of Namibia, Business School and that the student wishes to base the research project on my organisation named below:

Name of organisation: *Namibia Breweries Limited*

My consent is subject to the following conditions, which I insert in my own handwriting:

* No confidential / proprietary information is divulged

* Content remains the intellectual property of NBC and unam jointly and not to be published or distributed without consent.

* Student will provide NBL with a copy of the final thesis.

I hereby append my consent to the student basing their research project on my organisation and confirm that I am authorized to grant this consent on behalf of the organisation. I understand that the information obtained by the student ~~by the student~~ about my organisation will be kept strictly confidential and only viewed by the student, the project examiners and essential University of Namibia, except where I have otherwise granted consent in writing.

Respondent's signature

Respondent's job title *Manager: HC Service Delivery*

Date of consent *16. 3. 2018*

Student name *PINEHAS UUPINDI*

Student signature

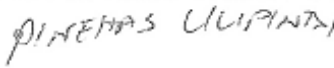| Ohlthaver & List Group of Companies	Confidentiality Declaration	F KP5-0046 Revision: 1

CONFIDENTIALITY DECLARATION

COMMENCING DATE:

ENTERED INTO BY AND BETWEEN

O&L Group (NBL)

(hereafter referred to as "DISCLOSING PARTY")

AND

PINEHAS ULIPINDI

(hereafter referred to as "RECEIVING PARTY")

Initial each and sign the last page of this declaration and send it to:

TO:	Attention:	
	Address:	
	Fax:	

DECLARATION:	We, the receiving party, fully understand, accept and apply this confidentiality declaration

1 "CONFIDENTIAL INFORMATION" MEANS:

1.1 information that provides the Disclosing Party with a competitive advantage, including but not limited to trade secrets, ideas, processes, formulas, computer software, data and know-how, copyrightable material, improvements, inventions whether patentable or not, techniques, marketing plans, strategies, business and product development plans, timetables, forecasts and customer lists all as related to the products and services, (past, current and prospective) of the Disclosing Party;

1.2 information about the Disclosing Party' business or technical information, including but not limited to any information relating to its product plans, product designs, products costs, product prices, product names, finances, marketing plans, business opportunities, source code, personnel, research, development or know-how and

1.3 any information designated by the Disclosing Party as 'confidential' or 'proprietary' or which, under the circumstances taken as a whole, would reasonably be deemed to be confidential; and

1.4 the terms and conditions of this declaration;

1.5 but excludes information that is in the public domain at the time of disclosure to the Receiving Party or

Ohlthaver & List Group of Companies	Confidentiality Declaration	F KP5-0046 Revision: 1

becomes generally known or available by publication, commercial use or otherwise through no fault of the Receiving Party; or

1.6 is known to the Receiving Party at the time of disclosure without violation of any confidentiality restriction and without any restriction on the Receiving Party's further use or disclosure; or

1.7 is independently developed by the Receiving Party without access or reference to confidential information of the Disclosing Party; or

1.8 is rightfully disclosed to the Receiving Party by another person not in violation of the proprietary or other rights of the Disclosing Party or any other person or entity; or

1.9 is approved for release by written authorisation of the Disclosing Party.

2 PURPOSE FOR WHICH THE CONFIDENTIAL INFORMATION IS DISCLOSED

The confidential information is disclosed to the Receiving Party for the purpose of facilitating discussions and/or contractual negotiations and/or the tendering process with a view to the provision of financial and/or technical information by the Receiving Party to the Disclosing Party.

3 OWNERSHIP AND USE OF CONFIDENTIAL INFORMATION

The parties agree that:

3.1 all confidential information is and remains the sole property of the Disclosing Party and shall not be used to the detriment or prejudice of the Disclosing Party;

3.2 the Disclosing Party is the sole owner of all patents, copyrights and other proprietary rights in connection therewith and that no licence is granted to the Receiving Party by way of disclosure in terms of this confidentiality declaration;

3.3 the Receiving Party agrees to hold in confidence and trust and to maintain as confidential all confidential information of Disclosing Party;

3.4 the Receiving Party will not use or disclose or divulge or copy or reproduce or publish or circulate or reverse or engineer and/or decompile or otherwise transfer; whether directly or indirectly, the confidential information to any other person or entity, save that the Receiving Party shall be entitled to give such information to its employees, consultants, and/or advisors assisting it in the process referred to in 2; provided that:

3.5 it is strictly necessary to do so; and

3.6 the Receiving Party shall have procured that its employees, advisors and/or consultants have agreed to be bound by the terms of this agreement; and

3.7 the Receiving Party shall take all such steps as may be reasonably necessary to prevent the Disclosing Party's confidential information coming within the knowledge of unauthorised persons or entities.

4 RETURN OF CONFIDENTIAL INFORMATION

4.1 Any documentation or written record or other material containing confidential information (in whatsoever form) which comes into the possession of the Receiving Party shall itself be deemed to form part of the Confidential Information of the Disclosing Party.

4.2 The Receiving Party shall, on request, and in any event, if the discussions and/or negotiations and/or the tendering process referred to in 2 above, should not result in an agreement, return to the Disclosing Party all of the Disclosing Party's Confidential Information which is in physical form (including all copies) and shall destroy any other records (including, without limitation, those in machine or computer readable form) as far as they contain the Disclosing Party's confidential information.

Ohlthaver & List	**Confidentiality Declaration**	F KP5-0046 Revision: 1

5 TERM AND TERMINATION

This agreement shall commence upon the commencing date defined on page 1 of this declaration and shall continue in full force and effect until such time as the confidential information passes into the public domain other than by breach of this declaration by the Receiving Party.

6 INDEMNITY AND DAMAGES

6.1 The Receiving Party hereby indemnifies the Disclosing Party against any loss, harm or damage which the Disclosing Party may suffer as a result of the unauthorised disclosure of confidential information by a representative or affiliate.

6.2 Without prejudice to any other rights or remedies that both parties may have, the parties acknowledge and agree that damages only would not be an adequate remedy for any breach of the provisions of this declaration and that the Disclosing Party shall be entitled to the remedies of interdict, injunction, specific performance and/or other equitable relief for any reason whatsoever.

SIGN-OFF:

Signature:

Name (print): PINEHAS LIUPINDI

Capacity: STUDENT

Date: 16/03/18

APPENDICE: 4

The Questionnaire

Faculty of Management Sciences

Master Research Project

Researcher:	Pinehas N Uupindi
Contacts:	E-mail: pnauupindi@yahoo.com
	Cell: +264 813042946

Supervisor: Dr Stewart Kaupa
Contact: +264 61 207 2678

Dear Respondent,

I, Pinehas Uupindi, am an MBA student in the faculty of Economics and Management Sciences, at the University of Namibia. You are invited to participate in a research project entitled: AN ANALYSIS OF THE IMPACT OF WATER SCARCITY ON NAMIBIA BEVERAGES PRODUCTION: A CASE STUDY OF NAMIBIA BREWERIES LIMITED-BEER PRODUCTION, WINDHOEK, NAMIBIA.

The aim of this study is to find out:

➢ To analyse the impact of water scarcity on Namibia Breweries Limited beer production capacity;

➢ To determine the impact of water scarcity on NBL's contribution to the country's GDP;

➢ To explore long term sustainable approaches of supplying water to NBL.

Through your participation I hope to understand: The challenges of water scarcity on NBL's beer production as a case study. This research is undertaken with the aim of contributing to the beverage production in the manufacturing sector. Your participation in this project is voluntary. You may withdraw from the project at any time. There will be no monetary gain from participating in this research project.

If you have any questions or concerns about participating in this study, please contact me or my supervisor at the numbers listed above.

It should take you about 30 minutes to complete the questionnaire. I hope you will take the time to complete the questionnaire.

Sincerely,

Investigator's signature_____ Date_____

Faculty of Economics and Management Sciences

MBA Research Project

Researcher:	Pinehas N Uupindi
Contacts:	E-mail: pnauupindi@yahoo.com
	Cell: +264 813042946
Supervisor:	Dr Stewart Kaupa
Contact:	+264 61 207 2678

CONSENT

I_____(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

_____   _____

Signature of Participant   **Date**

Please tick or circle the appropriate answer

Section A: General Information

1. Gender

Male	
Female	

2. Ages

(a) Under – 18

(b) 18 – 30

(c) 31 – 40

(d) 41 – 60

(e) over 60

3. Level of education

(a) No school

(b) Grade 1 – 7

(c) Grade 8 – 10

(d) Grade 11 – 12

(e) Tertiary/Vocational education

4. Position

(a) Executive

(b) Middle management

(c) Below management

(d) Others

5. How long have you been working for NBL?

(a) Less than a year ☐

(b) 1 – 5 years ☐

(c) 6 – 10 years ☐

(d) 11 – 15 years ☐

(e) Over 16 years ☐

6. Please indicate your Department

(a) Supply Chain ☐

(b) Marketing ☐

(c) Sales ☐

Section B: Production Capacity

1. What is NBL's main source of water?

(a) NamWater Dams

(b) Boreholes

(c) Reclamation Plant

(d) Others

If others specify……………………………………………………………………………
………………………………………………………………………………………………..
………………………………………………………………………………………………..

2. How many cubic metres allocated to NBL per annum?

(a) 1 – 4 Mio m³

(b) 5 – 10 Mio m³

(c) 11 - 15 Mio m³

(d) Over 16 Mio m³

(e) No idea

3. How many litres of beer produced by NBL per annum?

(a) Below 5, 000,000 Litres

(b) 5, 000,000 – 10, 000,000 Litres

(c) 11, 000,000 – 15, 000,000 Litres

(d) Over 16, 000,000 Litres

(e) No idea

4. What is the current water to beer ratio?

(a) 1.1:1 – 2.5:1 Litres

(b) 2.6:1 – 4 :1 Litres

(c) 4.1:1 – 5. 4:1 litres

(d) Over 5.5:1 litres

(e) No idea

5. In the past four financial years which year recorded a notable reduction/decrease in water to beer ratio?

(a) 2013/14   [   ]

(b) 2014/15   [   ]

(c) 2015/16   [   ]

(d) 2016/17   [   ]

(e) No idea   [   ]

6. What do you think about water to beer ratio?

(a) Less

(b) More

(c) Equivalent

(d) No idea

Please motivate your answer……………………………………………………………………

………………………………………………………………………………………………….

7. How is NBL's water to beer ration compared to other beverage products of NBL?

(a) less

(b) More

(c) Equivalent

(d) No idea

Please motivate your answer………………………………………………………………….

…………………………………………………………………………………………………
………………………………………………………………………………………

8. Does beer production capacity merely depend on the amount of water allocated by City of Windhoek?

Yes	No

If not, what other sources of water supply or NBL use?...

…………………………………………………………………………………………………
………………………………………………………………………………………

9. Does the alternative sources supply sufficient water in the events of drought to meet the beer demand locally and international?

Yes	No

10. How was the production rate for the past five years?

(a) Very high

(b) High

(c) Constant

(d) Low

(e) Very low

Please motivate your answer……………………………………………………………………

………………………………………………………………………………………………..

Section C: Sales Trend and Revenue

1. When does NBL's financial year end?

………………………………………………………………………………………

………………………………………………………………………………………...

2. Which financial period recorded the highest revenue from beer during the past five years?

(a) 2013/14   ☐

(b) 2014/15   ☐

(c) 2015/16   ☐

(d) 2016/17   ☐

(e) No idea   ☐

3. Was there any decline in beer revenue for the past five financial years?

Yes	No

4. If there was any decline in revenue which financial year?

(a) 2013/14   ☐

(b) 2014/15   ☐

(c) 2015/16   ☐

(d) 2016/17   ☐

(e) No idea   ☐

If yes to 3 & 4 what could be the reasons attributed to lower revenue?

……………………………………………………………………………………………

………………………………………………………………………………………

…………………………………………………………………………………………

5. How were the employees affected by decline in revenue?

………
………
…………………………………………………………………………………………….

6. Does decline revenue has effects on NBL's contribution to the country's GDP

(a) Strongly agree

(b) Agree

(c) Strongly disagree

(d) Disagree

Section D: Long term approaches

1. Did NBL foresee water scarcity in Windhoek?

Yes	No

2. Did NBL put any measure in place to mitigate water scarcity?

Yes	No

3. If measures were not taken, how was the impact on the production rate of beer and ultimately sales?

………
…………………………………………………………………………………………………….

4. As a result of interim measures, is NBL satisfied?

Yes	No

6. Did NBL try to conserve water?

Yes	No

7. Would you be in favour of putting restrictions on the amount of water an institution is allowed to use on a daily basis as proposed by the City of Windhoek?

(a) Strongly opposed

(b) Indifferent

(c) Strongly in favour

Please motivate your answer

……
……
……………………………………………………………………………………

8. What do you think could be the long-term sustainable approach of supplying water to NBL?
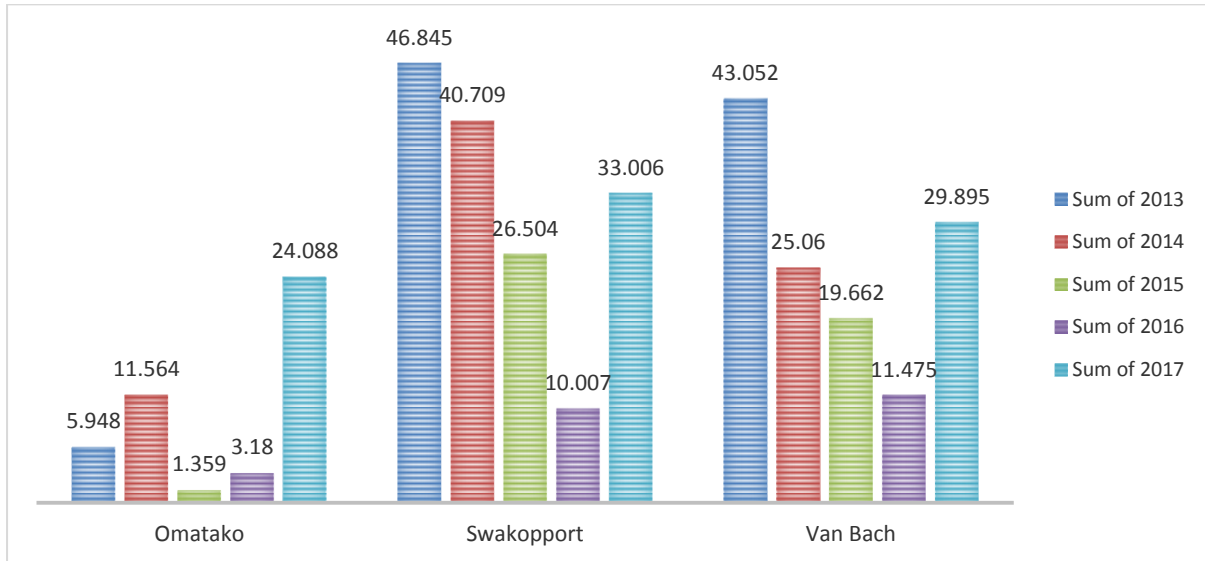
(a) Construct reclamation plant/effluent treatment plant

(b) Construct dams for rain water harvesting

(c) Drill more boreholes

(d) Migration of production to areas of reduced water risk

(e) Others

……
……
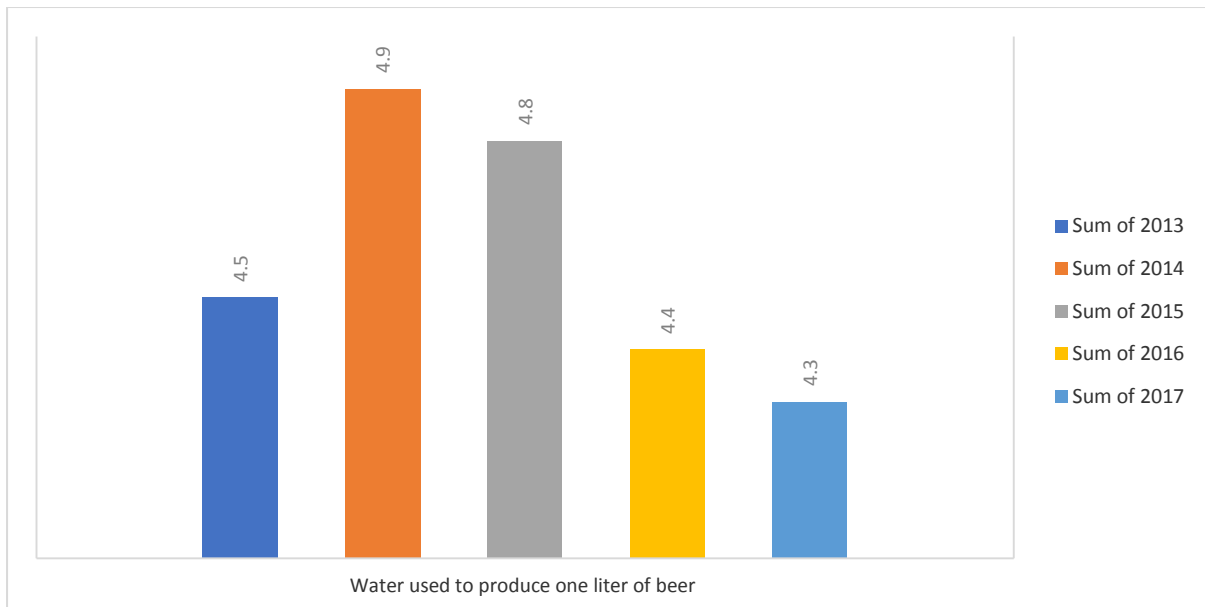……………………………………………………………………………………

The end: Thank you for your valuable time.
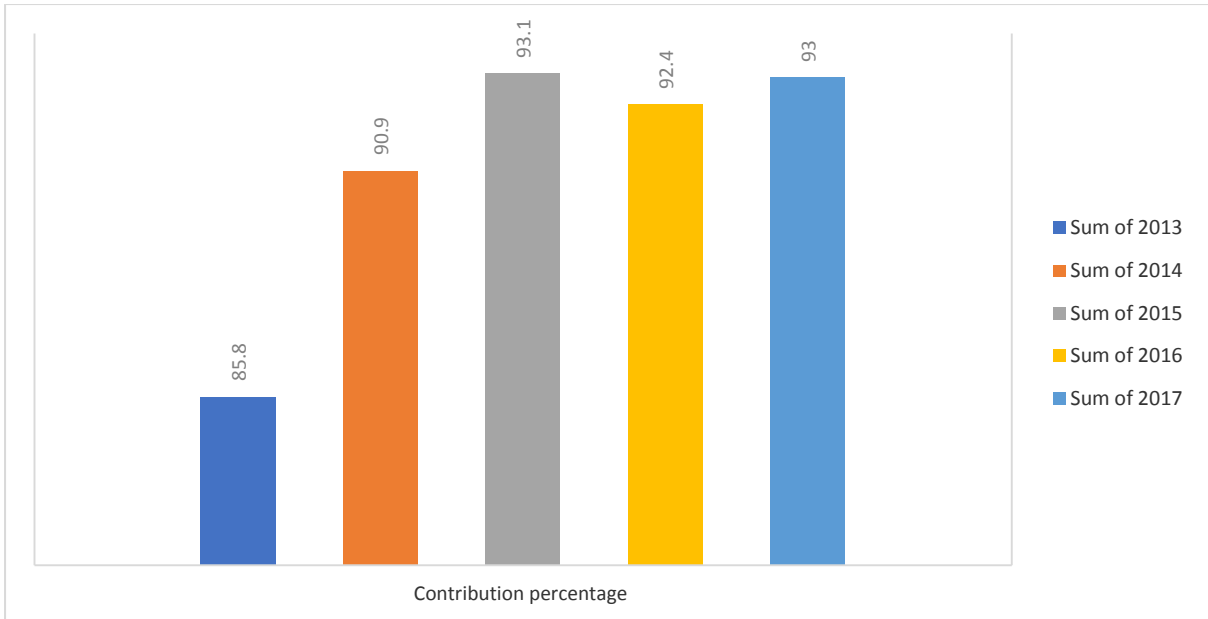
APPENDICE: 5

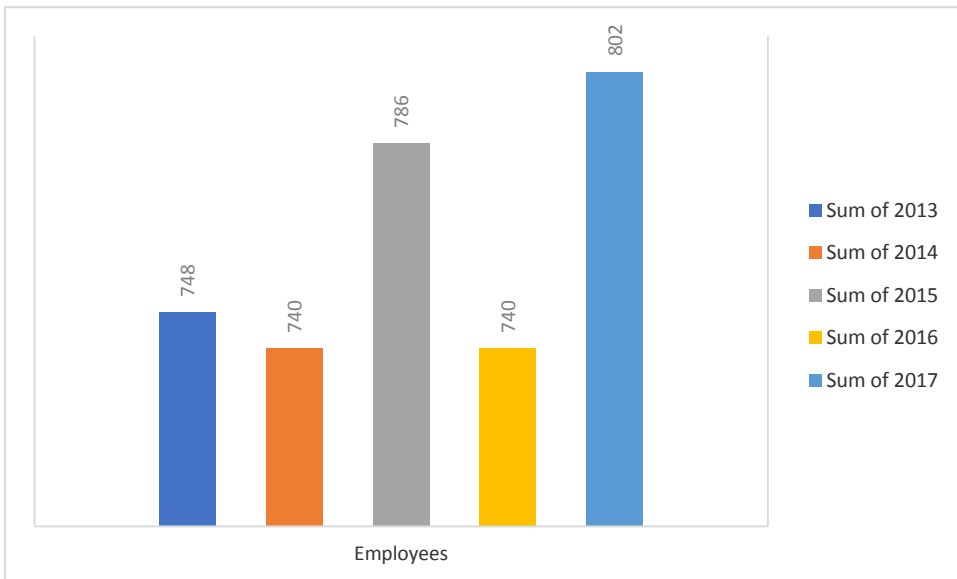**Supplementary information**

Source: NamWater weekly dam bulletin, 2018. **Recorded water inflow volume content**

for the past five year

 Source: NBL Annual Report, 2017. **Volume of water used to produce one litre of beer in the past five years**

Source: NBL Annual Report, 2017. **Percentage contribution to revenue from beer production for the past five years**

Source: NBL Annual Report, 2017. **NBL workforce for the past five years**

APPENDICE: 6

Language editing Certificate

The Rev. Dr. Greenfield Mwakipesile
ThD, MBA, HBS | mwakipg@outlook.com

CONTACT

PO Box 40529,
Ausspannplatz,
Windhoek,
Namibia

LANGUAGE & COPY-EDITING CERTIFICATE

9th August 2018

RE: LANGUAGE, COPYEDITING AND PROOFREADING OF PINEHAS NYANYUKUENI
UUPINDI's THESIS FOR THE MASTER OF BUSINESS ADMINISTRATION DEGREE OF
THE NAMIBIA BUSINESS SCHOOL OF THE UNIVERSITY OF NAMIBIA

This certificate serves to confirm that I copyedited and proofread PINEHAS
NYANYUKUENI UUPINDI's Thesis for the MASTER OF BUSINESS ADMINISTRATION
DEGREE entitled: AN ANALYSIS OF THE IMPACT OF WATER SCARCITY ON
BEVERAGES PRODUCTION IN NAMIBIA: A CASE STUDY OF NAMIBIA BREWERIES
LIMITED-BEER PRODUCTION, WINDHOEK, NAMIBIA

I declare that I professionally copyedited and proofread the thesis and
removed mistakes and errors in spelling, grammar, and punctuation. In
some cases, I improved sentence construction without changing the content
provided by the student. I also removed some typographical errors from the
thesis and formatted the thesis so that it complies with the University of
Namibia's guidelines.

I am a trained language and copy editor and have edited many
Postgraduate Diploma, Masters' Thesis, Dissertations and Doctoral
Dissertations for students studying with universities in Namibia, Zimbabwe,
Swaziland, South Africa and abroad. I have also copy-edited company
documents for companies in the region and abroad.

Please feel free to contact me should the need arise.

Yours Sincerely,

The Rev. Dr. Greenfield Mwakipesile

greenfield.mwakipesile   @mwakipg   +264813901701   Dr. Greenfield Mwakipesile