

**CAPACITY BUILDING FOR INCREASED WATER DEMAND
MANAGEMENT:**

A CASE STUDY OF THE COMMUNITY OF ALIWAL NORTH TOWN.

By

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Declaration

I, Rwiliriza Namara Kellen hereby present dissertation for consideration by the Department of Disaster Management Training and Education Centre for Africa (DiMTEC), Faculty of Natural and Agricultural Sciences at the University of the Free State (UFS), my dissertation in partial fulfilment of the requirements for the degree of Master in Disaster Management.

I, the undersigned, declare that the work contained in this dissertation is my own original work, that all sources used or quoted, have been indicated and acknowledged by means of complete references, and that this dissertation was not previously submitted by me or any other person at any other university for a degree.

No part of this work may be published without my consent as well as that of Disaster Management Training and Education Centre for Africa (DiMTEC).

The views, opinions and suggestions expressed in this study should be attributed to the author only.

Rwiliriza Namara Kellen

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Abstract

Looking at water scarcity in world and how it affects rural communities, the aim of this study was to investigate how the government structures in charge of water sector, engage in building the capacity of people in Aliwal North Community to address the increased water demand management in their community, with the aim of giving out set of findings and recommendations.

According to the researcher, the data collected from different respondents, confirms that there was water scarcity in Aliwal North. Through a literature study, interviews with key informants and focus group sessions with local female, male and youth-members, the researcher discovered that women and the youth are more vulnerable to water scarcity. The reason for their susceptibility to waters scarcity is their status in the community. The women are left in the rural areas while men seek work elsewhere.

They do not have proper access to water and therefore depend on natural resources. Most have an economic status of unemployment which makes it difficult for them to deal with stock and crop loss. Their vulnerability is also caused by lack of their participation in decision making.

It is proposed that the government structures in Aliwal North should create awareness campaigns concerning the looming water scarcity facing communities, to prepare them so that they are pro-active when having to deal with water scarcity and water management. Furthermore, community member's participation in decision making should be strengthened by increasing the current percentage of persons represented in working within the water sector of Aliwal town.

Human induce water scarcity problems, such as desiccation as a result of overstocking/overgrazing, should be monitored and minimized. Women's generating income focussed projects should be financially supported to ensure sustainability and empowerment, since they have been identified as more vulnerable. People should also be equipped and provided with technical skills through their involvement in the implementation phase of community water projects such as the installation of communal taps. Lastly, local community member's needs, experiences and knowledge should be documented and used in the formulation of relevant strategies in order to reduce a community's vulnerability to water scarcity and to decrease its impact. This, in turn, will prevent further water degradation and environmental degradation.

Key words: water scarcity, water demand management, vulnerability, decision making, capacity building, community,

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Acronyms

CVA Capacity Vulnerability Analysis

DEAT Department of Environmental Affairs and Tourism

DFID Department for International Development

DiMTEC Disaster Management Training and Education Centre for Africa

DRM Disaster Risk Management

DRR Disaster Risk Reduction

FAO Food and Agricultural Organization

HFA Hyogo Framework of Action

IDP Integrated Development Plan

IDWSSD International Drinking Water Supply and Sanitation Decade

IFRC International Federation for Red Cross

IWRM Integrated Water Resource Management

NWSC National Water and Sewerage Corporation

SADC Southern Africa Development Community

UNDP United Nations Developmental Program

UNISDR United Nations International Strategy for Disaster Risk

WDM Water Demand Management

WHO World Health Organization

WRC Water Research Commission

Definition of Key terms

Disaster - refer to ‘a progressive or sudden, widespread or localised, natural or manmade occurrence which Cause or threatens to Death, injury or disease; Or Damage to property, infrastructure or the environment; Or Disruption of the life of a community; and Is of a magnitude that exceeds the ability of those affected by the disaster to cope with its effects using only their own resources’ (Government gazette, 2002).

Disaster risk management - disaster risk management refers to integrated multisector and multidisciplinary administrative, organisational and operational planning processes and capacities aimed at lessening the impacts of natural hazards and related environmental, technological and biological disasters. This broad definition encompasses the definition of ‘disaster management’ as it is used in the Disaster Management Act, 2002 (Government gazette, 2002).

Community - A coherent, social group of persons with interests or rights in a particular area of land which the members have or exercise communally in terms of an agreement, custom or law (ISDR, 2003).

Hazard - A hazard is a physical situation with a potential for human injury, damage to property, damage to the environment or some combination of these. It is a potential damaging phenomena (hazard) only has the potential of becoming a disaster event when it occurs in populated areas where it can cause loss of life or major economic losses (Allen, 1992).

Water security - has been defined as the sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socioeconomic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political (United Nations, 2012).

CHAPTER 1: INTRODUCTION

1.1 Introduction

Water is more than just a commodity; it is an essential element to all life and is a basic necessity within many economic activities. Having access to safe drinking water is a very important human need and a basic human right (WHO 2000). Therefore, its economic value must be recognized and addressed in all policy and sector activities in order to initiate and promote the wise and efficient use of water resources in all sub-sectors, especially in the large urban centers. Using water in an efficient manner and managing competing demands in any city, country, or region are essential steps to ensure that water is no longer undervalued and misused in our world (Arlosoroff, 1998).

As it was indicated by the Water Research Commission (WRC) research study conducted in (2012) as a well-known issue that water is South Africa's scarcest resource, and that the country counts amongst the world as parched with a mean annual precipitation of approximately 465 mm and an average annual runoff of less than 50 000 million m³. As a result of this inherent scarcity, the country uncomfortably walks a tightrope between socio-economic development and protection of its water resources. This makes quantifying exactly how much water the country has one of the most important tasks to be undertaken in the water sector (South Africa year book, 2013/14).

In recent years Water Demand Management has taken centre stage in the fight against the ever increasing scarcity of South Africa's most precious natural resource. High levels of water losses coupled with low levels of payment for services and poor quality infrastructure have ushered in an era of intense debate regarding how best to preserve this resource to aid future development (Siqalaba, McKenzie & Wegelin 2007).

While South Africa is well-known for strategy planning and policy development, the implementation of water demand management, however, remains the foremost challenge in improving service delivery to the 5 million South African citizens who remain without a basic consistent supply of water and sanitary facilities (Siqalaba, McKenzie & Wegelin 2007).

Some of the key challenges in terms of implementation rest with the transfer and development of skills within the water sector and the integration of community education and involvement in

decision making, which are essential in developing relevant strategies that address the most pertinent issues. Different papers have been written worldwide which assess and advocates various water demand management interventions that play a significant role in decreasing water losses.; However, few, if any, present a holistic perspective or take into account the importance of active community participation in the successful implementation of sustainable water demand management (Siqalaba, McKenzie & Wegelin 2007).

Lack of community support has proven to be one of the key factors in the slow and inefficient delivery of services, often comprising of vandalism of a much needed infrastructure and essential measurement tools, as well as a general disregard for the manner in which water is utilized. This leads to the failure of many potentially successful Water Demand Management projects (Siqalaba, McKenzie & Wegelin 2007).

In this study the researcher will therefore focus on the role of capacity building through information and knowledge sharing that may play a role in the increased water demand management in the community of Aliwal North, where groundwater is the major source of water. With the development of a water reconstruction and development programme, groundwater has been given a very important role in South Africa and therefore, this study may be of importance to the overall strategic direction of water demand management in South Africa.

1.1 Background to the study

The UNISDR emphasises the need to invest in community based Disaster Preparedness as an effective means to lessen disaster impacts. The Hyogo Framework for Action (2005) puts further the key global priorities that should be taken care of. Disaster management is defined in the South African Disaster Management Act No. 52 of 2002 as a continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures aimed at:

- preventing or reducing the risk of disaster;
- mitigating the severity or consequences of disasters; emergency preparedness;
- a rapid and effective response to disasters;
- and post-disaster recovery and rehabilitation (Government Gazette 2003).

The Water Research Commission made a call for increased awareness amongst all South Africans, and not only to engineers or municipalities, regarding the increasing water scarcity in the country. Without this component of Water Demand Management, the technical interventions will be difficult to implement and are often not sustainable. While technical solutions are clearly an important component of any Water Demand Management programme, the support of the community is by far the most important factor that will determine whether project is successful (Siqalaba, McKenzie & Wegelin 2007).

The focus of training and capacity building has often centred on municipal personnel, however, the local residents who possess the local knowledge and memory have habitually been neglected as a valuable source of capacity for the Municipalities. They are the knowledgeable resources on the ground that the municipality can effectively partner with if communication is undertaken in a constructive manner (Siqalaba, McKenzie & Wegelin 2007). This study is therefore a key step in identifying the mechanisms that exist in knowledge and information sharing between the municipal structures and the community in Aliwal North.

1.2 Area of Study

Aliwal North town is located on the Orange River and is the seat of Maletsai Local Municipality within the Joe Qgabi District Municipality in the Eastern Cape Province which lies on the border between the Free State and Eastern Cape Province of South Africa. The study area extends from longitudes 26° 42' 52"E to 26° 43' 06" E and latitudes 30° 42' 49" S to 30° 42' 50" S (IOSRJEN, 2014).

The town covers an area of about 39.5 km² with a population of 35,153 and 12,105 households according to 2011 population census people (Integrated Development Plan 2015/16) and geographically situated between the Eastern Cape and KwaZulu-Natal province, the northern part leads to Bloemfontein through the General Hertzog Bridge and to the south-west, the Kramberg rises to about 2,000 m above the sea level (Hartnady, 1985). The climatic condition of the Eastern Cape is a mixture of the climatic condition of the Western Cape and KwaZulu-Natal, which get very wet gradually from the west to the east part of the province (Hartnady, 1985). The central business town is surrounded by the following suburbs: Dukathole, Hilton, Joe Gqabi, the Springs (where the well-known Aliwal Spa is situated) and Arborist. Many residents and staff of the Goedemoed Correctional Services facility (situated on the Free State side of the Orange River) also use the

town's many businesses, hospital, churches and schools. The town is connected to neighbouring towns via a good roads system, and serves as a thoroughfare for tourist's end route to resorts in the Eastern Cape.

Aliwal North is therefore an ideal for this study, considering the researcher's proximity to it, as well as the numerous observations that have been made about the water shortage challenges in the area.

Map of Easter cape and the specific study area.

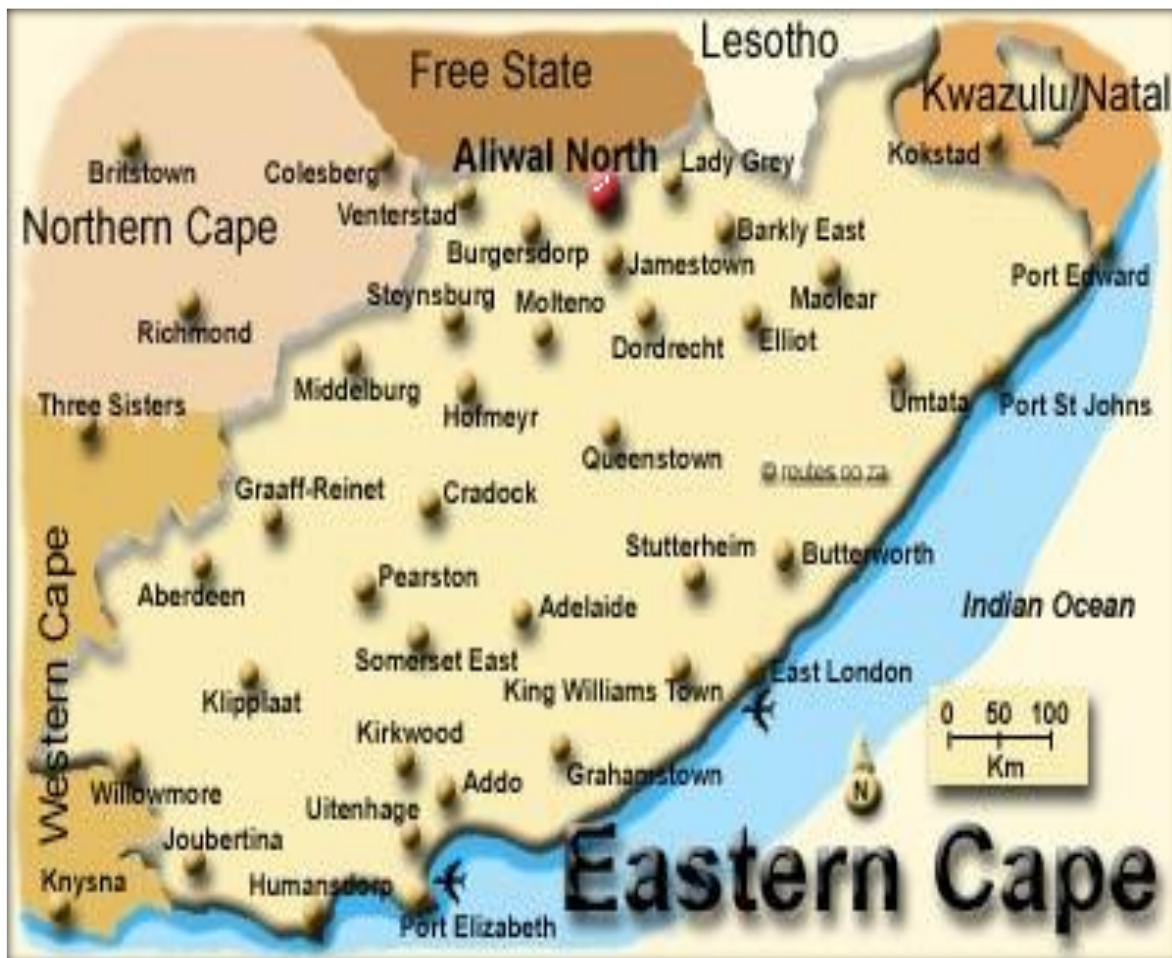


Figure 1: Source: routes.co.za

1.3 Research problem

While so much has been achieved in South Africa to address the differences of past political dispensations, relatively little has been done in engaging the residents around water usage. Judging by the vision of the national regulator in terms of the essence of water demand management, it is clear that it cannot simply be the domain of the technocrats, but requires the participation of the consumer as the beneficiary of the technical interventions to ensure optimal implementation of an effective water management system.

The challenge of information and awareness regarding water scarcity is therefore one of the key challenges faced in the efforts for effective water demand management. This would be necessary as a water scarcity mitigation option in respect to the continuous challenge of water demand management in Aliwal North Town, where people source water from springs, rain water, streams, rivers and dams.

It is against this background that this study seeks to examine the level of knowledge and information sharing as a premise of water demand management in Aliwal North, as a way of seeking to understand how the water scarcity problem is being dealt with in the area of study.

1.4 Research questions

In order to understand the problem in this study, several questions will need to be answered at several levels. These will include: -

- Which sections of the community are most affected during the time of water shortages?
- How do the municipal sectors of the government engage with communities about water shortages?
- How do communities respond to the water scarcity challenge?
- What can be done to lessen the impact of water challenges in the community of Aliwal North?

1.5 Research Objectives

The overall objective of this study is to investigate how the government structures engage in building the capacity of the Aliwal North community for increased water demand management.

1.5.1 Sub-Objectives

- To investigate what kind of knowledge that the community in Aliwal North receives about water demand in the area
- To assess the extent to which women and youth are affected by the effects of water scarcity challenge in this community.
- To examine how the knowledge and information of increased water demand management is shared in this community.
- To propose ways of strengthening awareness of the Aliwal North community on the water scarcity challenge through the knowledge of working with the community in water scarce areas, promoting community participation and involvement.

1.6 Significance of the study:

This study will be a contribution to the research field of disaster management, specifically addressing the risk of water shortages. It will thus be helpful for the following groups, communities and agencies as outlined below.

- The study will be helpful to municipal and other government and Non-governmental agencies that are involved with the management and supply of water resources in South Africa.
- It will also be helpful for other researchers and risk assessors seeking to understand the dynamics involved with water demand management.
- The study will also be helpful for the community of Aliwal North, by enabling an engagement around water demand and supply challenges in the area.

1.7 Research Methodology

This study aims at investigating the knowledge the people in Aliwal North community have on the issues of water scarcity challenges they face in an effort to determine whether capacity building can be developed and lead to enhanced risk reduction. This section outlines the research design and methodology utilised to satisfy this broad aim. The research is an empirical study that endeavours to be backed by evidence. The researcher employed various methods to gather data and establish the prevailing situation. This assists to explain some phenomena and fulfil objectives of the study. Since a research is a logical model that guides the researcher in the process of collecting, analysing and interpreting data, the intention is to fuse theory with empirical evidence.

1.7.1 Research design

This study will be quantitative in nature and will collect data through interviews, focus group discussions and through a review of documents.

1.7.2 Planned activities

In seeking to collect the relevant information therefore, this study will be planned to follow the following strategies:

- i. Develop a relationship with the community members by means of visiting, to get a preliminary understanding of the issue of study.
- ii. To design an interview guide that would enable the researcher to have an understating of the nature of water scarcity in the community.
- iii. Select samples of community members for the interviews. These will be selected to mainly amongst women and youth, as the key target group of this study
- iv. Make appointments with municipal officials to conduct interviews
- v. Attend workshops and training programmes organised by the local leaders and the volunteer disaster management officials.

1.8 Limitations and delimitations of the study:

This study acknowledges that the findings from Aliwal North will not necessarily be generalised to be reflective of all other parts of South Africa, although the findings may be helpful for furthering studies on water demand management.

The researcher also notes the language barrier that might stand as a limitation of effective data collection. However, the researcher will recruit an assistant from the community to help with translation within the community.

In terms of delimitations, this study will be located within the larger field of disaster management, although its focus will be on the aspect of water scarcity management. The study will therefore specifically look at knowledge and information sharing as a key aspect of water scarcity management in Aliwal North. The choice of this scope and area of study is partly because of the access issues for the researcher, who resides in the area and will be able to collect data with relative ease. The other reason for this choice is based on the researcher's own observed water shortages in the area over time, for which a study of this kind might benefit.

1.9 Ethical consideration

This study will ensure that there will be no risk of harmful exposure for the respondents. In that regard, respondents will only be identified by pseudonyms and their true identity will not be revealed in the course of the report. Due attention will also be taken to ensure that the data collected is kept safe and that their details provided by respondents will not be put to any other use other than the one for which it was collected.

Informed consent will be sought from the respondents before any interviews will be conducted, and the respondents will be free to discontinue the interview at any time.

1.10 Outline of Chapters

The study has the following layout of chapters;

Chapter 1: This section provides the background of the study, justification and the focus of the study. It describes the research objectives, research questions and methodology, which guides the conduct of the study.

Chapter 2: With the purpose of giving an insight into the theoretical background and related studies, this chapter provides the reviewed literature. It also gives insights on key emerging findings and gaps existing from previous studies and related assessments.

Chapter 3: This chapter documents the design and methodology followed during the research fieldwork. It discusses the instruments used in the measurement of the key variables of the study and explains the sample design, techniques used in data collection and analysis.

Chapter 4: This chapter presents the findings and results of the information collected for capacity building for increased water demand management.

Chapter 5: This chapter discusses the main findings of the study and draws conclusion and recommendations. It provides a summary of the research project in view of the broad research focus.

Annexes of tools used to conduct the study and other relevant detailed analysis for the study.

1.11 Conclusion

Community awareness of the situation or the phenomenon that affect the community is a significant component within the community. The focus of this study is to investigate how the capacity building of people in the community of Aliwal North is being handled by the government sector responsible for water, because it is lack of community support that has proven to be the key factor that has promoted water challenge.

The study seeks to address one of the tools of demand management which involves awareness raising and capacity building.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of literature related to this study. The chapter will give an overview of the disaster management field and discuss how the topic of water demand management fits within this field. The chapters will also a number of thematic aspects such as water scarcity and provide examples of the management and supply of water resources in different parts of the world.

2.2 Disaster management

Disaster management is defined as a continuous and integrated multi-sectoral, multi-disciplinary process of planning and implementation of measures aimed at reducing disaster risk and planning and implementing response to a disaster. It includes preventing and reducing the risk of disasters, mitigating the severity or consequence of disasters, emergency preparedness, a rapid and effective response to disasters, post-disaster recovery and rehabilitation’’ (Disaster Management Act, 57/2002, South Africa).

Carter (2008) notes that disaster management is an ongoing process which, in most cases, is a national requirement that is important to governments and people as well. It has become very important today because of increased dangers to the global environment. In order for disaster management to be effective it needs to be implemented as a comprehensive and continuous activity but not periodic reaction to human disaster events. Effective disaster management therefore requires disaster mitigation mechanisms.

2.2.1 Disaster mitigation as a component of disaster management activity

During the launch of the Hyogo Frame Work for Action for disaster risk reduction (2005 – 2015), in January 2005. The former President of the United States of America, Bill Clinton, said: *‘We cannot stop natural hazards, but we can and must make people and their livelihoods less vulnerable to them.’* Disaster mitigation is indeed one of the most important disaster management activity for which all UN organisation personnel and professionals that form disaster management teams as well as government agencies need to be trained (UNDP, 1994). Coburn (1994) defined mitigation as a means of action put for words reduce the effects hazard before it strikes the society. This terminology applies to a variety of activities and protective measures that may be instigated, from

the physical, like constructing stronger buildings, dams that are resistant droughts, procedural, like standard technologies for incorporating hazards assessment in land use – planning.

2.2.2 The importance of Knowledge and information in disaster mitigation

The most important step towards implementing the mitigation measures is the process of understanding the nature of the threat that a society is faced with (Spence, 1990). In every country and region, there are different types of hazard depending on the location and the geographical set up. Some countries are prone to droughts, others to floods and hazards such as tropical storms, whereas some are known to be exposed to earthquakes and volcanic eruptions. These disasters cause damage to properties and claim people's lives and leave countries in economic crisis.

Disasters can also occur because vulnerable individuals simply did not know how to avoid harm or to take protective measures (UNDP, 1992). This ignorance may not necessarily be a function of poverty, but a lack of awareness of what measures can be taken to build safe structures on safe locations. Perhaps some people did not know about safe evacuation routes and procedures. Other populations may not know where to turn for assistance in times of acute distress. Nevertheless, this issue should not be taken as a justification for ignoring the coping mechanisms of the majority of people affected by disasters. In most disaster-prone societies, there is a wealth of understanding about disaster threat and this understanding should be incorporated into any efforts to provide external assistance.

Community-based disaster management can be seen as risk reduction programs designed primarily by and for the people in certain disaster-prone areas. Disaster mitigation, using government and institutional interventions alone, is insufficient because they pay little attention to addressing the community dynamics, perceptions, or priorities. At the same time, local communities are often either unaware of these formal disaster management interventions or they find the interventions inappropriate due to the lack of recognition of community's vulnerabilities and capacities, or they lack the external resources or technical support to supplement their own initiatives and capacity. Just as every individual, family, organization, business, and public service within a community will be affected by a disaster; each has a role to play in managing disaster. Looking at it practically, the multitude of actions that must be taken to implement an effective disaster management program

requires the participation of the entire community. Capacity building is important in any development process and in many cases it is the fundamental prerequisite to make development possible. This is obviously true for developing countries, but equally holds for the processes of economic and social development (Alaerts& Kaspersma, 2009).

Knowledge and capacity building therefore involves more than the strengthening of individual skills and abilities. Trained individuals need an appropriate environment, and the proper mix of opportunities and incentives to use their acquired knowledge. This research discusses the capacity building within the water sector at three different levels. This study will therefore be looking at the aspect of knowledge and information sharing as an important contribution to disaster mitigation strategies within the management of water demand in the community of Aliwal North, in South Africa.

2.3 Understanding Water Demand Management

Most working definitions of water demand management consist of the following components: reducing the quality or quantity of water required to accomplish a specific task; adjusting the nature of task so it can be accomplished with less water or lower quality water; reducing losses in movement from source through use to disposal; shifting time of use to off – peak periods and increasing the ability of the system to operate during drought seasons (David, 2005).

Water Demand Management is further defined as the ways of developing and implication of strategies, policies, measures or other initiatives aimed at influencing demand, to achieve efficiency and sustainable use of the scarce water resource. In order to achieve effective WDM, water authorities or service provider should commit to the using of human, physical and material resources in the process of improving the efficiency in water use both within the water supply system and on the customer's side (Savenije and Van Der Zaag 2002).

2.3.1 Water Demand Management measures

The purpose of this research is to see how government structures at the municipal level engage with the community in building the capacity of WDM through knowledge and information sharing. A number of water demand management measures exist, as discussed below:

- i) *Structural and operation measures;*

This could be used at the utility level to reduce water losses by organizing the process of water distribution networks to carry out the active role of water leakage management or to install pressure reduction in some zones identified as having unnecessarily high pressures. This can also be introduced to end – user’s premises by placing fixtures and appliances with devices that use water in more efficient ways (White et al, 2001).

ii) *Economic measures;*

This involves proper use of market - based signals to attract interested types of decision – making. They either give financial rewards for good behavior or impose costs for undesirable behavior (Cantin et al 2005).

iii) *Behavior modification;*

WDM programs should be designed from an analysis of the ways that motivate to take actions and change their ways of thinking and responding to this challenges. Awareness raising and public education programs for modifying the behavior of water consumers may be used hand in hand with other WDM measures for more effective strategies (Texas Water Development Board, 2004).

iv) *Legal and institutional measures;*

There is always variety of regulatory tools that can be developed to ensure WDM options. There is a need that this law must be conducive towards the effective legal and institutional functioning. To ensure that water service providers carry out a comprehensive water resource planning to cover resource management, production management, distribution management, and customer side management (Louw & Kassier, 2002).

2.3.2 Actions for water demand management

Addressing WDM requires different types of actions which are listed down in various ways according to Louw & Kassier (2002).

- Giving out different types on incentives, whether through legal obligations, economic incentives, or motivated through public information/ education programs.
- Some kind of tools used – structural for example network improvement or retrofitting water devices in the end – users’ properties, or structures such as pricing or education, which leads to infrastructural improvements.

- By location of water supply system, whether at the water treatment plant, storage tanks conveyance and distribution network, or in end – users’ properties.
- The entity bound to carry out the measure for example the local authority, service provider or end – users.
- Final by sectors in which measures are applied, such as urban use, industrial use or agricultural use.

In seeking to understand water demand management however, the key risk of water scarcity needs and the imperatives for water security need to be taken note of. This study will therefore be located within an understanding of risk awareness as a premise for water demand management.

2.4 Water security and water scarcity awareness

Water security has been defined as the sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socioeconomic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and politics (United Nations, 2012).

Water Scarcity on the other hand, denotes to a lack of sufficient water, or not having access to safe drinking and clean water supply. Whereas water is a very important element in sustaining human life, its scarcity continues spread as water is need in most developmental activities of both developed and developing counties. (Paulson, 2015)

It is widely accepted that water scarcity and the lack of clean and safe drinking water are some of the most pressing issues of the 21st century. Water scarcity is also increasingly contributing to destabilization among neighboring countries, more especially in regions with differences in ethical, territorial or religious tension. As a result of water scarcity, water quality continues to be a major threat to human health and well – being. According to the World Health Organization (2000) over 1 billion people lack access to clean water, mostly all of them in developing countries. Unclean or contaminated water is the primary cause of quite a number of waterborne diseases such as: diarrhea, cholera and typhoid; and most of these are leading killer disease in children under the age of five, accounting for over 2 million child deaths per year (WHO, 2000). The deaths caused by waterborne diseases also exert a great burden on economic development due to loss of productivity in work – force and an increase in national health care costs.

Water as the most important element of life is becoming continuously scarce, with one third of the world's population living in water – stress countries it is estimated that these figures will raise to two – thirds by 2025 (Elimelech, 2006).

2.4.1 Factors that contribute to water scarcity

The causes of water scarcity are diverse; some natural causes, while others occur as a result of human activity. The predominant debates currently site the causes of water scarcity as largely deterministic, in that scarcity is a result of identified cause and effect. However, if water scarcity is the point at which water stress occurs (the point at which various conflicts arise, harvests fail and the like), then there are also less definable sociological and political causes. Many of the causes are inter-related and are not easily distinguished. Some of the main causes are listed below. The list is not in order of priority although some causes have greater impact than others (*Len, 2001*).

a) Population growth

An increase in population growth is a main cause of water scarcity. Population growth comes with two direct elements of water demands: the direct consumption by the people; and more importantly water for the developmental needs of the growing population. According to UN – HABITAT (2009), country, city and town planners and policy makers are continuously facing increased challenge of providing water services for their ever growing population and the expansion of economic activities to meet the demands of the growing population. Whereas the population of the more industrialized countries is either decreasing or constant, the developing countries' population is constantly increasing at a rapid rate, yet the water resource availability remains constant and is continually polluted by the growing population. There SADC region, whose population growth rate is between 2.2% - 3.8% (cite) faces an even bigger problem with the need to grow enough food to feed the population.

b) Food production

SADC countries continue to have problems related to food security. In the mix of the drought of 1990s all the countries in the region had to import food in various forms, from greens to cereals. With the increased population it has become more imperative for countries to devise better water management policies so as to be self – sufficient and provide food for the citizenry. The case of Botswana is a good example: through its policy of ensuring food security through economic growth

following its recognition of water scarcity. The rewards from good economic policies are used to import food in time of need. South Africa finds it's self in unique position as it has to make internal transfer of food when there are shortages in other regions of the country and then import food in time of shortages nationally (FAO 2009).

c) Land use

Land management and particularly usage play a big role in the availability and supply of water. A decrease in vegetation cover could lead to water run - off and consequently diminish the volume of ground water infiltration as the storage capacity of dams and lakes are also reduced through siltation. A region's climatic change may also be affected by the extent of drainage on wetlands and level of deforestation. The need for proper farming methods and land management can't therefore be under - estimated as anything to the contrary will have devastating consequences. A related land usage issue is the plantation of 'thirsty' crops in mountainous areas. Planting such crops may have some economic benefits but it also comes with negative spill overs in the form of water availability. Such situations may lead to reduced water run off for such vegetation resulting in the considerably reduced level of water availability for downstream users (*Len, 2001*).

d) Water quality

Polluted water reduces the volume of water available for use, especially in times of water scarcity. During periods of water sufficiency, the volume of polluted water is reduced because rivers would have more dilution factors to contain toxic elements. The reverse is the case in times of scarcity where rivers are hardly able to cope with toxic elements; they are thus sensitive to pollution just as the people who depend on it. Causes of water pollution or contamination include agricultural return inflows, industry and domestic uses. Both surface and groundwater can be affected by pollution (UN – HABITAT, 2009).

e) Poverty and economic policy

Poverty is one factor that can expose one to extreme water scarcity in the face of any level of drought. People in poor communities can hardly finance alternatives to traditional sources of water such as boreholes. Therefore, in times of drought, the poor are forced to buy water at high prices from those who can afford to store in big reservoirs or acquire it from boreholes. Poor communities

can thus hardly meet the prices demanded for water. Any given situation of drought or water shortage would have dire consequences for a poor community than a middle income community. It is for this reason that the macroeconomic policy of a country, and its effectiveness in addressing poverty, will have an important role in determining what constitutes conditions of water stress. Similar climatic conditions in two countries will cause famine in the poorer country and a temporary, limited economic depression in the wealthier country' (Len, 2001).

f) Legislation and water resource management

The lack of adequate legislations can impact negatively on an already bad effect of water scarcity. There are water laws that give exclusive rights to some specific users, of which an example may be found in the agricultural sector. Where these are good security measures for such investments, it might also have some adverse effects, such as putting other communities into jeopardy in times of water scarcity. Water Laws in South Africa (present and future) would provide everyone guarantees or rights to basic minimum supplies of water. These laws should be balanced and equitable so as not to negatively affect the development of other sectors of the community or society. The effects of the Riparian Doctrine in the current Water Act are a case in point (*Len, 2001*).

g) International waters

According to Abrams (2001), the use of international water from international rivers could lead to scarcity, depending on the opposition of the country along the fall of the river. Countries upstream would always be in the better position regarding water supply and availability. Any major project or use of water in the upstream country would result in adverse supply of water in downstream country. To avoid this situation riparian country should maintain constant communication and formulate treaties to guide their uses of water. These treaties should be undertaken in times of water abundance and not in a time of water crisis. Having an equitable and fair sharing system for the use of international water would assist in avoiding disasters among the neighbouring states in times of water scarcity.

Furthermore, the Southern African Development Community (SADC) is made up of 15 shared courses. At least five countries of SADC are facing the problem of water shortage, while over 50 – 70% of the regional surface water is shared between two or more countries. The sub - region shows

a high spatial and temporal variability in water resource. It is estimated that in the next coming? Three or four countries in SADC will be suffering from a serious problem of water scarcity. As the economies are growing and population increases with in these countries in the region the studies predict the region to become ‘water stressed’ by 2025 (FAO 2006).

h) Sectorial resources and institutional capacity

Due to the precarious nature of the economic situation of countries around South Africa, it becomes extremely difficult to design and implement measures that would minimize, if not avert, water scarcity. Institutions to handle water issues tend to be weak and are characterized by unnecessary bureaucracy and inefficiencies. Despite South Africa being in a far better financial position compared to neighboring SADC countries, not much has been done in the design and implementation of disaster management policies. It is a matter of lack of will as against lack of resources, and this leads to water scarcity, a situation that could have been averted quite easily (Kayaga, 2011).

i) Political realities

Politicians and decision-makers are the individuals who have the greatest influence towards the allocation of scarce budgets and the adoption of a policy. Unfortunately, the horizons of many politicians do not coincide with the horizons of prudent water resource management, resulting in decisions being made on the basis of short term political expediency. To have the political will to develop a policy and supportive legislation which will introduce the discipline necessary to manage water scarcity in South Africa and the sub-Continent requires considerable political courage and foresight. Political tension and conflict within countries and between countries often have a greater influence on de facto policy than the practice of sound water policy (Kayaga, 2011)

j) Sociological issues

There are a number of sociological and cultural issues which exacerbate the water scarcity situation. These are often as a result of practices which were not originally a threat to the environment but have become a threat as population pressures and modern consumerism increase. The resulting pressures on the environment, for example from over grazing, have a direct and detrimental effect on water resources.

Other phenomena such as ethical issues, tribalism and civil war also results in critical incidences of water scarcity, within some sectors of the population. The apartheid era in South Africa resulted in large proportions of the population suffering critical shortages of water whilst neighbouring communities enjoyed, and often wasted, an excess of water. The protracted civil wars in Angola and Mozambique have resulted in the already limited infrastructure being destroyed or lapsing into disrepair. The long-term economic and social impacts of these issues often predetermine the overall political and economic framework from which many of the other causes of water scarcity stem (Abrams, 2003)

Water scarcity is a global challenge and arid or semiarid regions are especially disaster prone. In those regions, the climate is estimated to exacerbate water scarcity and increase and intensity of drought events (Alcamo et al.2000). It is therefore the consideration of this study to find out how knowledge and information sharing between the municipal sectors and the community can contribute to a more effective water demand management regime that would be better prepared to mitigate potential water scarcity related disasters in the community.

2.5 Access to safe water supplies

According to Elimelech (2006), The United Nations General Assembly (UNGA) designated 1981 – 1990 as the “International Drinking Water Supply and Sanitation Decade” (IDWSSD), with the objective of full access to water supply and sanitation for all people. Within that time the availability of safe water and sanitation was provided to hundreds of millions, at a cost exceeding \$700 billion but a number of people still remain without access to safe drinking water and sanitation. However, slight progress has been made in provision of safe water to low – income urban populations, as well as those in rural areas Elimelech (2006). Although in developing countries, providing safe piped water to rural areas is still a very expensive exercise. Above all, continuous rapid population growth in rural and some urban areas affects the planning and constructions of new water and sanitation infrastructure. At a time when centralized water treatment facilities continue to be an important objective of water providing authorities.

The fact remains that there have been failures in reducing number of people without access to basic water supply and sanitation. Approaches that were advanced during the 1990s have proved inefficient at solving the problem and there is a need for - alternative interventions to help yarning populations in developing countries. The studies show that there is a growing evidence that simple “low – tech” low – cost participation at the household and community level can seriously improve

the safety of household water quality give an opportunity and supported by the local leaders (Elimelech, 2006).

2.5.1 The role of the community in ensuring safe water supplies

According to UNDP (1990) the global water conference endorsed community management as the guiding principle in water management. This was part of the reaction to the continuous failures in upkeep and maintaining of community participation schemes of the 1980s. Paradigm championed by Chambers et al. (1980) that communities should not just be involved in system inception, but should accept sole responsibility for and ownership of the whole life cycle of the system entrusted to the community.

Other supporting principles on community management was adopted from The New Delhi Statement (1992) - promotes an integrated approach in addressing different challenges of developing nations, that involves changes in procedures, attitudes and behavior and integrate full participation of women at all levels in sector institutions. It further encourages the use of appropriate sound financial practices, where community management should play a significant role in promoting their communities (Schouten & Moriarty, 2003').

This principle was further stressed in the Dublin Statement on water sustainable development in 1992 (ICWE 1992), which agreed that water development and management should be based on a participatory approach involving users, planners and policy makers at all levels. They emphasized that women play a central part in provision, management and safeguarding of water because the adverse impacts of water affects them most during water crisis times. It is against this background that this study will seek to investigate the level of involvement of the community of Aliwal North by way of examining the knowledge and information sharing in water demand management.

Agenda 21 activities linked to community management

Agenda 21 activities linked to community management

- Encouragement of water development and management based on a participatory approach, involving users, planners, and policy makers at all levels
- Application of the principal that decisions are to be taken at the lowest appropriate level, with public consultation and involvement of users in the planning and implementation of water projects
- Support and assistance to communities in managing their own system on sustainable basis
- Encouragement of local population, especially women, youth, indigenous people and local communities in water management
- Linkages between national plans and community management of waters
- Integration of community management within the context of overall planning

Evans and Appleton,1993

Figure 2 Source: Schouten & Moriarty (2003)

The principle of Dublin statement stressed the importance of a water sustainable development plan in 1992, and put different countries in the world on a task to words the goal of working together to deal with water challenge within different stakeholders in the community to manage water crisis, in this research therefore the example of Uganda's approach to the community involvement and India's on water supply management will be highlight in the discussion bellow. According to Mugisha (2004), there are not many variations in water supply systems; the raw water supply must be extracted, treated in some cases distributed and the system must be financed and managed by responsible sectors. Having a focused governmental sector is crucial for reform champions (Mugisha & Berg, 2008).

2.5.2 The Government of Uganda's approach of community involvement to address water scarcity challenges.

In most cases, an ongoing crisis becomes a catalyst for change. In a way to address managerial inefficiencies in National Water and Sewerage Corporation (NWSC) in Uganda the government of

Uganda had to appoint new local government, the business community members, professional bodies, the environment, the ministries of finance, water and health and some small – scale industries (Blokland, et al ,2009).

The formation and structuring of this board enabled it to use its governance functions to work properly upon the assigned tasks, and it was able to protect the corporation from political influence and patronage. The new board which was formed, in turn appointed a new managing director, who was given the mandate to reverse strategies for a better performance. The new appointed director led to an emphasis on commercial viability using ‘customer care’ as an ongoing theme, the incoming board and new management introduced the method of having performance contracts with the government of Uganda in which the duties and obligations of the management team were clearly spelled out.

A positive outcome for the new team which was formed was that it was stipulated that management and the staff had to have the knowledge of the crisis situation and how to address it. The new appointed managing director devised the solution of working with every community member to deal with an ongoing crisis. In a way of responding to a growing concern of water challenge and limited resources at its disposal, the NWSC focused its efforts to building capacity and strengthening operations in various innovative approaches which included; effective change management, emerging managerial tools and principals, water loss management, water resource protection and stakeholder coordination, timely water production capacity building.

- *Effective change management;*

At this point in time the new board management implemented a different series of change management initiatives;

Good service delivery and revenue enhancement program; these programs were put up to focus on restoring customer confidence in the ability of NWSC to deliver services. Within this program, NWSC established customer service centers and front desks, conducted customer surveys to identify customer concerns and instituted amnesties for illegal water users.

Area and service performance contracts; this program aimed at making service provider reach commercial sustainability; the manager of new board management had authority to make very fundamental decisions and were accountable for outcomes.

Improving customer services; coming up with account balance checking system with local telephone and direct – debit system with local banks.

- *Water loss management;*

A large amount of water lost with the systems was due to illegal use and other sources of commercial losses. Without a well – established hydraulic zone and demand management system it could not be possible to come up with percentage that illegal use contributed to the losses. In an attempt to cut the continuous illegal use, the committed and well supported areas with clear out put that put a basis for their remuneration.

- *Water resource protection and stakeholder coordination;*

The NWSC faced many external difficulties which affected service delivery that came as a result of climatic change, and involved the quantity and quality of raw water in most areas of the country. A continuum approach was developed to respond to the water challenges. One of these approaches was to emphasis on compliance with abstraction permit conditions, among others, the need for utility restriction of war water abstracted within the acceptable limits. The NSWSC management increased the watch on surveillance of the source and condition with the environment protection authorities and communities where measures were undertaken to protect the source and reduce any adverse impacts.

- *Timely water protection and capacity building;*

A major investment was put in place prior to 1998 resulted in extensive Idle plant capacity for most infrastructure systems. Whilst, as in 1998, the whole plant capacity utilization for all NWSC plant was only 55%. The excessive idle plant capacity gave rise to economical depreciation costs, which brought operation cost up due to the oversize system. These massive investment activities also meant the funds were focused to that project and there were no enough funds left to carry out network expansion programs. However, coming from a new connection policy, expansion of customer base and improvement in service delivery improved that utilization capacity of the system to 75% in 2007. Though new water supplies will continue to be developed and new water systems

installed, particularly in the developing world, neither the Millennium Development Goals nor the secularly growing demands for food will be met from actions on the supply side alone.

2.5.3 The example of India's approach on water supply through community precipitation

Water scarcity and conflicts have been shown to be as a result of an increasing gap between water demand and supply in India. These causes which are already identifiable in some regions in India, are about to pursue a national proportion and may become permanent feature of water sector in the country, only if measurable policies are put in place faster to manage water demand and supply at all different levels. Water demand is growing fast due to a rapid population growth and economic activities, On the other hand, water supply remains at the same level because of serious financial and physical limits for water supply constrains (Rathinasamy, 2010).

Some recent research studies indicate that if the demand gap and supply gap continues to grow at the existing rate, nine basins in India that have over four - fifths of total water use in India will face physical water stress by 2050 (Amarasinghe *et al*, 2007a). For a heavily populated, monsoon-dependent and rural-based country, such as India, water scarcity of this magnitude will not only lead to serious water conflicts among sectors and regions, but also have adverse effect on the food and livelihood of people in the communities of India.

Looking at water demand and supply indicators for India, the usual approaches, involving water development based on the creation of additional water storages and water allocation based on sectorial and regional demand, cannot be an exclusive basis for managing water scarcity and water conflicts. A durable strategy calls for the simultaneous promotion of both water demand and supply management options. There is a need for a large-scale promotion of demand management options, particularly in the irrigation sector, having over four-fifths of water withdrawals but showing just 40% use efficiency (Amarasinghe *et al*, 2007b).

2.5.4 India's measures in addressing the water challenge of demand and supply management

India, as a nation, addressed water scarcity challenges through the effective use of water demand management options which includes; water pricing, water marketing, water rights, energy regulation, water saving technologies, user and community based organization.

According to Rathinasamy (2010), India had to come up with a number of demand management options. This focused on the ongoing water demand challenge by;

- Water price

This option was mainly applicable in Canal regions where as other options were confined mainly to saving groundwater areas. Much as pricing policy was not ineffective in raising water – use efficiency. For instance, in Krishna Delta, in the state of Andhra Pradesh, farmers received 40% less than normal supply during drought of 2001 – 2004.

- Water marketing

Have been considered to have a marginal impact under the India's present conditions.

- Water rights

This option was very effective and lasting, as an institution system forming water in general and irrigation in particular, the first step of this option was to convert the abstract legal notion of water rights into an operationally acceptable volumetric framework (Narain, 2000).

- Energy regulations

Resources used for irrigation purposes, which significantly influenced water withdrawal and use, more especially in groundwater regions. Energy regulation which brought up fixed supply hours was more effective in controlling groundwater withdrawals as compared to the introducing energy prices, regardless of their levels and structures.

- Water saving – technologies

The option not only covered people involved in irrigation application (drip, sprinkler and micro irrigation), and also those that farm practices, for example water – saving crops, crop spacing, use of plastics to restore moisture in plants and deficit irrigation. Unlike other options, this particular option had direct and an immediate impact on water consumption in irrigation. The water – saving technologies managed to save in irrigation areas from 60 – 90% and water in this area was saved by 48 – 67% energy costs by 44 – 67% and labor costs by 29 – 60% irrespective in all private and government sectors (R.M. Saleth, 2009, pg. 676).

- User and community organizations

These organizations cover both the formal water allocation systems, namely Shejpali, Pini Panchayats and Warabandi. Although the former two systems are respected in the states of Maharashtra and some other parts of Orissa, the latter operate mostly in the states of Punjab Haryana, and parts of Uttar Pradesh.

Being a form of demand management option, the organizations can mostly contribute - to water savings through group – or community - based incentives for water allocation and demand management.

2.6 The kind of knowledge needed for water scarcity management in Aliwal North

There are two types of knowledge-based areas needed in order to address water scarcity Aliwal North: 1) the actual data about the water available and the beneficiaries or end user of the water in an area; and 2) knowledge as in form of institutional arrangements and tools. Water Demand management is not only about managing water only, but it should also be managing all the elements that impact water resources.

First and foremost, the water provider should have knowledge of the status of surface water resources in the river, the tributaries, associated lakes and wetland, and associated groundwater, and know both quantitative and qualitative points of view. As all water in rivers, dams, or basins have to be managed as a unit, knowing the availability and use of groundwater resources are paramount, since it affects surface water usage. On the important note it is also crucial to have reliable data on all uses of water; surface and groundwater uses. Withdrawal for industry, drinking water and irrigation points or non – points of water pollution and discharges (Valensuela, 2009).

Various types of data and information on water demand management

Information on water	other information
• Water resource quality • Water quality • Uses of water resource • Status of ecosystems • Risks: floods and droughts • Regulation on water resource	- Land use: status and trends - Population: status and trends - Social indicators - Health indicators - Economic indicators

Figure 3 Source: (Kaspersma et al, 2009)

It will therefore be worthy for this study to find out what kind of knowledge and information are shared in relation to the area of study, as this will play a big part in understanding the capacity building measures in place to facilitate water demand management.

It is been suspected that poor operation and maintenance of water supply, treatment and reticulation infrastructure are resulting in significant losses, of which once it is been responded to, can solve the current problem of water shortages being experienced. On the other hand, the generally poor management of community infrastructures remains a threat to surface water and groundwater quality downstream (Riemann et al 2011). Looking at the way many municipalities perceive groundwater as an unreliable resource; although, in general, the issue of staff and skills shortages to manage the resource effectively seems to be problem. This is an operational issue rather than a groundwater-resource-specific issue. This aspect requires special attention for existing groundwater schemes and proposed groundwater development Department of water and sanitation (2014/15)

2.7 Causes of water scarcity in Aliwal North

The communities' water requirements in towns vary significantly throughout the country depending upon factors such as the climatic conditions, level of service, socio-economic situation, institutional capacity and consumer behavior. However, there are general factors that contribute to water scarcity in this area of study (Riemann et al 2011).

2.7.1 Climatic change and variability

The issues of climatic changes is one of the main contributing factors of water scarcity in the community of Aliwal North and this has more to do with climate change and its perceived effects on rainfalls volumes and patterns. The belief is that climate change is leading to global warming, though not proved scientifically. The consequence is therefore believed to be unfavourable conditions of either a drought or extreme water scarcity (Len, 2001).

According to Field et al. (2014), one of the major global factors that has mostly contributed to water scarcity is climate change. Climatic change indicators for sub – Saharan Africa differs from region to region with differing estimates of fresh water availability into the next coming years. A recent study review of climate change research indicates that in addition to adverse impacts of water for house hold hygiene and drink, also change in water availability is likely to affect crop yields, disease vectors in both animals and human beings which will affect most regions on the African continent.

2.7.2 Water demand

Poor water management in the face of a growing demand definitely led to water scarcity. The notion that there was plenty water and that the only hitch was how to make it available to consumers is wrong. A proper management of water that is demand driven is the most appropriate way to ensure that this scarce but essential commodity to human existence is always available when needed. Measure to provide the efficient use of water as well as the introduction of conservation measures by way of legislation and policy are needed if water is to be managed well (Len, 2001).

2.7.3 Sectorial professional capacity

Closely related to the financial and institutional circumstances noted above, is the critical problem of facing water sector professionals. South Africa and the region is not without highly competent and motivated professionals, but the conditions of employment and the incentives are generally not able to compete, particularly with those offered in the private sector. Disaster management has not been a professional option or area where experience and expertise have been developed in South Africa. The lack of sufficient expertise to manage water resources and develop and implement policy is a direct contributor to water scarcity. The consensus is that the effect will be to accentuate the extremes with more pronounced droughts and more severe flooding.

The above factors impact on Aliwal North community as in recent years it has been observed that climatic condition and global warming has brought significant effects on various sectors of Aliwal North community. If you compare South Africa with other African countries, South Africa has relatively low potential soils, a dry and unstable climate, and a high – cost economy which makes South Africa more Vulnerable to climatic changes (FAO,2001).

Also the increased water demand in Aliwal North is driven by population growth which seen to be not documented by the district Integrated Development Plan (IDP) due to urbanization, improved living conditions like improving of the town’s new college, hospital which attracts the people from neighborhood who use the town’s facilities and hence putting pressure on Aliwal North water resource facility.

2.8 Sources of Water in Aliwal North

Aliwal North is part of the Joe Qgabi District Municipality in the Eastern Cape, which is specifically within the semi-desert area. The rainfall precipitation is well below the national average, even though the latter is well below the world average.

Groundwater is the main source (ref table 1 below) but due to the predominantly hard rock nature of the area, the amount of water gathered is generally inadequate for the demands of the community. In particular, Aliwal North is serviced by just one river, The Orange River, without any known dam. Many residents are not aware of, or provided much education by the municipality on the dire nature of the water resources in the community. There is therefore too much wastage. The management aspect is also not in good shape. Provided that the community’s water resources are judiciously managed and wisely allocated and used, sufficient water of appropriate quality will be available to sustain a strong economy, irrespective of the limited volumes of supply.

The table below demonstrates the availability status of water in all the areas of Qgabi district Municipality which is predominantly ground water followed by surface water, external sources (Bulk purchased water) and water returned to resources plus how much water is re – used (Recycled water) which is not often done in the district and in Aliwal North area which falls under this district.

Table 1 Water Availability Status in Joe Qgabi District Municipality as of April 2015

Water sources	Number of sources	Current abstraction (Ml/Day)	Licensed abstraction (Ml/Day)
Groundwater	215	8.574	0
Surface Water	19	60.314	0
External Sources (Bulk purchase)	5	20.261	0
Water returned to resources	0	0	0
How Much Water Is Re-Used (Recycled Water)	0	0	0

Source: Water Services Development Plan, Joe Qgabi District 2015

The table below list the sources of surface water supply in the district where the study area falls under, and it is clearly highlighted on the table that one of the main source of water in Aliwal North is surface water that originates from Orange River Weir which is real not a reliable because most of the river water is determined by the climatic change. However, groundwater is another major source of water but due to lack of information and technology in water supply is always not documented, and public perception indicated that groundwater is not a sustainable resource for bulk domestic supply and therefore cannot be managed properly.

Table 2 Surface Water Sources as of April 2015

Name	LM	Source Type	Yield (Ml/d)	Allocation		
				Domestic (Ml/d)	Irrigation (Ml/d)	Environment (Ml/d)
Maclear	Elundini	Maclear Dam	1.3	1.3	No data	No data
		Aukamp Dam	?	?	No data	No data
		Mooi River2	?	?	No data	No data
Elundini	Elundini	Mt Fletcher Dam5	5.512	5.512	0.000	0.000

rural Communities						
Ugie	Elundini	Ugie Dam1	No data	No data	No data	No data
		Wildebeest Weir	1.3	1.3	No data	No data
Lady Grey	Senqu	Lady Grey Dam6	0.184	0.184	0	No data
		Witfontein Dam6	0.022	0.022	0	No data
Sterkspruit	Senqu	Holohlatsi Dam3	26.027	11.507	8.685	5.836
Barkly East	Senqu	Langloof weir & Commonage Dam2	1.3	1.3	0	No data
Rhodes	Senqu	Rhodes Dam	0.3	0.3	0	No data
Aliwal North	Maletswai	Orange River Weir	?	15	0	0
Jamestown	Maletswai	Off Channel Dam	1.172	1.172	0	0
Steynsburg	Gariep	Orange Fish Tunnel3	347.9	4.383	0	0
Venterstad	Gariep	Gariep Dam	347.9	1.8	0	0
Burgersdorp	Gariep	JL de Bruyn Dam3	1.233	1.233	0	0
		Stormberg Spruit	No data	No data	No data	No data
		Chiappini's Klip Dam	No data	No data	No data	No data

Source: Water Services Development Plan, Joe Qgabi District 2015

2.9 Adverse Impacts of Water Scarcity on Community of Aliwal North

The continuous water scarcity is affecting every aspect of life, ecosystems and the environment, food security and poverty (King 2004).

According to (IFRC 2004) the shortage of clean and safe drinking water, sanitation and irrigation have a negative impact on ability to sustain agriculture, livestock and starvation, migration and dislocation and economic losses as categorized below.

2.9.1 Economic Impacts:

These are synonymous with costing people and communities' money. Examples include: -

- Loss of money by farmers when crops fail to survive
- When water supply is too low, a farmer is forced to spend more money in irrigation or drilling a borehole
- Pastoralists will spend more money on buying feed and water for animals when grass is little
- People will pay more for food
- Companies that rely on agriculture like farm equipment and food may run out of business thereby leading to job cuts

2.9.2 Environmental Impacts:

Animals and plants depend on water and when drought occurs their food supply is diminished and habitats are thereby damaged. Following are some examples: -

- Destruction of wildlife habitat
- Food and drinking water for wild animals is unavailable leading to migrations
- Disease increase in wildlife as food and water supplies are reduced
- Water levels in reservoirs, rivers, lakes and underground reservoirs reduce
- Loss wetlands
- Increased wild fires
- Deterioration in soil quality
- Wind and water erosion of soils become more prevalent

2.9.3 Social Impacts:

These affect people's health and safety and to a greater extent community cohesion and peace. Examples are:

- Loss of life to humans
- Fewer recreational facilities
- Mental and physical stress
- Water user conflicts

Indeed, it has been argued that adequate water and sanitation is an essential prerequisite to economic development. Thus, the issue of inadequate water supply could not only bring about various health problems such as respiratory infectious diseases as well as other water-borne diseases, but also significantly affect the economic activity of the community negatively. Businesses may have to close down or downsize their operations in response to situations of water shortages. The above mentioned impacts have been known to affect all the parts of aspects in the community of Aliwal North in the past years and if the situation is not dealt with decisively the conditions could continue deteriorating.

2.10 Conclusion

This chapter has explained the water demand management and water scarcity in the study area and at the global perspective, it has described the measures and actions used in the process of water demand management on the global and area of study. The chapter further gave examples of other countries. It also discussed the factors that contribute to water scarcity and the impacts of water scarcity in the communities of Aliwal North. It is clear from the discussion in the chapter that community's participation in water demand management is very important if at all the global has to solve water challenges

CHAPTER 3: THEORETICAL AND LEGISLATION FRAMEWORK

3.1 Introduction

The previous chapter clearly indicated how big the crisis of water scarcity is in the world and in the study area as well. In chapter two the discussion shows that less developed countries will have the greatest burden of the water scarcity because they are bound to be more in demand for water due to the rapid population growth. This chapter also shows that local people are not involved in water management and decision making remains a concern, this makes the community of Aliwal North more vulnerable to water scarcity hazard and this will trigger drought disasters in the community if it is not well addressed.

South Africa is one of the countries that ranked to be water scarce, and most people who are mostly affected by water scarcity are those living in remote rural areas (Revenga & Cassar, 2002).

In the African lay out, African rural communities are the first to be affected when there is water crisis. People in rural areas are more vulnerable than urban because they always do not have reliable water resources and if they are always not well maintained (Sass, 2002).

These resources are also responsible for both domestic and agricultural uses, rural people they also suffer because people with the lowest status and wealth in the social hierarchy often suffer consequences when water supplies are limited.

In this chapter the discussion will focus on the theoretical frame work model of reducing risk of water scarcity hazard in the community by improving the community's vulnerability through capacity building on water demand management.

3.1 Participatory assessment of disaster risk reduction

The purpose of the tool is to enable a community to assess the factors that contribute to the size and scale of any potential disaster and to develop a locally owned plan to address those factors and reduce the risk of disaster. It is essentially a community-empowering process, helping people to understand cause-effect relationships and to realise their own capacities to reduce risks. It also enables them to identify and challenge the social, political and economic structures which contribute to their vulnerability (Hansford et, 2011)

According to Hanstord et al, 2011. Disasters are not random or isolated events. PADR is introduced in this research as a tool and part of research project for showing how disaster occur when natural and man – made hazard impacting a vulnerable population like the case of the community of Aliwal North where there is a hazard of water scarcity and will be applied in this study.

The diagram below will demonstrate how hazard and vulnerability combine to squeeze or ‘Crunch’ the population causing a disaster.

Illustration of the Crunch Model

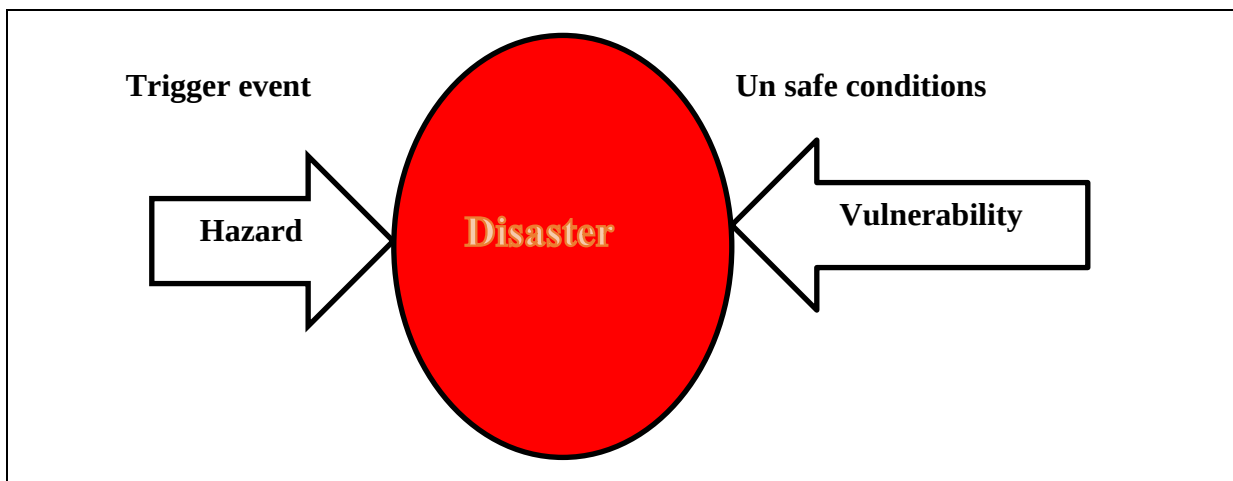


Figure 4 Source (Hanstord et al, 2011).

The following terms and concepts are used in this research paper. This section bellow defines and briefly discuss these terms and concepts so as to build a common understanding thereof and their consistent use. The concepts to be discussed include hazard, disasters, vulnerability, disaster risk reduction, and other closely related concepts.

Hanstord et al, 2011 defines **A hazard** is as an extreme event or occurrence which has the potential to cause injury to life and damage to property and the environment. May be a natural phenomenon, such as an earthquake, a drought or a cyclone, or it may be the result of human activity, such as conflict or an industrial accident. Human activity often influences the intensity of natural hazards. For example, cutting trees may locally exacerbate the duration and impact of a drought. Climate change is also increasing the frequency and severity of extreme weather-related hazards, which now affect wider areas.

According to UNDP (2004). **Vulnerability** has been defined as a set of conditions and processes resulting from physical, social, economic and environmental factors, which increase the susceptibility of a community to the impact of disasters.

There is no universally agreed definition of **Disaster**. However in this paper will be referred as the result of a hazard's impact on a vulnerable community, causing damage to life, assets or livelihoods in a way which exceeds the community's capacity to cope (Hanstord et al, 2011).

Disaster Risk Reduction is the systematic development and application of policies, strategies and practices to minimise vulnerabilities and disaster risks throughout a society and to avoid (prevent) or limit (prepare against and mitigate) the negative effects of hazards within the sustainable development context (UN/ISDR, 2002).

According DFID, 2006 and White et al, 2004, indicate that the aim should be having more resilience to future shocks and ensure sustainable development. DFID - Reducing the risk of Disasters-Helping to achieve sustainable poverty reduction in a vulnerable world: A DFID policy paper, 2006 - point out that DRR aims to curb disaster losses through minimising the hazard, reducing exposure and susceptibility and enhancing coping and adaptive capacity. Thought use of knowledge, innovation and education to build a culture of safety and resilience at all levels and reduce the underlying factors to the community.

According to Yodmani, (2001). Community-based disaster risk management can be seen as risk reduction programs designed primarily by and for the people in certain disaster-prone areas. Disaster mitigation using government and institutional interventions alone is insufficient because they pay little attention to addressing the community dynamics, perceptions and/or priorities. At the same time, local communities are often either unaware of these formal disaster management interventions or they find the interventions inappropriate due to the lack of recognition of community's vulnerabilities and capacities, or they lack the external resources or technical support to supplement their own initiatives and capacity.

3.2 Dynamic pressures – structures and processes

The figure below identifies wider factors affect the vulnerabilities and capacities of a community. These factors include powerful people and social structures, and the processes through which they influence the community (Hanstord et al, 2011).

Dynamic pressures - structures and processes

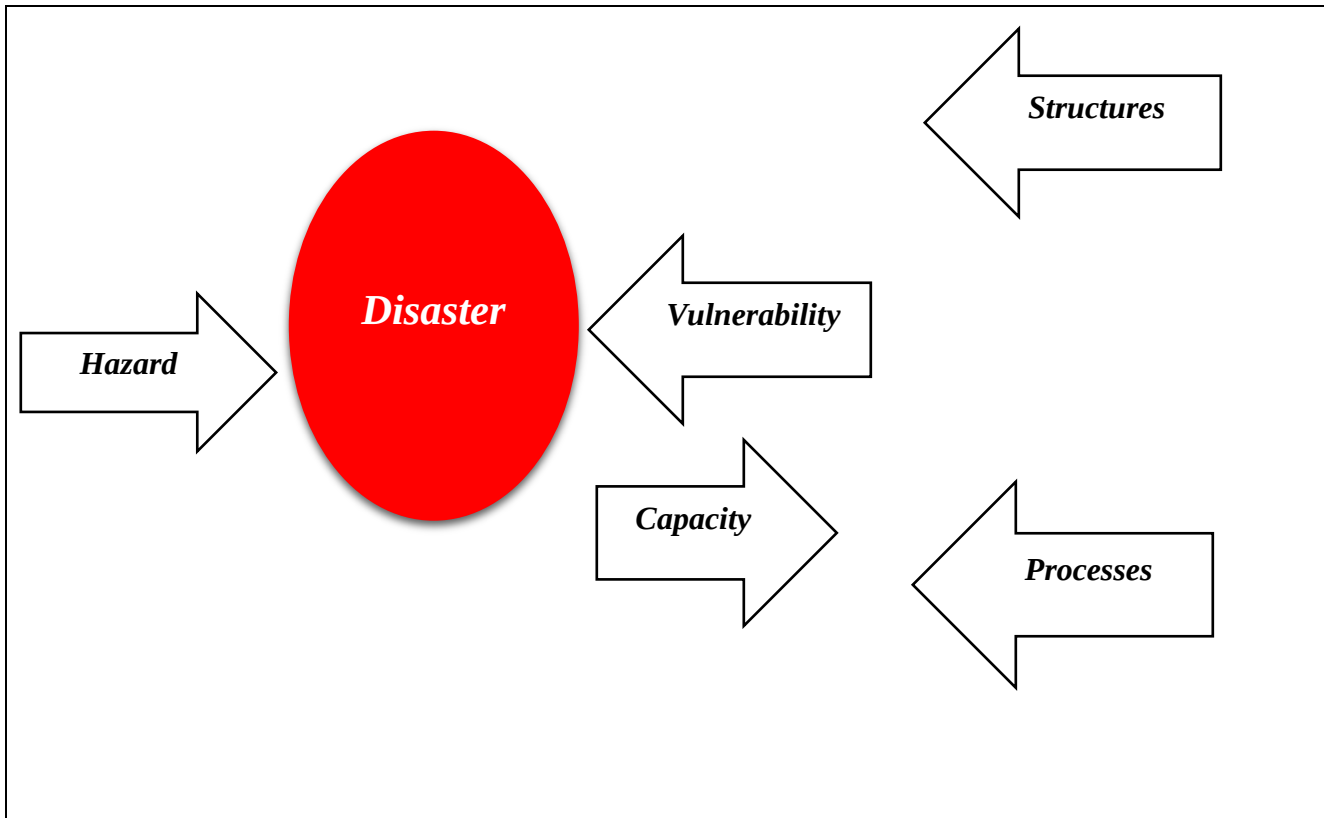


Figure 5 Source (Hanstord et al, 2011).

These figures are interrelated and link to each other; they analyze vulnerability and capacities, and give a full picture of how to reduce disaster risk in a given community. The figures show the DRR approach considers a comprehensive range of vulnerability factors and aims to devise strategies that safeguard life.

Figure 5 analyses the wider factors that influence the vulnerabilities and capacities of a community to cope with the disaster. While as figure 6 indicates how those factors if they are not well addressed in the entire government sphere will emerge to cause disaster to a vulnerable community.

Hence the arrows of vulnerability face the same direction implying that there is a vulnerable community and no capacity in place to reduce the risk occurrence.

Changes in Dynamic - structures and processes

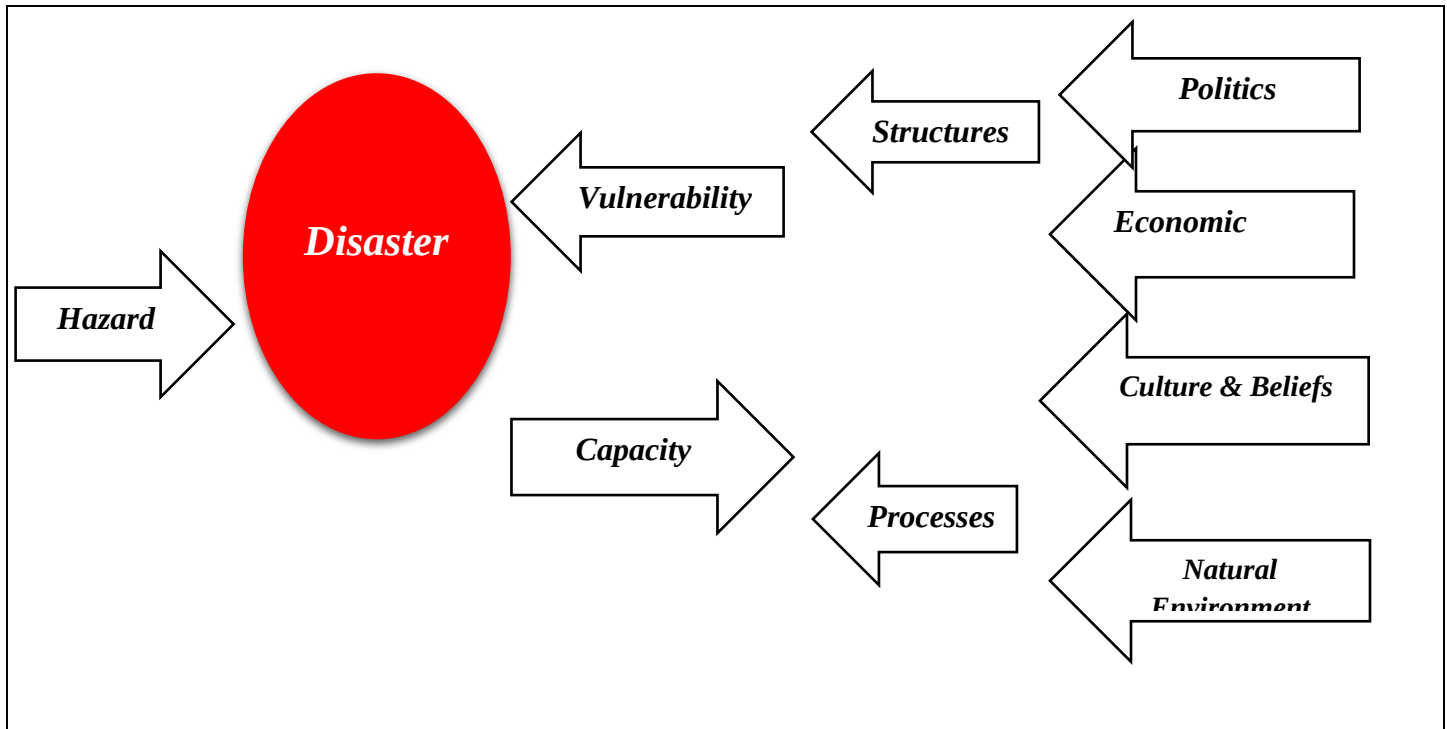


Figure 6 Source (Hanstord et al, 2011).

- *Politics*

The national government may provide resources to a particular district or withhold them, often for political reasons (for example the voting preferences of that district's population!). A government's motivation for action is often a desire to retain power at the next level.

- *Economics*

National government has to make decisions on spending priorities, for example health and agricultural services may be underfunded if more spending is directed towards defence or debt repayment. Also, the prices of internationally traded commodities such as coffee, sugar or cotton will influence the price farmers receive for their cash crops.

- *Culture and Beliefs*

A culture which attributes disaster to the bad behaviour of spirits may not be willing to embrace measures to reduce disaster risk. Culture also influences farming practices: those who traditionally adopt slash-and-burn agriculture will increase their vulnerability to both drought and flood, as the loss of trees affects local climate and increases runoff of rainwater. A male-dominated culture may place a low value on women, which will increase their vulnerability. For example, when evacuation is urgently required, women may be unable to leave their house without a male relative to escort them.

- *Natural Environment*

There are aspects of climate, soil type and geography which affect vulnerability. For example, steep hillsides will influence what type of farming practices are used, and increase the likelihood of landslides. Human activity is constantly degrading the natural environment, making it more fragile and less able to resist extreme weather.

Figure 7 indicate that if the proper measure and actions of mitigating the impacts of disaster has been put in place there will be lesser impacts of disasters in the community because the vulnerability has been reduced by capacitating people through information sharing about the hazard that are likely to affect the community. In this case the direction of the arrows in the disaster crunch model will change and face different direction implying that the release of the pressure which previously caused disaster to the community has been addressed.

3.3 The Release Model

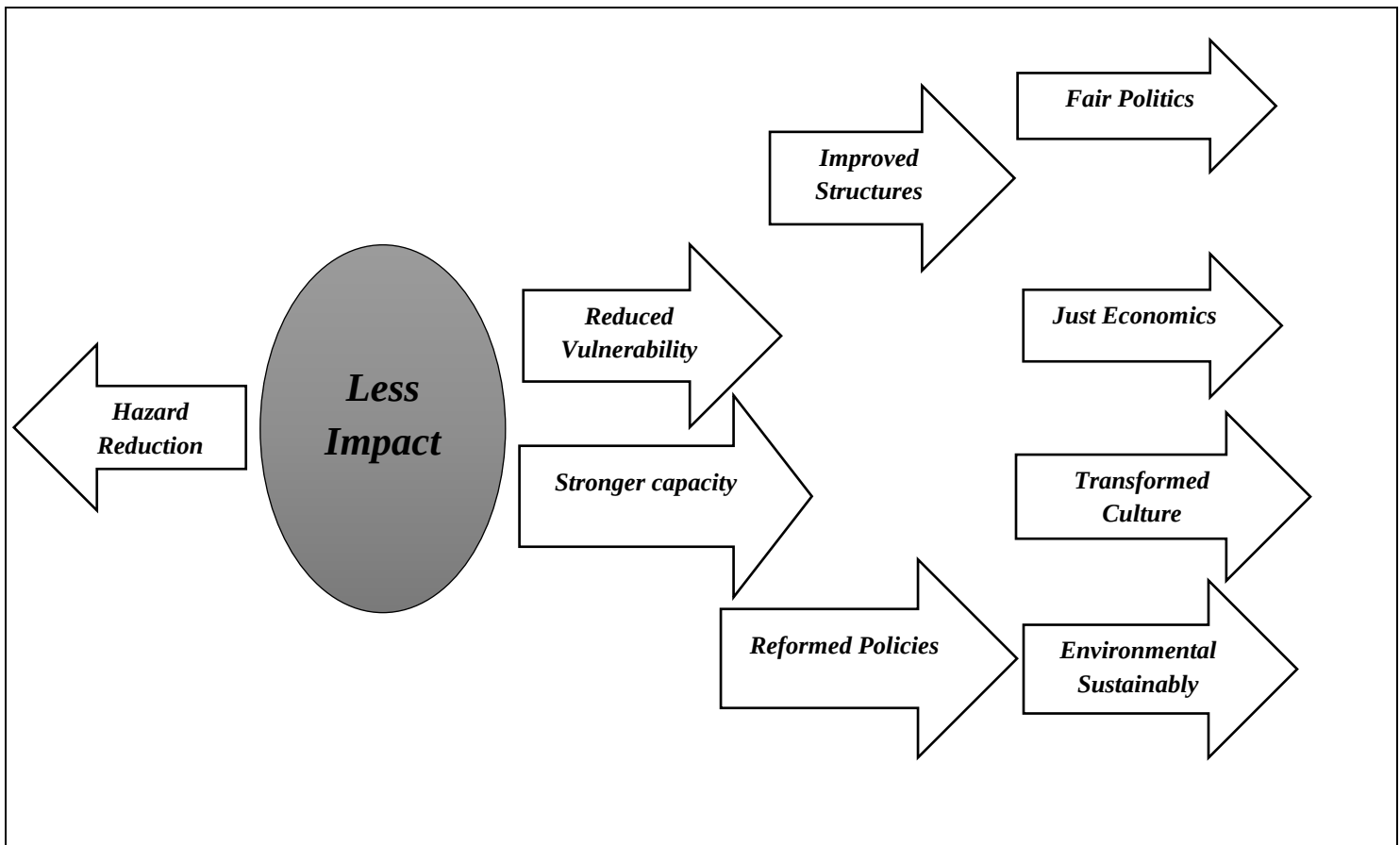


Figure 7 Source (Hanstord et al, 2011).

Honstord et al, (2011). Argues that changing the direction of the arrows is not always easy and requires activities at local, national and international levels to be correctly coordinated and improved as examples are given in below section.

- *Hazard Reduction*

There are ways of reducing the occurrence, frequency or strength of some hazards. For example, construction of embankments or channel dredging can reduce flooding. Trees can be planted to offset drought, or to stabilise soils which are liable to being eroded. Advocacy can be used to influence politicians to do more to counter climate change and its effect on weather-related hazards.

- *Reduced Hazard Impact*

Some of the ‘elements at risk’ can perhaps be strengthened to reduce disaster risk. For example, tube-well pipes can be raised to keep hand-pumps free of flood water, extra open-well rings can be added and sealed, and houses can be strengthened or built on stilts.

- *Reduced Vulnerability*

A risk assessment process will identify specific vulnerabilities, and measures can be taken to reduce them. For example, inadequate warning systems can be improved, poor farming practices can be changed or alternative livelihoods can be introduced. The most vulnerable groups of people should be targeted first.

- *Stronger Capacities*

Communities will always have some capacities which they use in times of disaster – for example, local knowledge of naturally occurring wild foods (for times of food crisis), or banana trees (for boats). If the existing capacities can be strengthened, the impact of hazards is reduced. New capacities can also be developed, for example, selecting and training volunteers, developing new skills or simply providing more boats.

- *Improved Structures and Reformed Processes*

Dynamic pressures can act in a positive or negative way. The PADR process should determine the negative ones – and action plans can then attempt to change them. For example, pressure from a farming community may increase the output of a government agricultural extension worker, or modify the harmful activity of a commercial flower farm can be done to reduce that vulnerability. After looking at the factors that contribute to the community’s vulnerability, this study therefore seeks to see to what extent the government structure involves the community member, in adaptation of water scarcity challenge. This may require effective changes within the community by combining local knowledge and the government initiatives in water demand management.

3.4 The indicators Of Water Scarcity in the World

The WRI (2002) has argued that, globally, water supplies are abundant, but they are unevenly distributed among and within countries. In some countries water supplies are literally shrinking and groundwater reserves are being depleted faster than they can be replenished by precipitation.

This situation has already caused serious water shortages to develop in some regions. Engelman, et al.(2002) are of the opinion that the pressure on water supplies hampers efforts to reduce the number of people who lack access to safe water.

According to Engelman, et al. (2002), affluent and developed countries rarely experience water scarcity. On the other hand, when water is scarce, the poor tend to suffer the most. The poor are mainly constituted of rural inhabitants in the developing world. People of the Middle East, North Eastern and Southern Africa and of Southern Asia will be especially vulnerable. In turn, lack of supply and distribution services are responsible for an estimated four million deaths annually, mostly of infants and young than 6 year of age and this is a hindrance to sustainable development. Growing shortages of fresh water are leading to tension along the many rivers shared by nations. Some of these rivers include the Nile, the Danube, the Tigris and Euphrates, and the Ganges.

In the past, these rivers provided more than enough water for all. But under today's economic and demographic conditions, development of water resources by upstream countries reduces levels downstream (Engelman, et al., 2002).

Given the need of all human beings for water, not to mention those of a million other species who inhabit water bodies, the global water situation is expected to become considerably worse over the next 30 years, without major improvements in the way water is allocated and used.

In the year 2000, 508 million people were living in 31 water stressed or water scarce countries, and it is estimated that by 2025, between 2.4 and 4.2 billion people (over 45 percent of the global total) will be living in countries that cannot meet the requirement of 50 litres of water per person per day to meet basic human needs (UNFPA,).

Table 3 demonstrates some of the countries that are water scarce and those that are projected to have water scarcity problems by 2025

Table 3 Countries experiencing water scarcity in 1955, 1990 and 2025 (Projected) based on availability of less than 1,000 cubic meters of renewable water per person per year

Water scarcity countries in 1955	Countries added to scarcity category by 1990	Counties added to category by 2025 under all un population growth projection	Countries added to the category by 2025 only if they follow the medium or high projections
• Malta • Djibouti • Barbados • Singapore	• Qatar • Saudi Arabia • United Arab • Israel • Kenya • Rwanda • Burundi	• Libya • Oman • Iran • Egypt • South Africa • Ethiopia • Haiti	• Cyprus • Zimbabwe • Tanzania • Peru

Source: (PAI, 2002)

Leonard (2003) considers Africa's water supply to be the most vulnerable in the world. While Africa uses about 4% of its renewable freshwater resources and some countries have abundant lakes and rivers, countries in arid regions are already dependent on their ground water reserves. 14 African countries are already subject to water stress and scarcity, and a further 11 will join them by 2025.

Today, countries in the Middle East and North Africa are most seriously affected by water scarcity, but sub-Saharan African countries will join them over the next half-century.

In 2000, only 62% of people in Africa had access to safe water. Furthermore, people in urban areas often have better access to water than those residing in rural areas.

Leonard further urged that, in 2000, 85 of the population in urban areas had access to water in comparison with 47% in rural areas.

What is more is that the demand for water is expected to grow by at least 3% annually until 2020 (National Population Unit, (2000 UNFPA, 2001, World Global Trends, 2005). Different continents and countries are and will without doubt experience water scarcity differently. In addition, people in different social structures in one country may experience water scarcity differently.

3.5 Legislation concerning water management In South Africa

Over the past years, the nature of legislation and structures with regard to water management and the provision of water services in South Africa have been transformed.

This transformation started with the proclamation of the Constitution of the Republic of South Africa in 1996, followed by the Water Services Act 108 of 1997 and the National Water Act 36 of 1998.

Focus has shifted towards an integrated water resource management (IWRM) structure with all role-players involved and specific emphasis on the responsibilities of local government. Through the Municipal Structures Act 117 of 1998 the role of a developmentally orientated local government sphere has been clearly defined for the first time (Nealer & Van Eeden, 2010).

This section is an overview of the important legislation on water resource management in South Africa. In 1998, the Local Government: Municipal Demarcation Act 27 of 1998 established the 283 municipalities now functioning within South Africa covering the country from one end to the other. This brought about major changes and for the first time the place and role of local government was identified and established. Newly established municipalities are demarcated according to the topographical, environmental and physical characteristics of an area along with specific demographical and geographical aspects. However, some important aspects with regard to water management, such as the surface water catchment areas and specific geology of the areas were not taken into account when demarcating these municipalities (Nealer & Van Eeden, 2010:134).

In relation to access to water and water services, government has outlined a number of policies. Mehta & Ntshona (2004: 5) have acknowledged that the South African government stands alone internationally in endorsing the constitutional right to water, but have also argued that these policies have been informed by several dominant settings in water management which include an emphasis on cost recovery.

These policies include the following: The Constitution of the Republic of South Africa (Act 108 of 1996), the Reconstruction and Development Programme (RDP), the white Paper on Water and Sanitation (1995), the Water Service Act (1997), the White Paper on a National Water Policy for South Africa (1997) and the National Water Act (1998) According to de la Harpe (1998), the Constitution is important to water law as it encompasses the following:

- Everyone has a right to have access to sufficient food and water,
- Everyone has a right to an environment that is not harmful to his or her health or wellbeing,
- The environment must be protected for the benefit of all people living now and in the future (sustainable development).
- National government is the custodian of the sources of water, such as rivers, ground water and dams,
- Local government is in charge of municipal water services.

3.6 South Africa's institutional arrangement with regard to water resource management

3.6.1 Constitution of the Republic of South Africa (Act 108 of 1996)

Section 24 of the Constitution states that all citizens of South Africa have the right to an environment which is not harmful to their health and well-being, an environment which is protected and sustained by reasonable legislative criteria (RSA, 1996). These reasonable legislative criteria include measures that:

- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

3.6.2 The Water Services Act (Act 108 of 1997)

This Act defines the role of water service authorities (municipalities, water service institutions, water boards) and minimum standards for basic water and sanitation services – giving expression to the principle of equity.

One of the main objectives of the Act is to provide the right of access to basic sanitation and water supply along with an environment that is not harmful to human health or well-being. When taking this objective into consideration, it is important for authorities to ensure the quality of water provided to the community is of such a nature that it is not harmful to an individual's health and well-being. This is to be taken into account in the management of the water for Aliwal North community with regard to water scarcity.

3.6.3 The National Water Act (NWA) (Act 36 of 1998)

This Act is implemented by the Department of Water Affairs (DWA) and gives a legislative framework to the way in which water resources are developed, managed, used, protected, conserved and controlled. Along with these aspects, there are other important factors such as geo-hydrological activities of identifying, surveying and mapping (demarcating) the nature and extent of a specific water resource, that need to be considered even before the water resource can be protected, used, developed, conserved, managed and controlled (Nealer & Raga, 2008b).

The aim of the NWA has been to introduce integrated water resource management to South Africa through a process that focuses on the meeting of basic human needs, equity in access, facilitating social and economic development, protection of the aquatic and associated ecosystem, reducing and preventing pollution and degradation and meeting international obligations (RSA, 1998b).

3.6.4 The National Environmental Management Act (Act 107 of 1998) (NEMA)

The Department of Environmental Affairs and Tourism (DEAT) regulates this Act along with relevant provincial Departments of the Environment. The Act lays down basic environmental principles and makes room for cooperative environmental governance through the establishment of

principles for public decision-making on matters affecting the environment. Principles such as Duty of Care, Polluter Pays and Sustainability are promoted (Annon, 2009a).

In both the National Water Act (Act 36 of 1998) and the NEMA (Act 107 of 1998) pollution is defined as implying a human-induced change in environment that has an adverse effect on human health or well-being. In both these Acts, it is evident that pollution must be prevented as far as possible and in instances where it does occur, all possible measures must be taken to prevent such pollution from continuing or returning.

3.6.5. Municipal Structures Act (Act 117 of 1998)

Chapter 5 of the Act provides a clear definition of the roles and functions of a specific municipality. The Act provides for a Category C (district) municipality to have the power and functions to administer the bulk supply of water that affects municipalities in the district (potable water supply systems, waste water and sewage disposal systems and solid waste disposal), whereas a Category B (local) municipality is only responsible for storm water management systems in its own jurisdiction area.

The Minister for Cooperative Governance and Traditional Affairs after consultation with the Minister of Water Affairs and the members of the Executive Council responsible for the local government in a specific province could authorise a Category B municipality to exercise power with regard to their potable water supply systems (Nealer & Van Eeden, 2010).

Looking at the important explanations given above, a paradox seems to exist in the legislation and its implementation, specifically with regard to water services management in the local government sphere of South Africa. Currently, in most cases, the Category B municipalities have been taking responsibility for their own bulk water supply in terms of potable water and the management of their grey water in their jurisdiction areas.

These municipalities are directly connected to the water end users at a grass-roots level, but the Structures Act delegates the authority for water services management away from the Category B

municipality and gives the authority to the Category C municipality in whose municipal management area the Category B municipality falls.

The responsible Category C municipalities are often located very far away and do not have the capacity, skills or experience to manage the water services in order to be in line with the Integrated Development Plan of their respective Category B municipalities. This leads to confusion and grey areas where the respective municipal responsibilities are concerned, which in turn results in poor municipal management of the water services (Nealer & Van Eeden, 2010).

3.6.6. Municipal Systems Act (Act 32 of 2000)

In combination with the Municipal Structures Amendment Act (33/2000b) and Local Government, the Municipal Planning and Performance Regulations No. 7146 (2001), the Municipal Systems Act identifies a number of obligations for environmental management and sustainable development by local government that must be accommodated and reflected in the institutional framework and policies of a municipality (Pretorius, 2009).

This Act defines the main principles, processes and mechanisms that are necessary to enable municipalities to progressively move towards social and economic upliftment of their respective communities. In this Act, the integrated development plan of a municipality is defined (Joubert, 2008)

3.7 Conclusion

The chapter above shows the framework in which the research will take place. It describes the release model which will be used in the research and the legislation that govern management of water in South Africa

This chapter also concentrated on the risk reduction model and the aims of the model in reducing the water crisis challenge in the community of study. It has also showed how water is one of the basic necessities of human life, and it is increasingly becoming a scarce resource. Although access to safe drinking water is key to enhancing both human well-being and securing sustainable livelihoods, millions of people have no access to water. Currently the world is using more than half

of its freshwater resources and the demand is increasing yearly. The chapter has also given insight on the legislation governing water and Institutional arrangement in the context of water management in South Africa.

It is clear that the Asian and African continents are experiencing the most severe water shortages. At the same time, these two regions need this resource for agriculture, as there is an increased demand for food. Considering the causes of water scarcity (both environmental and physical) in the world, new management strategies should be considered.

In short, the conferences that set goals and principles to deal with water scarcity should play a major role in the formulation of these strategies. The chapters that follow are based on some of the methodology in the study area to find more on the issues related to water and water management in the Aliwal North Community.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

In this chapter the design and methodology followed during the research fieldwork will be documented. It discusses instruments that were used in the measurement of important variables of the study and elaborates the sample design and techniques used in data collection. The chapter further gives a description of the procedures used in capturing and editing data and the aim behind the selection of data analysis procedures employed. It concludes by giving a discussion on the quality of data collected by highlighting shortcomings, limitations and gaps in the data.

A qualitative research design approach was used in the study. Qualitative researchers study things in their natural settings, attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them (Denzin & Lincoln 1994). To support this view, Creswell et al. (1988), argues that in qualitative research there are multiple perspectives held by different individuals, with each of these perspectives having equal validity or truth. Impact assessment studies involve making observations, conducting interviews, answering questionnaires and making use of documents; and that qualifies part of the study to be qualitative (Barbie & Mouton 2001).

This methodology will have involved a direct exploring of the experience of people living in this community during the water crisis time and understanding the underlying cause of the water scarcity.

The researcher collected raw data directly from the community based organisations with the assistance from the community members (Leedy and Ormrod, 2001).

4.1 Selection of study area

The researcher selected the Eastern Cape, more especially the Maleswai Municipality, as the area of interest. This was because of her interest in the area and after a long period of observation and investigation into the water-related situation within the Aliwal North community. It is important to know that Aliwal North is a rural setting and it consists mainly of three locations and is also characterised by poor socio-economic conditions. These conditions are exacerbated by climate change which results poor access to water services hence reduction in water resources during droughts. These conditions, together with the culture of this area, determine the role and experiences of Aliwal North community members. Their roles, problems and experiences are documented below and demonstration of the impact of access to water for rural people and the role that rural people can play in mitigating water scarcity.

4.2 Data Collection

Firstly, the researcher conducted a literature study. In addition, the researcher used both in -depth personal interviews and focus group sessions to collect data. The interviews and focus groups were chosen because these methods ensure easy accessibility to the locations.

A random sample of residents was selected to include different locations in the study area.

A total sample size of 60 residents with a mean of 20 people per each selected location in the study area. In both in-depth interviews and focus groups the researcher assured the participants of anonymity and none of the participants was forced into participating.

4.3 Literature Review

The researcher conducted a study of relevant sources concerning global water scarcity, in Africa, as well as in South Africa. These sources on water scarcity were consulted in conjunction with sources concerning the role of community involvement in water demand management. The sources were consulted in order to understand problems under investigation and to realize the extent of the work already covered, concerning the problem. Sources used included books, newspapers, journals, reports and official documents from the Department of Water Affairs and Forestry and the Department of Environmental Affairs and Tourism. Information available on the internet was collected and integrated with the data obtained from the above-mentioned sources as suggested by Mouton (2001).

4.4 Personal Interviews

The interviews will be conducted with key informants for example a technical official different departments and Municipality.

Focus group discussions will be organized in three locations out of study area. An effort will be made to have at least 20 participants taking part in each of the focus group discussions.

The objective of these focus group discussions will be to collect in-depth qualitative information about the water scarcity challenge with regards to the community's expectations, planned activities, and contributions towards setting up the water demand management in their community.

Perceptions on environmental management. A checklist with key questions will be drawn up to guide the discussions.

Male and female participants were combined during the discussions as the proposed topic is expected to benefit both men and women equally with no special bias to gender. Efforts were made to have both the youth and adults to accommodate diversity in terms of views and perceptions.

A total no of 60 community member participants took part in the three focus group discussions representing each location.

4.5 Data Analysis

Information collected through focus group discussions and questionnaires was largely qualitative and thus deductive reasoning was used to analyse the data, given that the research questions were both exploratory and interpretive. Data analysis was guided by use of the constant comparative method where emerging themes were categorized and re-evaluated.

Comparison of new data sets with old data sets on related or similar themes to check for variations was conducted and in turn this generated appropriate discussion sections. Throughout the process, analysed information was re-examined and interpreted in view of the research questions established earlier.

An in-depth description and interpretation of findings was presented in words and narratives quantitative data was compiled through document review and key informant interviews.

Data collected from all participants was summarized and interpreted as statistics using excel computer software to produce tables, pie charts and histograms as urged by Mouton (2001).

4.6 Conclusion

The chapter has described the methodology used in this study. The characteristics of the study area have been presented to help bring better understanding of the physical, environmental and social trends of water scarcity in this community. The next chapter presents analysis and findings derived from the data.

CHAPTER 5: DATA ANALYSIS, INTERPRETATION AND PRESENTATION

5.1 Introduction

This chapter discusses the data analysis and findings from 30 questionnaires completed by 50 participating from three locations of Aliwal North community in August 2016. The purpose of this study was to identify factors contributing to water scarcity in this area.

The results presented in this chapter have been arranged in sections which include; the analysis of social demographic aspects of the respondents, water sources, social impacts of water scarcity, environmental impacts of water scarcity, preparedness, mitigation measures as well as legislations. Social demographic aspects of respondents this includes gender, age groups, application of marital status, educational level, household size, disability status, people. The data is presented in form of graphs, pie charts as well tables to reflect people's opinions.

"Data analysis is the process of bringing order, structure and meaning to the mass of collected data. It is a messy, ambiguous, time consuming, creative, and fascinating process. It does not proceed in a linear fashion; it is not neat. Data analysis is a search for answers about relationships among categories of data."- Marshall and Rossman, 1990:111

5.1 Data Analysis

5.1.1 Socio – Demographic information of Respondents.

According to the data collected in August 2016, the analysis of the respondents from the 3 locations of Aliwal North Community indicates that 36% were male while as 64% were female. The data was collected by the main researcher from the community based Non – Governmental Organisation without biasness based to any gender. This shows that are more female living in Aliwal North due to lack of opportunities in this town man prefer to work on farms which are far outside the town and others travel to big towns in search for opportunities.

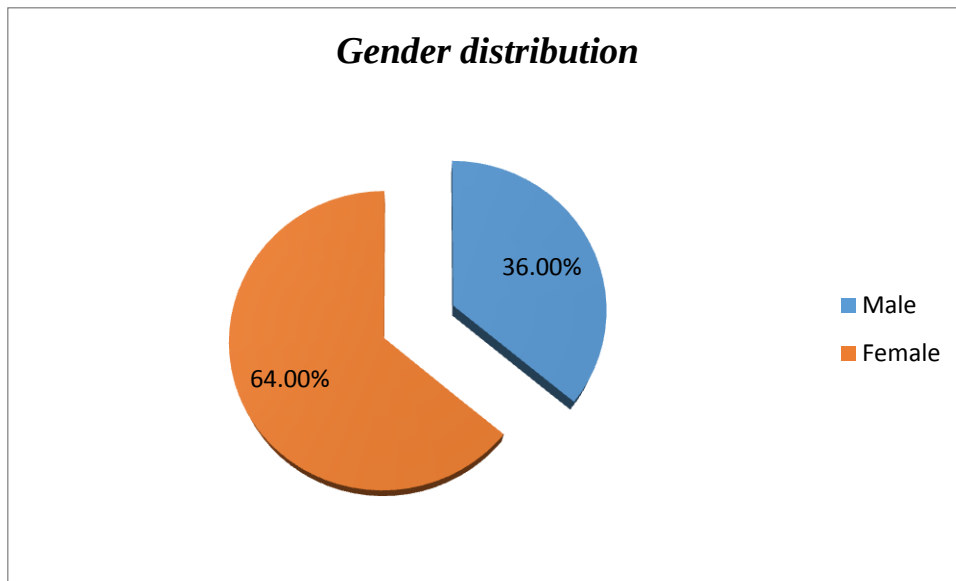


Figure 8 gender distribution: Source data collected on Aug, 2016

Figure 9 below presents the age group distribution of respondents the highest being 28% of 25 – 35 and 45 to 60. This was because the age is mostly connected to water related activities at the household level and looking at the community based organization this is the age that carries out awareness Campanian during water crisis time in town.

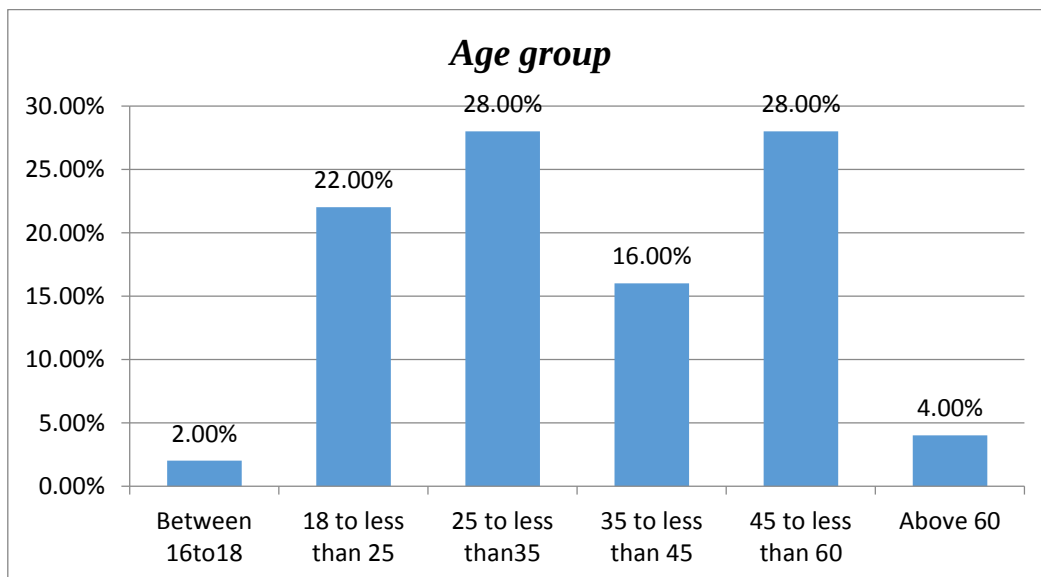


Figure 9 age group: Source data collected on Aug, 2016

The findings indicate that the majority of the respondents, (60%) as shown in figure 10 below were single and due to the cultural of man always traveling out of this town and end up marrying woman from where they have settled for work. Followed by married participants (30 %) who were lack enough to get employed and settled in this town as a family. Another small 10% of the respondents were divorced and below 10% were widowed.

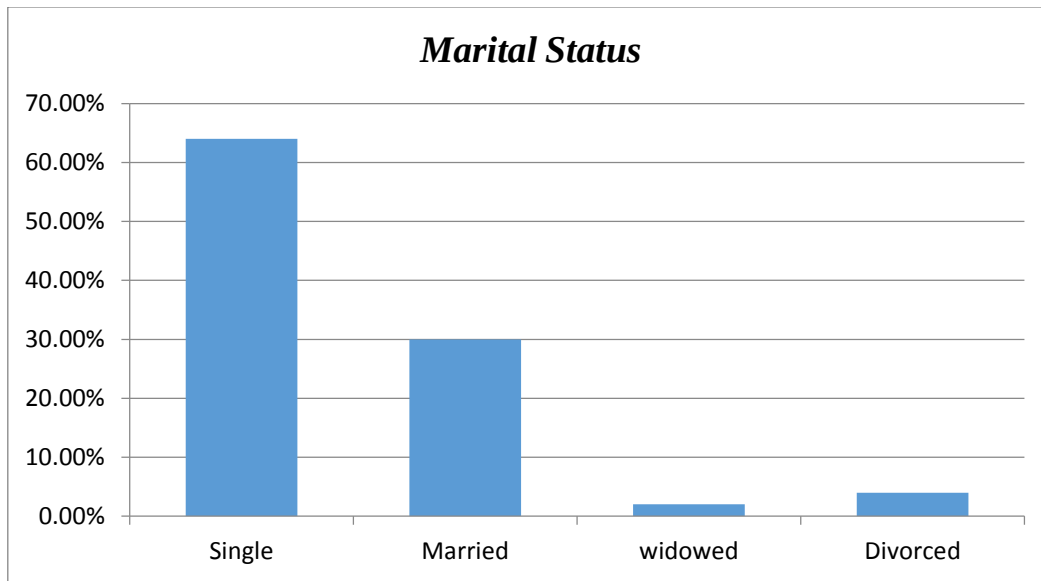


Figure 10 marital status: Source data collected on Aug, 2016

According to responses in Figure 11 the biggest is 66% household which is made up of 2 – 5 people in house followed by 24% of 5 to less than 12 people in a house 6% of 9 – to less 12 in house and 4% of more than 12 people in house.

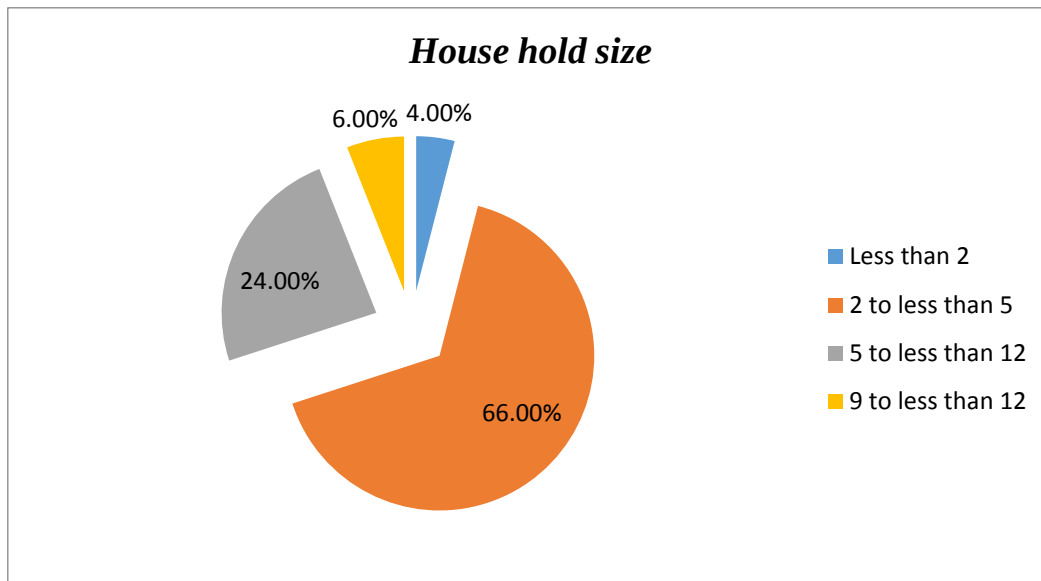


Figure 11 house hold size: Source data collected on Aug, 2016

In this section, the researcher sought to determine whether respondents have got any disabled member of the family. Figure 12 shows that 98% of all the respondents and beneficiaries indicated that they were in perfect health condition. Only one person 2% stated was some kind of disabled.

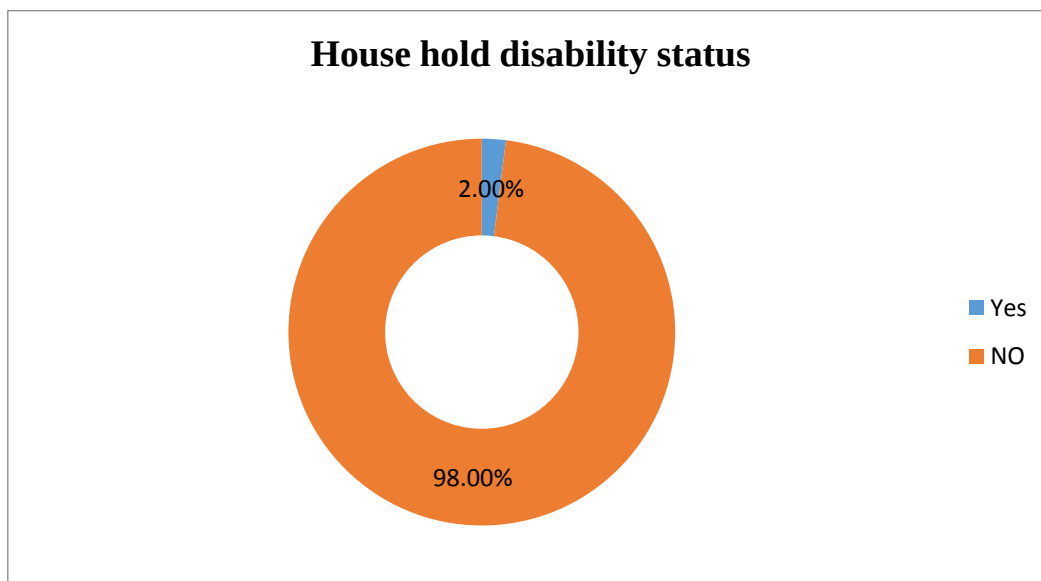


Figure 12 house hold disability status: Source data collected on Aug, 2016

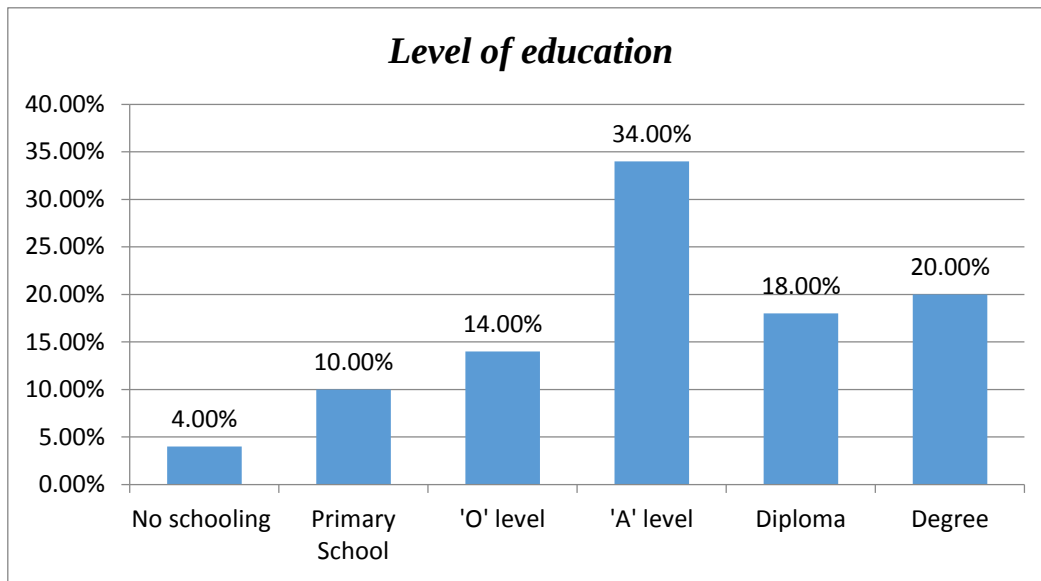


Figure 13 level of education: Source data collected on Aug, 2016

Out of 50 respondents as shown in figure 13 above, 4% of all respondents have no education background, 10% have primary education, 14% have 'O' level education, 34% have 'A' level or grade 12, 18% have diploma and 20% of the entry population have degree qualifications.

5.1.2 Water sources and scarcity awareness in the community of Aliwal North

According to the key informants that were interviewed in the field, the occurrence of water scarcity in the area happens quite often because it was a natural phenomenon and the study area is drought prone.

According to figure 14 below 96% of participants indicated their main source of water is tap water while as 4% said they use borehole water for their domestic consumption.

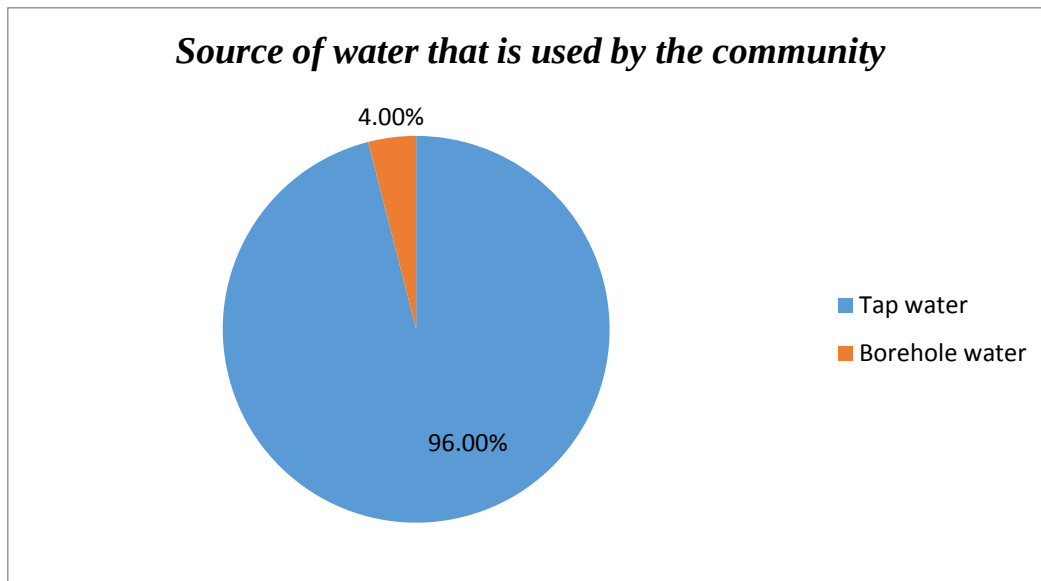


Figure 14 source of water that is used by the community: Source data collected on Aug, 2016

In the figure 15 below most of respondents indicated Municipality as their main source of providing water with 88% followed by the Non – Governmental Organisations with 8% and other source of provider of 4% which of most respondents indicated these were some farmers who use spring water from the mountains?

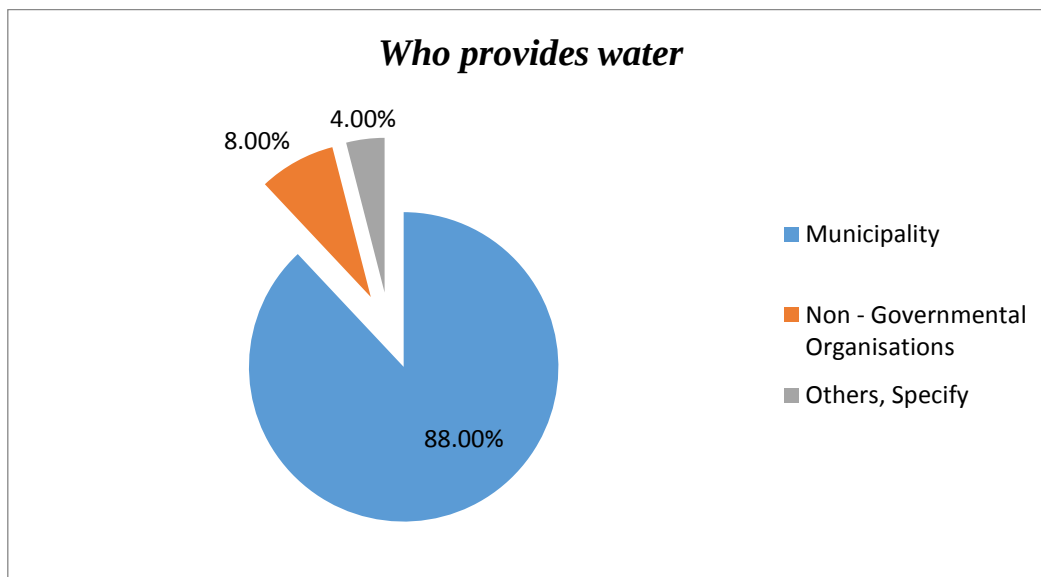


Figure 15 who provides water: Source data collected on Aug, 2016

Most respondent rated water quality as average with 50% as shows in the table below followed by 34% of people who said the water was just good 10% indicated the water was very good 4% said water was bad and 2% said water was very bad all of them based on whoever supplies them with water.

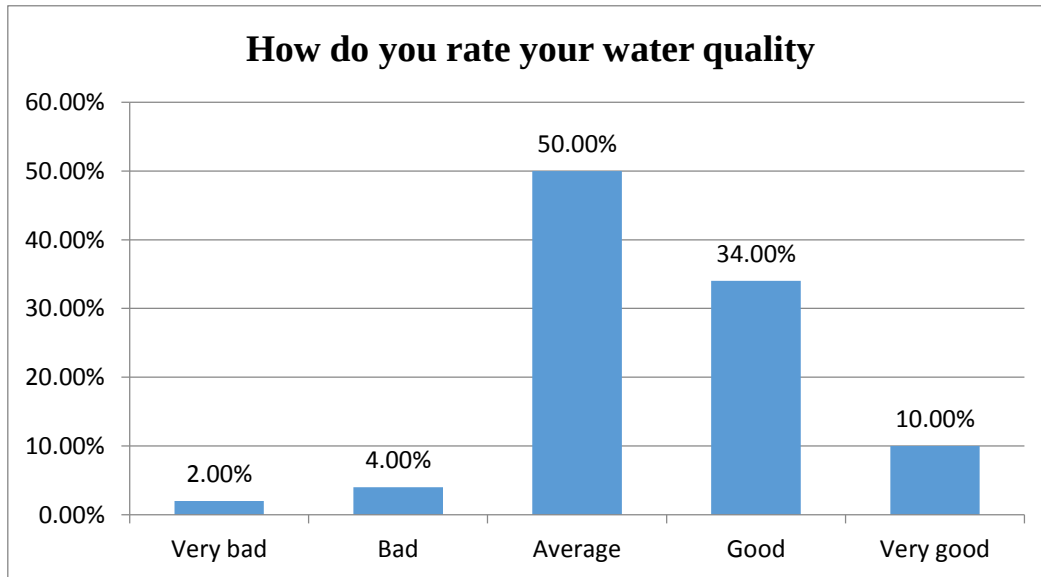


Figure 16 how do you rate your water quality: Source data collected on Aug, 2016

According figure 17 below 72% of respondents said they do not used Orange river water for any purpose while 28% said they use Orange river water to water their crops.

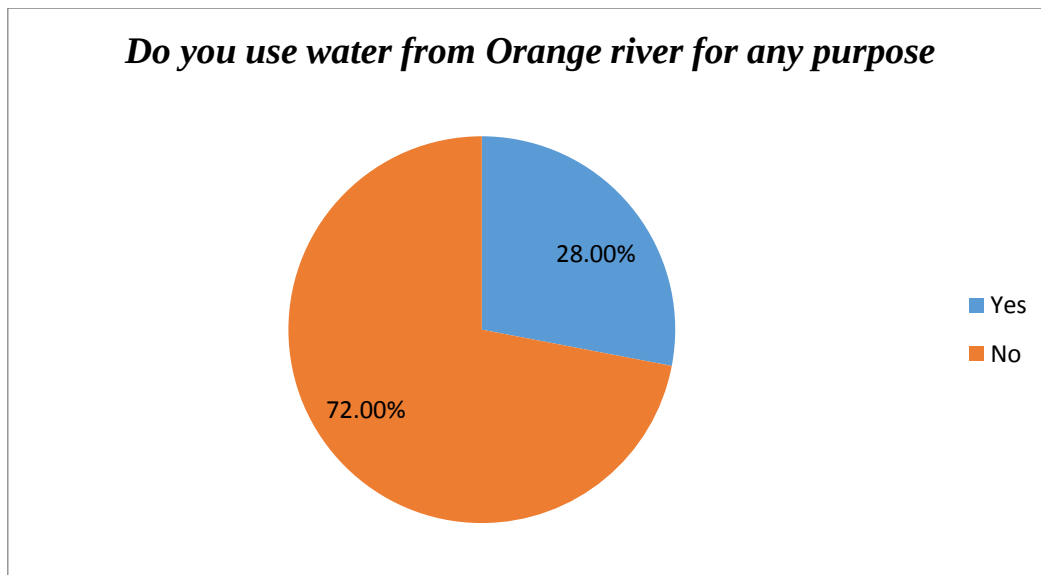


Figure 17 do you use water from Orange River for any purpose: Source data collected on Aug, 2016

In the figure 18 below 38% of respondents answered Yes when they were as if the water is enough for the whole town of Aliwal North while 62% answer No to this Question

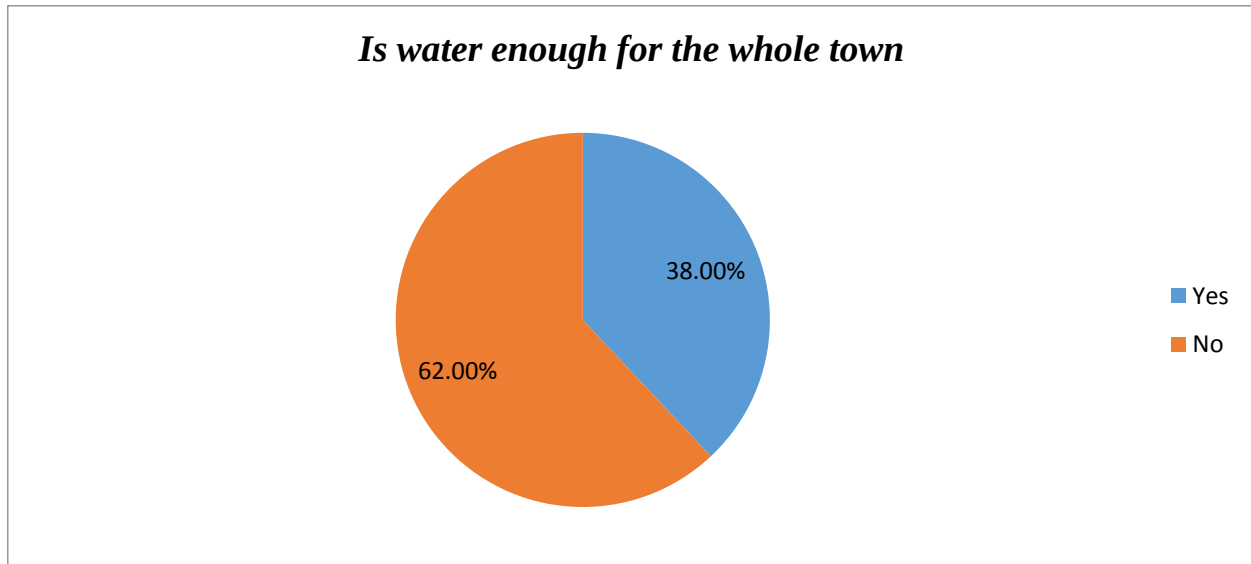


Figure 18 is water enough for the whole town: Source data collected on Aug, 2016

The majority of respondent indicated with 64% they said were aware of water scarcity problem in Aliwal North town and 36% indicated they did not know any water scarcity issues in town

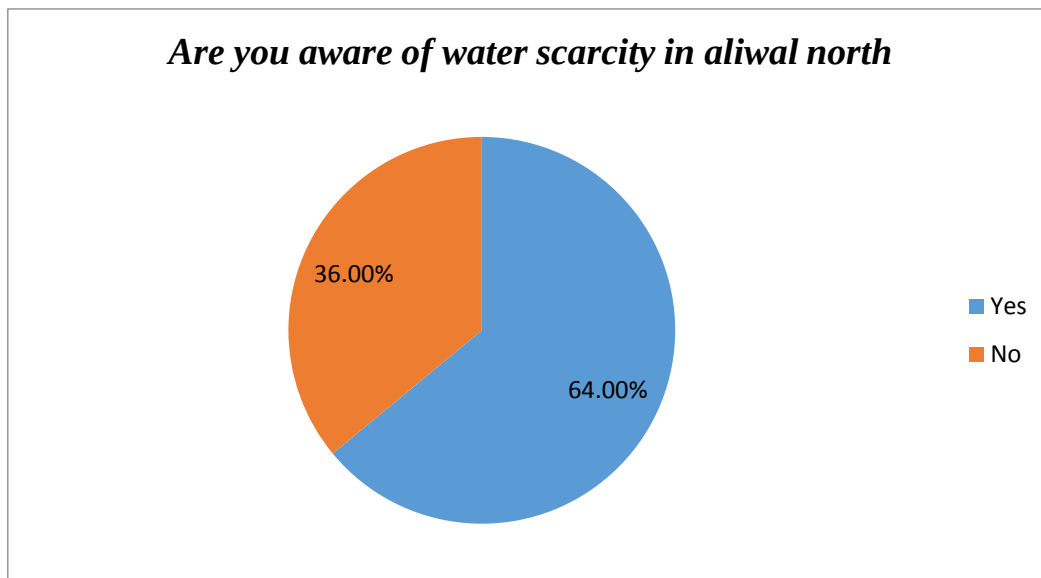


Figure 19 are you aware of water scarcity in Aliwal north: Source data collected on Aug, 2016

5.1.3 Social impact of water scarcity

In the social impact section of water scarcity, the key informants were interviewed about if they have suffered from water related diseases how is water scarcity a threat to their lives and this is how they answered the questions.

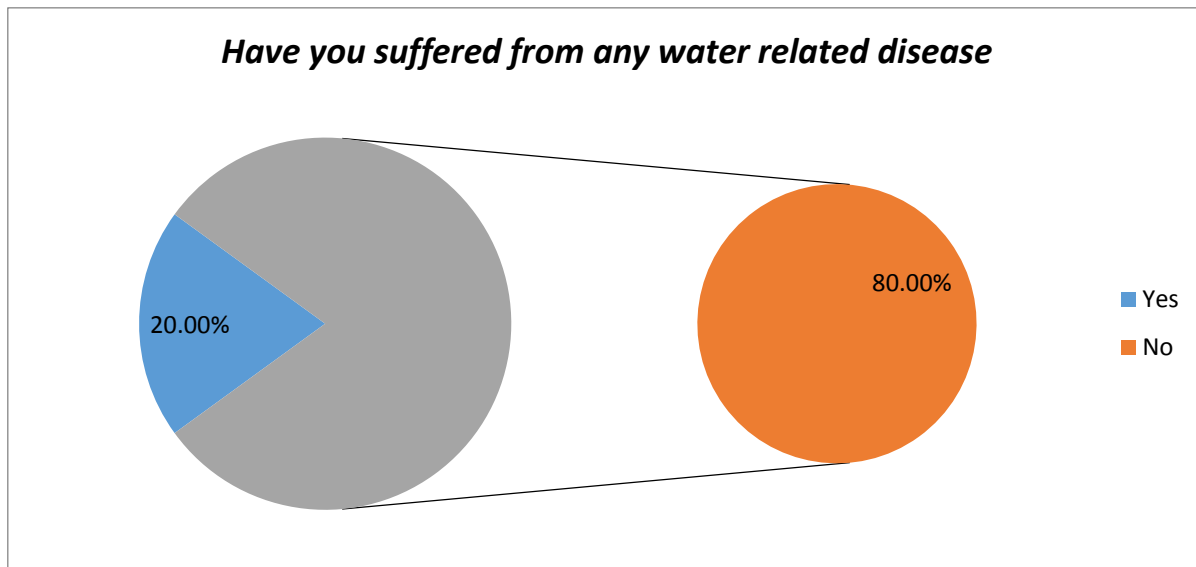


Figure 20 have you suffered from any water related disease: Source data collected on Aug, 2016

In figure 20 above 80% of respondents said they had not suffered from any water related disease while 20% said they had suffered.

In figure 21 below 18% indicated they knew anybody who had suffered from water related diseases and 82% said they did not know any of their locations or work places.

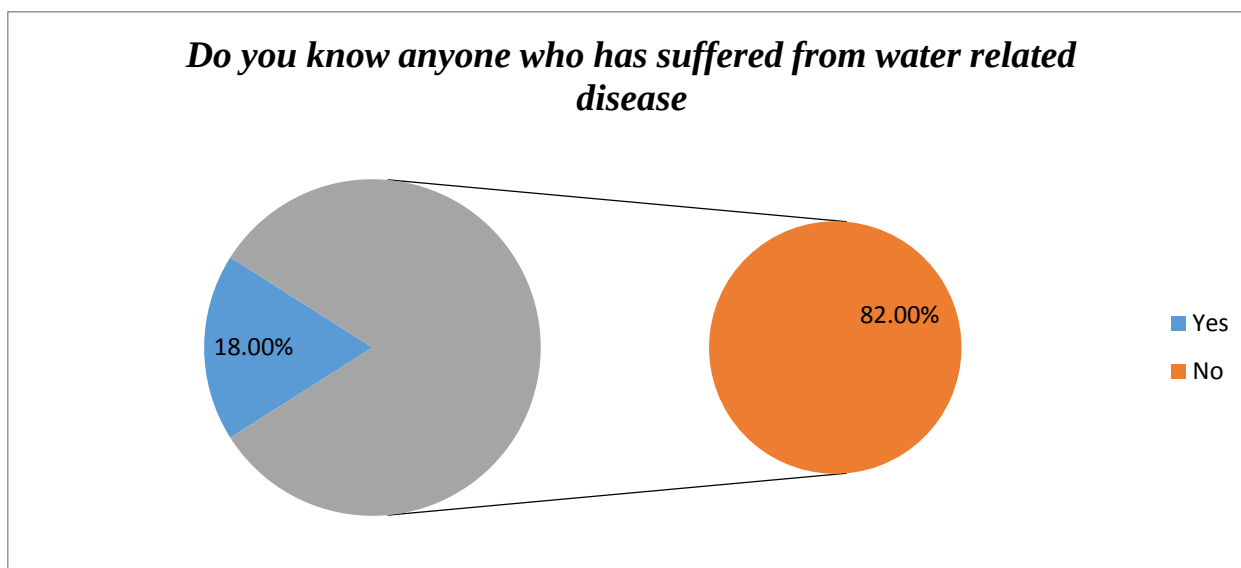


Figure 21 do you know anyone who has suffered from water related disease: Source data collected on Aug, 2016

In this figure below 12% of respondents indicated people who suffered from water related disease it was Diarrhea and 4% was skin disease and majority of people with 84% said they never suffered from any disease.

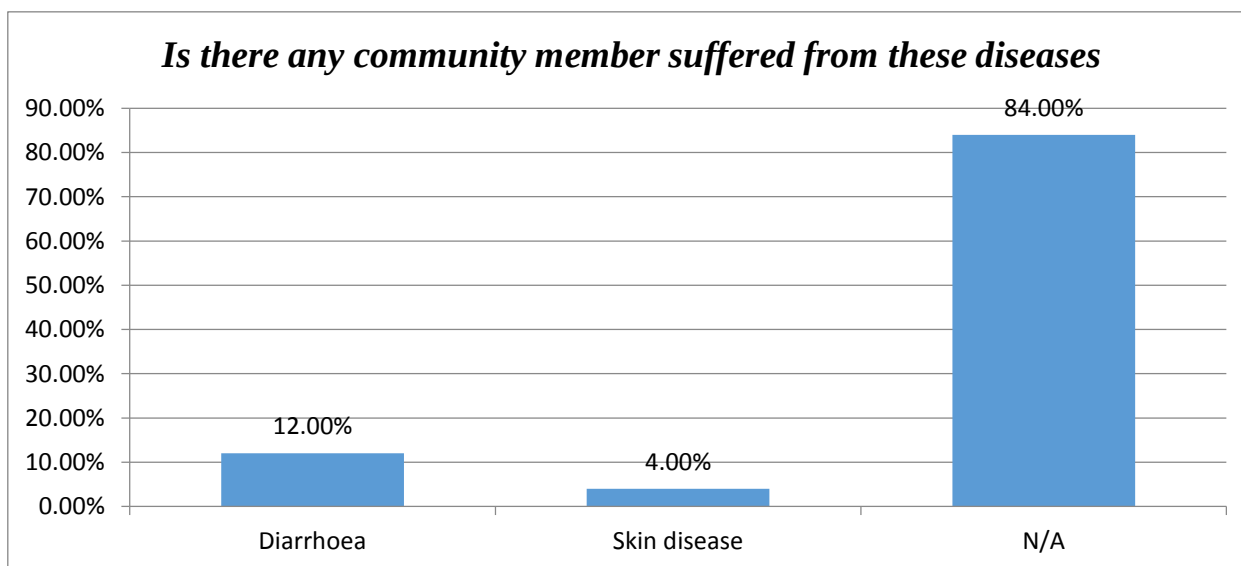


Figure 22 is there any community member suffered from above diseases: Source data collected on Aug, 2016

In figure 22 below the respondents were asked whether the water scarcity was a threat to their lives 48% strongly agreed 28% agreed 8% were neutral 6% disagreed while 10% strongly disagreed.

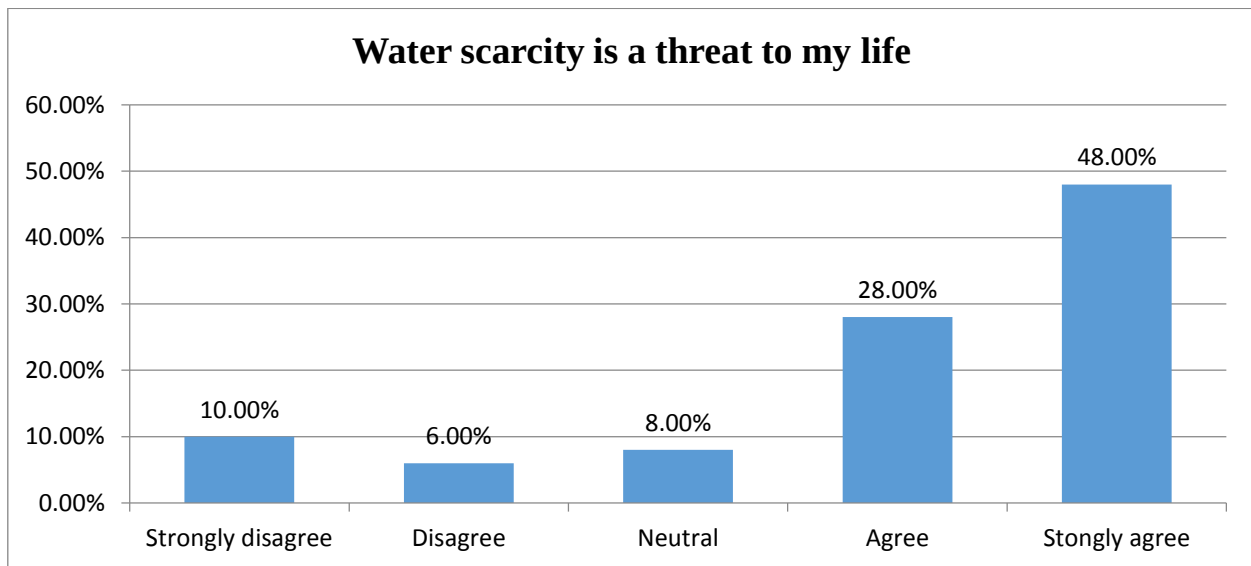


Figure 23 water scarcity is a threat to my life: Source data collected on Aug, 2016

As shown in figure 24 below most respondents strongly agreed and agreed with each other, where 40% lack water access has sometimes affected livelihood of the people in the community 10% strongly disagreed 6% were neutral while as 4% disagreed with this statement

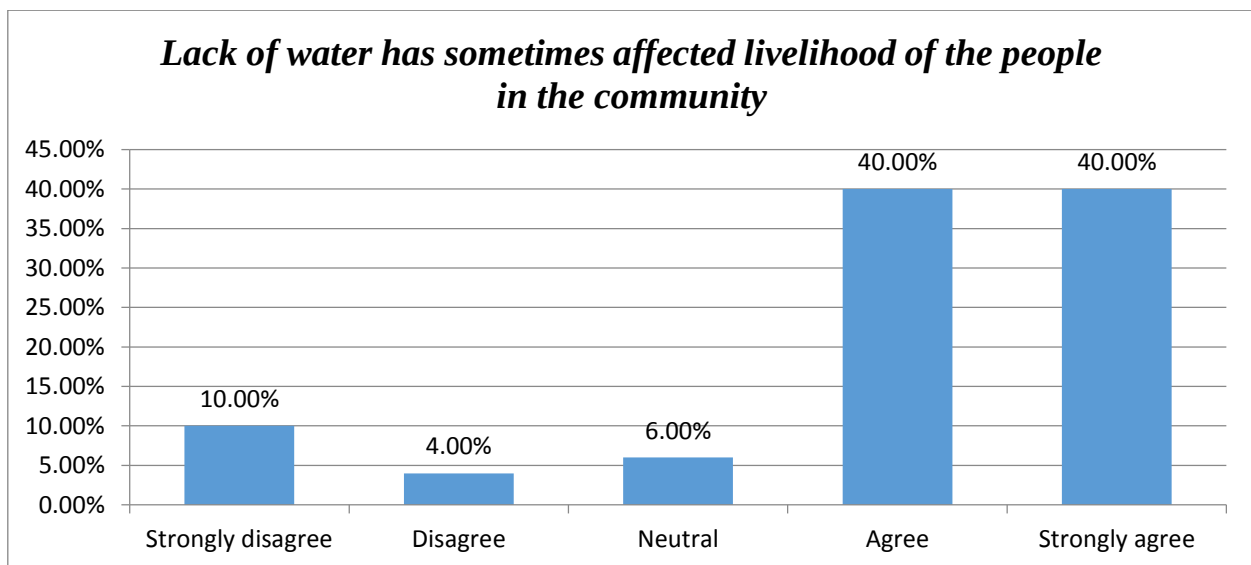


Figure 24 lack of water has sometimes affected livelihood of the people in the community: Source data collected on Aug, 2016

Table 4 briefly state the effects of water scarcity on your daily activities as the respondents indicated when they were interviewed during data collection

<i>Joe Qgabi</i>	<i>Hilton</i>	<i>Dukatole</i>
• Affects our daily washing	• I can't wash and water garden	• I have to hire somebody to help me to collect water from a farm that provides our with water
• Affects my cooking and I go hungry	• We have to buy water for drinking	• Animals dies and plants also dries out which is a high risk
• Bad smell comes from toilets no water for plants and for washing children	• We run around looking for water and we can't use toilets	• It affects work productivity due to absence of workers
• I don't wash myself and my body is itching and I also become thirst	• We can't wash ourselves, our clothes and dishes	• It affects me I have to go to fetch water far to the place where I stay
• It affects both people and animals	• School and business can't function properly	• Animals die others get disease because they are not well feed

Source data collected on Aug, 2016

In the above table people of Aliwal north community gave their opinions on how water scarcity has been affecting the social lives and daily activities.

5.1.4 Environmental impacts water scarcity

As shown in figure 25 below 74% of the respondents said they do not cultivate crops, while as 26% of respondents said they cultivate crops for subsistence farming.

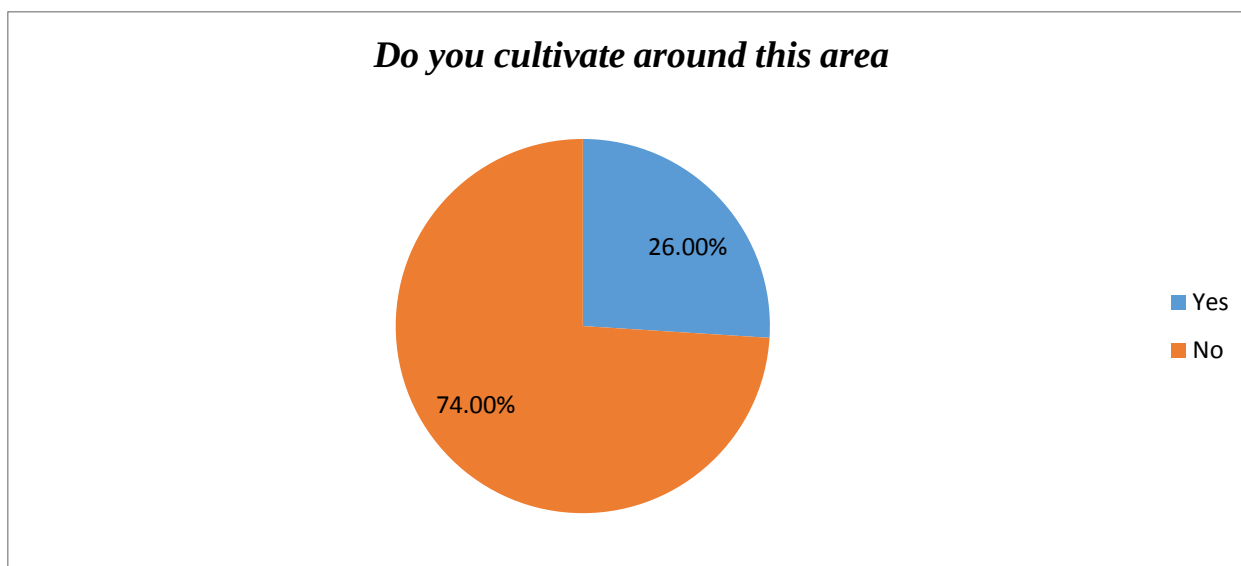


Figure 25 do you cultivate around this area: Source data collected on Aug, 2016

In figure 26 below 38% of respondents who said they had crops they said water scarcity affected their crops as well and 62% said they do not have crops.

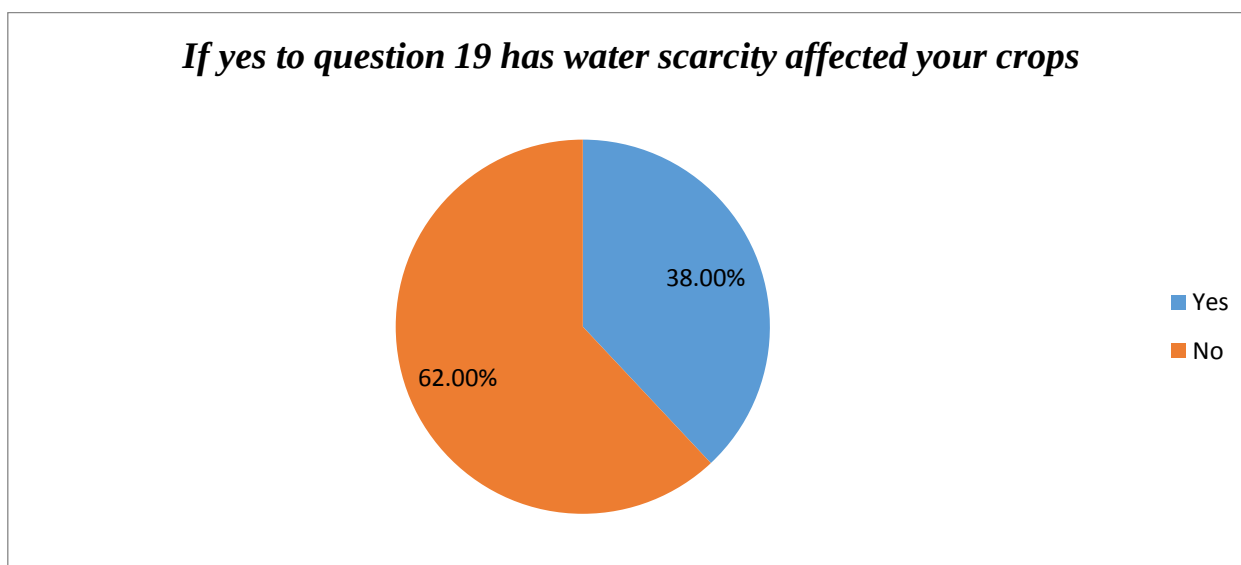


Figure 26 if yes to question 19 has water scarcity affected your crops: Source data collected on Aug, 2016

In figure 27 below 38% said yes water scarcity affects well and the boreholes in the community while as 62% said no water scarcity does not affect well and boreholes.

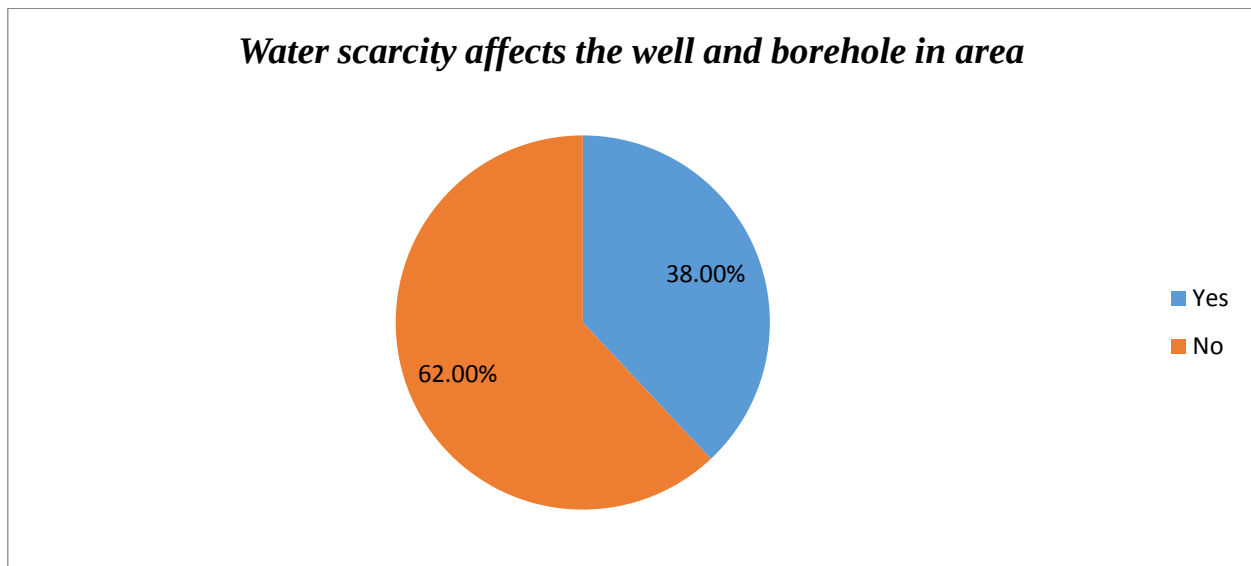


Figure 27 water scarcity affects the well and boreholes in area: Source data collected on Aug, 2016

As shown in figure 28 below 72% are not aware of the fact that water scarcity has affected farming in Aliwal North 25% said yes the farming was affected while 2% said no the farming was not affected.

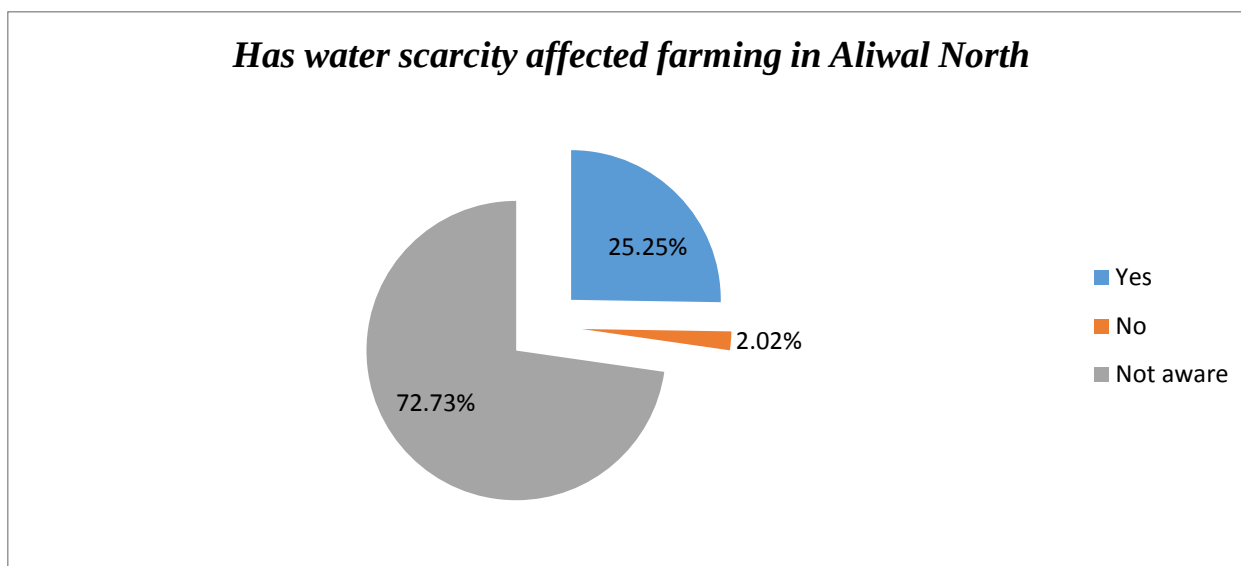


Figure 28 has water scarcity affected forming in Aliwal North: Source data collected on Aug, 2016

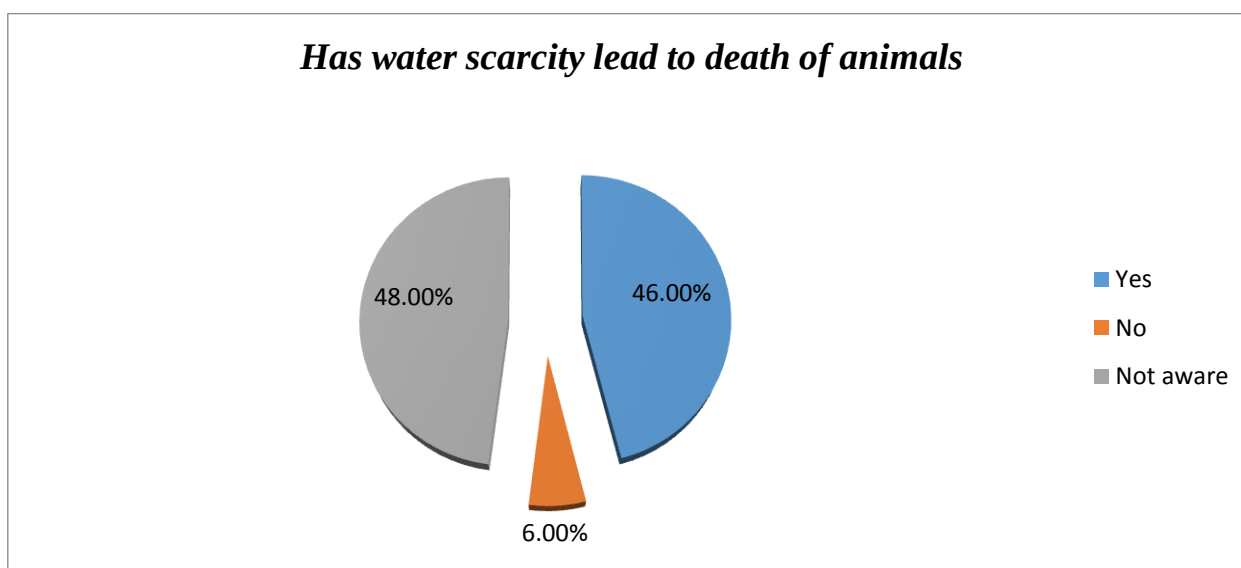


Figure 29 has water scarcity lead to death of animals: Source data collected on Aug, 2016

In figure 29 above 48% of respondents said they were not aware of how water scarcity has led to death of animals in the community 46% said yes the know animals had died while as 6% said they did not know.

5.1.5 Preparedness

In figure 30 below respondents were asked how prepared was the community to the water scarcity challenges 60.53% of respondents agreed there community had plans in place to deal with water scarcity challenges, 31.85% were neutral while as 7.89% disagreed.

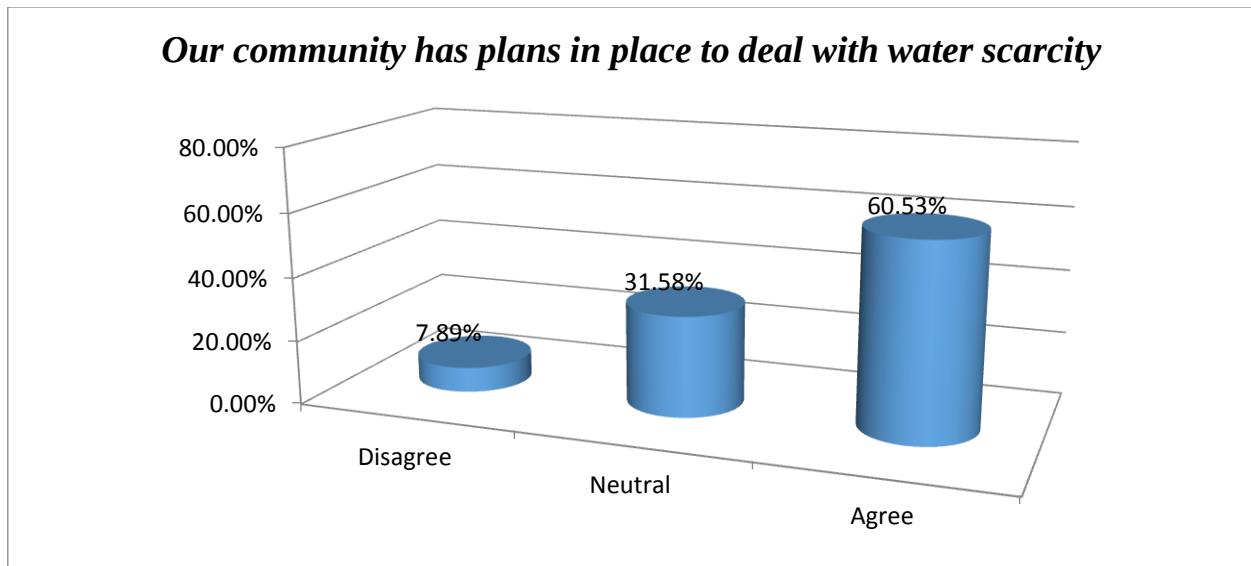


Figure 30 our community has plans in place to deal with water scarcity: Source data collected on Aug, 2016

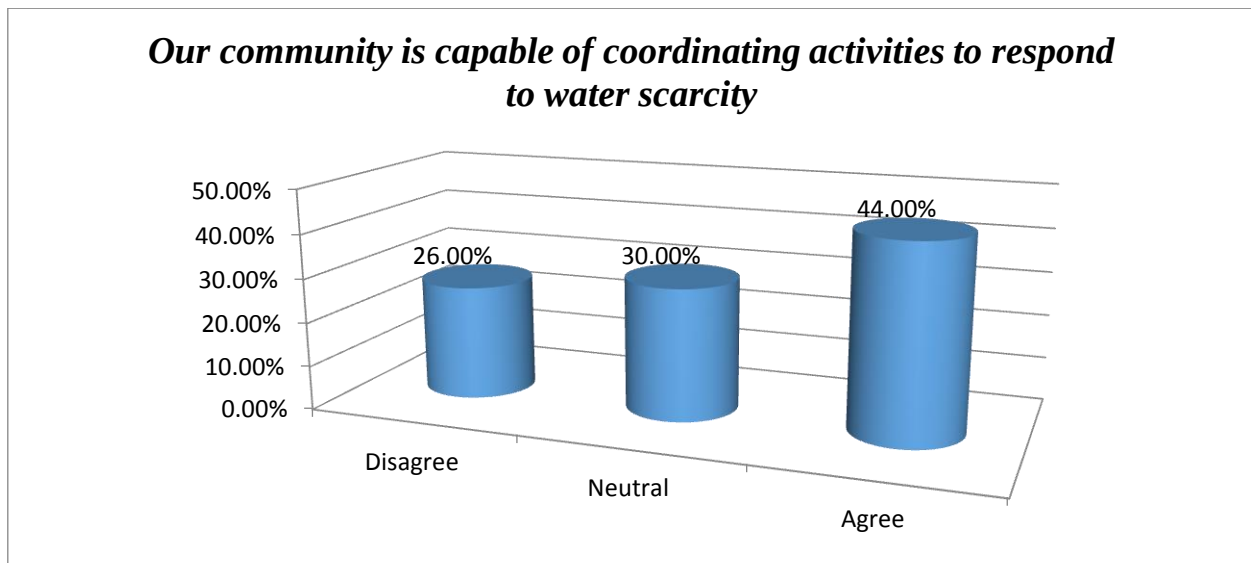


Figure 31 our community is capable of coordinating activities to respond to water scarcity: Source data collected on Aug, 2016

In figure 31 above on the capacity question 44% of respondents agreed their community is capable of coordinating activities to respond to water scarcity challenges, 30% were neutral while as 26% disagreed that the community is not capable of coordinating the activities to respond to water scarcity challenge

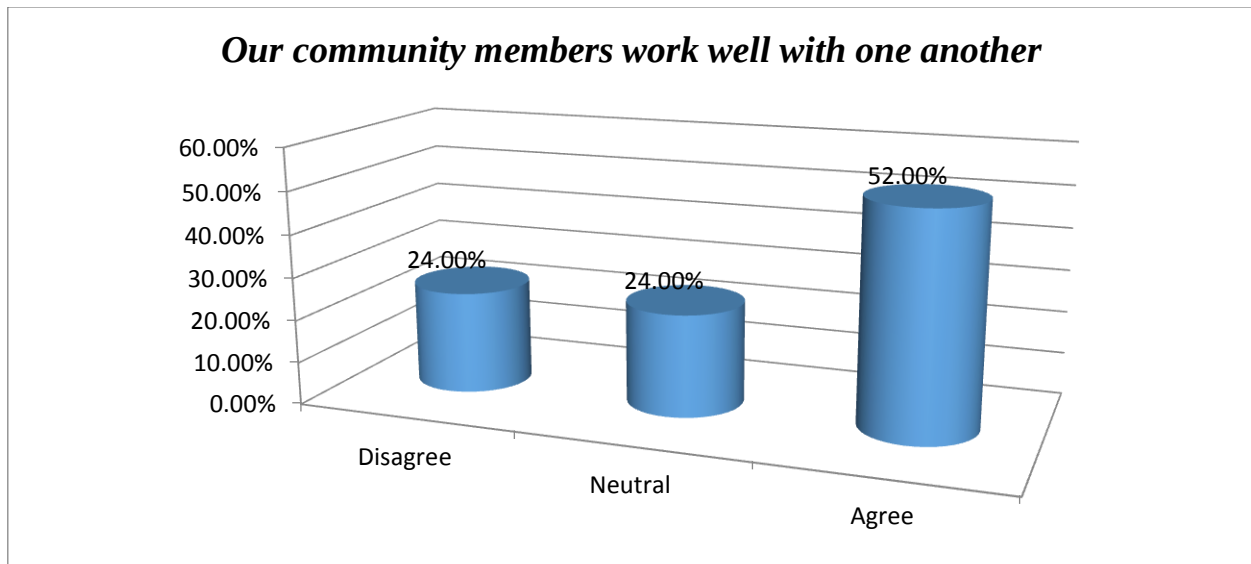


Figure 32 our community members work well with one another: Source data collected on Aug, 2016

In the figure 32 above 52% agree our community members work well with one another 24% were neutral while 24% disagreed the community members does not work well with one another.

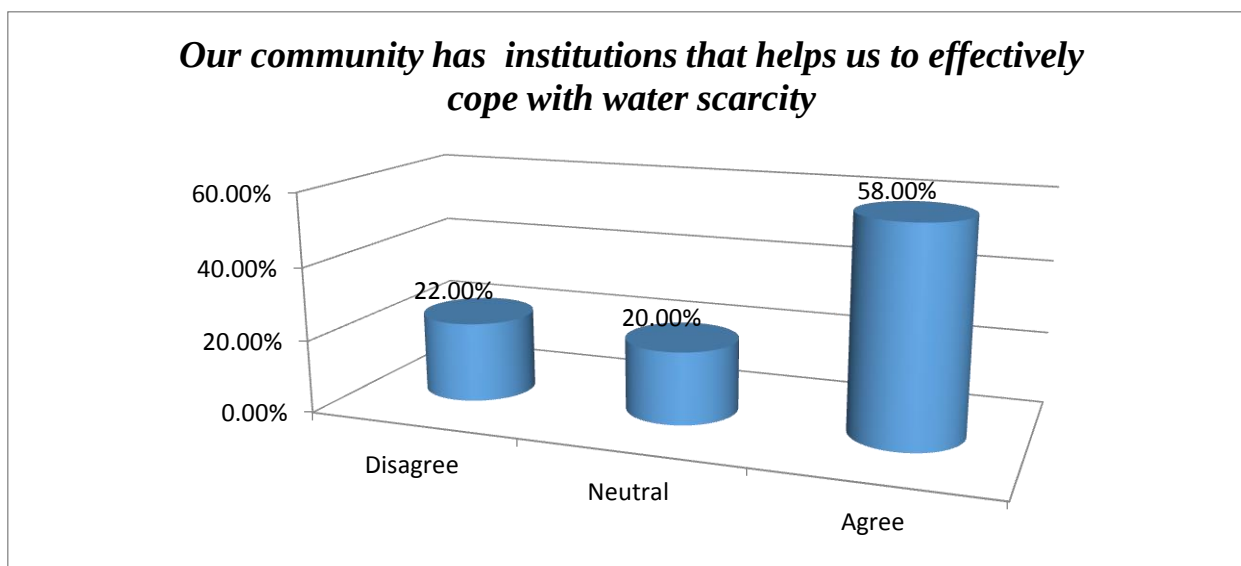


Figure 33 our community has institutions that helps us to effectively cope with water scarcity:
Source data collected on Aug, 2016

As shown in figure 33 above 58% agreed that the community of Aliwal North has got institutions that helps with the effective coping with water scarcity challenges, 20% were neutral while us 22% disagreed the institutions were doing their jobs.

5.1.6 Mitigation Measures

Table 5 respondent's option on what can be done to reduce water scarcity in the community of Aliwal North

<i>Joe Qgabi</i>	<i>Hilton</i>	<i>Dukatole</i>
We need more taps in the community	Put more tanks and boreholes in the community	Provide water tanks and tapes
Municipality should build more dams in the area	Community members must put water tanks on the houses	They can save water by when you wash dishes you can use the same water on the garden
Water must not be	People must not leave	People must use water

wasted, broken taps must be reported for maintenance, buckets must be used when washing cars and not hosepipes	their taps open	when needed
• Municipality should put more water reservations in place	• All burst pipes should be fixed in time	• People should be taught how to save water
• Government should help the community members with water tanks	• Stop watering plant two times a day	• Wash all 3 children in one round

Source data collected on Aug, 2016

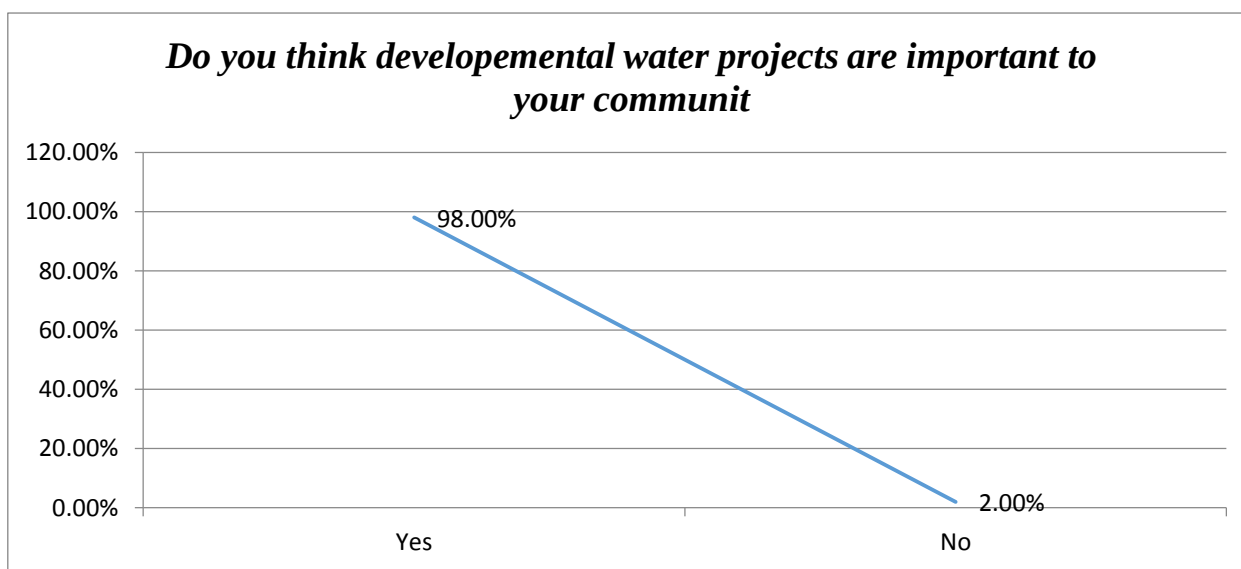


Figure 34 do you think developmental water projects are important to your community: Source data collected on Aug, 2016

As shown in figure 34 above, 98% of the respondents said that developmental water projects are important to their community and 2% said it was not necessary for the community to have developmental water projects.

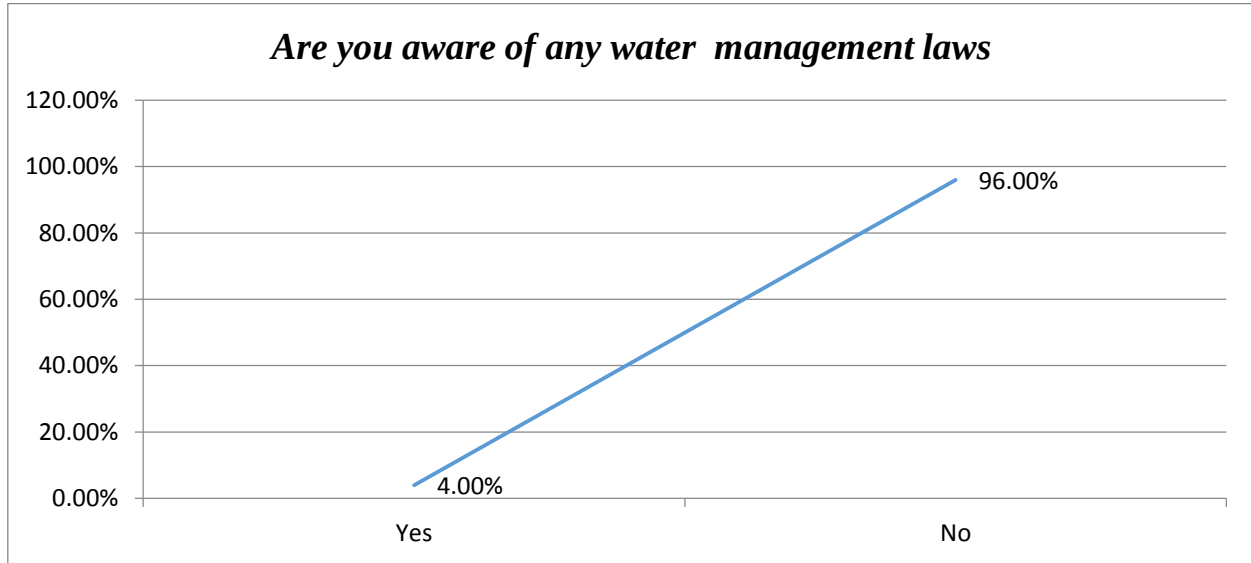


Figure 35 are you aware of any water management laws: Source data collected on Aug, 2016

In figure 35 above 96% said they were not aware of any water management law while 4% said yes they know some of them.

5.2 Data Analysis

The analysis of 10 participants who were interviewed in the central town of Aliwal North who represented the working group and the business people and gave their views on water scarcity challenge in town. These included male and female whose age group was 30 years and above and working for different government institutions, Non – Government Organisation and Businesses around the town.

Table 6 analysis of Interviews

Question	Responses
How do you rate water availability in this area	• Very unreliable • Often not available • Average

	• Poor there is no enough water supply in this area • Always available
Are you aware of water scarcity in this area	• Yes I am aware • Yes • Yes • Yes the area does not have enough water only get water from Orange river and from Lesotho • Yes because we hear it from media local radio stations but not all times
What do you think is the cause of water scarcity	• I do not know • Climate change unreported, leaking pipe, and car wash businesses • Draught and lack of maintenance of water equipment • This is a dry area geographically • The area does not have dams to conserve rain water, the area is also very hot in summer seasons and there is too much evaporation • We are over populated, low capacity of the machine that can pump water from the dams • Drought and lack of rains in the country and the effects of global warming • Poor planning can also be a cause
How has the livelihood of the community members been affected by effects of water	• People walking long distances to collect water from Municipality during drought • Poor hygiene leading to sickness, poor agricultural production

How has the crops and vegetation been affected by the water scarcity challenge	• The crops are no more growing well because people save water for drinking instead of watering gardens. • Poor harvesting and some places no harvesting at all • The crops are affected as there is no water to supporting the growing of crops and vegetation as well • The crops are drying off • Some people have decide not to grow vegetables because there is no rain
Did the animals in the community experience some problems during water scarcity	• Animals died because of lack of water • Yes the animals were starving because of drought • Yes more and more animals died in last summer and in December 2015 due to the heat waves an inadequate drinking water
How prepared is the community of Aliwal North to the effects of water scarcity	• Not prepared at all • The town learnt a lesson in the last drought and the community has the experience of not having access to water supply. Boreholes drained to use ground water, salty water from the Aliwal Island Spar Resorts to be used • Those who have enough money they bought themselves JOJO tanks but others are still straggling They rely on borehole water from the surrounding farms and from local business hence they are not prepared.

What are the activities that are being carried out to reduce the impacts of water scarcity in this community	• Posters in town, and in the media, on how to save water • Awareness was done to educate the community about water saving tips • I have not seen any yet
How did the government and other Non – Governmental Organisation assist the community during the time of water scarcity	• Supply water tanks to community with water • Government distributed water to the community in their yards • The Municipality placed water tanks in different areas and NGO provided schools with bottled water for drinking during school hours • I have not heard of any measures being put in place

Source data collected on Aug, 2016

In the above table drawn n from the interviews of the Aliwal north community working class and business people, the majority of respondents indicated that they know about water scarcity challenge in the community but they are not in charge of addressing it.

5.3 Conclusion

The chapter presented results of the data analysis based on the focus group discussions of questionnaires, observations and key informant interviews carried out. The section discussed the socio demographic characteristics of respondents, water sources, social impacts of water scarcity and environmental preparedness, mitigation measures of the community regarding water scarcity issues. The main reasons for lack of awareness or information of water scarcity were discussed. Most households relied on assistance from NGOs and government to cope while their major strength to adapt to the impact of scarcity.

CHAPTER 6 FINDINGS, CONCLUSION AND RECOMMENDATION

6.1 Introduction

The overall objective of this study was to investigate how the government structures engage in building the capacity of the Aliwal North community for increased water demand management.

As the entire world is continuously faced with water scarcity challenges, the study was conducted with the intention of sharing these experiences with local authorities as well as end users of water.

Looking at the relevant literature within a global setting, it is evident that water resources are dwindling in many areas across the world. There are many speculations about the next world war being fought over water. Due to the developing nature of the world, with urbanisation and industrialisation, available water resources are exposed to many forms of exploitation and pollution. Having access to safe drinking water is definitely a basic need for people all over the world.

According to Pelser (2001) and Biggs et al. (2004), documenting the strategies of water management is essential and can be effective in mitigating water scarcity, but the strategies are rare and not well reported. Local people's perceptions are also very important as people's needs are usually not addressed or poorly addressed during the policy-making period.

This chapter provides a summary of the main findings of the study as well as recommendations offered by the participants themselves, and compiled from the literature and data analysis.

6.2 Findings

In the process of compiling the above chapters the researcher identified a number of different finds as discussed below.

Finding 1 There is water scarcity challenge in the world

According to (IWMI 2007) water scarcity is a major challenge, affecting every continent around the world. Water scarcity occurs when the water demand exceeds the available water supply. Several

groups, including the World Resources Institute and the International Water Management Institute (IWMI), have developed tools to promote a better understanding of where and how water risks are emerging around the world. The IWMI, for example, estimates that 1.2 billion people all most 20 percent of the world's population live in areas of physical water scarcity, where water withdrawals for agriculture, industry, and domestic purposes exceed 75 percent of river flows. An additional 500 million people live in areas approaching physical scarcity.

Another 1.6 billion people live in areas of economic water scarcity, where water is available but human capacity or financial resources limit access. In these areas, adequate infrastructure may not be available or, if water is available, its distribution may be inequitable (IWMI 2007).

Finding 2 Community involvement regarding water management

According to UN (2012b), water scarcity is not solely a natural phenomenon, is also a human phenomenon, a numerous of human activities such as untimely water use, pollution, insufficient or poorly maintained, infrastructure or inadequate management systems can result in or exacerbate water scarcity. As noted by the United Nations, there are adequate water resources to meet our needs, but water is distributed unevenly and too much of it is wasted, polluted and unsustainably managed.

A community's vulnerability to climate change will depend upon the magnitude of the impact and the community's sensitivity and adaptive capacity, According to Kenneth et (1999) the Socioeconomic impacts of floods, droughts, and climate and non-climate factors affecting the supply and demand for water will depend in large part on how society adapts. The poor and those living in developing countries are the most vulnerable because they have fewer social, technological, and financial resources to enable them to adapt

Finding 3 Community's Vulnerability of woman and youth to water scarcity

The previous chapter has clearly shown that, because women remain home while men find jobs in other towns, they are more vulnerable to water scarcity. When the men migrate, they take with them their expertise in technical skills. According to this research, this sphere was considered a male

domain. The researcher has therefore discovered that there is a need for capacity building amongst the women in Aliwal North community. The women have the knowledge about water resources but do not have the financial and technical capacity to maintain water infrastructure. Sometimes they are excluded when projects are implemented and therefore pass up the opportunity to gain the technical skills associated with equipment used. This has proven to be a problem in the past as men or technical help are usually not available in remote areas when needed the most.

Their vulnerability is further influenced by the fact that they are poor as most of them are unemployed as a result; they do not have the financial capacity to deal with water problems.

Another major concern influencing Aliwal North people vulnerability to water scarcity is their involvement and participation in decision making concerning water issues.

Finding 4 Wasted time and extra burden during water scarcity



Figure 36 people in Aliwal north town queuing for water

Although some of the participants in the study have access to water close to their homes, there is always time when they claim to waste a great deal of their time in search for water when there is water scarcity. They wake up before dawn, walk long distances and wait in long queues for water. As shown it diagram above.

Finding 5 on how water scarcity has affected the farming community of Aliwal North

Unexpectedly, the greatest worry for people in Aliwal North is the loss of livestock and crops when there is not enough water, as opposed to the need to have water in their homes. This is due to two reasons. The first one is that some people already receive water for household consumption but do not have access to water for livestock or crops (see diagram below). When there is water scarcity due to drought, the problem is usually intensified because agricultural activities usually become

impossible. According to farmers, during these times, humans find it difficult to survive and it is even worse for animals. “The livestock die because they cannot reach the decreasing levels of water in dams and sometimes they even dried out”. The livestock usually fall while trying to get to water.



Figure 37 animals affected by water scarcity in the area of Aliwal northSource: Agric Eastern Cape Jan, 2016

Finding 6 on institutions & structures involved in water demand management

There are various institutions and structures available for preparedness and response during water scarcity crisis in Aliwal North and this makes it difficult for community members to know who to report to when faced with this challenge. Again, it is the coordination which is lacking. The private sector is virtually playing no role in the process of helping with this problem during the water crisis time while the local authority is more visible at and around the district centre.

The documentation of necessary information is poor with reliance on oral communications. Central government and NGOs provide external support to the people of Aliwal North community in the event of a drought seasons.

There is lack of clarity on who should develop and disseminate drought early warnings while the local authority and civil society players do not efficiently cooperate nor do they fully trust each other.

Finding 7 Lack of knowledge on the community’s climatic changes and variation.

According to information gathered from questionnaires and interviews, it is indicated that people in this community do not have knowledge concerning climate change effects. The area of Aliwal North falls mainly into two climate zones, namely: arid and semi-arid moderate midlands' and arid and semi-arid cold high-lying land. The arid climate of Aliwal North means that there is a normal, long-term shortage of water in the area caused by a dry climate. Rainfall in the area varies dramatically, depending mostly on altitude. Aliwal North is very cold in winter and it rains in summer. The summer rains have a 70 – 80 percent precipitation that occurs in the form of thunderstorms on most occasions. These storms are of high intensity and are sometimes accompanied by hail. Only 20 – 30 percent of the rainfalls occur during winter. As shown in the figure bellow.

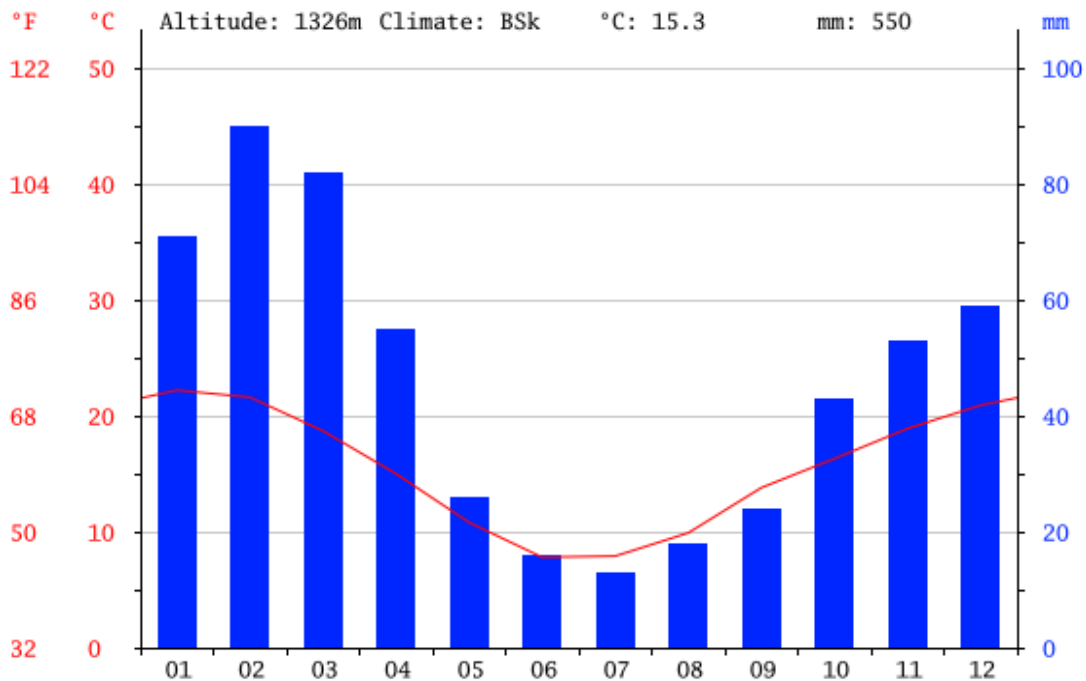


Figure 38 the rain fall pattern of Aliwal North town Source (DWAF, 2002).

During the summer months, the maximum temperature often rises to 40°C in the low-lying areas. Minimum temperatures in winter months in the high-lying areas are often well below zero and frost is a common occurrence throughout the area. As a result of the high summer temperature, surface water evaporates rapidly. The high temperatures are also expected to increase by 5 percent as a result of climate change (DWAF, 2002).

Finding 8 on awareness of water scarcity in the community

The Joe Qgabi district Municipality has instituted public education programs, local committees and media campaigns to promote water conservation. Contests and awards have been part of the activities promoted to increase awareness of responsible and rational water usage.

6.2 Conclusion

Results from the study have shown that Aliwal North is prone to water scarcity as a result of the arid climate, drought, desiccation, poor water supply and lack of infrastructure. Furthermore, the study shows that women are vulnerable to water scarcity as a result of their social, economic and political conditions.

Respondents have further pointed out that, as a result of the area's climactic changes, people living in this area are faced with the negative impact of water scarcity. These people are particularly suffering from to loss of livestock, health problems, wasted time and energy, mostly likely unable to afford water services for nondomestic chores.

The study has, in addition, demonstrated that over the year's people in Aliwal North have developed coping strategies in order to deal with water scarcity. However, these strategies do not help a lot during water scarcity crisis.

The analyses in these chapters have shown the abundant knowledge the people in the Community have collected are as a result of their daily use of water resources and the effects of the lack thereof. The main objectives of the research were to investigate how government structure engage community in capacity building for increased water demand and judging on the participants response to the questionnaires and interviews in the study area it is clear that this objective has been achieved and valuable insight has been gained into the problems faced by the community of Aliwal North.

6.3 Recommendations

From the findings discussed above, it is important to point out a number of specific recommendations that can be implemented in order to move forward in ensuring that people of Aliwal North community can better understand the water scarcity situation in their community and be able to mitigate it in the future.

Recommendation 1 Address how the people in the community use water

Authorities should train the community members on how to maximize the utilization of the available water supplies, and minimize water losses, and try to conserve water resources, promote effective water use efficiency, to adopt with the challenge we face of water scarcity in order to reduce the gap between supply and demand.

Recommendation 2 Water management

Rehabilitation of water infrastructure, water systems, including the main pipelines and distribution lines connecting different areas, should be implemented, in order to achieve the highest possible efficiency in transmission and distribution and minimize and reduce losses as well as the protection of networks of water pollution is important.

Recommendation 3 Regulation and institutions regarding water management

Regulations and instructions should be developed to reduce water losses such as washing cars and watering sidewalks. In addition, limiting the creation of ornamental ponds and water features in homes without recirculating pumps or timers and follow-up periodic maintenances of the household water connections to reduce the dripping in faucets, plumbing leaks, and storage tanks that leak or overflow due to poor maintenance.

Recommendation 4 Accountability for water users

A Water auditing process for commercial and high rise buildings should be conducted on a regular basis in order to identify and monitor the amount of water used, and identify a baseline and benchmark water use. It is crucial to make sure that the actual consumption of water is below the recommended amount set by the specification of maximum water flow of the Joe Qgabi district Municipality. Implementing the water audit process will therefore lead to applying the concept of

optimal efficiency use of water and reduce losses and maintain it, where high rise buildings and shopping malls are among the largest water consumers in the area of Aliwal North.

Recommendation 5 Creating public awareness about water scarcity

Continue public awareness campaigns and water education through several means of communication and media focusing on water scarcity and spreading the culture of awareness and responsibility to protect the water sources and its efficient use. Public awareness programs should be implemented for staff and employee in all sectors (tourism, industrial, commercial, agricultural, etc.), to increase public awareness of importance of water and its efficient use in the community of Aliwal North.

Recommendation 6 Capacitate and empower community members

Developing the capacity of water sector institutions and capacity-building of human resources must be given priorities, through: Organizing training and continuous education programs (whether internal or external training), in particular for those concerned in the implementation of water demand management policy, and provide them with the needed experience and communication through close interaction with relevant parties with experience and knowledge in the field. Training operating and maintenance technicians in all water and water facilities, to raise their skills and enable them to perform various tasks with professionalism and in accordance with best practices for operations, maintenance, planning and management.

Recommendation 7 drought mitigation measures

Finally, drought mitigation measures should be made available to the people of Aliwal North, since it has been proven that, in drought prone areas, it should be clearly indicated to the community members that drought is a natural phenomenon and may occur from time to time. It should be made clear that water scarcity has a negative impact on all sectors, especially irrigated agriculture sector, and therefore it is necessary to develop strategy and action plans to manage the drought crisis, including early warning systems for drought preparedness in the event of an occurrence.

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APPENDIX A



Faculty of Natural and Agricultural Sciences

17-Feb-2016

Dear Ms Kellen Rwiliriza

Ethics Clearance: **Capacity building for increased water demand management.**

Principal Investigator: Ms Kellen Rwiliriza

Department: DiMTEC (Bloemfontein Campus)

APPLICATION APPROVED

This letter confirms that a research proposal with tracking number: UFS-HSD2016/0069 and title: 'Capacity building for increased water demand management.' was given ethical clearance by the Ethics Committee.

Your ethical clearance number, to be used in all correspondence is: UFS-HSD2016/0069

Please ensure that the Ethics Committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the Ethics Committee on completion of the research.

The purpose of this report is to indicate whether or not the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the Ethics Committee should be aware of.

Note:

1. This clearance is valid from the date on this letter to the time of completion of data collection.
2. Progress reports should be submitted annually unless otherwise specified.

Yours Sincerely

Prof. PD (Danie) Vermeulen
Chairperson: Ethics Committee
Faculty of Natural and Agricultural Sciences

Natural and Agricultural Sciences Research Ethics Committee
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APPENDIX B

18 July 2016

ATT: To whom it may concern

RE: RESEARCH LETTER

Good day,

Rwiliriza Namara Kellen, student nr 2009118155, is enrolled for the Masters Degree in Disaster Management at the University of the Free State. Her thesis topic is: Capacity building for increased water management: A case study of Aliwal North Community.

Please be so kind as to assist her, as you may benefit from her study.

Kind regards



Prof. A.J. Jordaan
Director: UFS-DiMTEC

APPENDIX C

The Joe Qgabi District Municipality

Satellite water service office

Smith Street.

19/07/2016

Dear Sir/Madam

REQUEST TO CONDUCT RESEARCH

I am applying for a permission to conduct research in Aliwal North town. Part of the research includes the community awareness for increased water demand management. I am studying a master's degree in disaster management at the University of the Free State. My research topic is the following: **The Capacity Building for Increased Water Demand Management in the Community of Aliwal North** My email address is kbarigira@yahoo.com in case you might want to contact me and Cell phone 0834664155.

The main objective is to investigate how the government structures engage in building the capacity of the Aliwal North community for increased water demand management.

- To investigate what kind of knowledge that the community in Aliwal North receives about water demand in the area
- To assess the extent to which women and youth are aware about the water scarcity challenge in this community.
- To examine how the knowledge and information of increased water demand management is shared in this community.
- To propose ways of strengthening awareness of the Aliwal North community on the water scarcity challenge through the knowledge of working with the community in water scarce areas, promoting community participation and involvement.

I hope you will take my request into consideration

Yours sincerely

Rwiliriza Namara Kellen



APPENDIX D

UNIVERSITY OF THE FREE STATE

Disaster Management Training and Education Centre for Africa

RESEARCH QUESTIONNAIRE

Introduction

My name is Rwiliriza Namara Kellen, a student at the University of the Free State studying a master's degree in Disaster Management. I am carrying out research on ***Capacity Building for increased Water Demand Management***. You are invited to participate in this research by providing your views and your contribution will be highly appreciated. You are welcome to leave out any question that you are uncomfortable with or to withdraw if you feel so. The data collected will be kept strictly confidential and the findings will be used for academic purposes only.

Instructions

Please, indicate your choice with an “X” in the boxes provided. You may also add your comments in the spaces provided.

Community area _____ Date of the interview _____

Demographics

Question 1

What is your gender?

1	Male	
2	Female	

Question 2

What is your age group in years?

1	Between 16 to 18	
2	18 to less than 25	
3	25 to less than 35	
4	35 to less than 45	
5	45 to less than 60	
6	Above 60	

Question 3

Which one applies to your marital status?

1	Single	
2	Married	
3	Widowed	
4	Separated	
5	Divorced	

Question 4

What is your household size?

1	Less than 2	
2	2 to 5	
3	5 to 9	
4	9 to 12	
5	More than 12	

Question 5

Is any member of your household disable?

1	Yes	
2	No	

Question 6

What is your highest level of education?

1	No schooling	
2	Primary school	
3	'O' level	
4	'A' level	
5	Diploma	
6	Degree	

Water Sources

Question 7

Which of the following source of water do you use for daily consumption? (You may tick more than one where applicable)

1	Tap	
2	Borehole	
3	Well	
4	Bottled	
5	River	

Question 8

If the community get drinking water from the tap water, borehole and water others. Who is the source of water provider?

1	Municipality	
2	Buy water from other community members	
3	Non-Governmental Organizations	
4	Others, specify	

Question 9

How do you rate the water you use for domestic purpose?

1	Very bad	
2	Bad	
3	Average	
4	Good	
5	Very good	

Question 10

Have you ever used water from Orange River for any purpose?

If yes, specify

Question 11

Do you think the water is enough of for the whole town?

1	Yes	
2	No	

If no, what do you think the Community should do?

Question 12

Are you aware of the water scarcity in Aliwal North Town?

1	Yes	
2	No	

If yes, what are some of the causes of water scarcity in this town identified? _____

Social Impact of Water Scarcity

Question 13

Have you suffered from a water related disease(s) ever since you started living in this community?

1	Yes	
2	No	

If yes, state the disease(s) _____

Question 14

Do you know anyone in this community who has been affected by a water related disease?

1	Yes	
2	No	

Question 15

If yes to which of the following disease did the person suffer from? (Multiple responses are possible)

1	Diarrhea	
2	Cholera	
3	Typhoid	
4	Bilharzia	
5	Skin disease	
6	Cancer	
7	Other diseases, specify	

Indicate to what extent you agree or disagree with the following statements:

Question 16

Water scarcity is a threat to my life

1	Strongly disagree	
2	Disagree	
3	Neutral	
4	Agree	
5	Strongly agree	

Question 17

Lack of water has same times affected the livelihood of the people of this community

1	Strongly disagree	
2	Disagree	
3	Neutral	
4	Agree	
5	Strongly agree	

Question 18

When there is no water in this town briefly state how this affects your daily activities?

Environmental Impacts of Water Scarcity

Question 19

Do you cultivate around this area?

1	Yes	
2	No	

Question 20

If yes has the water scarcity affected your crops?

1	Yes	
2	No	

If yes, specify the crops and how they were affected?

Question 21

Water scarcity affected the wells and boreholes in the area?

1	Yes	
2	No	

If yes, how were they affected?

Question 22

Has water scarcity affected the farming around the Aliwal North Community?

1	Yes	
2	No	
3	Not aware	

If yes, specify how the farming has been affected?

Question 23

Has scarcity water lead to the death of animals around this Aliwal North Community?

1	Yes	
2	No	
3	Not aware	

Preparedness

Questions

Indicate by marking an “X” how you feel about the following statements:

What is the community’s ability to prepare, cope and reorganize?

	1	2	3
Statement	Disagree	Neutral	Agree
24. Our community has plans in space to deal with water scarcity issues.			
25. Our community is capable of coordinating activities to respond to the impacts of water scarcity			
26. Our community members work well with one another			
27. Our community has an institution that helps us to effectively cope with water scarcity issues			

Mitigation Measures

Question 28

What in your own option do you think can be done to reduce water scarcity in this community?

Question 29

Do you think developmental water projects are important to your community?

1	Yes	
2	No	

Legislations

Question 30

Are you aware of any water management law(s)?

1	Yes	
2	No	

If yes, specify which law(s) you know

Interview Guide

Occupation _____

Years of service _____

Dept, Organisation, Municipality _____

Introduction

My name is Rwiliriza Namara Kellen, a student at the University of the Free State studying a master's degree in Disaster Management. I am carrying out research on ***Capacity Building for Increased Water Demand Management in Aliwal North community***. You are invited to participate in this research by providing your views and your contribution will be highly appreciated. The data collected will be kept strictly confidential and findings will be used for academic purposes only.

Questions

1. How do you rate water availability in this area? _____

2. Are you aware of water scarcity in this area?

3. What do you think is the cause of water scarcity in this area?

4. How has the livelihood of the community members been affected by the effects of water scarcity?

5. How are the crops and the vegetation reacting to the effects water scarcity challenge?

6. Did the animals in the community experience some problems during water scarcity?

7. How prepared is the community of Aliwal North to the effects of water scarcity?

8. What are the activities that are being carried out to reduce the impacts of water scarcity in this community?

9. How do the government and other Non-Governmental Organisation assist the community during the time of water scarcity?
