THE EFFECT OF METOLONG LOWLANDS WATER SUPPLY SCHEME (MLWSS) ON THE LIVELIHOODS OF THE CATCHMENT COMMUNITIES

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DECLARATION

In order to comply with regulations of the National University of Lesotho, I hereby confirm that, this dissertation is the original work of the author and has not been previously submitted to any University. Where the work of other people has been used, it has been acknowledged and referenced accordingly.

Signature of the Researcher……..Date……

Signature of the Supervisor……..Date……

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LIST OF ACRONYMS

AGOA	Africa Growth and Opportunity Act
CBL	Central Bank of Lesotho
COVID	Corona Virus
DPE	Development for Peace Education
DFID	Department of International Development
DMA	Disaster Management Authority
DRC	Democratic Republic of Congo
DRWS	Department of Rural Water Supply
FAO	Food Agricultural Organisation
GNP	Gross National Product
GDP	Gross Domestic Product
GOL	Government of Lesotho
GSP	Generalised System of Preferences
HDR	Human Development Report
IDRC	International Development Centre
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
KIHBS	Kenya Integrated Household Budget Survey
KNDHS	Kenya National Demographic and Health Survey
KNWRMS	Kenya National Water Resource Management Survey
LDCs	Least Developed Countries
LHDA	Lesotho Highlands Development Authority
LLWS	Lesotho Lowlands Water Supply

MDGs	Millennium Development Goals
MLWSS	Metolong Lowlands Water Supply Scheme
MW	Ministry of Water
NSDI	National Strategic Development Plan I
NUM	National Union of Mineworkers
OCHA	Office for the Coordination of Humanitarian Affairs
ODI	Overseas Development Institute
RSA	Republic of South Africa
SSA	Sub-Saharan African
SIWI	Stockholm International Water Institute
SMEC	Snowy Mountain Engineering Consultancy
USA	United States of America
UN	United Nations
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNGA	United Nations General Assembly
WASA	Water and Sewage Authority
WASCO	Water and Sewage Company
WFP	World Food Programme
WHO	World Health Organisation
WSS	Water Supply Scheme

ABSTRACT

Many developing countries are branded by high levels of poverty and water-borne diseases caused mainly by water shortage. There are diverse factors that cause water shortage in many developing countries and erratic climatic changes are some of them. Severe drought is identified as the leading factor. Various measures are applied to resolve the state of water shortage in these countries and construction of dams/reservoirs to create water supply schemes is the overriding measure.

The Lesotho Government has constructed several dams to secure availability of water since the mid-1980s. The Metolong Lowlands Water Supply Scheme (MLWSS) was constructed and implemented from 2008 to 2015 and is expected to make available 75,000 m3 of treated water per day to respond to the shortage of water and industrial requirements for at least the next 40 years in the urban-lowlands areas of Maseru and the neighbouring towns as a result of an increasing water demand for domestic consumption and industrial use including urbanization in the Lowlands. This profoundly study aims to investigate the effect of the Metolong Lowlands Water Supply Scheme (MLWSS) on the livelihood of the communities in the catchment areas to achieve the following objectives: The effect of MLWSS on the livelihoods of the catchment communities, the people's coping mechanisms of the in the catchment areas and the challenges of the unconnected households.

The findings from this study indicate that MLWSS is beneficial to the households within the four concerned councils: Qiloane, Manonyane, Mohlakeng and Mazenod. The government provides them with water access which they would otherwise be unable to access. However, the problem still lies with those who are not connected to the supply network. This has improved the livelihood for many households because they were able to engage in other (new) means of livelihood to sustain their family needs.

The data obtained from the selected study councils indicates that water and land are important requirements for agricultural production and other commercial engagements such as bricks production and car washing. Irrespective of whether agriculture is for subsistence or commercial, water and land prove to be the fundamental pre-conditions of effective agricultural production. The study reveals that some households adjacent to the water belt were not connected to the water supply. Consequently, they resorted to illegal connections to survive.

CHAPTER ONE

1.1. Introduction

The significance of water in livelihoods development has been overemphasized by many research studies such as Slaymakeretal 2007, Thompson et al 2001 Joshi, 2004. These studies show a general correlation between improvements in levels of access to Water Supply Scheme (WSS) and the overall development of livelihoods. Access to improved domestic water supply contributes to improvements in agricultural productivity through access to water for irrigation and minimises health impacts. It also leads to other benefits, including improvement in income and savings at household level and reduces poverty (Slaymakeretal, 2007). The benefits associated with improved access to water supply extend far beyond time savings and health (Thompson et al, 2001). The small-scale productive uses of domestic water supplies are often an important source of additional food and non-food income at household level (Joshi, 2004).

People require water for a wide range of activities essential to their livelihoods. They need water to address both domestic (drinking, washing, cooking and sanitation) and productive needs (vegetable gardening, livestock, brewing beer, brick making, etc). Supplying water for these needs can contribute to poverty alleviation and employment. However, formal domestic water services often fail to address the water needs in an integrated way (Smits, 2005).

The focus of water supply is usually on the health benefits and not on the other livelihood impacts that water can bring and these impacts are less well documented and accepted, although they are realistic. Cairncross et al. (2003) argue that the discrepancy between the needs of people and the design and management of water services leads to a number of problems, particularly by failing to capitalize on the benefits that cater for multiple needs, sometimes jeopardizing the sustainability of water services (Cairncross et al, 2003).

In situations of chronic poverty where there is food insecurity, certain groups of people may not be in a position to realise the economic benefits of the WSSs (Ariyabandu & Aheeyar, 2004). Improved access to WSS plays an important role in preventing further destitution. Where WSS facilities are provided, they capacitate people with livelihoods and relieve them from shocks and stresses of not being able to achieve basic food security (Aklilu & Wekesa, 2001).

Given the prevailing concern with food security and issues of livelihood risk and vulnerability, including resilience in the face of increased climate change everywhere in the world, there is a need to better understand how livelihoods of different groups of people in communities around the Metolong Water Supply Scheme catchment areas are affected.

1.2. Background

Studies show that there is a high demand for water globally due to the continuous population growth at the rate of over 100 million people each year (International Commission on Water, 1999). Twenty-five African countries are expected to face water scarcity or stress by 2025 and fourteen of them are already experiencing water stress (African Studies Centre, 2012). In sub-Saharan Africa, 334 million people lack access to clean water while around 600 million lack access to sanitation (Greve, 2013).

In some regions, urban water insecurity is exacerbated by increasing numbers of prolonged and severe droughts. These repeated water shortages create perceptions of government failure, deepen social inequalities and intensify existing tensions. Securing urban water supply is crucial, since the number of urban residents living with seasonable water shortages is expected to grow from close to 500 million people in 2000 to 1.9 billion in 2050 (World Bank, 2014).

The International Commission on Large Dams (1999) has stated that one of the best ways to manage water resources is through the construction of large dams for the storage and future distribution. The dams have been successfully used in history to collect, store and manage water for a sustainable community. Large urban areas rely heavily on water from dams, especially in dry areas and in drier cycles with low rainfall. Regionally, dams have had a positive impact regarding job creation, regional development and water supply for irrigation which leads to food production and generation of electricity which stimulate economic growth (Water Commission on Water, 2000).

However, these positive benefits can be offset by many negative impacts, caused by construction of dams, especially on the livelihoods. The storage and supply of water to the communities have been very important for the catchment areas experiencing drought or in areas having rainfall that is seasonal to maintain the means of livelihoods that would otherwise be affected negatively by the shortage of water or limited supply (Bashir, 2011).The supply of water has therefore been very useful for supporting agricultural irrigation activities. In many regions, especially during dry seasons, irrigation is required for

growing crops as a way of increasing productivity in communities (International Commission on Water, 1999).

The economy of Lesotho relies heavily on agriculture, livestock, manufacturing, mining and water export (GOL: undated). Production in all these sectors requires a reliable water supply, thus the storage treatment and distribution of water are essential pre-conditions for the functioning of the sectors that constitute the Lesotho economy. Agriculture, which comprises the key source of livelihood and subsistence for Basotho, is predominantly dependent on both accessibility and availability of water. Lesotho's poverty is closely linked to its dependence on rain-fed subsistence farming (World Bank, 2010).

Agriculture is the livelihood of most peri-urban and rural residents, considering that 75% of them participate in agricultural practices (OCHA, 2013). IFPRI (2021) takes cognizance of the fact that agriculture is primarily a rural activity that provides the livelihood of most rural residents and employs 60-70% of Lesotho's total labour-force; however, it only accounts for approximately 10% of the Gross Domestic Product (IFPRI, 2012).

The annual cereal production in Lesotho has been shrinking since the 1970s. According to World Food Programme (WFP), in 1980 the domestic cereal production met about 80% of the national requirement but had dropped to 50% in the1990s and to 30% by 2004 (UN WFP, 2009).In 2012, the annual cereal production was at the lowest point in ten years at 32% of the normal harvest (UN 2012) due to the water shortage related to the weather extremes which obviously have a negative effect on food production.

An example is that in 2007, when Lesotho was experiencing a severe drought caused by a combination of high temperatures and low rainfall (water shortage), there was large scale damage to crops and an accompanying decline in food production. The drought conditions, compounded by other sub-standard social and economic conditions, increased the number of vulnerable people in Lesotho (FAO, 2008). The maize prices increased by over 35% in 2008 (FAO, 2008). The decreased food production and the high food prices left more people in need of food assistance. The impact of these natural conditions on food production and on human security in Lesotho was severe considering that in the first quarter of 2008, an estimated 400 000 people faced food shortages (WFP, 2009).

Other water-related condition, namely the extremely heavy rains, also caused destructive effects on agriculture in Lesotho. For example, the heavy rains of December 2010 and January 2011 devastated crops in most parts of Lesotho (Irin News, 2011).

According to the Lesotho Food Security and Vulnerability Monitoring Report of 2011, the damage caused by flooding reduced the yields of maize (the stable food of Basotho (the people of Lesotho)) by an average of 62 percent compared to the previous year (GOL- DMA, 2011). These floods have also compounded the already existing food insecurity situation.

Out of a population of over two million, an estimated 514 000 needed humanitarian assistance in 2011, twice the number that needed assistance in 2010 (Irin News, 2011). In August 2012, and as a result of the food insecurity, the Prime Minister of Lesotho declared a food crisis situation and called on the Development Partners, such as the European (EU), United Kingdom (UK), China and the United States of America (USA) to assist Lesotho (GOL, 2012b).

The water related weather extremes in Lesotho worsened the food insecurity of the already vulnerable groups, especially the poor rural populations that depend on agriculture for their livelihoods. The lack of investment in irrigation causes farmers to depend on uncertain rainfall land makes agricultural produce to be vulnerable to the effects of erratic weather conditions, causing waning livelihoods and economic conditions for Basotho. Lesotho's poverty is closely linked to its dependence on the rain-fed subsistence farming (World Bank, 2010). Furthermore, limited irrigation and underdevelopment of water infrastructure increase the vulnerability of the rural economy to water shocks (World Bank, 2010).

With the realisation that water shortage for the lowlands communities was not addressed, GOL built the Metolong dam to curb water shortage in the lowlands. In 2015it targeted supplying water to the Lesotho's capital city, Maseru, and the neighbouring towns of Teyateyaneng, Roma, Mazenod and Morija in order to increase the demand for industrialization and urbanization in the lowlands. The Metolong dam became the first large lowlands water supply for domestic (including sanitation) as well as the industrial use (SMEC, 2007).

The government identifies the expansion of water and sanitation distribution services to the industries, commercial centres, households and other institutions. It is also responsible for the expansion of water harvesting infrastructure, as part of a strategy to enhance economic growth and reduce poverty in the country (IMF and GOL, 2012). This study seeks to examine the impact of the scheme on the livelihoods of the communities in the local councils' catchment areas of the Metolong Lowland Water Supply Scheme.

1.3. Statement of the Problem

Despite the efforts being made to harness the water through the Metolong dam in order to resolve the problem of water shortage in the catchment areas, the communities continue to suffer from water shortages. The agricultural sector and livestock husbandry which largely depend on the availability and access to water comprise the key means of livelihood for Basotho; therefore, the water shortage undeniably causes adverse effects on the livelihoods and well-being of communities. These effects range from shortages for domestic consumption, poor agricultural production, and insufficiency for commercial activities which constitute the fundamental daily survival of the affected communities. The perpetual inability to perform the aforesaid activities leads to poverty, illness and unemployment.

1.4. Aim of the Study

The aim of the study is to investigate the effect of the Metolong Lowlands Water Supply Scheme (MLWSS) on the livelihood of the communities in the catchment areas.

1.5. Research Objectives

The objective of the study is to identify the means of livelihoods of the communities in the catchment areas before MLWSS

- To investigate the effect of MLWSS on the livelihoods of the catchment communities
- To examine the people's coping mechanisms of the in the catchment areas
- To investigate the challenges of the unconnected households

1.6. Significance of the Study

Investigating how the Metolong Lowlands Water Supply Scheme has impacted on the livelihood of the communities in the catchment areas does not only add to the already existing research but it also influences policy direction. Projects of this nature have proved to negatively impact on people's livelihood across the world. The study may eventually guide the relevant stakeholders in policy formulation to address some of the challenges that are affecting the people's livelihoods in the catchment areas.

Addressing these challenges will probably not only improve people's livelihoods but will also minimise other challenges that face the society. These are the challenges related to poverty, unemployment and food insecurity. The study will provide the basis for how the sustainable

means of livelihood can be promoted at household and community level, thus suggesting mechanisms for reducing poverty and increasing the economic growth for the country.

1.7. Organisation of the Study

This study comprises six chapters:-

Chapter I introduces and provides the background to the study. It further gives the statement of the problem, the research questions, as well as the aims and objectives. The chapter explains the significance of the study.

Chapter II presents the literature review, drawing attention to the water supply from the large dams and their impact on the livelihoods of the communities. The chapter also presents the conceptual and theoretical frameworks which frame this study.

Chapter III presents the methodology which entails the research design, the data collection methods, the study population, the sample size, the sampling techniques and data analysis techniques. The study limitations and ethical considerations are also presented in this chapter.

Chapter IV presents the findings of the study.

Chapter V presents and discusses the findings of the study, giving their full meaning in relation to the literature and theories which framed the study.

Chapter VI presents conclusions of the study and makes some recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter reviews the empirical literature related to the water supply schemes and their overall impact on the development of livelihoods for the affected communities in the catchment areas globally, regionally and nationally. The researcher identifies the theories relevant to the study on water supply schemes and their impact on the livelihoods of the communities in their catchment areas.

These theories will further form a framework within which to present and analyse the findings of the study. It further reviews the literature on the coping strategies adopted by communities to address water shortage in order to explain how far the efforts of responding to water shortage are. The chapter comprises three sections, the conceptual framework, the theoretical framework and the empirical literature which frames the study.

2.2. Conceptual framework

A conceptual framework binds facts together and provides guidance towards the collection of appropriate data or information (Katani, 1999). In this study the main concepts to be studied are: livelihoods, livelihoods resources, water supply schemes, communities in catchment areas, large dams/reservoirs and water use.

2.2.1. Livelihoods

Chamber and Conway (1992) refer to livelihoods as comprising people, their capabilities and their means of living, including food, income and assets. A sustainable livelihood is one which can cope with and recover from stress and shocks and provide for future generations (Chamber and Conway, 1992). The livelihoods framework is a way of looking at the complexity of people's livelihoods, especially the livelihoods of the poor, whether they are rural or urban. It seeks to understand the various dimensions of one's livelihoods; the strategies and objectives pursued and the associated opportunities and constraints (Chamber and Conway, 1992).

There are various ways of conceptualising the components of a livelihood and the influences it. Its essential features can also apply to both rural and urban livelihoods (Drinkwater and Rusinow, 1999). Livelihood encompasses the stocks of natural resources from which further resources and services can be developed and which may prove useful to livelihoods. Within

the framework for sustainable livelihoods, the relationship between the natural capital and the context of vulnerability is very close (Carney et al., 1999).

Natural capitals (land and soil) and the services that they contribute (including food production, woods and forest resources, water, protection from erosion, water supply, biodiversity, environmental resources the skills and knowledge) are important because they give one the ability to pursue different livelihood strategies.

Capability, equity and sustainability are the fundamental means and ends of sustainable livelihoods. Livelihoods are the capabilities, assets/capitals and activities (including both material and social resources) required to make a living. The assets are the means of production (natural, social, political, human, physical and financial capitals) available to a given community that can be used to generate adequate material resources for the community's survival (Sen, 1985).

The livelihoods assets are the resources that communities in the catchment areas own or have access to them in order to attain their livelihood outcomes. These are composed of five assets. The human assets include community capabilities; the natural assets refer to access to land and water; the physical assets constitute equipment and technologies; social assets address social relations and affiliations while the financial assets refer to a community capital base.

The livelihoods that people make, according to this definition, depend on the assets and people's capabilities; such a view acknowledges the fact that people are active agents. Wallman (1984) perceives livelihoods as more than just a matter of finding or making a shelter, transacting money, preparing food for home consumption or for exchange in the market place. It is also a matter of asset ownership and social relationships that affirm personal significance, group identity and inter-relation with each other. Water shortage comes in various forms, including exclusion from network connection, a prevalent situation now for some Metolong water belt catchment communities.

2.2.2. Livelihood resources

Scoones (2009) refers to livelihood resources as the basic material and social, tangible and intangible assets that people use for constructing their livelihoods. They are conceptualized as different types of 'capital' to stress their role as a resource base and these resources or assets are natural, economic or financial, human and social capital. Another capital asset that was added by DFID was physical capital.

Scoones (2009) further describes natural capital as the natural resource stocks such as water, soil and air, among others. Apart from natural capital, livelihood also depends on economic or financial capitals, such as infrastructure, production equipment and technologies, are critical in pursuit of any livelihood. This implies that a livelihood relies ona number of other factors among which is the availability of water.

In this context human capital is referred to, as skills, knowledge, ability to labour and good health and it is important for the pursuit of different livelihood strategies. Social capital refers to social resources that is the networks, social claims, relations, affiliations and associations upon which people draw when pursuing different strategies.

Grey-Gardner, (2008) has summarized the livelihood assets as natural (water availability, quantity and quality), human (skills, knowledge, ability and health), physical (water supply infrastructure, equipment, maintenance materials (including tools); financial resources (the savings, grants, pensions, loans) and social (quality of social networks and relationships).

2.3. Water supply schemes

According to Glossary of Environment Statistics (1997), the term, water supply schemes, refers to the provision of water by public utilities, commercial organisations, community endeavours or by individuals, usually through a system of pumps and pipes under a well-defined scheme. It is also defined as a system for collection, transmission, treatment, storage and distribution of water from the source to the consumers for various uses such as domestic consumption, commercial establishments, industries, irrigation.

Smits (2005) stresses that, people require water for a number of essential activities to their livelihoods, including both domestic (e.g. drinking, washing, cooking, sanitation) and productive needs (vegetable gardening, livestock, brewing beer, brick making etc). Access to adequate water supply is perceived to have ability to enhance a wide range of assets both tangible and intangible.

2.3.1. Communities in catchment areas

The Cambridge Dictionary (2019) describes the catchment community as the group of people working together, people who identify with a geographical area, usually based on a river or lake catchment or who connect socially within a farming district.

2.3.2. Dams/reservoirs

Reservoirs are those water bodies formed or modified by human activity for specific purposes, in order to provide a reliable and controllable resource (Thornton, 1992).

2.3.3. Water use

White et al. (1972) described water according to the following uses: consumption, hygiene and amenities. Water for consumption refers to the water content in beverages and food. Hygiene refers to the minimum water to wash one's body, clothes, utensils, food, clean the home and for sanitation. Amenities refer to other uses which include bathing, watering gardens, washing cars. Through these categories, water utilized or consumed may vary from each item that may cause a vulnerability to the household assets.

International Commission on Water (1999) states that, one of the best ways to conserve and manage water resource is through the construction of large dams for the storage and future distribution. The primary benefit of dams and reservoirs in the world is the water supply. Other key purposes and benefits include irrigation for agriculture (food production), flood control, hydropower, inland navigation and recreation (International Commission on Large Dams, 1999).

The direct positive social effect of water supply schemes through construction of dams can induce multiple indirect positive benefits ranging from improved nutrition, enhanced incomes, flood protection, water storage for consumption, industrialization and irrigation, creation of job opportunities and acceleration of economic growth (Cernea, 2004).The construction of dams, especially large one enable people to store water and collect it in reservoirs in areas that experience drought or seasonal rainfall (Bashir, 2011). This water storage and supply is useful for supporting agricultural irrigation activities in many regions of the world, especially during the dry seasons. Irrigation is required for growing crops for increasing productivity (International Commission on Water, 1999).

In the same manner, the Metolong water supply scheme is intended to assist the areas in its catchment with water. However, this research study is intended to show how the water supplied to these areas impacts on the livelihood of the households in such communities.

2.4. Theoretical framework

2.4.1. Introduction

This section discusses the theoretical framework which is applied for conducting the study. It hinges mainly on the sustainable livelihoods framework and water supply reliability theories which define the extent of their theoretical influence regarding this study.

2.4.2. Sustainable livelihoods framework theory

The sustainable livelihood framework refers to the capabilities, assets (material and social) and activities which are available to impoverished community living together for sustaining livelihood (Chambers, 1995 and UNDP, 1999). The sustainable livelihood framework focuses on household livelihoods, including both intra- and extra-household social relations (Murray, 2001). The sustainable livelihood framework requires the understanding that the poor move in and out of relative poverty as they respond to the opportunities, shocks and social, economic and environmental-stress which they experience (Moser, 1996 and Chambers, 1995).

Chambers and Conway (1992) write:

> "*A livelihood comprises capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable if it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term."*

This approach has increasingly been adopted by many development institutions in the analysis of processes through which individuals and households use all or part of it in their reach to make their living.

This approach is people-centred and analyses people's livelihoods and how they have been changing overtime. It recognises people's views as valuable and fully involves them in decision making processes. Ellis (2000) describes assets as a 'stock of capitals that can be utilized, directly or indirectly, to generate the means of survival of households or to sustain their material well-being at different levels above survival.

Furthermore, one's assets are not merely the means through which a person makes a living, but also provide a meaning to the person's world. To some extent, they are, also reflections and components of the means which one has tried to create through their livelihood strategies. These assets are not simply the resources that people use in building livelihoods, but they are also assets that give them the capability to act accordingly (Bebbington, 1999).

This definition indicates the importance of assets as a means to empowerment. Thus, some livelihood activities may help people to achieve their various objectives and empower them while others may place them in a vulnerable position. People can realize their potential through the assets that they have. However, what an asset is and the importance that people attach to assets may vary according to time and context.

A similar approach is found relevant to this research study because the views of the affected communities form the basis of analysis to reflect how MLWSS has affected their livelihoods with households at the catchment areas being at the centre of the impact.

2.5. Water Supply Reliability Theory

The theory discusses the significance of water supply reliability and analyses the effects of water shortage on livelihoods. The theory can be studied as a social problem in social sciences or purely as a natural course to analyse community livelihoods. Social scientists such as: Damelin and Arad (1972) have used a number of theories to understand water supply schemes such, as water system reliability and its effects on the livelihoods of the concerned communities.

The water supply system reliability theory defines "reliability as probability that a given reliability factor will be achieved, and can be increased by adding facilities, storage, pumping capacity and pipelines (Damelin and Arad, 1972)." It influences one to perceive that, for an adequate water supply to prevail, the water supply system must be reliable. Water supply system reliability is defined in terms of the shortages that result from failures of the system's physical components such as its network design and used materials for water distribution. In the case of MLWSS, the issue of network design to connect all the en-route villages has been a concern of the villagers and their respective authorities since the inception of water supply.

The water management and distribution institutions have the onus to provide the required water supply reliability. Therefore, the theory explains the need for reliability assurance for MLWSS with regard to the catchment communities to avoid the adverse effects of the

system's failure to supply water. It proposes some control and improvement measures that need to be applied by water management institutions.

This research study is intended to disclose the socio-economic vulnerabilities imposed on catchment communities affected by MLWSS. The livelihoods approach constitutes the core of analysing how the MLWSS has affected the catchment communities, by showing theoretically and empirically how the water supply scheme from the downstream conveyance system and network supply, has affected the households' livelihoods.

The findings focus on the changing livelihoods of the households and explain why and how they do so. In this way the analytical framework makes people to be located at the centre of the inquiry, as suggested by the livelihoods approach which frames this study.

2.6. Empirical Literature

2.6.1. Introduction

This section presents the literature review on the water supply-livelihoods nexus with reference to water and food security as well as water and human security in order to examine the relationships between water supply schemes and the means of livelihoods in these areas.

2.6.2. The water supply-livelihoods nexus

Water is an indispensable resource that affects human beings existence. It is also vital for food production, energy production, health, economic activities and many other aspects that are essential for human survival and the performance of the state. This necessitates the management of water to be approached in a sustainable manner in order to achieve water security (Jansky, Pachova and Nakayama 2008).

Water security means to an access to good quantity and sufficient quality of water to satisfy the basic needs as well as other necessities for healthy and productive living. Water security manifests itself from the individual, community, national to the international levels (Jansky, Pachova and Nakayama 2008). Due to its inevitability to peoples' survival, water is inextricably intertwined with human life security. It helps people to attain their basic necessities of life, including the food production which is also the basic component of a livelihood.

2.6.3. Water and food security

As far back in 1974, the World Food Summit has defined food security as the "availability at all times of adequate world supplies of basic food stuff to sustain a steady expansion of food consumption and to offset fluctuation in production and prices" (UN, 1975). It was further defined as the general availability of food with no specific referent object and no specific value to be protected.

According to FAO (2001), this definition has changed overtime and identified individuals, households, nations and regions as referent objects of food security; and the values to be protected are dietary need and food preferences for active healthy living. Food security is also viewed as a situation that exists when all people at individual, households, national, regional and global levels have physical and economic access to sufficient, safe and nutritious food to meet their dietary need and food preferences for an active healthy life. Water is critical for food and crops production through agriculture and livestock need water to grow. Agriculture as the main source of food human beings requires large quantities of water for irrigation and good quality water for various production processes (FAO, 2001).

A decade later, in 1983, the FAO further expanded this definition to include securing access by vulnerable people to available supplies, "ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 1983). In 2001, FAO further defined food security as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary need and food preferences for an active and healthy life.

Manda (2002) considers agriculture as a fundamental panacea for development in many developing countries and is usually measured in terms of increased production and productivity. Specifically, agriculture is an important factor in the improvement of the living standards of the rural people and farmers in particular. Additionally, this ultimately necessitates the developing countries to emphasise on shaping up the future of agriculture, expanding the market opportunities coupled with a shift in production and export of farm commodities (Manda, 2002).

2.6.4. Water and human security

Poverty is explained as an individual state of deprivation whereby the opportunity and choice of most basic to human development are denied (UNDP, 1996). It contributes to ill health, food insecurity, the impeded growth of children, a lack of education and skills development,

as well as other factors related to human development. Therefore, an effective water management can reduce poverty by enhancing livelihoods, reducing health risks, reducing vulnerability to water related threats (WHO, 2009). Moreover, an effective water management contributes to improving human security, whereas the mismanagement of water resources can lead to forced migration, underemployment and social instability and deteriorating human security conditions (Moench, 2002).

Thus, water is essential for food production, energy production, health, economic activities and other factors that affect human security (UNDP, 1996).With the cognizance of the centrality of water to human development and human security, the supply of water to the communities and households plays a significant role in influencing their means of livelihood. However, climate change poses risks associated with the maintenance of these livelihoods. The unfavourable atmospheric conditions created by emissions of green gas adversely affected the climatic systems thus leading to water scarcity in some areas. It is imperative to show that Lesotho as well is prone to these adverse results which may also impact negatively on the livelihoods of the communities.

Government of Lesotho (GOL) (2007) indicates that, Lesotho is highly vulnerable to the impact of climate change as it experiences frequent droughts and heavy rains that have a damaging impact on its environment. More than 300 000 households in Lesotho depend on agriculture, fishery and livestock watering activities (Olaleye and Sekaleli, 2010). This means that Lesotho needs more water resources to serve the national needs, mainly to support households and communities to aggressively diversify livelihoods and reduce poverty. The country has embarked on the MLWSS project as a large-scale water supply project to serve communities in its catchment areas with water which, among others, was to influence the means of livelihoods and reduce poverty amongst the households and communities themselves on the supply belt.

2.6.5. Water and economic security

Bajpai (2000) asserts that, one of the benefits of water supplied to the communities and households is that they are able to generate economic gains in the form of income. The economic security provides an enjoyment of basic income that contributes significantly to livelihood enhancement of an individual.

Water resource provision impacts positively on the country's economic security and livelihoods of its citizens and communities, but, may also cause economic loss and growth constraints. Lack of access to reliable and safe water can result in financial loss to business operations and consequently lead to a loss of employment (Grey and Saddoff, 2006).Lesotho's vulnerability to water shortage means- invariably investing in water storage and supply for irrigation in order to enhance economic security to improve livelihoods of the households and the country at large.

2.6.6. Water supply schemes and their effect on the livelihoods

2.6.7. Vulnerability context

This section aims to identify the losses (vulnerabilities) and achievements (positive changes) of the households from the MLWSS. Vulnerability is a concept analysed in various livelihood studies including Chambers, (1990), Moser, (1998) and Ellis, (2000).

Chambers (1990) defines vulnerability as "defencelessness, insecurity, and exposure to risk, shocks and stresses as well as difficulty in coping with such situations. Chambers also points out that, losses can result in economic impoverishment, social dependence, humiliation and psychological harm. The ability of individuals to withstand stress, shocks and risks depends on a range of factors, including individual or household levels of human and physical assets, production, income and consumption, and, importantly, the ability of individuals or households to diversify their sources of income and consumption, in order to effectively reduce the effects of the risks that they face at any given time."

Nicol (2000) further states that in the sustainable livelihood framework, the water sector is critical in getting an understanding of vulnerability context within which rural people gain and secure access to water resources. Moreover, that access and water security are determinants of local level processes including norms and customs, local property rights regimes and local economic factors related to water issues.

Nicol, (2000) argues that vulnerability is not exclusively caused by physical factors and that it is also the risk and vulnerability to livelihoods through unstable social, physical and political environments which see voting controlled through patron-client networks and local processes of decentralization captured by elites. In addition, social vulnerability may relate to fragmentation caused by adverse social processes, age-sex composition of the households and communities and the ability to overcome the challenges posed by heterogeneity and extremism.

Twigg (2001) further stipulates that vulnerability context affects livelihood assets and vice versa. Policies and institutions as well as process have a two-way impact. It is, therefore, important to note that when there are favourable government policies and processes, they result in reduced shocks and negative effects on people's livelihoods. Any deprivation of any of the livelihood assets/capital may have a negative impact on the vulnerabilities of households and communities.

Access to a reliable supply of water allows people to expand and diversify their livelihoods, improve productivity and minimise the risks associated with the vulnerability. These factors that make up the vulnerability context are important because they have a direct impact upon people's assets and the livelihood options that are open to them (Twigg, 2001).

For example these categories include trends, shocks and seasonality. Trends are long term and usually large scale. These include population trends, resource trends, economic trends, trends in governance and politics, and technological trends. Shocks include human health shocks, natural shocks, and economic shocks. They can destroy assets directly or force people to dispose of assets as part of coping strategies.

Twigg (2001) articulates that, the resilience to external shocks and stresses is an important factor in livelihood sustainability and seasonality is expressed in terms of seasonal shifts in prices, production, food availability, employment opportunities and health. These are one of the greatest and most enduring of hardship for poor people.

2.7. The traditional and modern means of livelihoods and water in Southern Africa communities

2.7.1. Introduction

Everything in Southern Africa starts with water because life is sustained by water (Chenje and Johnson, 1996). From the beginning, water has been central to human life. Human cultures, are nourished, flourished or decayed according to the availability of water for drinking, cultivation, or navigation. Great rivers such as Nile, Niger, Limpopo, and Zambezi gave birth to African civilisations and have successfully sustained the whole ecosystems as well as supporting the biodiversity (Chenje and Johnson, 1996).

The traditional Southern African societies have demonstrated themselves to be capable and effective custodians of water management. Rainfall and water were key to their lifestyles,

influencing the activities they were involved. These communities have been irrigating their lands for agricultural production in many years (Twort, et al, 1974).

2.7.2. Traditional means of livelihoods and water

The onset of rains was and still is a significant annual event amongst different communities, influencing their activities across the region. For example, the Shona people in Zimbabwe could predict the onset of rains through observing the changes in leaf colours, wind direction, and the sun ray's strength amongst other things. These observations, therefore, would enable them to make crucial decisions related to land preparation, planting and choice of crops to be grown (Chenje and Johnson, 1996).

The indigenous farmers' have harvested rain for crop production by developing practical technologies applicable to their own environment. Some used tillage systems that harvested and conserved water while at the same time preventing soil erosion. In Angola, the valley-bottom soils have been exploited in an ecologically sound manner for generations, using ditches to raise and lower the water-table (Chenje and Johnson, 1996).

The traditional societies had ways and means of regulating and managing water resource use because their lives revolved around the availability of sufficient water for consumption and other livelihood related activities such as agricultural production and livestock husbandry. The traditional leaders such as chiefs and rainmakers had great influence on people's lives, determining when resources could be used (Twort, et al, 1974).

2.7.3. Modern means of livelihoods and water

While the traditional system of managing water has paved a way to development with the advent of state's role, the concepts are virtually the same. The responsibilities of chiefs and other traditional leaders on water management have been taken over by the government al both central and local levels. This water management in modern days, consists of a whole set of technical, institutional, managerial, legal, and operational activities used to plan, develop, operate and manage the region's water resources (Chenje and Johnson, 1996).

Although, the rainfall maybe adequate in some parts of the southern region of Africa, it is very scarce in others and this deficiency is worsened by consecutive droughts experienced in 1980s, 1990s and 2000s. This water shortage therefore affects agriculture on irrigation for crops production and food security, including the livestock husbandry. It also affects industrial production as well as the tourism attractions.

For example, in Tanzania, the Wachagga in the Mount Kilimanjaro area, the households developed a network of furrows and channels to manage and distribute water for domestic use and irrigation, laying foundation for intensifying agricultural land use. Theses furrows display indigenous engineering skill which involves leading water out of the deep river valleys and for long distances, crossing other furrows and even other rivers using hollowed out tree trunks (Chenje and Johnson, 1996). This irrigation enables the production of crops throughout and secures food for the sustenance of the communities.

Additionally, Chenje and Johnson (1996), state that, water is crucial for industrial use since many processes are water driven. It should be noted that, the industries create many jobs for the households to generate income for their livelihoods. Moreover, most countries within Southern African such as Mauritius, Zambia, Namibia and South Africa, tourism is another growing industry which relies heavily on the water availability. The coastal areas, lakes and rivers as well as national parks are major tourism attractions which use high volumes of water. (Twort, et al, 1974). Furthermore, the people of Tanzania and livestock compete with industries and agricultural irrigation for scarce water

Furthermore, the people of Tanzania and livestock compete with industries and agricultural irrigation for scarce water. Drawing from the stated water demands in various sectors, this implies therefore that, industries, mines and irrigation schemes will further increase the Tanzania's water demand in future.

Twort, et al, (1974) states that, in order to satisfactorily meet the demand of water for the people especially within the modern societies where water is not only required for consumption and agricultural production only, but also on industrial production which greedy for water in nature, the ideal water supply system should satisfy the following conditions:

a) The supply must be maintained for 24 hours/day
b) All sources and service metres must register accurately and correctly
c) Routine inspection on the whole system must be maintained to check for the wastage and leakages, and where necessary maintenance is required
d) The plumbing to service lines must be adequate to avoid wastage
e) Record of all connections to the system must be of high quality and as much as possible, prevent unauthorised/illegal connections to avoid distortion of the picture for water demand

f) The price of water should not be so low in order attach the necessary value to water and prevention of wastage by customers and

g) The communication between the service undertaker and customers must be maintained, promoting education on reduced wastage and preventive maintenance of the system as well as hygiene.

2.7.4. Socio-economic factors of water access and livelihoods

The Overseas Development Institute (ODI), (2003) emphasises that where women carry out most agricultural labour, productive impacts are significant on households and economies relying on the sale of labour. Therefore, the cost of losing a day's labour can be exceptionally high at particular times of the year and the opportunity cost of water collection can have both social and economic dimensions respectively.

Lenton et al (2005) -provide an example that, when the burden of collecting waterfalls unduly on the children, the result may be the loss of education, health and safety of children among other multiplier effects. Women and children who collect water at night may either inflict themselves or even engage in incidents that may erode their emotional wellbeing. People suffering from water-related diseases occupy more than half of the world's hospital beds.

Furthermore, economically, improving water and sanitation services worldwide would have great benefit. It is estimated that each dollar invested in improving water and sanitation could yield $3-34 depending on the region, and $ 7.3 billion in health-related costs could be avoided each year (Lenton et al, 2005).

Water pricing has been a critical concern in the management of water projects especially the under-pricing of water, which is practiced in most countries of Africa and Middle East, allow slow-value users such as agriculture (which accounts for 88 percent of end users overall) to consume large qualities of water and use it wastefully. The result -leads to depletion, degradation and physical and economic losses. Under-pricing also results in unreliable service, unwillingness to pay, and decline in capacity to provide services, (IDRC, 1996).The IDRC report further stated that, apart from water pricing other factors such as complex social, cultural, political and economic factors impact availability, allocation and use of water.

2.7.5. Examples from developing countries on how households were able to cope where water supply scheme affected their livelihoods:

2.7.6. Introduction

This section will discuss the effects of water supply schemes on the livelihoods of the households and their coping strategies in various developing countries.

Case of Kenya

The Elementaita Division study of 2015 in Kenya used the sustainable livelihood framework in its analysis and establishing what areas of interventions would be considered for the study. That included looking at the assets, capital, livelihood strategies, institutional processes and vulnerability context. In this study, a similar approach will be adopted to analyse the effects of MLWSS on catchment communities. The focus will be on the households, water access and livelihoods. The study further inspects the coping strategies of the households whose livelihoods have been affected.

According to Kenya Integrated Household Budget Survey (KIHBS) of2006, 57% of the households in Kenya have access safe drinking water sources, 82% in urban areas and 48.0% in rural areas respectively. The current situation of water shortage in Elementaita Division is scary, and several projects that were initiated by Agricultural Development Corporation in 1980s were vandalized by people who resettled in the farm. Eight boreholes that were functional during the ADC operation remain dysfunctional with only one functional. About 10,000 kilometres pipeline remains in a dilapidated state as the inhabitants sold most of the steel pipes as scrub metals. There is also a noted depletion of forest cover in water catchment areas.

According to Kenya National Water Resource Management Survey (KNWRMS)(2006), Kenya is classified as a water scarce country with 647 m3 per capita per annum and because it falls short of 1,000 m3 per capita per annum benchmarked by the United Nations (UN). Kenya National Demographic and Health Survey (KNDHS) (2009) reveals that increasing access to improved drinking water is one of the Millennium Development Goals (MDGs)that Kenya along with other nations worldwide has adopted United Nations General Assembly (2001). This notion has been reiterated by the United Nations General Assembly in 2015 when it adopted the Sustainable Development Goals (SDGs).

The KNDHS report (2009) further states that, inaccessibility to water resource may limit the quantity of suitable drinking water for use at households. Several water projects have failed not because of funding but because of systems, policies as well management related factors coupled with socio-economic issues that have reduced sustainability of water projects in

Rural Kenya. There are several dysfunctional water projects across the countries that are in dire need of evaluation to ascertain what may have caused their current state.

According to Bauman (2005), an estimated 35 percent of rural water supplies in sub-Saharan Africa are non-functional, an indication that peoples' livelihoods are being jeopardized and connections of water points to households in Africa remain low. This limits access of households to water and reduces several households into seeking mitigating measures that would resort to high vulnerability.

When households are not connected, they have limited options and therefore impact negatively on their livelihoods. This means that they may collect water from untreated water sources or purchase water from middle persons/vendors who overcharge them. Through this water becomes expensive and most households spend a lot of money to buy water which would have been less costly to them (UNDP, 2006).

Onjala (2002) confirms that a large number of households are still far from water points. He further says that the level of coverage goes down as low as 20% during the dry season when seasonal water sources dry up, making distances to water long and often exceeding 5kilometers.

Households coping strategies during water scarcity and livelihoods

Table 2.1: Household coping strategies for water supply

Description	**Frequency**	**Percentage**
Sale of chicken and eggs	**52**	**26.7**
Sale of small livestock (goats, sheep)	**33**	**16.9**
Sale of large livestock (cattle)	**1**	**0.5**
Sale of house items (tables, beds etc)	**22**	**11.3**

Source: KNWRMS: 2006

This study shows that the shortage of water has circumscribed and compelled the households to resort to temporary coping means of livelihoods. These means equally require water in

order to thrive. For instance, livestock and farm produce require water to survive. This explains how important water availability is to sustain the means of livelihoods for the households and how water shortage affects household means of livelihoods negatively

2.7.7. Physical factors of water access and livelihoods

According to Human Development Report (HDR) (2006), the UN Committee on Economic, Social and Cultural initiatives, has declared that water is a human right that everyone is entitled to. Water has to be sufficient, safe, acceptable, physically accessible and affordable for personal and domestic use. The report further states that poor households are less likely to get their water from a variety of improved sources. For example, in Dar- es Salaam, Tanzania, and in Ouagadougou, Burkina Faso, fewer than 30 percent of the households are connected.

According to World Bank (2009), rural areas perform consistently worse than urban areas on water access. Approximately 38 percent to 52 percent have better access safe water in comparison to 59 percent to 83 percent in urban areas. UNFPA, (2003) reports that in Sub-Saharan Africa, the following ten countries: Angola, Chad, Democratic Republic of Congo (DRC), Ethiopia, Eritrea Guinea, Madagascar, Kenya, Rwanda, and Sierra-Leone which constitute the most vulnerable in terms of access to safe water as well as food.

UNDP (2006) reports that water access fell short by 5 percent since 1990 due to the shortage of adequate funding to repair or replace rapidly aging infrastructure. However, this coupled with other issues of management and post project implementation through tariffs may improve the operations and maintenance of water systems to meet the needs of communities. About 49 percent of rural communities had access to water falling short of the target of 85 percent as stipulated by the MDGs-targets. Consequently, the livelihoods amongst the rural communities were adversely affected on production or domestic consumption as well as sanitation activities.

According to the SIWI (2004) report, some of the benefits related to improved water supply, but, are not restricted to, include: improved human health, improved education, improved food security and food production. These cannot be accomplished accordingly, unless the best management of water practices are operationalized to ascertain that, advantages of water spill over to the households in communities are sustainable. This, therefore, implies that concrete plans are required to ensure that communities manage and utilize water in an effective and efficient way.

There is a need to link other factors together to ascertain the level of impact that water access has on sustainable livelihoods. This can include observing the following: availability of water, distance to collect water, affordability and management of water projects and their corresponding challenges affect rural livelihoods. This also involves looking at the interdependence and interlink of these factors.

2.7.8. Water availability and livelihoods

In order to get an understanding of water availability, Carlevaro and Gonzalez (2011) identified sources of water categorized into three main types; rainwater, surface water (river, streams, lakes and ground water. Out of these three sources, groundwater is assumed to be of good quality. However, this assumption is not always correct. The selection of a water source depends on the water quality and water quantity, the costs of development, operation, funds available and distance from the community. It serves (DFID, 2011). All these factors may affect the livelihoods of households positively or negatively while posing vulnerabilities and risks if some issues.

OCHA (2010) reveals that in a provisional 2010 sphere project, the standards for water use projected that the average per capita water consumption was at least 15 litres per person per day that equals to 5, 475 litres annually. However, the study revealed that availability of water sources remains a daunting task for communities and families. Availability of water poses several challenges to households and communities. In areas where water is not available, women and children travel tens of kilometres to fetch water. This is seen through the queues in water points during dry seasons. According to the DFID, (2002) report, the availability of a good quality water source close to home has numerous benefits especially in terms of human wealth, with subsequent linkages to all other dimensions of livelihoods.

Rainwater Harvesting is an ancient technology that has proven record of provision water next to the house for domestic use and on a larger scale for economic use by increasing the productivity of arable lands and watering livestock (Smet, 2005). The families that do not have the technology to utilize the water may not be able to harvest it. This is because it needs guidance on the design, construction and maintenance of rainwater catchments systems that may cost more than the facility could afford (Petersen and Gould, 1999).

2.7.9. Distance and time spent to collect water and livelihoods

Inadequate water infrastructure can create multiplier risks in rural areas. Several hours are wasted when women and children spend more time to fetch water for domestic use on foot for long distances. Another critical aspect to this challenge is the time used to queue at the water points that may take over 4 hours. This is coupled with the low inflow of water due to an unimproved water source and dilapidated infrastructure. The HDR (2006) argues that Kenya will need to increase the number of people with access to water by 11.6 million. This target is daunting but may be attainable.

OCHA, (2010) reported that as at 2010, 1.1 billion people lived more than one kilometre from their nearest safe water source. This number would be even worse with the projections that more than 5 billion people of the world's population would be without access to water and sanitation by 2030. The UNFPA (2002) report estimated that women in many developing countries walk for an average of about 6 kilometres each day to collect water.

The report further states that water collection for domestic purposes is generally the responsibility of women and children. Therefore, availability of clean water to the households reduces the women's workloads and hours spent in fetching water. The UN2000) report showed that water collection times for villages in Kenya average just over 4 hours per day during a dry season and two hrs a day during a rainy season. The information also indicates the times ranging-from four to six hours a day in the following countries: Botswana, Burkina Faso and Ivory-Coast.

Women are continuously exposed to the risk of contraction of water-related diseases largely because of their role in collecting water, washing clothes, cleaning and cooking and in particular in rural areas performing day-to-day agricultural task. Carrying heavy water jars over long distances puts women's health at risk, particularly during pregnancy. Bearing heavy loads can result in premature birth, a prolapsed uterus, or back injuries, UNFPA, (2003).

2.8. Management of water projects and livelihoods

2.8.1. Introduction

This section discusses the importance of adopting effective water management systems and interventions by authorities for the current and future situations in order to sufficiently benefit the communities.

2.8.2. Water supply interventions in some developing countries: India, South Africa and Colombia

The UNDP-World Bank, Water and Sanitation decade (2008) report estimates that achieving lasting benefits from water supply interventions involves more efforts than the building facilities. It is focused on the importance of involving the community in all aspects of service delivery, the use of appropriate technologies and the role of governments as service promoters, rather than providers. The report further reveals that governments assume that, communities somehow do not 'manage' their facilities, but build the human capacities nor have any commitment to do so. These, therefore, leave the communities with the onus to design their traditional-approaches towards managing water systems. There is need to define the roles of community members in project planning, implementation, cost recovery, operations and maintenance (O & M) and asset ownership that are poorly defined and communicated.

Haysom (2006) reported that management of water projects encompasses among other critical elements, participation that is viewed as a tool for improving the efficiency of a project. It is also seen as a fundamental right that beneficiaries should have a say about interventions that affect their lives. Participation can take different forms including the initial expression of the demand for water, the selection-of-technology-and-its-site, the provision of-labour-and local materials, a cash contribution to the project costs, the selection of the management type and even water-tariff.

Management of water projects remains critical for its operationalization as well as continuity of the project. Most projects that are managed well outlive their functions. Haysom (2006) proposes, in his study on Tanzania water projects, that there could be separation of roles as purchaser, service provider, regulator and asset holder to be able to meaningfully manage the water and to reach many people in rural communities. El-Sadek, (2011) identified three levels of decisions and improvements that can be taken as the management of water.

The lowest level that this study will address is the user's level which includes increasing the users' awareness, applying water pricing and water saving technology to improve the local water efficiency. With water shortages and the grim future, if the current trend continues, there would be a growing understanding that sustainable water management requires water governance, including integrated water resource management that coordinates-the-development-and-management-of water, land and related resources. It seeks to maximize

social and economic welfare in an equitable manner, to sustain ecosystems and bring together the technical, social and political spheres (El-Sadek, 2011).

In India and South Africa as well, the households reaped the benefits of access to the water supply scheme. A study in Gujarat (India) revealed that rural women put the time saved by improved water supply to other productive activities. In this way, each woman could generate between £10 and £77 per year income as a means of livelihood (James, 2004).

Pérez de Mendiguren-Castresana (2004) has found that poor people in the Bushbuckridge (South Africa) district obtained 17-33 percent of their average yearly income through small-scale productive activities, in which water was a crucial contribution for the means of livelihood. During the recent droughts in small productive water points proved to be a reliable input to small-scale food production when the major crops failed (Robinson et al, 2004).

Hope et al. (2003) found that the better-off in a village were actually the ones with the best access to water supply and hence in a better position to get the full benefits of this water. It is generally clear that improved water supply has the potential to have a positive impact on a number of aspects of people's livelihoods. However, water is neither always the most important constraint to people's livelihood options (Hope et al, 2003).

For example, Moriarty and Butterworth (2003) indicate that, improved water supply on the livelihoods leads to better health and better quality water contributes to reducing disease. Healthy people are able to work and live more productive lives, time savings. That is, time and effort spent collecting water can be reduced. This time can be put to other activities. Improved water supply leads to reduced expenditure on water provided by water vendors and less money is spent on the treatment of illness.

Improved water supplies can make other productive use of water possible and generate employment and income. Despite their potential, few water supply systems, as well as the related governing institutions have been designed with people's actual livelihood needs and behaviour in mind. When there is a mismatch between people's water needs and supply, sustainability, efficiency and equity of the services frequently become threatened. If the total amounts supplied are not sufficient, some villagers may use more than their fair share of water (often through unauthorised connections), leaving others without any (Moriarty and Butterworth, 2003).

Traditionally, in Colombia, the drinking water sector has focused exclusively on health benefits, and hence hardly ever considered the productive needs of poor people. Equally, the irrigation sector is concerned with water only for crop production. Water requirements for cattle are often not even considered by irrigation engineers. While the users do not see their water needs from a sub-sector point of view, the reality is that institutions and projects operate almost exclusively within their own narrow area of interest (AWARD, 2004).

In other cases, water quality may be an issue. For example, in the village of La Castilla (Colombia) a conflict emerged when a new water treatment plant was constructed. Some users argued that the treated water is expensive and should not be "wasted" on irrigating crops. Other users depended on those crops for their livelihoods and were not so interested in good quality of water; quantity was considered more important for their survival. They said, "We can always drink coffee instead of water, but we need water for our vegetables and cows" (AWARD, 2004).

2.9. The institutions of water resource management in Lesotho

2.9.1. Introduction

Governments have several departments at both central and local levels which are dealing with water supply and management. However, the recurrent droughts expose their weaknesses in both conservation and supply respectively. In most cases, conservation measures are usually established when communities, particularly those residing in urban areas, are facing water shortages (Chenje and Johnson, 1996)

Institutions of water resource management provide a structure for activities related to water management. The purpose of water management institutions is to organize the provision of water services so as to accord with the collective wishes of society (Fox 1976). In Lesotho, the following institutions dealing with water supply and management, with different responsibilities and purposes. Irrespective of the level and the purpose for utilization of water, it affects the livelihoods of the communities:

2.9.2. Rural water supply in Lesotho

Before water supply schemes became successfully alternatives used in history to collect, store and manage water for a sustainable community. Traditionally, in Lesotho the springs were used for drinking purposes, while rivers were mainly used for washing and bathing purposes as well as watering animals. As a result, therefore, almost all the villages established before the introduction of boreholes have at least one reliable spring that supplies the households

with water throughout the year. However, the introduction of boreholes has actually made it easy for the settlements to expand into more arid parts of the country, populating areas which might not have been occupied (Chakela, 1999).

Generally, Basotho (inhabitants of Lesotho) neither made extensive use of surface water found in rivers and dams for household purposes, nor were they engaged in the digging of shallow wells, due to the fact that supply was met through the use of springs. They have regarded water as a valuable and readily available resource that is a free gift from God as they often call it (Ntlama, 2013).

However, it should be noted that, this situation of an essentially rural population with an abundant supply of water has changed remarkably over the years. A major factor that has influenced the change is urbanization, brought about by rapid population growth and migration from the mountain areas to the lowlands. This has resulted in the need for government intervention in supplying water for both the rural and urban population, which in turn resulted in investments in water resources development, a process that has made water a costly resource that can no longer be seen as a free gift (Chakela, 1999).

a) The Department of Rural Water Supply (DRWS):

The DRWS is responsible for providing water and sanitation to the rural areas of Lesotho. The DRWS is entrusted with the supply of rural water infrastructure, while the operation and maintenance of the water supply schemes are the responsibility of local authorities and local communities. The DRWS has its headquarters in Maseru and operates in three regions and ten districts. The Lesotho government is responsible for funding the DRWS. The DRWS does not charge tariffs for water supply and maintenance in the rural areas. Rural water systems are subsidized by the Government. Recent reductions in donor funding has negatively affected the functioning of the DRWS (Ntlama, 2013). The current budget allocation of the Government does not cover all the needs of the DRWS (Chakela, 1999).

Rural water infrastructure is maintained under the Government subsidy (Chakela, 1999). The DRWS oversees the completion of infrastructure completion and once completed, hands the responsibility for operation and maintenance of systems over to the communities. The communities are responsible for the operation and maintenance of small items. For example, in the case where a system uses electricity or diesel, the communities contribute to monthly purchasing of electricity or diesel to run their system (Ntlama, 2013).

This shared responsibility between the DRWS and rural communities complicates rural water supply. Where communities lack the means or commitment to manage the systems, the DRWS has to extend its involvement in and support to the communities beyond its delegated responsibilities.

Villages in rural areas appoint a Village Water and Health Committee which is responsible for the management of water systems (Ntlama, 2013). The lack of capacity (skills and resources) of these committees to manage water systems is a challenge for rural water supply. In addition, the lack of accountability on the part of these committees has been reported to have led to some water users' unwillingness to pay for operation and management costs (Chakela, 2013). These committees also do not have a legal status and are therefore not able to take action against defaulters, e.g. against households not paying water fees or misusing water (Ntlama, 2013).

In summary, the DRWS experiences the following challenges: increased demand for piped water in rural areas; diminishing natural water resources since the springs which serve the rural communities are declining in performance and have low yields, resulting in communities rationing water supplies; and a shortage of human resources and skilled manpower, often linked to a high vacancy ratio (Ntlama, 2013). These challenges and the limited means to address them negatively affect the delivery of water as a service and the ability of the DRWS to execute its duties.

2.9.3. Urban water supply in Lesotho

a) Background

The policies and legislation related to water resource management in Lesotho are essential and instrumental for addressing water security threats to economic activity, energy production, food production and human health. The translation of these policies and legislation into implementable programs is dependent on capacity as well as resources (human and financial) of the relevant institutions of water resource management (GOL, 1991). .

In the urban and peri-urban areas of Lesotho, Water and Sewage Company (WASCO) (formerly Water and Sewage Authority (WASA) is currently the singular provider of reticulated water. According to WASA report (1996) the entity was created as a parastatal in 1992 to be responsible for supplying water services to Maseru and in fifteen other urban areas in the country.

The report further states that WASA provides services only within its demarcated areas of operation whereas the DRWS is flexible enough to extend its services even to other peri-urban areas, especially in Maseru, where in coverage of WASCO should provide services. This is influenced by the slow pace and character at which WASCO is expanding its water network into these areas.

b) The Water and Sewerage Company (WASCO)

The WASCO, previously the Water and Sewerage Authority (WASA), is the operational authority for managing water supply and wastewater collection, conveyance and treatment. It is the custodian of the Lesotho Water and Sewerage Authority Order of 1991 and the Lesotho Water and Sewerage Authority Regulations. The authority (WASA) became a company (WASCO) in 2010, following the formulation and as an outcome of the Water and Sanitation Policy. It was established through the Water and Sewerage Company Act, 2010 **(**GOL, 2010).

The establishment of WASCO as a company enabled the Government to regulate it as required by the Water and Sanitation Policy. The functions of WASCO, stipulated by the Lesotho Waste and Sewerage Authority Order of 1991, are to extract water, undertake studies, design, construct, operate and maintain waterworks and distribution systems and sell water from such schemes; undertake studies, design, construct, operate and maintain sewage and sewerage treatment schemes, store collect, charge for and discharge and disuse treated effluents and waste from such schemes; and secure the supply of water and the treatment and disposal of effluents at reasonable prices (GOL, 1991).

WASCO is also responsible for promoting economic and efficient water use, conducting research in order to improve its functions, as well as monitoring urban water supply. WASCO is authorised by the Order (section 39.1) to charge water related tariffs. These tariffs include deposits for services provided, connection and re-connection fees, and rent for apparatus provided by WASCO (GOL 1991). WASCO was not regulated until May 2013 when the Lesotho Electricity and Water Authority (LEWA) commenced with the regulation of urban water supply.

c) The Lesotho Lowlands Water Scheme (LLSW)

The LLWS was established to address the water shortages in Maseru and the Lowlands district. The LLWS is planned to give more than 1.2 million people access to clean water by 2020. The scheme is also planned to improve water supply for industrial production, and to

promote investment in the textile sector. The LLWS centres on the construction of the Metolong Dam and Water Supply Programme. This project also includes water treatment works and a downstream conveyance system. The project is mainly financed by the Millennium Challenge Corporation (MCC), South Africa, the World Bank, the Kuwait Fund, the OPEC Fund for International Development (OFID) and the Saudi Fund for Development (MCA: Undated).

The Lesotho Highlands Development Authority: The Lesotho Highlands Development Authority (LHDA) is responsible for the Lesotho Highlands Water Project (LHWP) in Lesotho. The LHDA was established through the Lesotho Highlands Development Order of 1986 (GOL, 1986).

2.10. Livelihoods in the post-independence Lesotho

2.10.1. Introduction

This chapter discusses land, agriculture, livestock, employment (mining and clothing industries) as the traditional means of livelihood that sustained the life of Basotho overtime, especially in the post-independence era. The chapter further discusses the related challenges as well as the mitigating strategies taken for each identified means of livelihood.

Following the GOL's agreement to send the majority of the productive age men to the mines of RSA, leaving the agricultural production with women and children, who could not be as vigorous as men Lesotho's agriculture deteriorated dismally and Lesotho became the impoverished labour reserve of RSA in recent years (Colin Murray, 1980). Lesotho's economy was also estimated to be supported by the selling of grain to the tune of 400,000 Pounds, wool and mohair export was 75,000 and the earnings of the labourers and transport riders were100, 000 Pounds (Colin Murray, 1980). Over 100 years ago, Lesotho's production of grain used to surpass the South African production and Lesotho was labelled the grain reservoir of the Free State and Cape-Town because it was able to export some of its surplus maize to these provinces of RSA (Colin Murray, 1980).

Lesotho's economy was based on agriculture, which contributed to 10 percent of the Gross Development Product (GDP). There is also a small manufacturing sector and remittances from the Basotho mineworkers in the Republic of South Africa (RSA) (Irin News, 1999). Besides agricultural production, other key means of livelihood that epitomised the Basotho's way of living include landownership, animal husbandry and employment in the mines and textile firms.

Generally, Basotho depended on subsistence agriculture as their key means of livelihood for decades. From urban to peri-urban locations, Basotho livelihoods were closely intertwined to the production of crops such as maize, sorghum, beans, peas and wheat. This demonstrates how important agriculture has been to the entire Basotho nation. Subsistence agriculture connotes a situation at which the farmers exclusively grow crops for their own consumption and that of their families. In subsistence agriculture, production is aimed at survival, with little or no surplus trade (World Bank, 2011).

2.10.2. Agriculture

Lesotho is one of the least developed countries (LDCs) that are characterised by poverty, hunger, decreased productivity rate and income-earning potential, with 57.1 percent of its population living below poverty line, which is $1.95 or less per month (World Bank, 2010). Subsistence agriculture by peasants has been the main means of livelihood in Lesotho, whereby 70 percent of the population is living within the rural locations and depends on small scale agriculture (Lesotho Review, 2018).

CIA World Factbook (2021) specifies that agriculture employs a modest 57 percent of the labour force, mostly on subsistence farms in Lesotho. This figure is lower than that of similar developing countries as the mountain environment offers less terrain for growing crops and many adult males work in the South African mines. While the CIA World Factbook (2021) estimates that 35 percent of the male wage earners work in South African mines, it also estimates that 86 percent of the resident population is involved in subsistence agriculture, a much higher number. According to Lesotho Review (2018), 70 percent of Lesotho's population resides in the rural locations and 53 percent is engaged in both crop production and rearing livestock, while 15 percent is involved in growing crops for sale. As a result, the country continues to be impoverished as the farmers' production becomes inadequate to feed the nation and, even worse, cannot sustain their families throughout the year.

Nonetheless the reliance on subsistence farming is gradually changing. The Lesotho Review (2018) has also articulated that, in Lesotho, almost 50 percent of the population earns income through informal crop production and animal husbandry, with nearly two-thirds of the country's income coming from agricultural production. The northern lowlands form the major agricultural zone in the country because it has plenty of arable land for cultivation. The arable sub-sector deals with rain-fed cereal production while in the livestock sub-sector the focus lies extensively on animal grazing, wool and mohair production and the fast growing aquaculture industry (Lesotho Review, 2018).According to this review, agriculture employs approximately 8.5 percent of the urban population and 54.3 percent of the rural population.

Despite the improvements in agricultural production, agriculture has declined from 50 percent in the 1970s to just 18 percent in 2000. During the 1990s, about 13 percent of the country was cultivated. This amount is shrinking as soil erosion, drought, and the destruction of farm equipment during civil unrest in 1998 take a cumulative toll (CIA World Facebook, 2021).

Recently, the extreme drought caused by severe climate change has adversely affected the production of agricultural production and consequently threatens the national production of food security as most Basotho heavily depend on agriculture to sustain their families. In early 2011, Lesotho was affected by the heaviest rains in decades, resulting not only in loss of agricultural products but also in damage to infrastructure (power lines collapsed, roads destroyed and bridges/culverts severely damaged). This has eventually affected the agricultural production negatively. This situation was worsened by the Elnino-heat wave of 2015, which has resulted in subsequent dry seasons (NSDP II, 2018/23). The NDSP II indicates that the contribution of agriculture to the GDP has declined dismally from 15percent in 1984 to 5.2 percent in 2014.

In addressing these underlying challenges in order to increase agricultural production, the NSDP I (2013/17) indicates that the farmers' capacity needs to be enhanced and the agricultural institutional frameworks be reformed. In addition, effective training of the farmers to support commercial agriculture and transformation of services are essential to facilitate commercialisation and diversification. Improvement of the agricultural research capacity (such as infrastructure and equipment) and the development of integrated land and water management policy framework are also very important for increased production.

2.10.3. Livestock

Animal husbandry plays a vital role in enhancing the households' ability to maintain their livelihoods through converting assets into money (cash) in Lesotho. Most farmers also raise livestock to supplement crops and maintain food security during the drought when crop yields are low (Care, 1999). Animal husbandry is important everywhere and is often the only revenue source in the mountainous areas. The types of livestock commonly owned by the households include cattle, sheep, goats, pigs, poultry, donkeys and horses.

The donkeys and horses are usually hired for transport to generate income whereas wool and mohair are sold to build future reserves for the potential emergencies (Care, 1999). The cattle are also used for ploughing the fields and they are sometimes sold for generating immediate income to attend to urgent and critical family matters. Sheep and goats also produce meat, milk and very high quality wool and mohair. They are the most important animals. Cattle are also increasing because they fetch more lucrative contracts. Generally, cattle, sheep, goats, donkeys and horses are predominantly owned by men while pigs and poultry are mainly owned by women (Care, 1999).

Apart from deteriorating pastures caused by environmental pollution as well as the arable land encroachment, the stock theft raiding has been rife and is a threat to livestock ownership. Above all, it has raised an alarm between Lesotho and South Africa as a matter of concern. High cross border livestock theft remains a perpetual challenge between the two countries due to porous borders. The longest border demarcations are protected by wire and poles which are usually subjected to theft and vandalism.

The terrain of the policing activity is costly to maintain from both sides (Chelin, 2019).Muller, (2016) states that from 2002 to 2006, the total number of 22, 311 cases of livestock theft were reported in Lesotho and that the highest rate was recorded in 2003 with 5394 cases. The highly affected districts are Qacha's Nek, Mokhotlong, Thaba-Tseka, Butha-Buthe, Leribe and Quthing.

The escalating issue of cross border livestock theft remains a perpetual challenge between the two neighbouring countries of Lesotho and South Africa due to the highly porous borders, poor security patrols and inadequate monitoring of the borders (Chelin, 2019). Furthermore, the landscape and the mountainous terrain of the border areas make it difficult for effective policing (Chelin, 2019). From the period between 2002 and 2006, Lesotho had a total of 22, 311 reported cases of livestock theft, with the year 2003 on the lead with 5394 cases (Muller, 2016).

Muller further posits that the five districts that were highly targeted by radical thieves include Qacha's Nek, Mokhotlong, Thaba-Tseka, Butha-Buthe, and Quthing, possibly because these districts are located close to the South African borders and are largely mountainous; thus animal tracking by police becomes complicated and, consequently leads to negative economic and social impacts for the country.

The animals stolen across the borders are usually hidden within the caves and ridges for some time and are later driven into the other country, where they are rebranded and auctioned or sold to the butcheries (Clack, 2013). In responding to the stock theft challenges, the GOL has developed the strategies on reducing stock theft by increasing recovery through strengthening the police service capacity, establishing the stock theft unit and intensifying cross-border collaboration. Additionally, the GOL has implemented livestock registration, and intensified marking cross the country for easy identification of the animals (NSDP I, 2013/17).

2.10.4. Land ownership

In Lesotho, land ownership is one of the most important determining factors of household ability to maintain sustainable livelihoods and job creation (Mohasi and Turner, 1999). The land is primarily used for three purposes: residential building, crops production and animal grazing. This is how the ownership of land has sustained the means of Basotho livelihoods over the years. Traditionally, land allocation was granted by the chiefs. With the dawn of urbanisation, the land tenure system has been commercialised through the Land Act of 1979. The inception of the local councils further reiterated this practice in 2005 (Mohasi and Turner, 1999).

The declining land quality and land encroachment remain the critical challenges towards food production for the nation (NSDP II, 2018/23). This situation is caused by human exploitation and erratic climate change. Lesotho has lost vast amounts of arable land due to the fast-paced encroachment by new settlements caused by poor implementation of policies and enforcement of the laws. This has led to the low production within the agricultural sector and has raised concern on food security for the country (NSDP II, 2018/23).Additionally; the Lesotho land tenure system does not create incentives to reduce inefficiency or underutilisation of the land despite being a limited asset. The NSDP I further states that the high infertility of soil also contributes to the low crop yields and large areas of unused and fallow land.

Despite these challenges, efforts have been taken to improve the land. The land tenure system has shifted from the agricultural perspective by introducing the measures to increase its productive use. These include reducing the deterioration of agricultural and rangelands by conserving the land (NSDP I, 2013/2017).

2.10.5. Employment

Employment has also served as one main means of livelihood in Lesotho besides the mining remittances which sustain the households overtime. The textile industries have expanded the opportunities for the Basotho to earn income for a living.

2.10.6. Textiles and clothing employment

With the inception of Africa Growth and Opportunity Act (AGOA), many investors from Asia took an advantage to establish the firms. AGOA was signed into law in May 2000, and Lesotho qualified in October 2000. AGOA is a trade preferential agreement between the United States of America (USA) and Sub-Saharan African (SSA) countries that extends an

opportunity to these countries to export 6,400 products under Generalised System of Preferences (GSP) and 1,800 tariff line products USA markets duty-free and quota-free (Nouve and Staatz, 2003).

From 2001 to 2004 alone, 30 firms set up operations in Lesotho, with 22 of them directly targeting the USA Markets all due to the AGOA benefits and eventually employed many Basotho women (85 percent) who earned some wages for their families. Even though the number of the textile workers has substantially declined from 49,000 to 27, 000 in recent years due to uncertainties and poor market performance, this industry is still considered one of the key employment sectors for many Basotho and constitutes a significant livelihood means for the households (LNDC Report, 2015).

Due to the poor performance of the textiles and garment firms, many firms have closed their operations in Lesotho and consequently, retrenched the labour force. This has impacted negatively on many families which relied on employment from the sector as the key means of livelihood. Many of them are now poor. Employment within the textiles industry and manufacturing had declined from 46, 386 in 2009 to 45, 595 in 2010 respectively (NSDP I, 2013/17).

Although, the GOL is committed to addressing most of these challenges, the following challenges remain the major threat to further investment. They include the long and cumbersome process involved in licensing new development, difficulties in obtaining land, inadequate water supply to industry areas, poor rail connections, low level of productivity among the workers, a weak and divided labour movement and inadequate dispute resolution systems (PRSP, 2004/5-2006/07).

Even though there has been some kind of development to assist women and youth to participate in the development of the livelihoods in the country, the major challenge remains. A considerable effort is still required by the GOL to create a more conducive environment with supportive legislation and better access to credit, markets and business development services in order to enable effective participation of these groups in the economy (PRSP, 2004/05-2006/07). Some of the strategies that are necessary to fully address these challenges include upgrading of the textiles and clothing curriculum at skills development centres in order to provide a full range of relevant factory skills, to promote an investment in the production of garments as well as the integration of textiles and clothing industry into the curriculum of the technical and vocational schools (NSDP I, 2013/2017).

2.10.7. Mining

Mining has also played a significant role in the household livelihoods in Lesotho over several decades. In the late 1980s, almost half of Lesotho's Gross National Product (GNP) was based upon remittances from over 120,000 male migrant labourers, mostly working in the Republic of South Africa (RSA) gold mines. Today, half that number of migrants is retrenched (PRSP, 2004/05-2006/07). Similarly, the mining sector in Lesotho has also been contributing to the employment of Basotho men and women, thus influencing the means of Livelihood in their households (NSDP II 2018/2023).

Most mines in South Africa, especially the Gold, Charcoal and Platinum mines, have employed Basotho men to provide labour. These men earn some wages to sustain their families. The employment of Basotho men in the RSA mines has been embraced as one of the key areas which sustained the livelihood of Basotho families' overtime through sending remittances home (CBL, 1995).

Table 2.1 indicates the employment of males in the RSA mines and their remittances.

Table 2.2: Mineworkers' income and remittances: 1989-1993

Years	Av number employed	Average annual wage	Total income	Remittances	%of income for mineworkers
1989	126	8.7	1096.2	820.1	0.75
1990	127	10.1	1282.7	961.1	0.75
1991	122	11.3	1378.6	1041.1	0.76
1992	120	12.3	1476.0	1103.8	0.75
1993	116	13.4	1554.4	1126.5	0.72

Source: CBL: 1995 and IMF: 1994

Table 2.2 shows that Basotho mineworkers in RSA have been employed in large numbers over the years and have remitted money, including the deferred pay to their respective families. It was estimated that each mineworker was remitting M442 monthly in cash through various channels such as the co-workers when they visit home. According to the government figures, the mineworkers' remittances contributed to about 67 percent of the country's (GDP) 1990. This figure declined to about 33 percent in 1996. Unemployment among Lesotho's population of about two million was estimated at between 40 and 45 percent (CBL, 1995).

Table 2.3: Mineworkers employment trends per districts: 1986-2020

Year	Maseru	B-Buthe	Leribe	Berea	Mafeteng	M' Hoek	Quthing	Qacha	Mokhotlong	Total
1986	20167	8662	13247	10966	13352	8577	9139	5563	3215	**92888**
1987	32619	9186	14659	12003	14821	9550	9519	5513	3347	**111217**
1988	23020	8947	14602	11707	14384	9565	9317	5414	2904	**99860**
1989	23999	9037	15261	11801	14656	9605	9210	5421	2751	**101741**
1990	23980	8978	15033	11601	14181	9573	8851	5084	2423	**99707**
1991	22572	8528	14159	10984	13339	9108	8315	4830	2062	**93897**
1992	24701	7928	12326	9822	11838	9620	7072	6338	3874	**93519**
1993	23010	7883	13693	10087	12469	8321	7743	4256	2478	**89940**
1994	32192	6799	13005	9760	12902	8714	7863	4311	2530	**98076**
1995	10954	9906	10697	9876	10972	9984	9764	7937	7854	**87944**
1996	10794	9667	10554	9498	10498	9502	9647	6698	5499	**82357**
1997	15447	7983	9471	7687	9780	8171	6998	5948	4875	**76360**
1998	16340	8491	5806	4778	2371	9245	5391	1599	6428	**60449**
1999	14683	4465	9194	4390	7743	5213	3754	1810	1234	**52486**
2000	14874	4350	9252	3792	8261	4632	3324	1636	1230	**51351**
2001	14868	4167	9425	3239	7754	3870	3205	2054	1017	**49599**
2002	17355	4354	11194	3221	8303	4312	2910	1554	1187	**54390**
2003	17621	4769	10839	2519	8409	4501	3154	1342	1048	**54202**
2004	17178	3716	9558	2041	7206	3947	2547	1286	958	**48437**
2005	13821	3486	8960	2105	6739	4003	2477	1114	988	**43693**
2006	15565	3886	9192	2124	7262	4567	2170	1179	979	**46924**
2007	15508	2803	9308	2326	7291	4265	2141	1080	886	**45608**
2008	13779	2511	9287	2336	7062	3988	1931	1278	806	**42978**
2009	12736	2302	8593	1726	7480	2861	1349	626	746	**38419**
2010	11853	2051	7864	1703	6351	2875	1286	568	628	**35179**
2011	12114	2131	7602	1650	6307	2854	1123	602	597	**34980**
2012	10363	1773	7109	1820	4792	3114	1258	507	540	**31276**
2013	9201	1846	6241	1571	4649	2612	1141	480	492	**28233**
2014	8694	1723	5509	1383	4020	2595	1093	401	433	**25851**
2015	7642	1755	5341	1533	3424	2276	988	298	415	**23672**
2016	7382	1354	5294	1351	3663	2162	908	217	373	**22704**
2017	6848	1310	5168	1299	3051	2094	893	136	435	**21234**
2018	6521	1084	4572	1101	2932	1868	758	98	353	**19287**
2019	5878	951	4176	724	2590	1683	677	63	268	**17010**
2020	1824	419	1138	146	730	344	178	10	82	**4871**

Source: Ministry of Labour and Employment, March 2020.

Table 2.3 shows the mineworkers' recruitment trends and retrenchment patterns between 1986 and 2020, per district, into and from the South African mines. In 1995, most districts experienced a drastic retrenchment rate. The Maseru district was the most hard-hit district with the declined from 32, 192 to 10,794. Leribe dropped from 13, 000 to 10, and 697. In 2012, all the districts experienced a decline. Generally, the number of Mineworkers declined drastically from 92, 888 in 1986 and to 871 in 2020.

During the 1990s, most mines in the Republic of South Africa (RSA) closed down their operations for various reasons. For example, the diminishing gold's extracts due to over mining and poor international market performance are cited as the key reasons for the business decisions to close the operations (IMF, 1994). Moreover, the RSA mining industry has been hard hit by declining gold prices in world markets and the fact that gold deposits are now located deeper underground, leading to higher mining costs and increased danger to the miners. More than 10,000 Lesotho miners employed in the RSA gold mines have lost their jobs since the beginning of this year and more might follow, further straining Lesotho's struggling economy (Irin news, 1999). They were tempted by mining houses to accept retrenchment by offering them relatively large severance packages and many of these retrenched mineworkers return to Lesotho where they face bleak employment prospects (Irin news, 1999).

In his budget speech in March 1999, the Finance Minister told the parliament that a further 17,000 Basotho mineworkers faced job losses in that year alone. He indicated that despite being faced with a deteriorating economy, the GOL needed to create 40,000 new jobs (IRIN News, 1999). In 2010, the number of Basotho mineworkers who lost jobs in South Africa declined from 45, 276 to 41, 555 in 2009 and had exceeded 50, 000 in 2015 (NSDP I, 2013/17).

The retrenched Mineworkers from the RSA mines struggle to be employed within the local industries. A considerable number of the returned mineworkers have been affected by several diseases such as tuberculosis, silicosis, and HIV/AIDS and consequently their capacity to work effectively has been reduced Mineworkers Development Agency (MDA), 2011.

The South African National Union of Mineworkers (NUM) has established MDA in various countries to provide training and to allocate small loans for the ex-mineworkers so that they can be employed or engaged in entrepreneurial activities. In the case of Lesotho, the ex-mineworkers have opened small shops, minimarkets, and engaged in taxi businesses. In addition, MDA has trained 1, 335 ex-Mineworkers in various areas to capacitate them with entrepreneurial skills.

For example, 325 of them were trained in basic business management, 929 in poultry management and 81 in leadership skills. MDA does not only focus on individual ex-mineworkers but it also assists those ex-mineworkers who have formed organisations with small loans through the Moliko Finance Trust or assisted them with obtaining financial

support from development institutions. Furthermore, MDA has assisted the following organisations, formed by the ex-miners, to obtain funding from the Smallholder Agricultural Development Programme (SADP):

T**able 2.4: The MDA assistance of Ex-mineworkers with funding from SADP**

Organisation	**Membership**	**Type of project**
BAPOFA Butha-Buthe	323	Poultry Abattoir
BAPOFA Berea	32	Hatchery
Masika-Lihoai Cooperative Society	200	Sorghum processing
S & T Orchards	2	Orchard improvement
Lekhela Fruit Processors	1	Fruit drying

Source: MDA Presentation: 2011

Table 2.4 shows the organisations assisted by MDA, the number of their membership as well as the type of project each organisation pursued.

2.10.8. Employment in construction of dams

Another source of employment for Basotho has been the construction and building of major water dams across the country. Following the signing of a treaty between Lesotho and RSA in 1986 whereby Lesotho agreed to transfer water to RSA and to ultimately receive the royalties under the Lesotho Highlands Water Project (LHWP), the construction of big dams for water storage and supply have surfaced as the key employment sector for many Basotho, both skilled and unskilled. The Katse dam was the first one to be completed in 1997 (Mofokeng, 2013). The number of jobs increased substantially after the subsequent agreement was signed to construct both the Mohale dam in 2002 and the Polihali dam in 2011 respectively.

LHWP was regarded as an ideal project for providing jobs for some returnees from the RSA mines as well as for others who were still in the country. The project's main contracts created a high number of job opportunities generating up to 22, 000 jobs for immediate employment in Phase 1A and 15, 400 in Phase 1B. The residents who were affected by the construction of the dams were the ones who were mostly considered. During the peak of the construction of Phase1B, there were more than 8 000 jobs for local and regional workers (Mofokeng, 2013).

Later on, in 2008, the construction of dams diversified the focus from transferring water exclusively into RSA. The lowland areas of Lesotho, where two thirds of the population resides, the Lowlands Water Supply Scheme (LWSS) was initiated and the scheme has created more than 10, 000 job opportunities (SMEC, 2008).This implies that, the inception of dams has constituted the means of livelihoods for many Basotho, irrespective of whether it is intended to transfer water into the RSA to target the local communities.

Besides these positive impacts, there are setbacks as well on livelihoods of Basotho households. LHDA (2003) has indicated that, thousands of Basotho households were left without regular income after the completion of the Katse dam in 1997 as well as after the completion of the Mohale dam in 2002 when jobs were terminated. Irin, (2011) indicated that the LHDA is building a third major dam (Polihali), despite the concerns about the welfare of thousands of the villagers who lost their homes and land after the first dams that were built in return for what many feels is inadequate compensation.

Amnesty International states that nearly 8,000 people are facing the loss of their homes or livelihoods as construction begins around the Polihali dam in Lesotho. The organization has called for the halt of the construction of the dam, which is intended to supply water to RSA, until the affected communities in the Mokhotlong district, have been properly consulted and compensated accordingly by the relevant authorities.

In order to mitigate some bad effects of these water projects the LHDA has established some livelihood training programmes intended to capacitate the workers with skills and alternative means of post-employment livelihood (LHDA, 2003). For examples, women are trained in dress-making and knitting. They make quality school uniforms. The skills will assist them to supply the schools with uniforms in future because a uniform is still the main attire in most schools in Lesotho. LHDA has also introduced training on high valued production of alternative crops such seed potatoes, giant garlic and paprika to the resettled subsistence small farmers in order to improve the agricultural income (LHDA, 2003).

2.10.9. Chapter summary

This chapter summarises the supply of water dimensions and its effects on the means of livelihoods for the communities in various developing countries such as India, South Africa and Colombia. It has been observed that, water supply in the sense of availability and accessibility in terms of satisfactory quantity and quality for utilisation at both households and community levels for self-sustenance and productive activities is a critical component of communal means of livelihood. Water supply, as an essential pre-requisite for community production and domestic activities, has a significant impact on food security, human security, economic security and household coping strategies.

This chapter has also indicated that the Basotho livelihoods were dominated by land ownership, agriculture production, livestock rearing, and employment wages (mining and clothing industries). There cent employment on the construction of dams is another source of livelihood. It sustains the families. These means of livelihoods are not immune to the challenges that are caused by different factors.

CHAPTER THREE
METHODOLOGY

3.1. Introduction

The main aim of this chapter is to provide the details about the methods that were used to collect data as well as those followed in analysing the collected data. Methodology is the correlation of the two concepts that make up a significant part of the most important field of scientific research and technology (Kumar, 2005). Birks and Mills (2011) assert that research methodology is a set of principles and ideas that inform the design of a research study and that the method is seen as practical procedures that are used to gather and analyse the data. Research is the quest for the knowledge to weigh, evaluate and observe the facts in order to explain opaque proceedings (Kothari, 2005).

It is the systematic investigative scrutiny into an unknown scientific process, whereas methodology is the system of the methods followed in a particular discipline. Methodology includes a collection of theories, concepts, ideas, and ideologies as they relate to a particular discipline or field of inquiry (Yin, 2003).

Linked together, the two come to mean the inquiry of facts within a particular field, using a particular method suited to that field. This study applied a qualitative method of research. The chapter presents the research design, the study area/location of the study, population and sampling, population sample, sampling procedure, data analysis, ethical consideration and limitations of the study.

3.2. Research design

A qualitative research approach was employed in undertaking this descriptive research study. An interview instrument was divided into two sections. The first section focuses on the questions. Qualitative research is used to obtain an understanding of the reasons, opinions and motivations behind people's thinking. It uses words rather than numbers (Creswell (2013). The qualitative analysis allows for an in-depth understanding of the research subject to be enquired.

The researcher mainly used the secondary sources to analyse and evaluate the livelihoods in relation to Water Supply Schemes in order to understand how they are affected mainly at household and community levels. The study adopted certain theories and concepts to analyse the relationship between water supply and livelihoods.

The qualitative research is generally used in situations where the subject of research at hand is one that incorporates the significance of the study trends that cannot be expressed using quantitative figures. Using qualitative research methods allows the researcher to be involved fully throughout the research process (Hamusunse, 2015).

3.3. Data collection method

The study used both primary and secondary data. In collecting primary data, unstructured questionnaires and personal interviews were used. The interview instrument was divided into two sections. In the first section, the questions were directed to the affected catchment communities by the scheme and the key local governance structures (chiefs and local councillors), and the second section to the key institutions which implement the scheme.

The secondary data was collected from the available literature review. The data was collected from the documents such as the grey literature, articles, journals, government gazettes and official documents, white papers, books as well as the previous research studies that were relevant to this study to provide a theoretical perspective to the issue under study in both developing countries as well as in Lesotho.

3.4. Study area/location of the study

The study data was collected within the Maseru District from the Qiloane, Manonyane, Mohlakeng, and Mazenod local councils as well as from the Ministry of Water (MW) and the Water & Sewage Company (WASCO).

3.5. Population and sampling

3.5.1. Population

The population of this study was composed of the affected households, the key informants representing the affected communities (chiefs and local councillors) of: Qiloane, Manonyane, Mohlakeng and Mazenod local councils and the key institutions for the implementation of the scheme: Ministry of Water (MW), and WASCO in order to probe relevant information.

3.5.2. Sampling procedure

In carrying out this study, the purposive sampling technique was used. The participants were selected deliberately purposively from the targeted local councils within the catchment areas of the scheme: Qiloane, Manonyane, Mohlakeng and Mazenod.

Purposive sampling was further used to select the relevant officers from the selected institutions involved with the implementation of the scheme (MW and WASCO).The study also purposively selected the households directly affected by the scheme within the catchment communities.

3.5.3. Sample

Thirty-two households from eight selected villages within the four councils, twenty unconnected households from each council, one chief per village and two local councillors from each council and two key water officials were selected and interviewed.

3.5.4. Inclusion and exclusion criteria

The study exclusively interviewed the households directly affected by the scheme to examine the impact of the scheme on communities and determine whether their means of livelihoods were restored or not. The findings were used to draw reasonable conclusions and recommendations about the impact of the scheme on the means of livelihood for the affected communities.

The second key group of interviewees were the technicians and managers of water management and distribution related institutions. They responded to the questions on management and distribution of water on a daily basis and provided information on both the technical and policy challenges faced by their respective institutions on provision of water for the communities.

3.5.5. Data analysis

A thematic method of data analysis was applied in examining and interpreting the interview transcripts and to identify the common themes, topics and patterns. A qualitative analysis was also applied in examining and interpreting the responses in order to discover the underlying meanings and patterns of relationship between the MLWSS and livelihoods in the catchment communities.

3.6. Ethical considerations

Ethical considerations refer to the professional practice and responsibility in the manner the researcher behaves and conduct himself or herself in a particular set up of the research. A researcher may unwittingly act unethically and violate the rights to privacy and confidentiality of the participants (Du Plooy-Calliers et al, 2016, p268). This study relies on both primary and secondary sources of data, including the literature review. However, ethical consideration was taken into consideration and these included the acknowledging of sources of data, adhering to the principles of scholarly research policies and regulations of the institution.

Furthermore, the researcher ensured that the information was not falsified, distorted, or deliberately changed to give wrong impressions or meanings and was treated with utmost good faith and confidentiality. The informed consent, anonymity and confidentiality were maintained at all times. The respondents were informed about the purpose of the study and made aware of their right to withdraw from the process should they feel uncomfortable or threatened.

3.7. Limitations of the study

Some respondents are directly affected by the shortage of water and were therefore, likely to be biased or to exaggerate some issues. Other respondents have worked for the water supply institutions and may have been reluctant to disclose some weaknesses associated with their employers. The sampling size was to some extent, compromised in order to observe the World Health Organisation (WHO) guidelines and the national restrictions such as social distancing to fight the COVID -19 pandemic diseases. The research design approach adopted the qualitative research only for the study. This implies therefore that, the research lacks some complementary strengths of the quantitative research approach.

CHAPTER FOUR
DATA PRESENTATION AND ANALYSIS

4.1. Introduction

This chapter presents and analyses the findings from the data collected from four households in each of the villages selected from the four councils: Qiloane, Manonyane, Mohlakeng and Mazenod. It further presents the findings from each chief from the selected villages, one councillor from each council and two water officials from the Ministry of Water and WASCO.

A thematic presentation of the findings is adopted. The themes were constructed from the three research objectives during data gathering and the sub-themes were additionally developed from the research questions. The collected data was first coded so that the presentation of the findings reflects anonymity and confidentiality of the respondents, as indicated with different codes in table 4.1 below. The chapter is divided into three main sections: Demographic profiles of the respondents, research findings and the chapter summary.

Table 4.1: Participants in the study

Households in councils	**Villages**	**Codes**
Qiloane	Masekoeng &Ntlo-kholo	HHS1 and HHS2
Manonyane	Ha Mafefooane & St-Michaels	HHS3 and HHS4
Mohlakeng	Ha Motloheloa & Ha Maja	HHS5 and HHS6
Mazenod	Ha Mantsebo & Ha Masana	HHS7 and HHS8
Unconnected Households in councils		
Qiloane	Masekoeng &Ntlo-kholo	UNHS1 and UNH2
Manonyane	Ha Mafefooane & St-Michaels	UNHS3 and UNH4
Mohlakeng	Ha Motloheloa& Ha Maja	UNHS5 and UNH6
Mazenod	Ha Mantsebo & Ha Masana	UNHS7 and NNH8
Chiefs		
Qiloane	Masekoeng &Ntlo-kholo	CF1 and CF2
Manonyane	Ha Mafefooane & St-Michaels	CF3 and CF4
Mohlakeng	Ha Motloheloa & Ha Maja	CF5 and CF6
Mazenod	Ha Mantsebo & Ha Masana	CF7 and CF8
Councillors		
Qiloane	Masekoeng &Ntlo-kholo	CL1 and CL2
Manonyane	Ha Mafefooane &St-Michaels	CL3 and CL4
Mohlakeng	Ha Motloheloa & Ha Maja	CL5 and CL6
Mazenod	Ha Mantsebo & Ha Masana	CL7 and CL8
Water Management Officials		
Ministry of Water	Maseru city	MW1 and MW2
WASCO	Maseru city	WS1 and WS2

Source: Field Survey November 2020

4.1.1. Demographic Profiles of respondents:

The data from the households reflects different age groups that have been affected by the MLWSS, as indicated in Table, 4.2.

Table 4.2: Age range of respondents

Age	Households (32)	Chiefs (8)	Councillors (8)	Water Officials (4)
26-35	2	2	3	1
36-45	12	5	4	1
46-65	14	1	1	0
66-75	2	0	0	2

Source: Field Survey: November, 2020

The household interviewees in this study were between eighteen and ninety years of age. Nonetheless, most of the respondents were between thirty-six and seventy-five years of age. Table 4. 2 shows that, age group range of 46-65 was the most dominant for all the age groups out of the sample of 32households. It is followed by age range 36-45 the range groups 26-35 and 66-75.

4.1.2. Gender of the respondents

The findings from the data reflected that both male and female genders were affected by the MLWSS, as Table 4.3 indicates.

Table 4.3: Gender of the respondents

Age	Qiloane (Masekoeng & Ntlo-kholo)	Manonyane (Ha Mafefoane &St-Michaels)	Mohlakeng Ha (Motloheloa & Ha Maja)	Mazenod(Ha Mantsebo & Ha Masana)	Chiefs	Councillors	Water management officials
Male	5	4	7	6	8	6	3
Female	3	4	1	2	0	2	1

Source: Field Survey: November, 2020

Table 4.3 shows that out of thirty two households interviewed from the eight villages in the four councils, twenty two were males while ten were females. Seven males were from Mohlakeng council, six from Mazenod council, five from Qiloane council and four from Manonyane council. There were also four females from Manonyane council, three from Qiloane council, two from Mazenod council and one from Mohlakeng council.

The predominance of the males can be attributed to the fact that men are the household heads and were present during the interviews. All chiefs interviewed were male. In Lesotho, almost all the chiefs are men due to the Lesotho chieftainship succession which is patriarchal in nature. The councillors were composed of four males and four females**.** The water management officials constituted three males and one female.

4.1.3. Educational level of respondents

The data shows different education levels of the respondents from the catchment area of the MLWS scheme.

Table 4.4: Different qualifications of the respondents

Education level	Qiloane (Masekoeng& Ntlo-kholo	Manonyane (Ha Mafefooane & St-Michaels	Ha Motloheloa & Ha Maja	Ha Mantsebo & Ha Masana	Chiefs	Councillors	Water management officials
None	0	2	6	0	0	0	0
Primary	2	0	0	2	2	2	0
High School	6	0	0	4	4	6	0
Vocational School	0	0	2	2	2	0	0
Tertiary	0	6	0	0	2	0	4

Source: Field Survey: November, 2020

Out of thirty-two respondents selected from the households, ten held high school certificates, eight did not have formal education qualifications, ten held tertiary education and vocational education qualifications while four held primary school certificates.

Five chiefs held high school qualifications; two held tertiary education qualifications while had not completed high school studies.

The study further shows that out of the eight councillors interviewed, four had high school qualifications, two had tertiary qualifications and two had vocational qualifications. The water management interviewees were composed of four officials, two at the managerial level and the other two at the technical level. All of them had tertiary education qualifications.

4.2. Means of livelihoods before MLWSS

One of the objectives of this study was to identify the means of livelihood in the selected households before MLWSS was implemented in the four selected councils Subsistence agriculture (livestock and crops), self-employment and part- time jobs were the main livelihood means in these areas.

4.2.1. Subsistence agriculture

According to the findings, the majority of the households depended on subsistence agriculture, growing maize, sorghum, beans, wheat, potatoes and peas. Out of thirty-two households; twenty-nine relied solely on the agriculture. Eleven households were from the Qiloane council, nine-households from Manonyane council, five from Mohlakeng council and four from Mazenod council. HHS1 stated

"Before the MLWSS, we depended on growing crops mainly for home consumption. We used to grow maize, beans and other crops to sustain our family lives. This is because these crops were easy to maintain, given the scarcity of water in our area before the water was supplied. We used to get water from the springs and boreholes which were quite far and unreliable, especially during the dry seasons, before MLWSS was introduced in our areas. We were actually struggling to get water for drinking, washing or watering our crops because these sources were not able to meet our water demands".

HHS2 indicated:

"We relied on subsistence agriculture for consumption and sustaining our households before water was supplied in our area. We produced crops and vegetables which relied on natural rains. This means that, during the dry seasons, our agricultural produce declined due to water shortage. Even the boreholes became overstretched as they were the only source of water in the area and were no longer supplying enough water to the households. Ultimately, they became dry and dysfunctional".

CL1 echoed:

"This area used to be dominated by subsistence agriculture before the MLWSS. We produce only to feed our families. The shortage of water adversely affected the communities to sufficiently produce crops even for family consumption. That contributed to poverty in our communities, especially in 2015duringthe severe drought".

4.2.2. Livestock

The study findings show that livestock was also one of the predominant means of livelihood. Out of thirty-two households; twenty relied primarily on the livestock, cattle, sheep, goats, donkeys and horses as their means of livelihood. The by-products from these animals included wool and mohair from sheep and goats. Seven households were from the Qiloane

council, five-households from Manonyane council, four from Mohlakeng council and four from Mazenod council. One household member, HHS2from the Qiloane council narrated:

"We rely on rearing livestock as the key means of livelihoods for our survival in this area. The common domestic animals that we keep include the cattle, sheep, goats, donkeys and horses amongst others. We use cattle, horses and donkeys to perform daily livelihood functions especially the agricultural functions. We use them for ploughing, cultivating, and sowing our fields. We also use cattle, goats and sheep to perform our traditional and cultural activities such as paying lobola or making the ancestral feasts which are part of our livelihood. Animals like sheep and goats are used for other purposes but they are particularly reared for producing wool and mohair that we sell to generate income. The shortage of water in our area has compelled the majority of us to rear these domestic animals for survival. During the dry season we cannot produce any crops from our fields. We sell these animals to buy the basic food and to attend to other family pressing needs such as the payment of school fees for the children and for medical treatment".

4.2.3. Employment

The findings of this study further indicate that employment is one of the means of livelihood in the four councils. Out of thirty-two households interviewed, twelve were employed in the textile and apparel firms in Maseru and in South Africa as domestic workers. Two households were from the Qiloane council, two-households from Manonyane council, four from Mohlakeng council and four from Mazenod council. The majority of them were women. They were able to earn monthly income to take care of their families 'needs. The income was mainly used for buying food, school uniforms and school fees. HHS4 stated:

"I was employed at one of the textile firms at Ha Thetsane, Maseru and earned the income to support my family. Locally, the options to pursue our livelihoods were limited and the only viable option was to seek employment in the textile firms in Maseru. The income earned was very useful for their family needs food, school fees and uniform for the children, and basic furniture for the house. Nonetheless, many of us in the community were troubled by lack of water in our community because of drought as a result of climate change"

4.2.4. Self-employment

The study further revealed that, before MLWSS intervention, most household members relied on self-employment. Out of thirty-two households interviewed, twenty were self-employed doing metal welding, woodwork production or knitting wool clothes. Seven households were

from the Qiloane council, four-households from Manonyane council, four from Mohlakeng council and five from Mazenod council. The income generated was used to buy food for the families and pay school fees for the children. HHS5reiteratedthat:

"My main source of income has been welding of metals. I have been doing this job for many years and I am well known in this village and nearby villages. I make so many products such as the sieves, oxen yokes, gates, beams, and window frames and door burglar frames. I also fix the burglar proofs, wheelbarrows, ploughs and other equipment made up of metals".

HHS6, also explained:

"I have been relying on tailoring as a means of income generation for my family. I make cultural attire, church attire and school uniforms. Though I own land, I have not cultivated it due to drought. I depend on the income from tailoring and use it to buy other family necessities".

4.2.5. Part time works

The study also shows that some people are dependent on part-time works for their livelihoods. From the thirty-two respondents, eighteen have confirmed to be relying on these works. Five households were from the Qiloane council, six-households from Manonyane council, three from Mohlakeng council and four from Mazenod council. They are engaged in gardening and lawn maintenance for their livelihood. The generated income was used for buying food, school uniforms and school fees. HHS7, related:

"I was temporarily employed as a herd boy, but I lost that job. Since then, my living has been depended on part time work such as maintaining the lawns or gardening. I have been doing this job for many households in this area and also in nearby villages. With the generated income, I bought food for the family, paid fees for the children and bought the required school uniforms. We could not engage in other means of livelihood such as agriculture because the problem is limited supply of water in our area. We could not produce any vegetables from our gardens. We were forced to buy even vegetables for household consumption due to the current drought."

4.3. The effect of MLWSS on livelihoods

Another objective of this study was to identify the effects of water supply on household livelihoods in the four councils. The effect of MLWSS on the livelihood was two folds. It led to improvements on the traditional means of livelihood and also led to newly adopted means

of livelihoods within the four selected councils. The newly adopted means include commercial agriculture, bricks production and car washing businesses.

The introduction of MLWSS has had a significant impact on the former means of livelihood, especially agriculture and livestock. The approach towards agriculture drastically changed from subsistence to commercial farming. The households which used to rear more livestock considerably diverted to other means of livelihood, such as bricks production and car washing which were influenced by MLWSS.

4.3.1. Commercial agriculture

The study showed that, out of thirty-two respondents interviewed, twenty-nine affirmed that, they were engaging in commercial agriculture as a result of water supply from MLWSS to their areas. The respondents indicated that, as a result of being connected to MLWSS, they had put up green houses for producing crops and vegetables for commercial purpose and have subsequently bought more land as result of increased incomes. Four households were from the Qiloane council, five-households from Manonyane council, ten from Mohlakeng council and ten from Mazenod council.

The findings indicate that the income generated from the sale of these crops and vegetables was used for family needs such as the payment of school fees, buying furniture and acquisition of more farming land and equipment for increased production. The reliable supply of MLWSS water according to the study results had increased agriculture products for sale, showing the increased demand of such products. This was confirmed by HHS8 who stated that:

"The MLWSS has significantly changed my livelihood. The sufficient availability of water has assisted me to increase my agricultural production. I have been able to install several green houses in order to increase my production throughout the year. I would not take a risk of building greenhouses if water supply were still unreliable and inconsistent, but now the supply is sufficient and predictable to engage fully in commercial production. I have left my former employment in furniture stores as a salesperson in order to focus on commercial agriculture".

HHS9, reiterated:

"I can gladly confess that the water supply from Metolong Water Supply Scheme has indeed improved the means of my livelihood significantly. Due to the reliable and sufficient supply of water from Metolong dam, I took an advantage of that and installed the water sprinklers and set up green houses for production of agricultural products on a large scale. I am supplying both the local and national markets all around the year. This has substantially transformed my livelihood for the better and in a sustainable manner.

I have actually shifted from ordinary subsistence for household consumption into a commercial producer who produces crops and vegetables in large quantities and supply bigger markets. I use the generated income to pay school fees for my children, buy improved seeds and furniture. It has also enabled me to diversify business into other viable and water-driven businesses such as car wash business, and production of bricks".

HSS10 and HHS11 as well echoed the sentiments by indicating that, *"MLWSS has enabled diversification of their agricultural produce which they sold in their communities as well as supplying the market in Maseru".*

CF1was also of the opinion that MLWSS has improved the livelihoods of many in the affected communities. He asserted: *"My community has been so dependent on subsistence farming and livestock over the years for their survival and were not able to explore other income generating opportunities such as commercial agriculture. However, the introduction of MLWSS has actually opened doors for diversifying and exploring other means of livelihoods. I have also observed that, some households are engaged in commercial farming, bricks production and car wash businesses since the MLWSS".*

Similarly, CF2 and CF3affirmed by indicating: *"households in communities which are affected by MLWSS have improved their livelihoods in many ways. For example, the villagers have put up green houses for production of vegetables such as cabbage, spinach, tomatoes, onions, carrots and corn which they are able to sell and generate income for other needs including school fees for their children".*

4.3.2. Brick production

According to the findings, another type of livelihood newly adopted as a result of MLWSS was the brick production. The bricks were supplied to the government buildings, private businesses and new residential settlers. From the thirty-two respondents, twenty-two have

affirmed their reliance on bricks production. Three households were from the Qiloane council, three-households from Manonyane council, seven from Mohlakeng council and nine from Mazenod council.

HHS12 said:

"I was able to set up the bricks production business because the nature of this business relies solely on sufficient water supply. Initially, I was employed by someone who produced building bricks which were bought bythe nearby communities, but the quality of bricks was very poor due lack of water. Eventually, the customers sought alternative sellers of bricks which, led to the collapse of that business and we lost our jobs. Because I was very passionate about production of bricks with MLWSS which supplies sufficient water to our community, I identified the potential market for the building bricks and started my own business. The business is doing very well in terms of attracting many customers due the quality and timely production of bricks."

4.3.3. Car washing

The MLWSS has enabled communities along the supply belt to engage in car wash as another means of livelihood. They started the car wash businesses as a result of the water supplied from MLWSS. From the thirty-two respondents, twenty-four have re-affirmed their engagement in car wash businesses. Three households were from the Qiloane council, five households from Manonyane council, seven from Mohlakeng council and nine from Mazenod council.

HHS13, from the Mohlakeng council affirmed:

"The MLWSS that is supplying our area with water had enabled me establish this car wash as a business. I identified this as an opportunity some years ago, but I was unable to pursue it due to lack of water. I am mainly targeting taxis and other types of vehicles including big trucks which are being washed. The water comes with high pressure and makes car washing more effective and efficient. I wash approximately 15 vehicles per day and charge M50.00 for a small vehicle and M150.00 for a truck or Tractor Loader Backhoes (TLBs). The MLWSS does not only supply us with sufficient water but also water supply sustaining our businesses as they are dependent on water. I can proudly confirm that, my business is growing very fast."

Also, CL4 echoed:

"I can confidently confirm that, the MLWSS has made significant changes to many lives within our council. The evidence is the emergence of car-wash businesses which did not exist before the scheme and most of them are thriving. This water supply scheme has come at the time when climate change is affecting our communities. Most of our springs and boreholes have literally dried up. The demand for water by our communities has been met. We are now able to focus on other community priorities."

4.4. The effects of water shortage on livelihoods of the unconnected households

The study further investigated the repercussions of non-availability of water on the livelihood of unconnected households in the four councils under study to understand the dilemma they were facing. About twenty unconnected respondents confirmed that their livelihoods were affected by exclusion from the MLWSS because they were unable to connect to the belt and to access water. The reason stated for non-connectivity was their exclusion by the authorities in charge of the MLWSS. Six households were from the Qiloane council, six households from Manonyane council, four from Mohlakeng council and four from Mazenod council.

All the twenty respondents stated that their exclusion from water connection from water distribution network has caused inaccessibility to water and inconvenience to pursue their means of livelihood effectively in their respective catchment areas. The WASCO officials mentioned that the conveyance network system has been designed in a manner that excludes some villages from the water connection and, consequently they suffer from water shortage.

4.4.1. Water shortage

All the four respondents from the Ministry of Water (MW1) and from WASCO (WS1) have indicated that when MLWSS was implemented, some villages were far away from the conveyance systemin the catchment areas and were erroneously excluded from the connection of distribution network. The scheme was supposed to include all the downstream households, but the designers excluded them and eventually made them to continuously suffer from the water shortage. This shortage has affected all aspects of life for these households from domestic consumption and sanitation, watering of crops to commercial activities.

4.4.2. Business impediment

From the research study, most households which are economically active in all the four councils have indicated that, the shortage of water in their area has been a great stumbling block for them to engage in business over the years. They further stated that, the connected households in their neighbouring villages are already enjoying the benefits of MLWSS as they have taken the advantage of the water to engage in businesses for maintaining their lives.

HHS14 explained:

"We were hopeful that, the scheme will assist us to shift from the traditional way of using water for domestic consumption to commercial activities such as commercial production of agricultural products, establishment of businesses and improved sanitation services. However, we still struggle to get water even just for domestic consumption. We have to travel long distances to the rivers to wash our clothes with dirty water yet the clean water passes near our places. We are so disappointed by this unjust action and we totally blame the government for it."

The CL7 echoed:

"Metolong water belt has not changed anything on my livelihood. I am still suffering the shortage of water despite being close to the supply belt because I am not connected. We were told that we fall under the Department of Rural Water Supply (DRWS) therefore we cannot be connected to MLWSS. The bottom line is, we are not connected and we cannot do any business. This desperation for water has also been increased by drought."

4.4.3. Poor agricultural production

The findings of the study show that, all the twenty–six unconnected respondents were not able to produce crops and vegetables due to shortage of water. Nine households were from the Qiloane council, eight-households from Manonyane council, five from Mohlakeng council and four from Mazenod council.

HHS15 expressed:

"*I have a big field that could produce crops and vegetables like my neighbours who are connected to the water supply system. That would assist my family to get out of poverty and improve my livelihood as is the case with most of my neighbours who are benefitting from water supply scheme. Connection to the MLWSS would reduce our stress that causes unnecessary illnesses. At the moment I buy vegetables and corn and sell them in town to*

generate income as a way of coping with water shortage in our village. The most painful thing is that, I could actually produce the vegetables and crops by myself, given the land I own, but I am limited by the perpetual shortage of water. It is not only expensive to buy from other producers, but it is also costly to transport the products to and from the market every day.

I solely depend on what has been produced not on what I see as market demand at the time and eventually the sale does not attract more customers as one would wish. We therefore appeal to the Government and other related authorities to consider connecting us to the water belt urgently. We are continuously suffering from the effects of water shortage due to the severe drought that we are experiencing and we are also missing the business opportunities that others already benefit from due to the water supply. We attempted to connect to the system illegally, but WASCO has disconnected us and has instituted litigation against us."

CL6, also articulated:

"You may be aware that, recently we are facing perpetual drought and extreme heat waves. One of the papers that I read stated that "towards the end of 2015 and the beginning of 2016, Lesotho experienced the worst drought in 35 years due to the El Niño phenomenon and has resulted in poor rainfall, declines in aquifer and spring recharging, loss of livestock, and widespread crop failure leading to massive drops in food production.

Consequently, the communities were compelled to reduce meal sizes, decrease non-food expenditures, and sell productive assets". I agree with that newspaper. The shortage of water in our council has affected the lives of the communities negatively and caused extreme poverty".

4.4.4. Poverty

The findings of the study further indicate that the reliable water supply is closely linked to poverty reduction and economic development in the catchment communities. The shortage of water thereof has limited and reduced the household ability to produce and access food, to respond to human security challenges and to enhance economic productivity. Consequently, poor production has driven them into poverty.

All the respondents have confirmed that, their livelihoods have been affected by exclusion from the MLWSS. They experienced water shortage, poverty, business barriers and poor agricultural production.

4.5. The coping strategies for the unconnected households

One of the objectives of the study was to identify the coping strategies of the unconnected households along the MLWSS. All the twenty unconnected respondents confirmed that the total non-connectivity, coupled with extreme drought, have caused water shortage in their area and have negatively affected their means of livelihoods. They further confirmed that, the shortage of water has eventually influenced them to explore some other coping strategies including selling of livestock, selling of chicken, production and sale of wood products, welding of metals and doing part time work to sustain their livelihoods. Five households were from the Qiloane council, five households from Manonyane council, five from Mohlakeng council and five from Mazenod council.

4.5.1. Selling of livestock

Out of twenty households interviewed, eighteen have confirmed that, they have engaged in sale of livestock such as cattle, sheep, goats, donkeys and horses as a coping strategy.

UNHS1 confirmed:

"I usually sell some animals from my livestock in order to generate income for my family needs during the dry seasons when production of food from the fields is poor. This provides a great assistance to cope with the stress of limited food production as a result of drought and minimizes poverty in my family."

4.5.2. Selling of chicken

Twelve out of twenty unconnected households sold chicken as a coping strategy. **UNHS2 elucidated:**

"With the realisation of recent drought, I have engaged in poultry as a fall-back strategy to deal with the severe effects of poor food production due to lack of water supply in our area. By selling chicken, I have managed to withstand the hardships of water shortage and raised funds to pay fees for my children."

4.5.3. Production of wood products

The study shows that of the twenty unconnected households' fourteen engaged in woodwork production, making chairs, tables and coffins because they do not have alternative strategies.

They are not connected to MLWSS to be able to diversify their livelihood means. **UNHS3 affirmed the situation:**

"I have prepared myself financially by producing the wood products so that I would still be able to attend the family needs even if the food production is bad. I took this decision after realising that, the weather has changed drastically and dependence on agricultural produce was no longer reliable."

4.5.4. Welding of metals

Some of the unconnected interviewees were engaged in welding as a coping strategy. About nine of they confirmed that, they have engaged in welding because they are unconnected to the water supply belt from Metolong dam. They weld items such as wheelbarrows, ox yokes, window burglar proofing and steel gates.

UNHS5 narrated:

"I chose my business wisely anticipating the unforeseen circumstances that may affect our wellbeing negatively. I opened a welding workshop to attend my clients after the installation of electricity in our area and this business does not necessarily depend on water. It has helped me a great deal to survive the severe effects of poverty caused by shortage of water. I still manage to attend to family needs with the income generated."

4.5.5. Part-time work

The findings of the study show that twenty-three unconnected respondents engaged in part time works such as washing clothes, maintaining the lawns and gardening. They worked within their own villages as well as the nearby other villages. During the hard times, they went beyond searching for these jobs. Six households were from the Qiloane council, five households from Manonyane council, seven from Mohlakeng council and three from Mazenod council.

UNHS4, indicated:

"Due to the dire need for income for the family during the poor production of food, I decided to look for temporary employment from house to house within the village as well as in the neighbouring villages. Despite the limited funds that I am raising, I am able to meet the basic needs such as food".

4.5.6. Illegal connections

The study finds that the majority of the households that were unconnected to the water supply network and whose means of livelihoods were already vulnerable engaged in illegal connections of water from the water belt to address their water shortage problem. From the thirty-two respondents, twenty-four have re-affirmed their engagement in illegal connections. Five households were from the Qiloane council, eight households from Manonyane council, eight from Mohlakeng council and three from Mazenod council.

UNHS8 confirmed:

"The desperation created by water shortage has eventually driven some households to engage in illegal water connection. The main problem lies with the distribution whereby most villages have been excluded from the connections despite the water passing by their areas. Due to desperation for water, some members of these communities engage in illegal water connection."

The CL5 of the community echoed the sentiments: "*As a result of the desperate need for water for domestic consumption or advancing commercial activities, the communities sometimes lose patience to wait for the legal connections and take law into their own hands by illegally connecting water. We did not follow proper procedures to connect water from Metolong dam. People were desperate and have made numerous unsuccessful attempts to receive water supply. Places like the local clinic, Thaba-Bosiu Health Centre, do not have water; this is a clinic that helps women who give birth. It is a problem because women are always encouraged to give birth at hospitals, but that is not possible because there is no water."*

UNHS1 who is affected by shortage of water was quoted as saying "The taps are very far from here; we walk long hours and people end up being knocked down by cars trying to go fetch water. We cannot even resort to boreholes because of drought. It is even worse for the schools and clinics. In the light of this, we as the community, resolved to find someone to connect water from Metolong dam conveyance system for the school but may months down the line, he is being accused of connecting water illegally".

The survival of the majority of unconnected households depends on selling livestock, chicken, wood products, and metals and on doing part time work. But others have resorted to illegal connections in order to impose their means of livelihood

CHAPTER FIVE

THE FINDINGS AND DISCUSSION

5.1. Introduction

The chapter discusses the findings of the study on the basis of the objectives. It further discusses how the findings related to the theories that framed this study and the empirical literature arguments on water supply schemes and their effects on the livelihoods of the people.

5.2. Participants after MLWSS

It has been drawn from the study that, most respondents' age range was between 36 and 75 years. Between 46 and 65 years was discovered was the age range that was mostly affected by MLWSS in all the four councils. Due to its economic activeness, the same group also diversified into other means of livelihoods after MLWSS.

The male predominance was also realized from the respondents in all the four selected councils. The reason being that, men used to collect water from distant places during the dry seasons for the households in the absence of MLWSS. This male dominance was also identified at the institutional level whereby all the chiefs interviewed were males and the male councillors; they slightly exceeded the female ones. In Lesotho, almost the chiefs are men due to the patriarchal chieftainship succession and customary laws in Lesotho.

This study has found that the education level did not necessarily play any significant role on the direct effects of MLWSS. The shortage of water affected everyone irrespective of the qualifications. However, most respondents who had completed their high school were able to realize the opportunities that could be derived from MLWSS and engaged in businesses. Similarly, the primary and high school drop outs were also engaged in business as engaging in business does not require any special skill to establish it.

Chiefs and councillors had generally completed their high school certificates and few of them had obtained the tertiary education qualifications. All the water officials had acquired the tertiary education qualifications because it is a pre-requisite at their recruitment to join their respective institutions.

5.3. Means of livelihoods before the MLWSS

One of the objectives of this study was to identify the means of livelihoods for the households before MLWSS was introduced within the four concerned councils. The study discovered that ninety percent of the households relied on subsistence agriculture, livestock, employment, self-employment and temporary works as their main means of livelihood.

The households were confined to pursue their livelihoods within these means due to the shortage of water. This restricted them to tap into other opportunities that could improve their lives because their main sources of water were springs and boreholes, both of which provided insufficient water supply to the households (Plate 1). Consequently, they could not, easily engage in commercial activities. The households used the water from the springs primarily for drinking, bathing and washing.

The UNDP report (2006) states that: when households are not connected to water, they have limited options and therefore impact negatively on their livelihoods. This means that, these households maybe obliged to collect water from untreated water sources, which could as well be hazardous for their health. Alternatively, they have to purchase water from middle persons or vendors who overcharge them. This implies that access to water by the households is compromised:

Onjala, (2002) further confirming that a large number of households are still far from the water points and their level of coverage goes down as low as 20% during the dry season when seasonal water sources dry up, making the distances to the water sources long and often exceeding 5kilometres.

5.3.1. Subsistence agriculture

The study has specified that, ninety percent of the households depended on subsistence agriculture as their means of livelihood within the four selected councils. They further assert that subsistence agriculture can play an important role in reducing the unavailability of rural and urban food, insecure households, improving people's livelihoods and helping them to mitigate high food price inflation.

Baiphethi & Jacobs (2010) explain subsistence agriculture as when farmers grow food crops to meet the personal needs and those of their families on smallholdings. Subsistence agriculturalists target farm output for survival and mostly for local requirements, with little or no surplus. They produce both crops and vegetables basically for domestic consumption and their agricultural products rely mainly on natural rain.

They do not have stored water. Furthermore, it has been observed that, water supply has a direct bearing on agricultural production. As a result of the recent severe and perpetual drought, some fields were not cultivated at all while others were underutilized (i.e. half cultivated or being left fallow fora number of years. Consequently; this led to poverty due to the poor production of food.

In advancing this view, the NSDP I of 2013 specifies that, in developing countries, including Lesotho, most people rely solely on subsistence agricultural products and animal farming. This implies therefore that any shortage of water caused either by the shortage of rainfall, dry rivers, severe drought or climatic change has a significant negative impact on the production of agricultural products and animal husbandry for the entire country, including the four councils where this study was undertaken.

Plate 1

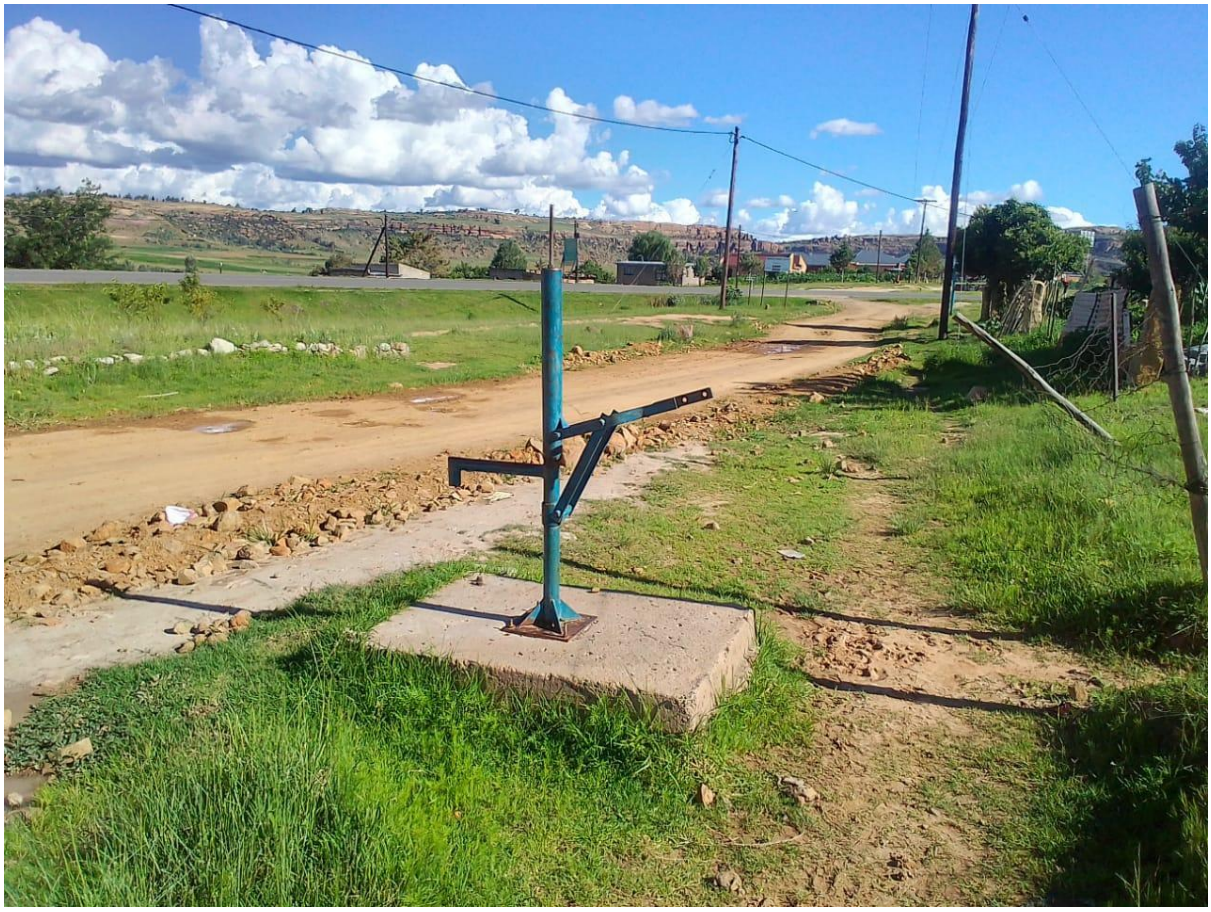

Plate 1 shows the old borehole at **Masekoeng village in Qiloane** council which the HHS1 indicated as supplying water for the village. The borehole is no longer functional, because it dried up as a result of severe drought caused by erratic climate change.

5.3.2. Livestock

Livestock refers to any 'domesticated mammal' that has been reared deliberately for agricultural purposes or that is meant for either subsistence or profit making. The purpose of livestock keeping can range from food, fibre, dairy products, draft, breeding, sport purposes, other product or labour. Therefore, livestock entails cattle, sheep, fur-bearing animals and horses (Lear, 2012).

Clack's (2013) definition encompassed any horse, ass, mule, ox, bull, cow, heifer, sheep, calf, pig, goat, poultry, domestic ostrich, domesticated game or the carcass of such stock. This definition supports the fact that livestock is reared to sustain the livelihood of the owners and the study followed both definitions.

With regard to the livestock, the study has reflected that eighty-nine percent of the households reared domestic animals to sustain their livelihood. These animals are also used for performing some cultural and traditional functions for the households within these selected councils. During the trying times of drought when food production is very poor, some households sell these animals in order to generate income for maintaining their livelihoods. It has also been observed that 98percent of the households had at least one type of t domestic animals or own more than one type ranging from cattle, sheep, goats, donkeys, pigs and horses. This is considered as the primary reason which made it easier for them to rely on livestock.

Specifically, both Qiloane and Manonyane council households rear the livestock because of their close location to the foothills where the grazing pastures were still available and livestock constitutes one of the key means of livelihood amongst the communities.

5.3.3. Employment

According to the International Labour Organization (ILO) (2021) an employed person has to be aged 15 years or older who have worked (for commensurate pay or profit for at least one hour during a given week or having a job from which being absent under conditions on the reason of absence (holidays, sick leave, maternity leave, etc.). This definition is relevant to this study because the payment is used to maintain the livelihoods of the employees and their respective families.

The study has revealed that, within the four selected councils, some women were bound to seek for employment in the textile firms while others were employed in domestic industry in order to earn income for their respective families.

Moreover, the study further finds that, within the concerned four councils, most households are engaged in self-employment activities such as welding and production of wood materials for sale in order to generate income for survival. Others, particularly women, weaving clothes for sale to generate income. The households are engaged in these income generating options because the entrepreneurship options are restricted by the shortage of water.

5.4. Effects of water supply schemes on the livelihood after MLWSS

Another objective of this study was to investigate the extent to which the inception of MLWSS has affected the means of livelihood for the catchment communities in the area of the study focusing on the newly adopted means of livelihood which include commercial agriculture, bricks production and car washing businesses. According to the respondents, the MLWSS has relieved households from the shortage of water. Over ninety-two percent of the households which were newly connected to the water scheme were able to diversify their means of livelihood into commercial agriculture.

It is further observed that 80 percent of the households within two councils: Qiloane and Manonyane have fundamentally shifted from subsistence agriculture and livestock rearing to commercial agriculture. They are located in the foothills where agriculture is the main means of livelihood for the households. As a result, it is easy for them to change their approach towards agriculture from subsistence to commercial approach.

Most households from the other two councils: Mohlakeng and Mazenod have opted for bricks production and car washing businesses. They are situated close to Maseru town where the demand for paving and construction of offices, construction of new residential houses is high. There are also many vehicles that need to be washed.

Moriarty and Butterworth (2003) stating that, the improved water supply can lead to productive use of water such as the creation of employment and income generation possible. Despite their potential, a few water supply systems, as well as the related governing institutions have been designed with cognizance of people's actual livelihood, needs and social behaviour in mind.

Hope et al (2003) support this finding. They state that, generally the improved water supply has the potential to have a positive impact on a number of aspects of people's livelihoods. For example, the improved water supply contributes to reducing disease. Healthy people are able to work and live more productive lives, save time and effort. Both India and South Africa

were cited as examples where the households benefitted positively from improved access to water supply schemes. In the case of India in particular, the rural women became even more productive and saved time (James, 2004).

Water is necessary for production; therefore water scarcity impedes people's effective engagement in commercial activities which are intended to create jobs, eradicate poverty and spurring the economic growth for the benefit of the communities, especially in urban areas where most manufacturing firms are located (MDGs Report, 2015).

5.4.1. Commercial agriculture

5.4.2. Land and livelihoods

The study finds that land was identified as the key asset and a necessary requirement for commercial agriculture. Most households were engaged in agriculture before and after the introduction of MLWSS. After the MLWSS, it focused on commercial agriculture particularly the crops and vegetables for generation of income to sustain the livelihoods.

Natural capital refers to the stocks of the natural resources from which further resources and services can be developed and which may prove useful to the livelihoods. A broad variety of resources, including land, fall within this category. Within the framework for sustainable livelihoods, the relationship between natural capital and the context of vulnerability is especially close (Carney et al, 1999). This therefore becomes a factor in reducing vulnerability of households as is the case with MLWSS catchment communities.

The households truly shifted from subsistence agriculture to commercial production of crops and vegetables targeted to supply the hawkers, supermarkets as well as the local villagers. Given the reliable supply of water for irrigation all year round and the wider market available for the products, their businesses have substantially thrived and expanded.

In order to engage in agriculture for either subsistence or commercial purpose, land was a required asset. In this regard, land has served as a precondition for agricultural production. Some households already owned land before MLWSS which was underutilized whereas others were obliged to acquire the new land by buying or temporarily leasing it in order to engage in agricultural production. In this regard, land has expanded their ability to pursue different livelihood strategies including a vigorous engagement in agriculture.

Both Mohlakeng and Mazenod councils which are located in lowlands close to Maseru city have more households who were engaged in commercial agriculture. They cited supermarkets and street hawkers as the reliable market for their products.

Plate 2

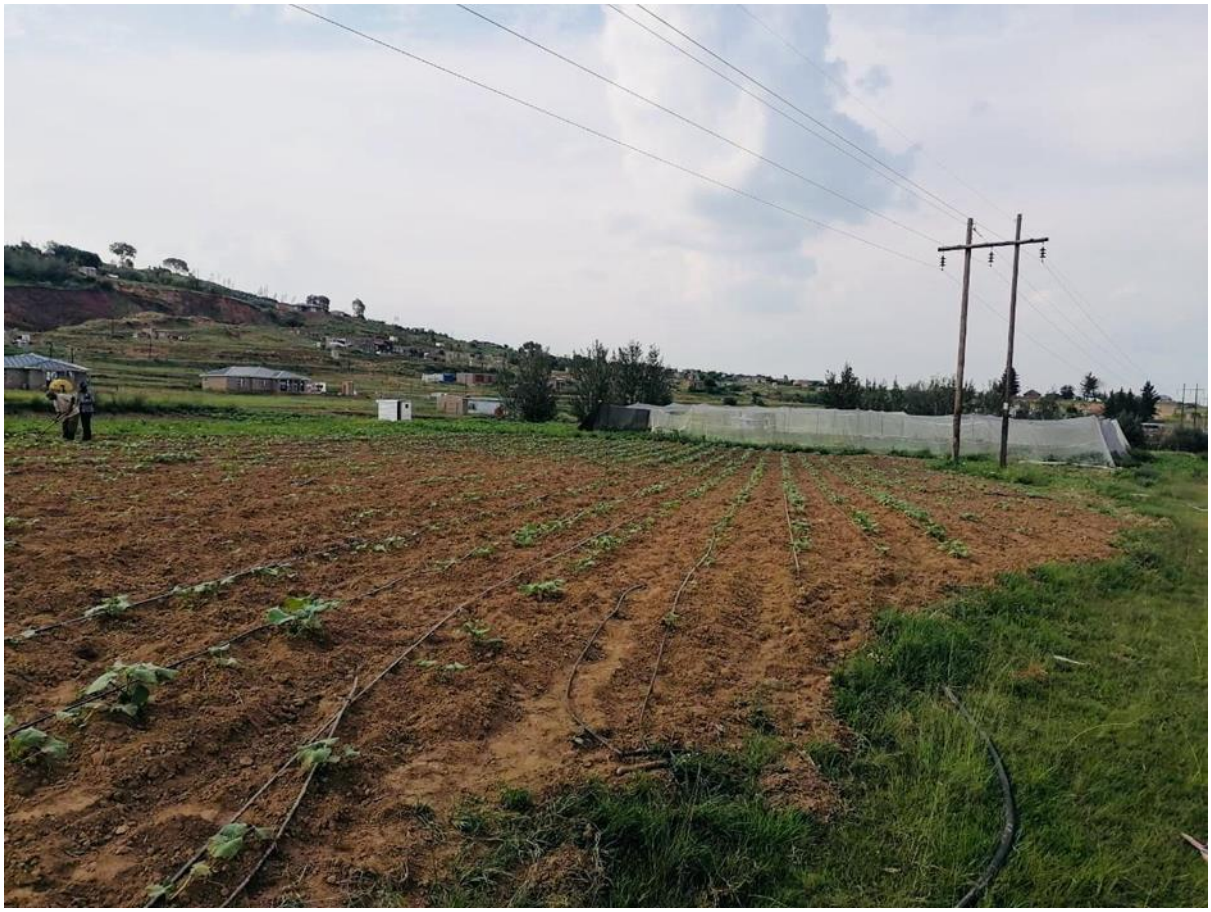

Plate 2 shows the workers removing the weeds on the agricultural land at **Ha Motloheloa, Mohlakeng Council.** The watering sprinklers are also visible on the ground. **Source: Field Survey, November 2020.**

5.4.3. Water and livelihoods

Water has also been proved to be the key asset for agricultural production within the four concerned councils before and after MLWSS respectively. It has been confirmed to be an essential requirement and the blood-life of the agricultural production regardless of whether it is for subsistence or commercial purposes. The households also state that before the inception of MLWSS, the agricultural production was very poor due to the shortage of water but improved considerably after MLWSS.

The study further points out that, water is an essential resource and its adequate supply to catchment communities of Metolong dam has meaningfully transformed the livelihoods of the households for better and in a sustainable manner. The sufficient supply has enabled some households to vigorously engage in commercial activities and improved a number of economic and social activities such as food production, health and sanitation issues, agriculture and brick production and car washing businesses, amongst others.

The FAO report (2001) indicates that water supply helps people to attain the basic necessities of life, including food which is also the basic component of livelihood. It has been observed that, agriculture requires large quantities of water for irrigation and good quality water for various production processes.

In supporting the importance of water supply to human wellbeing, Twigg (2001) stated that, access to a reliable supply of water allows people to expand their livelihoods, increase productivity and reduce the risks associated with the vulnerability. The factors that make up the vulnerability context are important because they have a direct impact upon people's assets and the livelihood options that are open to them.

The primary benefit of water supply schemes and reservoirs in the world is the water supply for agricultural irrigation amongst others (International, Commission on Large Dams, 1999). The stored water is important for areas experiencing drought or in areas having rainfall that is seasonal (Bashir, 2011).

Moreover, the direct positive social impact of water supply schemes can induce multiple indirect positive benefits, ranging from improved nutrition, enhanced incomes, flood protection, water storage for consumption, industrialization and irrigation, creation of jobs opportunities and acceleration of economic growth (Cernea, 2004). The reservoirs are useful for supporting agricultural irrigation activities. In many regions, irrigation is required, especially during dry seasons for growing crops, as a way of increasing productivity (International. Commission on Water, 1999).

5.4.4. Employment

In line with employment, the study has found that, both the formal and self-employment have constituted the means of livelihood within the four selected councils before MLWSS. Some women were employed in textile firms and domestic industry whereas men were mineworkers and taxi operators. However, after the MLWSS, the means of livelihood

changed gradually but significantly towards commercial agriculture, bricks production and car wash services, as the new alternatives necessitated by the provision of water.

The study has further identified that, other households within the concerned councils opted for self-employment alternative means such as welding of metals, production of wood items, tailoring and sewing of clothes, maintenance of gardens, knitting and weaving clothes as well as washing the clothes to generate income for a living.

5.4.5. Income generation through businesses and livelihoods

5.4.6. Bricks production

The study finds that the production of bricks has emerged as an alternative means of livelihood within the four selected councils. The respondents were motivated by sufficient supply of water from MLWSS to engage in this type of a business for income generation. Twigg (2001) defines business is as an organization or enterprising entity engaged in commercial, industrial or professional activities. The term "business" also refers to the organized efforts and activities of individuals to produce and sell goods and services for profit.

Because of MLWSS, bricks production has emerged as one of the robust means of livelihood that was adopted by the households to maintain the families at the catchment areas. Even though some respondents had already started to be in this business before, most of them were motivated by the reliable availability of water from MLWSS. This business has been highly dominated by the ex-mineworkers who stipulate that, they used their retrenchment packages as the capital to set up the bricks production businesses. In this case, the generated income from the sale of bricks is used to maintain the livelihoods of the business owners' families as well as their workers.

However, the ex-textile workers have also joined this business and they cited their severance pays received from their previous employers as the enabling capital used in starting these businesses. Apart from being persuaded by the MLWSS, most interviewees have indicated that, they were also attracted by the high bricks demand from government, companies and individuals within both Mohlakeng and Mazenod councils. These councils are geographically located in urban areas and most importantly, their proximity is close to the Maseru city where there are high demands of bricks for various activities.

Plate 3

Plate 3 shows a worker watering the bricks at Bricks production business at **Masianokeng, Mohlakeng council,** while others are loading bricks into the truck for delivery. Source: **Field Survey, November 2020.**

5.4.7. Car washing

As previously defined by Twigg (2001), business refers to the organized efforts and activities of individuals to produce and sell goods and services for profit, the definition fits into the washing of vehicles as a business. Profit accrues in the form of income to retain the livelihoods of the business owners' families as well as their respective workers.

The study has disclosed that the car wash businesses were established within the four councils but mostly in urban councils of Mohlakeng and Mazenod. These two councils are located close to main roads towards other small towns of Roma and Morija, where a number of travelling vehicles is reasonably high including many taxis which operating on daily basis. Apart from public transport which definitely needs to be cleaned frequently, there also are

companies, and privately-owned vehicles, especially the vehicles of people those who are working. This constitutes a reliable market for cleaning of the vehicles.

The respondents have also stated that car washes have surfaced as one of the new means of livelihood for most households in their area due to MLWSS. It provides reliable water supply that attracts people to be engaged in this business. The pressure of the water has improved their efficiency and quality on washing the vehicles. As a result of these efficiency and quality work, they have attracted many customers and their businesses are thriving.

This business has attracted ex-taxi operators and drivers. They have identified car washing as business opportunity. The MLWSS has addressed the challenge and eventually enabled them to engage in this business comfortably.

Plate 4

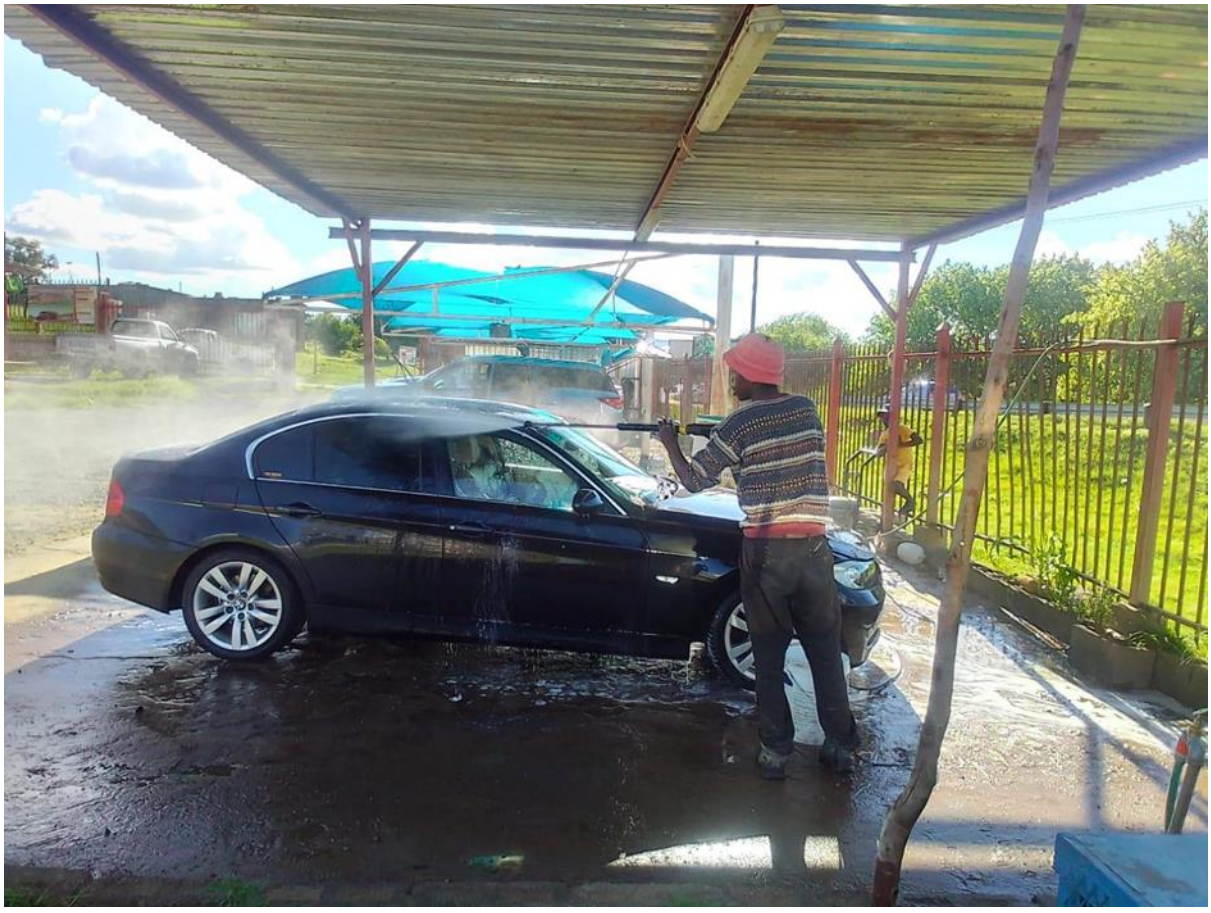

Plate 4 shows a worker spraying the car with water for thorough cleaning at the car wash at **Mazenod**. **Source: Field Survey, November 2020.**

5.5. The adopted coping strategies of the unconnected households

Another objective of this study was to examine the coping strategies of the affected households which were excluded from water connection although they live along the water belt and focus specifically on the sale of livestock and chicken, woodwork production, welding of metals, temporary jobs. The study further focuses on illegal water connections for the unconnected households within the four selected councils.

The livelihood of the households in the unconnected areas does not improve but rather it is declining because water is an essential and critical requirement in the production sector, especially for commercial purposes. The shortage of water has led the concerned households into poverty, especially during the dry seasons; they cannot produce food either for consumption or for commercial production.

The NSDP I (2013) states that water is usually a fundamental ingredient and resource for a fruitful life and production of essential goods which are necessary for the sustenance of human life. Without clean water, production of sufficient food becomes stifled and eventually poses a threat to food security. This leads to poverty amongst the Basotho communities, both in rural and urban areas.

Chambers (1990) pointed out that the ability of the individuals to withstand stress, shocks and risks depends on a range of factors. These include individual or household levels of human and physical assets, production, income and consumption as well as the ability of the individuals or households to diversify their sources of income and consumption, in order to effectively reduce the effects of the risks that they face at any given time, and the losses that can result in economic impoverishment, social dependence, humiliation and psychological harm.

Shocks include human health shocks, natural shocks and economic shocks and can destroy assets directly and force people to dispose of assets as part of coping strategies. Resilience to external shocks and stresses is an important factor in livelihood sustainability. Seasonality is expressed through seasonal shifts in prices, production, food availability, employment opportunities and health. These are some of the greatest and most enduring hardships for poor people (Twigg, 2001).

5.5.1. Sale of livestock and chicken

The study indicates that most households within the four councils opted for the selling of their livestock and chicken as a way of coping with water shortage stress and livelihood shocks. All the twenty interviewees have confirmed that they sold either their animals or chicken to generate income in order to attend to their urgent and critical family needs. Most households have reared cattle, sheep and goats. They own either one or more types of the domestic animals as the primary or complementary means of livelihood.

5.5.2. Self-employment works

Others have engaged in producing wood materials, welding of metals, and tailoring because these coping strategies do not necessarily depend on water to pursue them. Additionally, others engaged in domestic work (washing clothes) as well as temporary jobs (maintenance of lawns). In doing so, they were able to survive the hardships and unpleasant conditions caused by shortage of water in their areas. Chamber and Conway (1992) state that a livelihood refers to capabilities, assets (stores, resources, claims and access) and activities required for a means of living.

5.5.3. Illegal water connections

The study also revealed that eighteen out of twenty unconnected respondents have illegally connected to the water from the water supply network within the four councils as their coping strategy in trying to respond to the dire desperation for water. The concerned households were not only depressed by the dismal poverty situation caused by shortage of water but are also connecting water through illegal means. This illegal connection is not only disruptive to the flow of water to the targeted households but also poses danger to the perpetrators which may cause injuries or even deaths resulting from exploding pipes as they are tempered with. When the scheme was introduced in 2008, the catchment communities had the legitimate expectation that their long unresolved water shortage problem would be addressed.

The findings are similar to those of Moriarty & Butterworth (2003) who state that if the total amounts supplied are not sufficient, some villagers may use more than their fair share of water (often through unauthorised connections).

5.5.4. Sustainability of the coping strategies

From the study, it has been found that the adopted coping strategies were not sustainable at all especially the selling of livestock and chicken because they also require water for sustainability. Some respondents indicated some of their animals and chicken were already

dying due to the shortage of water because they equally need water for survival like the households. This implies that the continuity of drought or water shortage would reduce them and eventually leave the households with little or nothing for survival.

Moreover, it is observed that the effects of shortage of water are multidimensional. It can directly cause poverty for the households who rely on agriculture and farming for survival or adversely affect production of those who are doing agriculture for commercial purposes. This means that, even those who were able to fix their metal equipment or buy wood products would be affected by shortage of water to produce agricultural products sufficiently. Ultimately, their purchasing power would be reduced. Generally, these coping strategies were also vulnerable to the shortage of water hence temporary and unsustainable.

The Sustainable Livelihood Framework implies the capabilities, assets (material and social) and activities which are available to poor men and women who together make a living and requires the understanding that the poor move in and out of relative poverty as they respond to the opportunities, shocks and social, economic and environmental-stress which they experience (Moser, 1996 and Chambers, 1995). Jansky, Pachova and Nakayama (2008) further advances that the sustainable livelihoods approach is people-centred. It analyses people's livelihoods and how these have been changing over time. It fully involves people and respects their views.

Chambers and Conway (1992) consider sustainable livelihood a livelihood comprising capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable if it can cope with and recover from stress and shocks, maintains or enhances its capabilities and assets and provides sustainable livelihood opportunities for the next generation and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term.

In addition, Ellis (2000) describes assets as a stock of capitals that can be utilized, directly or indirectly, to generate the means of survival of households or to sustain their material well-being at different levels above survival. Bebbington (1999) indicates the importance of assets as a means to empowerment. In the case of the unconnected households, their adopted coping strategies have failed to respond to water stress and remain unsustainable due to the shortage of water. Neither are they empowered because they lack assets to serve as a cushion to fall back on during difficult times.

Thus, some livelihood activities may help people to achieve their various objectives and empower them while others may place them in a vulnerable position. People can realize their potential through the assets that they have. However, what an asset is and the importance that people attach to assets may vary according to time and context (Ellis, 2000).

5.6. The challenges of the unconnected households

The study was also intended to investigate the challenges on livelihoods of the unconnected households with the four councils. The findings from the unconnected respondents confirmed that their livelihoods have been affected by exclusion from the MLWSS due to poor distribution designs which denied them access to water supply and ultimately drove them into illegal water connections. This problem was exacerbated by unreliable boreholes due to severe drought. The desperation for water has really become a driving force and a matter of concern amongst the concerned communities.

5.6.1. Distribution designs

It has been established that the water distribution designs from the dam to the catchment areas, has also excluded some households adjacent to the water belt. The households stated that the exclusion from water connection was due to the poorly designed water distribution network by the authorities and they also perceive that approach as discriminatory and unacceptable.

Out of thirty-two, twenty four households stated that the exclusion from water connection due to poorly designed water distribution network has caused difficulty in accessing water and inconvenience for them in the catchment areas. They argued that, the adjacent communities to the water belt would not suffer from water shortage if they were also connected to conveyance water supply system. The water shortage impedes on their means of livelihoods as majority of them rely subsistence agriculture which requires reliable supply of water to sustain them. As Carney et al (1999) indicates large number of shocks which devastate the livelihood strategies of the most disadvantaged in a society are naturally occurring processes which includes drought, destroy natural resources and cause vulnerability.

In their theory of water supply system reliability, Damelin and Arad (1972) underpin that, in order for the adequate water supply to prevail, the water supply system must be reliable. Water supply system reliability is defined in terms of the shortages that result from failures of the system's physical components such as its network design and used materials for water distribution. In the case of MLWSS, the issue of network design and exclusion from water

connection for some households'-route the belt has been of great concern by both the households and their respective authorities.

Giles, Brown and Davies (1997) contend that most communities throughout the world are dealing with water shortage due to inaccessibility and relate this situation to the non-connectivity; high runoffs and mountainous terrains as some of the most notable and visible factors that cause access to water to be very difficult.

5.6.2. Authorities' decision

Most respondents have indicated that, the authorities who deal with water connections have applied a discriminatory approach, excluded some members of the community from the conveyance system and delay to fix the identified water related problems. Consequently, this affects the supply of water to the households 'adversely. Additionally, they mentioned the unreliable supply from the boreholes as another factor that contributes to water shortage in their respective locations. In most cases, the boreholes cannot supply water due to extreme drought.

The Habitat (2012) stresses that in most developing countries the water management authorities tend to procrastinate to connect the water supply systems to the various communities, either due to lack of the required equipment, incompetence of the staff to accordingly assess the increasing water demand across the communities or long bureaucratic processes to be followed before the actual connection can be effected. Moriarty and Butterworth (2003) emphasise that, when there is a mismatch between people's water needs and supply, sustainability, efficiency and equity of the services frequently become threatened and compromised.

Twigg (2001) states that vulnerability context impacts livelihood assets and vice versa. Policies and institutions as well as processes have a two-way impact. It is therefore, important to note that when there are favourable government policies and processes the result is reduced shocks and negative effects on people's livelihoods.

Any deprivation of any of the livelihood assets/capital may have a negative impact on the vulnerabilities of the households and communities. Generally, the affected households could not pursue alternative means of livelihood due to the shortage of water in their respective communities. This implies that, their ability to be more productive was compromised.

5.6.3. Severe drought

Eighteen households, four councillors and four chiefs have mentioned the severe climate change as the cause of water shortage. On one hand, they mention that since 2015, after the extreme Elnino drought, the supply of water from almost all the sources has declined significantly whereas the demand is increasing on the other hand.

Consequently, their means of livelihood were adversely affected because availability of water is necessary for pursuing their daily livelihoods such as production of crops and vegetables, as well as drinking for their livestock.

CHAPTER SIX
SUMMARY OF THE STUDY, CONCLUSIONS AND RECOMMENDATIONS

6.1. Introduction

The issue of water shortage and its effects is taken seriously by the world water organizations and national governments. However, water supply modalities and management policies fall short of effective strategies to address the shortage of water which affects the concerned communities adversely. The inspiration to conduct this study was motivated by the fact that water shortage is a real problem in the world. A large number of households, including the catchment communities of MLWSS, cannot access adequate water supply. The study was also intended to highlight the dynamics of the household means of livelihood for catchment communities of the Metolong water belt. The next section is going to provide a summary of the study, reach some conclusions and provide some recommendations from the findings of the study.

6.2. Summary

The aim of the study was to investigate the effects of the Metolong Lowlands Water Supply Scheme (MLWSS) on the livelihoods of the communities in the catchment areas. The study was conducted within the Maseru District and the data was collected from the catchment communities of MLWSS: Qiloane, Manonyane, Mohlakeng, and Mazenod local councils and from the Ministry of Water (MW) and Water & Sewage Company (WASCO).

The study focused on the effects of MLWSS on the livelihoods of the catchment communities. Water supply is deemed to be the pillar of many developing countries as many people depend on it for maintaining their livelihoods. The Lesotho government adopted the MLWSS in trying to resolve the perpetual problem of water shortage.

Water shortage is not a new phenomenon. It has been persistent for decades in many developing countries including Lesotho. Water supply (security) is one of the essential efforts for human survival. That is why the construction of water supply schemes and projects are of great importance in many parts of the world, especially in Africa. Water supply is geared towards addressing the problem of water shortage that has troubled the world, especially the developing countries, over years.

The findings from this study indicate that MLWSS is beneficial to the households. The government provides them with water access which they would otherwise be unable to access. However, the problem still lies with those who are not connected to the supply network. This has improved the livelihood for many households because they were able to engage in other (new) means of livelihood to sustain their family needs.

The data obtained from the selected study councils indicates that water and land are important requirements for agricultural production and other commercial engagements such as bricks production and car washing. Irrespective of whether agriculture is for subsistence or commercial, water and land prove to be the fundamental pre-conditions of effective agricultural production. The study reveals that some households adjacent to the water belt were not connected to the water supply. Consequently, they resorted to illegal connections to survive.

6.3. Conclusions

The main objective of this research was to ascertain how MLWSS has impacted the livelihood of the households in its catchment areas. The scheme has enabled, to a greater extent, the diversification of the means of livelihood in most households living in four selected councils. The MLWSS has diversified and stimulated some new means of livelihood for the concerned households and enabled them to shift from their traditional means of livelihood to the new, emerging ones which were created by the availability of water from MLWSS.

The study established that water and land are precondition for agricultural production irrespective of whether it is for subsistence or commercial reasons. It recommends that sufficient water be provided for these communities to improve their livelihoods. Besides the positive effects of the MLWSS, some repercussions were suffered in the catchment areas. Some households were left unconnected from the water belt, thus creating vulnerability among them.

Additionally, the study established that the unconnected households resorted to unsustainable coping strategies due to desperation for water. These temporary coping strategies required sufficient water supply in order to be sustainable. The households within the four studied councils engaged in subsistence agriculture and the rearing of livestock because they lacked other livelihood options that could improve their lives meaningfully due to the shortage of water.

The study concludes that the approach and network designs by the relevant authorities towards the connection of water for the communities are responsible for either being inclusive or selective on water network designs. Finally, the study concludes that the MLWSS has sufficiently provided reliable water and has meaningfully transformed the livelihoods of the catchment communities despite the shortfalls in the implementation of the scheme which did not provides guarantee that all the catchment communities will be connected to the water supply as it has been the case with certain villages along the water belt who eventually resorted to illegal connections**.**

6.4. Recommendations

The following recommendations are made to the GOL in order to improve the livelihood of the catchment communities in the four selected councils. Furthermore, they serve as strategies for the GOL to enable the communities to access water sufficiently for their wellbeing.

- The study recommends that the Government should modernise its water supply mechanisms and ensure that they are reliable and well protected sources to mitigate the future shortage of water and avoid water borne diseases which will be a cost to the health system.
- The study also recommends that the Government should make a policy that will enable the households to be provided with a reliable supply of water in order to diversify their livelihoods, increase productivity and reduce their dependence on subsistence agriculture & livestock as well as the risks associated with the vulnerability. The land distribution should also be aligned to this water related efforts because the two have proved to be intractably intertwined as far as agriculture production is concerned.
- The study further recommends that, the Government should learn some lessons from the implementation of this scheme to adopt strengths and avoid weaknesses if it is to replicate the schemes of this nature across in future.
- The Government should urgently make an inclusive water connection policy to the unconnected households to address the urgent need of water as well as to avoid the illegal water connections which are increasing and disruptive to the flow of water to others are the beneficiaries. This may also result in reduced shocks and negative effects on people's livelihoods.

- The issue of water connection requires urgent attention to be reviewed by the water supply authorities in the study areas in order to provide the means of survival to the households through commercial activities to address the problem of poverty.

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APPENDIX - Questionnaire

Interview Schedule

SECTION A

Demographic information of respondents:

N.B: Please tick the relevant box.

Location……

Number of years in the location……

Gender:

a) Male ☐

b) Female ☐

Age:

a) Below 25 years ☐

b) 26-35 years ☐

c) 36-45 years ☐

d) 46-55 years ☐

e) Over 55 years ☐

Marital status of the respondents

a) Single ☐

b) Married ☐

c) Divorced ☐

d) Separated ☐

e) Widowed ☐

f) Living together ☐

Households Headship:

Female-headed ☐

Male-headed ☐

Employment status

a) Employed (formal) ☐

b) Employed (informal) ☐

c) Unemployed ☐

Level of income per month in maloti

a) Less than 500 ☐

b) 501 - 1000 ☐

c) 1001 - 1500 ☐

d) 1501-2000 ☐

e) Over 2000 ☐

Level of education

a) None ☐

b) Primary ☐

c) Secondary ☐

d) Tertiary ☐

e) Vocational ☐

SECTION B

Means of livelihoods of the households in catchment areas before and after the MLWSS

Where do get water supply from?.....

What were your sources before the advent of MLWSS?.....

Indicate your major uses of water in the household……

Is it sufficient for your household needs?.....

What were your means of livelihood before water was supplied in this area?.....

Has the MLWSS improved your means of livelihood?.....

Has MLWSS helped your household to reduce poverty?.....

Do experience any water shortage?.....

Is the water shortage affecting your livelihood means?

What are your coping strategies now that MLWSS does not benefit you?.....

Are they sustainable?.....

Are there any other challenges you would like to mention that you are facing due MLWSS……