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LIST OF ABBREVIATIONS AND ACRONYMS

ACL	Anglican Church of Lesotho
CBD	Convention on Biological Diversity
CEO	Chief Executive Officer
COP	Conference of the Parties
COPD	Chronic Obstructive Pulmonary Diseases
CPMT	Common Property Management Theory
DDP	Dams and Development Project
EDF	Environmental Defense Fund
EIA	Environmental Impact Assessment
EIT	Economies in Transition
ELOHA	Ecological Limits of Hydrologic Alteration
FAO	Food and Agricultural Organization
FIVAS	Association for International Water and Forest Studies
GDP	Gross Domestic Product
GoL	Government of Lesotho
HDI	Human Development Index
GoRSA	Government of the Republic of South Africa
HIV/AIDS	Human immunodeficiency virus/Acquired immunodeficiency syndrome
IHA	Hydrological Alteration
IUCN	International Union for the Conservation of Nature and Nature Resources
IWGIA	International Working Group for Indigenous Affairs
JPTC	Joint Permanent Technical Committee
JPWC	Joint Permanent Technical Commission
JWC	Joint Water Commission
LCBPEOT	Local Community Based Project Execution and Observation Model
LECSA	Lesotho Evangelical Church of Southern Africa
LHDA	Lesotho Highlands Development Authority

LHWC	Lesotho Highlands Water Commission
LHWP	Lesotho Highlands Water Project
LIMCOM	Limpopo Watercourse Commission
MDGs	Millenium Development Goals
NAWISA	Network for Advocacy on Water Issues in Southern Africa
NRM	Natural Resource Management
OECD	Organisation for Economic Cooperation and Development
OKACOM	Okavango River Basin Water Commission
ORASECOM	Orange-Senqu River Commission
PJTC	Permanent Joint Technical Commission
PWC	Permanent Water Commission
RCC	Roman Catholic Church
RCCD	Roller Compacted Concrete Dam
RSA	Republic of South Africa
RVA	Range of Variablity Approach
SADC	Southern African Development Community
SARP	South Asia Solidarity for Rivers and People
SIWI	Stockholm International Water Institute
TCTA	Trans-Caledon Tunnel Authority
UNCED	United Nations Conference on Environment and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
WCED	World Commission on Environment and Development
WEHAB	Water, Energy, Health, Agriculture and Biodiversity
WF/ FAO	World Food Program/Food and Agriculture Organization
ZAMCOM	Zambezi Watercourse Commission

GLOSSARY

Definitions (in terms of this study)

Analysis

According to LeCompte and Schensul (2010:297), it is the process of breaking down data into smaller fragments so that it is sensible.

Aquatic weeds

Troublesome or unsightly plants growing in abundance in aquatic situations where they are not wanted (Miller, 2000:186).

Biodiversity

Schmidt (2008:1929) defines biodiversity as the variability among living organisms from all sources including inter-alia, terrestrial, marine, other aquatic ecosystems and all the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

Community-based resources management

Boudreaux and Nelson (2011:17) define community-based resources management as ‘a strategy for allocating and managing use and benefit rights over resources’.

Children

United Nations Children Fund (2003b:13) defined children as anybody below the age of 18 years.

Dams

Thornton, Steel and Rast (1992:41) define a dam as applied to both the physical structure retaining the water, and the water so retained.

Deafness

Storbeck (2007:348) states that “deafness is one of the largest categories of impairments in South Africa and encompasses the full spectrum of hearing loss.

Dependency theory

Dos Santos (1971:227) described dependency theory as showing the relation between two or more countries assume the form of dependence when some countries who (the dominant ones) can expand and be self-starting while other ones (the dependent ones) can do this only as a reflection of that expansion.

Developed Countries

Miller (2000:783) described developed counties as sovereign states that are highly industrialised having high per capita Gross Domestic Products.

Development

According to Hawi (2005:2), development is taken as being synonymous with economic growth.

Ecological Limits of Hydrologic Alteration

Poff, Richter, Arthington, Bunn, Naiman, Kendy, Acreman, Bledsoc, Freeman, Henriksen, Jacobson, Kennen, Merritt, O’Keeffe, Olden, Roger, Tharme and Warner (2010) define Ecological Limits of Hydrologic Alteration as a framework offering a flexible scientifically defensible compromise for broadly assessing environmnetal flow needs when in-depth studies can not be performed for all rivers in a region.

Ecology

Branch of Science that deals with the study of organisms and their physical environment.

Ecosystem

Interaction of organisms with their physical environment (Collin, 2004:68).

Environment

The environment includes all external conditions and factors, living and non-living, that affect an organism or other specified system during its lifetime; the earths's life-support systems for humans and for all other forms of life (Miller, 2000:731).

Geomorphology

Brooks (2011:14) describes geomorphology as the study of surface landforms, processes and landscape evolution of the earth.

Hydroelectricity:

Electricity generated from water (Beyene, 2011:76).

Large dams

Large dams are defined as dams with a height of 15m or more from the foundation; or/and a dam is between 5m and 15m high and has a reservoir volume of more than 3 million m^3 (World Commission on Dams, 2000:11).

Least Developed Countries

According to Miller (2000:784), Least Developed Countries are those countries that, according to the United Nations, exhibit the lowest indicators of socio-economic development, with the lowest Human Development Index (HDI) ratings of all countries in the world.

Modernisation theory

A theory that attempts to identify the social variables that contributes to social progress and development of societies, and seeks to explain the process of social evolution (Matunhu, 2011:65).

Oralism

An approach which reinforces the medical model of deafness as being a deficit to be remediated allows people who are deaf to assimilate with the hearing majority (Archbold 2000:259; Storbeck 2007:354).

Poverty

The inability to meet basic needs for food, clothing and shelter (Miller, 2000:789).

Reservoir

Reservoirs are those water bodies formed or modified by human activity for specific purposes, in order to provide a reliable and controllable resource (Thornton, Steel and Rast, 1992:41).

Soil erosion

The movement of soil components, especially topsoil, from one place to another, exposed by wind, flowing water or both. This natural process can be greatly accelerated by human activities that remove vegetation from soil (Miller, 2000:792).

Sustainable development

The development that improves people's quality of life while caring for the earth's life-support system (Musonda, 2008:44).

Thematic analysis

A qualitative, analytic method that identifies, analyses and reports patterns (themes) within data, and minimally organises and describes data sets in detail (Braun & Clarke, 2006:79).

Theory

A system of constructs and variables in which the constructs are related to each other by propositions, and the variables are related to each other by hypotheses (Wacker, 1998:363).

Treaty

An agreement signed between the government of Lesotho and the government of the Republic of South Africa in 1986 concerning the Lesotho Highlands Water Project (Makoro, 2014:24).

Trustworthiness

Trustworthiness is defined as methodological (research design, data gathering and data analysis) accuracy (soundness) and adequacy of the research inquiry (Holloway & Wheeler, 2002:30).

CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1. Introduction of the study

The research was conducted in the Maseru district of the Kingdom of Lesotho. It investigated the perception of the community on the socio-environmental impacts of the Metolong Dam and Reservoir in Lesotho. The Kingdom of Lesotho has a great deal of water, hence Mochebelele (2000:980) and Braun and Mclees (2012:437) call the Kingdom of Lesotho the "white gold" beacause water is Lesotho's most significant resource. Large dams were built by the Lesotho Highlands Water Project-LHWP, constructed in phases. Phase 1A was completed in 1997 involving Katse Dam whilst Phase 1B was completed in 2007 involving Mohale Dam and the current running Phase II project of Polihali Dam. Phase 1A was built with the dual purpose of selling water to the Republic of South Africa (RSA) and to generate electricity for the Kingdom of Lesotho (Willemse, 2007:457).

1.2. Construction of large dams

In the past centuries, large dams were built in different parts of the world for various reasons, ranging from supply of water, control of floods, waterpower for mills, production of power using water, irrigation, improved navigation, for recreation and waste disposal. These dams were constructed centuries in Middle Eastern countries and North Africa. According to the World Commission on Dams (2000:8), by 1949 5,000 large dams had been built worldwide. Observation from DiFrancesco and Woodruff (2007:1) shows that 45,000 or more large dams had been constructed worldwide. Eight years later, Shah and Kumar (2015:1) indicate that 1,700 large dams were still to be constructed, while 47,000 large dams had been constructed worldwide. Among all the large dams that were constructed, the World Commission on Dams (2000:10) indicated that only 1,039 are in sub-Saharan Africa.

After World War II, large dams were promoted by narrow definitions of development that prioritised economic growth. During this period of intense industrialisation, governments in both the “First” and the “Third” Worlds built large dams without paying much attention to their environmental impacts (Basiago, 1999:147). Basiago further states that in 1970, and towards the beginning of the 1980s, people began to question the negative social and environmental impacts of large dams. Today, developers, governments and financing agencies are paying much more attention to both the negative and positive impacts of large dam development.

Adding to the preceding stance, many researchers have opinions on large dam development, where most agree that their development creates advantages for communities, whereas few are against it. Yen (2003:1) agreed with their development, and states that the creation of large dams is seen as managing the problems related to seasonal flow of the rivers and storing water for irrigation and general us. On the contrary, Ellis (1998:4) deprecated the idea, and states that large dam development is not a solution in poverty reduction, for when people are resettled, their livelihoods are lost or changed. This study investigated the perception of the community on the socio-environmental impacts of Metolong dam and reservoir in Lesotho. A brief introduction and background to the Kingdom of Lesotho is provided in the following section.

1.3. Background to the Kingdom of Lesotho

The research was conducted in the lowlands of the Kingdom of Lesotho. The Kingdom is a country surrounded by the RSA (Figure 1.1). Maseru is one of the ten districts in the Kingdom. Turner (2005:371) stated that, being surrounded, the Kingdom lost its arable land, which is the Free State today, during the Basotho-Boer War (1858-1868).

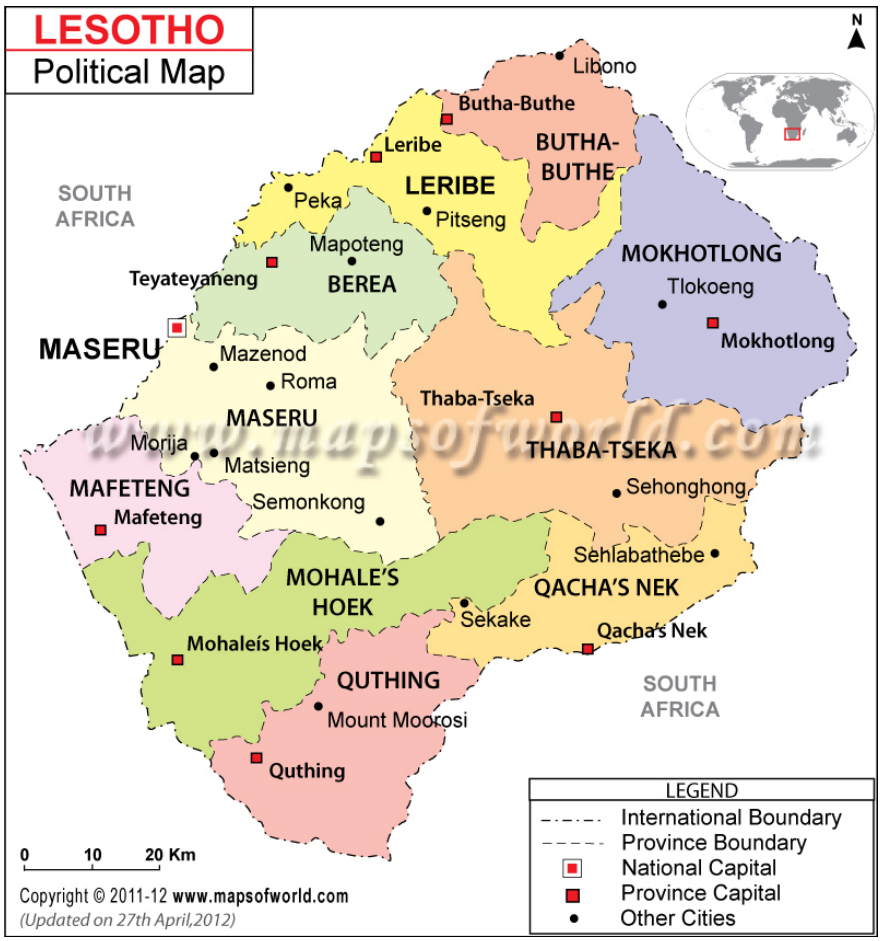

Figure 1.1: Map of the Kingdom of Lesotho**. Source:** Adapted from Maps of the World, 2012:2.

Formerly the British protectorate of Basutoland, the country adopted its new name, the Kingdom of Lesotho, on 4 October 1966, and has 30, 358 km^2 (Kishindo, 1993:1). The Kingdom has a beautiful landscape, characterised by high mountains and perennial rivers such as the Senqu River-Orange River. This river begins in the highlands of the Kingdom, and flows through the nearby country, the RSA, to Namibia, all the way to the Atlantic Ocean (Figure 1.2). Heath and Brown (2007:11) posit that the Orange River has a cachment area of 1 million km^2 – being the largest river basin south of the Zambezi.

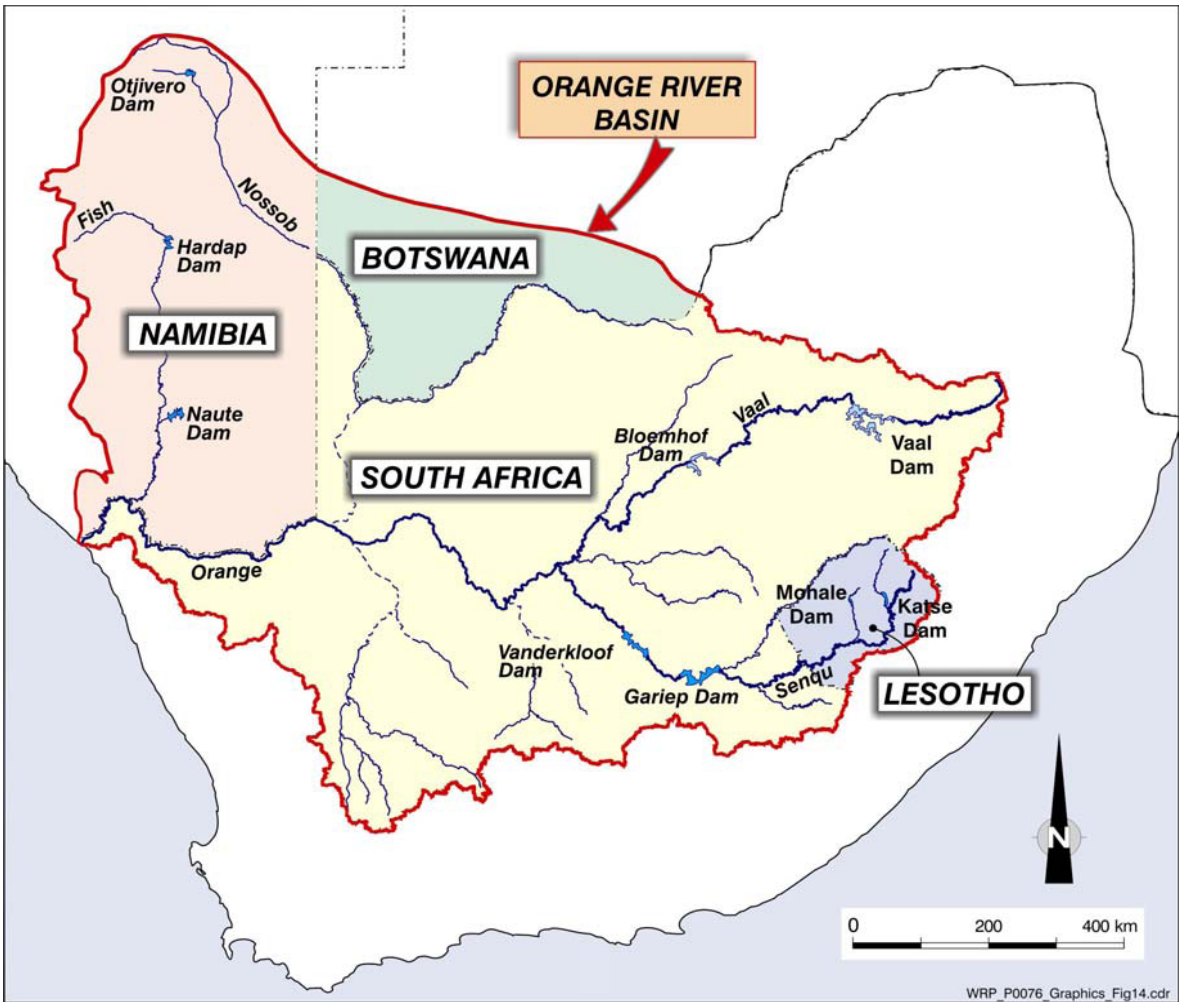

Figure 1.2: The Orange River that flows within four countries. **Source:** Adapted from Heath and Brown, 2007:01**.**

Furthermore, Lesotho has an elevation ranging from 1,388m in the west to 3,482m in the northeast (WFP/FAO, 2006:7). Besides its elevation, Lesotho has different relief regions (Table 1:1) but has two distinct relief regions: highlands and lowlands.

Table 1s:1: Lesotho's relief regions.

The Lowlands	**The Foothills**	**The Senqu River**	**The Highlands**
The lowlands form a narrow belt along the western border. Lowlands lie between 1400 and 1800m. Due to the relatively flat to gentle rolling topography compared to the rest of the country, this zone accounts for 80% of the arable land. The lowlands are filled with red to brown sand soil in the north, and clay soil in the south. In addition, the lowlands are moist towards the north and drier towards the south.	The foothills form the narrow strip between the lowlands and the highlands, occupying 4,600km2. Foothills topography is steeply rolling, consisting of very fertile soils. It is here where many dykes and sills are found. The soil from this parent rock is doloritic.	The Senqu river valley starts in the south-west, at the lowest point 1388m, and runs with the river up north-east through the mountains to 2200m. Topography is steeply rolling. Usually, the zone has a significantly lower rainfall than the rest of the country, because it is dry. The soils are composed of calcium carbonate. There is a tendency towards severe drought, and moderate soil erodibility in this area.	The highlands range from 2000 to 3482m. The topography of this area is very steep. Due to the rugged topography, this zone is most suited for livestock grazing, but some farmers also use the area for crop production. The population density is lower in this zone than the rest of the zones. The soils are usually fragile – a thin horizon of rich black or dark-coloured fertile clay loams formed through the weathering of basalt. The climate here is cold and moist, with long periods of frost, snow and hail.

Sources: Adapted from WFP/FAO (2006:7-8); Matsela, Atkinson & Durant (1981:12-13).

Lesotho's climate ranges from semi-arid to sub-humid and continental climate (Raselimo, 2010:11). This type of climate is characterised by warm, wet summers, with temperatures from 28^0C, and cold, dry winters ranging from -2^0C. Snow falls annually on the mountains

during the winter season, whereas light showers are experienced in the lowlands. Pomela (1999:8) stated that the rainy season starts in early spring, and ends in late autumn with heavy rain and hailstorms.

According to the Bureau of Statistics [Lesotho] (2006:1), Lesotho had about 1,876,633 inhabitants, made up of 912,798 males and 963,835 females, with a population density of 61 people per km^2 (Coburn, Okano & Blower, 2013:6-7). Ten years later, the Bureau of Statistics [Lesotho] (2016:1) reports that the country's population had grown, making the total population nearly 2,160,309 million people, with 1,057,629 males and 1,102,680 females. About 75% of the total population in Lesotho resides in the rural areas, and depend largely on subsistence agriculture and remittances from Basotho migrant labourers working in the mining industry of the Republic of South Africa (Government of Lesotho, 2004:2). Nkiwane (1997:4) stated that remittances by the Lesotho's migrant labourers account for 40% of the country's Gross Domestic Product (GDP). The Basotho society is homogenous in language and ethnicity, besides the few groups of the Baphuthi, Indians and, lately, the Chinese. It is a peaceable country, as is reflected in the Basotho greeting 'Khotso' which means 'peace'. More so, the peacefulness of the country is also reflected in the national motto: 'Khotso, Pula, Nala' (peace, rain, prosperity), and reinforced by shared indigenous language, history and culture (Government of Lesotho, 2004:3).

1.4. Research objective

The main objective of this thesis was to investigate **the perception of the community on the socio-environmental impacts of Metolong Dam and Reservoir in the Kingdom of Lesotho.**

1.5. Research problem

The construction of large dams is increasing at an alarming rate, when nations are trying to develop people's lives; however, the construction of these large dams brings both benefits

and disadvantages to the local communities. It is in this regard, that there are arguments within communities about the advantages and disadvantages of large dams, which set debates, in this century, about sustainable development. Construction of large dams creates job opportunities for the local communities, whereas, on the other hand, people lose their properties, land, trees and other owned properties.

Sadler, Verocai and Vanclay (2000:2) argued that when people are resettled, it creates fear and uncertainty among the potentially affected parties. Based on the objective of the study, the researcher intended to conduct an audit to evaluate the accuracy of the initial Environmental Impact Assessment-EIA (2008) of Metolong dam and reservoir by comparing it to actual predicted impacts. The audit undertaken for the study is a follow-up on socio-environmental impacts that occurred after the construction and operational phases of Metolong dam and reservoir in 2013. The study is among the first, if not the pioneer, in doing a follow-up of socio-environmental impacts that occurred in the construction and operational phases of Metolong dam and reservoir. The researcher attempts, in this direction, at closing the gap which appears not to have been addressed (Government of Lesotho, 2008). A gap identified is that, local people did not participate fully by having a voice over decision-making, planning, implementation and evaluation in Metolong project.

1.6. The main research questions

- What are the positive perception of the community on the socio-environmental benefits of Metolong Dam and reservoir?
- What are the negative perception of the community on environmental impacts of Metolong Dam and reservoir?

1.7. Reasons for choosing the topic

This study intended to investigate the perception of the community on the socio-environmental impacts of Metolong dam and reservoir. The study is particularly important, as it would provide a deeper understanding of the responses of the community to developments that effects their immediate life styles and the environment. So far, much theoretical information about large dam construction in the Kingdom of Lesotho, and elsewhere, has been provided, and how they can contribute to the field of study, is limited. The fact is underscored by Kotelo-Molaoa (2007:48-49), who points out that large dam development affects people with inequitable distribution of gains and pains. For these issues to bring debate, they require deeper research. This study is important, because, in developing countries, including the Lesotho and other partners in development, models have to be deployed, in order for countries to develop when large dams are constructed to raise the standards of laocal villagers.

Given the above, this research has a positive contribution to make to the ongoing discussion on large dam construction, and impacts in the area of environmental management. It is also of particular interest to project developers, policy-makers, and all those interested in the field in developing countries.

1.8. Ethical considerations and demarcation

This research ethics number 2016/CAES/35 was conducted with strict adherence to the UNISA research ethics policy (Appendix C). The research was conducted with permission from the Chief of the study area (Appendix D).

1.9. Research design and methodology

The research design for this study is discussed in Chapter 5. The study was conducted with 40 participants from Ha Seeiso village. The main aim was to obtain the participants' perceptions on the environmental impacts of Metolong dam and reservoir. How participants were chosen is elaborated in Chapter 5, Section 5.4 and 5.5. Figure 1.3 shows the data collection procedure that was used in this study:

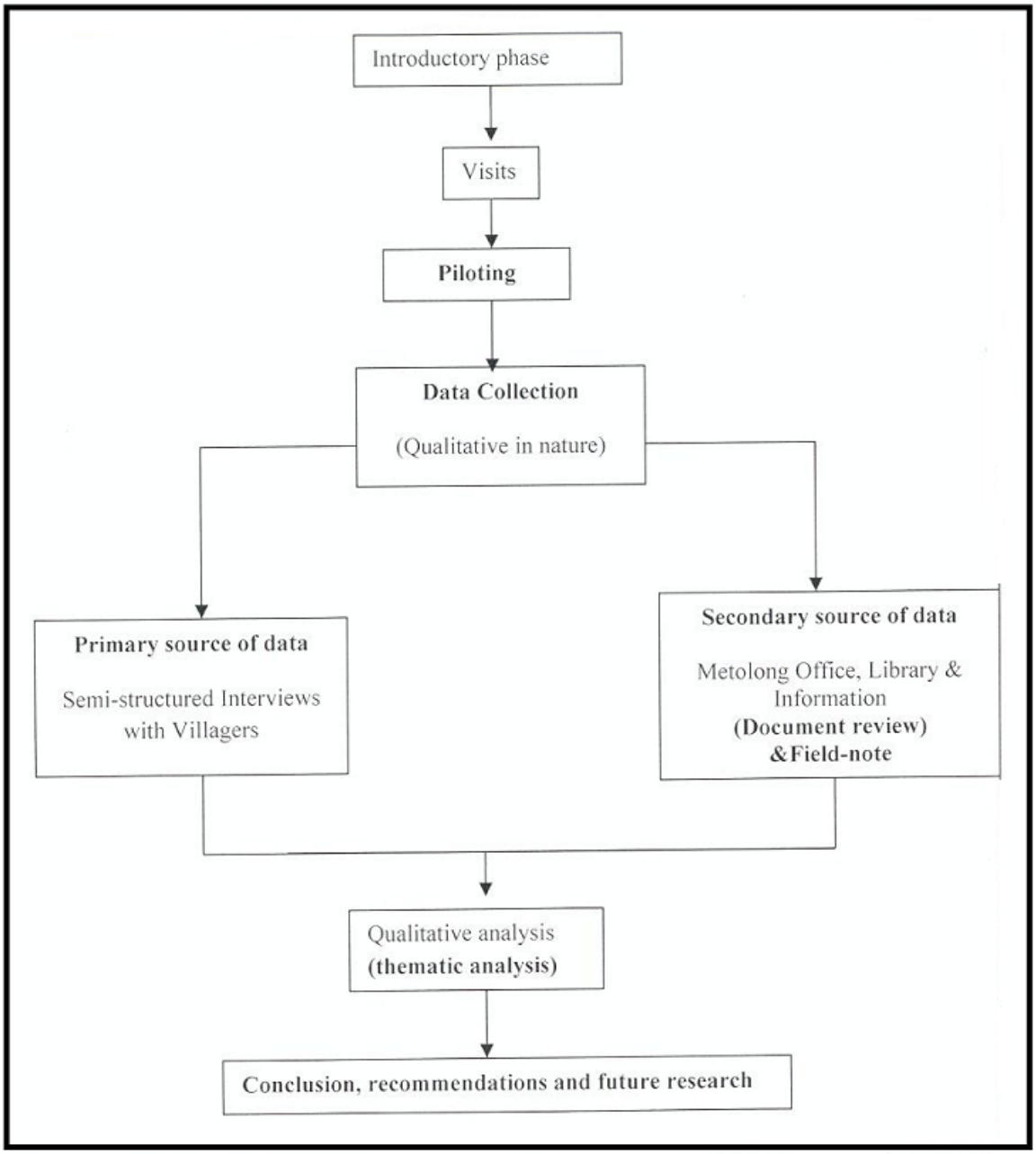

Figure 1.3: Research strategy. **Source**: Own.

1.10. Literature review

In Chapter 2, the theoretical framework for the study is determined, and this lays the foundation for the empirical research conducted.

1.11. Research results and analysis

The results of the perception of the participants from the study area were analysed, using thematic analysis. The results and analysis are discussed in Chapter 6. It became evident, during the study, that the project of Metolong had brought socio-environmental benefits that the study area had reaped. Concomitantly, the project had caused negative environmental effects as well.

1.12. Conclusions and recommendations

Chapter 7 presents the final conclusions drawn from this research project. It can be concluded that the project of Metolong had brought socio-environmental benefits that the study area had reaped. Concomitantly, the project had brought negative environmental effects as well.

1.13. Technical aspects

1.13.1. Referencing

The researcher decided to use the reference output style and adapted Harvard referencing method, as prescribed by his supervisors, and endorsed by the language editor.

1.13.2. Technical Care

The thesis was compiled using the guidelines given in the Unisa procedures for studies for master's and doctoral degrees, dated 08 May 2017, Parts 3.5 and 4.3.3.3. This research work was typed as recommended with a two-centimetre margin on the left, and one-and-a-half line spacing.

1.14. Originality of the study and contribution of the research

Phillips and Pugh (1994:61) state that the originality of the study is concerned with the way in which the study makes meaning and an original contribution to knowledge in the field of study. There are various characteristics, identified by Remenyi and Money (2004:100), that lay the groundwork for originality of the study. These comprise the following: looking at the areas that have not been researched before in the discipline; being cross-disciplinary; using methods different from those have been used before; trying out something in a certain country that has previously only been done in other countries; and, applying existing theory in a novel way to a different population. The study draws on a large amount of information and studies which have been done in the field of environmental management, but not much has been done in the context of Lesotho. Consequently, the outcomes of this study are markedly different, from the usual, to Lesotho, and, hence, original, in that sense.

Much of the information which has been provided so far on the topic, has been on quantitative design, and little on qualitative design. Most of the research done thus far has investigated the social impacts of large dam development projects, policy analysis of the consequences of water projects for rural communities, socio-economic impacts of water projects, and more. This study, therefore, has filled the gap left by previous studies by providing empirical evidence on the topic by investigating the perception of the participants on socio-environmental impacts of Metolong dam and reservoir. The present study broke new ground by specifically focusing on the contribution of modernisation

theories and the study recommends local villagers to be incorporated in the management of large water projects. The study has used a qualitative research approach, and has adopted a triangulation approach, semi-structured interviews, fieldwork and document analysis. In this way, the study will make an original contribution to knowledge.

1.15. Assumptions

The study has the following assumptions:

- Large dams serve as an essential component for development of a social and economic livelihood that is sustainable.
- Water is Lesotho's most significant resource.

1.16. Scope and limitation of the study

This study investigated the perception of the community on the socio-environmental impacts of Metolong dam in the Kingdom of Lesotho. The positive socio-environmental benefits enhancing the community, and the perceived negative environmental impacts of Metolong dam and reservoir, were explored. In investigating the perception of the participants on socio-environmental impacts of Metolong dam and reservoir, the study covered only the Ha Seeiso village in Lesotho; therefore, the study was confined to Ha Seeiso. The perception of the community on the socio-environmental impacts of Metolong dam in other districts where the dam is not situated will be different. Districts besides Maseru, found within Lesotho, were beyond the scope of this study. In investigating the perception of the community on the socio-environmental impacts of Metolong dam, the impacts would be measured and the outcomes would suggest whether the impacts are negative or positive.

1.17. Structure of chapters to follow

With Chapter 1 providing an overview of the research, the following chapters are structured as follows:

CHAPTER 2

This chapter will discuss the theoretical foundation of the study, the history of large dams and development, and will provide concluding remarks on the history of large dam development. The chapter will also discuss the theory and justification of large dams, large dams within the sustainable development framework, and the gap existing in large dam theories. The chapter will conclude with a discussion of the empirical literature review.

CHAPTER 3

This chapter will discuss international reaction and responses to the construction of large dams, declarations dealing with the sustainable use of water resources, and conventions and protocols that deal with the sustainable use of water resources. The chapter will conclude with a discussion of the international treaties on shared water systems.

CHAPTER 4

This chapter will discuss the LHWP, dams built in the project, phases in the project, management structure of the project, its review, and the impacts of the project. The chapter will conclude with an exploration of the international socio-environmental impacts of large dams, on an international level.

CHAPTER 5

This chapter will describe and justify, where necessary, the methodology used in the study. The chapter will include sections on the research design used to carry out the study, as well as a description of the study population and the sampling procedures used. The chapter will

cover the methods of data collection and the data collection instruments used in the study. Trustworthiness, confirmability, credibility, transferability and dependability issues applied to the study, and procedures for data analysis, will also be discussed.

CHAPTER 6

This chapter will deal with data analysis, interpretation, discussion and evaluation of the research findings. The empirical data of the semi-structured interviews, and document analysis, will be presented. The semi-structured interviews were conducted with the villagers themselves, while the documentation to be analysed will be reviewed from the Metolong offices, and Library and Information. Presentation of data in this chapter will not follow the sequence in the interview protocol.

CHAPTER 7

This chapter will provide a summary of the key findings, conclusions, recommendations and contribution of the study, as well as areas for future research.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

Chapter 1 gave an introduction to the construction of large dams, including the times in which large dams were established and how many were established since their evolution. The previous chapter also described how many dams are yet to be constructed; the concerns and misconceptions about the construction of large dams worldwide. In this chapter, the focus is on describing, in detail, theories that have emerged, due to the construction of large dams since the concept of development, large dams within a sustainable development framework, the gap existing in large dam theories, as well as an empirical literature review, including positive impacts associated with the construction of large dams, and the negative environmental impacts associated with large dam construction.

2.2. Theoretical foundation

A literature review helps the researcher to learn about the topic under investigation, and to connect it with past studies, in order to gain knowledge (Neuman, 2006:111). This view is supported by Taylor and Procter (2008:1-2), who posited that the literature review helps to connect what is known to unknown in the field of study. In addition, the literature review helps with methods employed previously, the results obtained, and what was done with such results. It is therefore very important that the study under investigation be connected to the literature review, to support it (Rocco & Plakhotnik, 2009:129-130). By exploring a literature review in this study, the researcher was able to clarify his own thoughts about theories on the construction of large dams, and established a framework within which to present and analyse the findings obtained.

2.2.1. History of large dams and development

The development and running of large dams in the African continent were politically influenced. Chavez, Nadolnyak and Sarania (2013:21) state that large dams were used in Africa ever since the Colonial period, for social and economic development. Since the 1950s, when many countries in Africa and Asia obtained their freedom, they accelerated their national development processes of people, by improving it. They therefore opted for the construction of large dams. The World Commission on Dams highlights the following:

> The end of any dam project must be the sustainable improvement of human welfare. This means a significant advance of human development on a basis that is economically viable, socially equitable and environmentally sustainable. The issues all relate to what the dam will do to river flow, to rights of access to water and river resources, to whether it will uproot existing human settlements, disrupt the culture and sources of livelihood of local communities; deplete and degrade environmental resources (World Commission on Dams, 2000:2).

Subsequently, building of large dams brought theories as people bring development. Hawi (2005:2) stated that, during this time, development was taken to mean one thing with economic growth. Todaro and Smith (2006:15) stated that ‘it is not easy to give out the definition of development since it has a lot’. In the same vein, the definition of development by Edwards (1993:80), is the way people live in society, to improve themselves. Similarly, Ninsin (1991:84) considered the definition of development to mean maximising the production of society, so as to raise people’s living standards and rectify unemployment, inequality and poverty. Todaro (1994:670) gave a more comprehensive definition by stating that people’s way of living can be developed by raising their income, food consumption and medical services, and, secondly, by creating conditions necessary for the growth of people, that can be enhanced through the formation of social, political and economic systems and institutions that promote human dignity.

In a similar notion, Burkey (1993:35-39) defined development as focusing on social, human, political and economic aspects. These are elaborated on below, as cited by Burkey:

- **Social development**: A process of gradual change in which people increase their awareness of their own capabilities and common interests. They use this knowledge to analyse their needs, decide on solutions, organise themselves for cooperative efforts, and mobilise their own human, financial and natural resources to improve, establish and maintain their own social services within the context of their own culture and political system.
- **Human development**: A process whereby an individual develops self-respect, becomes more self-confident, self-reliant, cooperative and tolerant towards others through an awareness of their own shortcomings. All the above can be enhanced through working with others, acquiring new skills, knowledge, participating actively in the economic, social and political development of the community.
- **Political development**: A process of gradual change over time, in which people increase their awareness of their own capabilities, rights and responsibilities. They use their knowledge to organise themselves to acquire real political power to participate in decision-making at local level, and to choose their own leaders and representatives at higher levels of government who are accountable to the people. They plan and share power democratically and to create and allocate communal resources fairly and efficiently among individual groups.
- **Economic development**: A process in which people, through their joint efforts, boost production for subsistence and commercial activities. This requires people to analyse their problems, identify the causes, set their priorities and acquire new knowledge.

Todaro and Smith (2012:23) and Korten (1990:67) state that development is contained as part of major changes in social structure and administration, together with the customs, attitudes and beliefs. For this reason, development cannot be set in advance on long-term goals and arrangements (Swanepoel, 2000:72). All the definitions view development as

being people-centered, as all humans can reach their potential. Likewise, the definitions put individuals as agents of change, who can be empowered to make their own choices.

According to Agbyoko (2010:23), development is defined as the way people try to satisfy their needs with natural resources from the environment, through exploiting them. Concurring with the preceding stance, Rodney (2005:1-2) pointed out that development comes about when people have a battle with the environment and dominate it. Development in this way is perceived as spiritual. Esteva (1992:10-11) indicated how Bonnet, in the eighteenth century, linked development to God, and stated that development cannot be separated from growth, evolution and maturation.

On the other hand, Todaro and Smith (2006:16) emphasised that if development does not increase the economy of the people and their standards of living, something is unjust. The state and society had to play a peculiar role in all the processes of development (Elakhe, 2014:73), to administer people's actions on the environment. However, governments in developing countries have tried in all their capacities to take part in development, but their standing and ability did not help them to perform well.

Many dams in Africa and in Lesotho have been built in terms of set national goals. Development as a transformation of both natural and built environment through large projects like dams, roads, pipelines, for example. These large-scale development projects brings benefit to the general public while there are some who suffer the costs that the projects bring to them. Explored literature review on development will help with the perceptions that participants at Ha Seesios village in Maseru may have regarding the construction of Metolong projects and development.

2.2.2. Concluding remarks on history of large dams and development

The above definitions completely cover development involving human, economic, political, social and spiritual elements. The definitions suggest development is to do with the reduction of poverty, improvement in the quality of human lives, improvement of the living standards of people, expansion of their choices, and improvement in the care for one another and their environment. When people mobilise one another and organise themselves to establish cooperative efforts that deal with them, that is the beginning of development. This process empowers people and leads them to sustainability.

2.2.3. Large dam theories and justification

As stated above, development deals with issues such as poverty, unemployment, oppression and inequality, and enables people to realise that they can do something about their situation without destroying their environment. Development takes place when the income of people increases so that their economic environment promotes growth. With this understanding of development, an attempt will be made to analyse the development theories of large dams. Stacks and Salwen (2009:4) explain the significance of theory as collecting and bring people's ideas together when exploring an unknown area of knowledge. Different theories have existed since World War II. These include reconstruction and development, economic development, the growth theory, modernisation (and its new variant–neo-liberal development), post-modern development and sustainable development (Long, 1990:16; Preston, 1996:154; Simon, 1997:184-185). Thorbecke (2006:3) stated that development theories behind large dam development originate from development thinking from the 1950s, when the modernisation theory emerged. The study explores modernisation and sustainable development within the context of large dam development.

2.2.4. Modernisation theory

Modernisation was born of American social scientists, and gained its strength around the 1960s (Preston, 1996:170-171). Modernisation was perceived by Du Pisani (1980:67) as the process involving change in social structures, changing people's behaviour, and leading people to a new sense of what should be done while development is still ongoing. However, modernisation requires a change in the values, attitude and norms of people, while people are transformed from a traditional society into a modern society. From the point of view of Myers (1999:12, 119), when people have changed, they recognise their true identity as children of God, and have a relationship with a triune God and the environment on which they depend for food, water and air.

Third World countries are taken as stagnant, underdeveloped, backward, and lacking industrialisation and potential for economic growth. By adopting the modernisation process of industrialisation and an economic system of capitalism, Third World countries could gradually abandon their traditional values and move towards a system of modernity. So (1990:36) stated this can be achieved when the Third World absorbs Western values and resources in the form of investments, loans and aid. Preston (1996:175), however, stated that modernisation can be achieved from Rostow's stages of economic growth, which identifies five stages through which all development societies must pass through for them to be modernised. These five stages are as follows:

- Stage 1: The traditional Society
- Stage 2: Transitional Stage (Preconditions for Takeoff)
- Stage 3: Take-Off
- Stage 4: Drive to Maturity
- Stage 5: High mass Consumption

Ha Seeiso village in Maseru is in Stage 1 (Traditional Society) of Rostow's stages of economic growth, for the economy is dominated by subsistence activity where agriculture is the most important industry. The society output is consumed by producers for there is no surplus for trading. In addition, production in the society is labour intensive using only limited quantities of capital with technology limited. For the study area to move all way up to Stage 5, Lesotho had to adopt Modernisation theory that changes people's behaviour and their perception. It is through adoption of Modernisation theory new knowledge of development (construction of Metolong project), the people will take advantage and know what to do while development still ongoing. Participants' adoption of Modernisation theory if well implemented in Ha Seeiso village in Maseru, people will abandon their traditional values and move gradually towards High mass Consumption.

2.3. Large dams within the sustainable development framework

Development is about change, while sustainable development is about lasting change. Sustainable development is there to create good living standards. Khan and Khan (2012:29-30) state that gaining sustainable development will not stop least developing countries from developing. According to Chatterjee and Finger (1994:155), sustainable development was polarised in the early 1980s, after the review of the state of the environment, where least developed countries and developed countries agreed to care for the environment. Nonetheless, Umberto, Andreas and Gerald (2012:41) state that sustainable development was polarised in 1987, after the publication of the Brundland Commissioners report on the global environment and development. It was during that time that sustainable development arose, having a different perspective than other modernisation strategies thought to have.

2.3.1. Agenda 21 of 1992

In 1992, at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, more than 170 governments met to discuss ways and policies to enhance sustainable development. Adams (2001:8-10) stated that this was the first-time heads of

state met to protect the environment. One of the beneficiaries would be the poor, their present and future needs. Fleurbaey, Kartha, Bolwig, Chee, Chen, Corbera, Lecocq, Lutz, Muylaert, Norqaard, Okerere and Sagar (2014:292) and the World Commission on Environment and Development (WCED) (1987:43) have stated that sustainable development is concerned with preservation of the needs of future generations, not putting aside the needs of the present generation.

Sustainable development and modernisation are theories that could be used to rectify underdevelopment and poverty in developing countries, only if the countries are following the path of economic modernisation growth. From the point of view of Ajei (2007:25), this economic growth was considered to be the same as development. The Rio Declaration 1992 contains 27 principles, usually known as the Rio Principles. The principles relating to development and issues of sustainable development, are as follows:

- **Principle 1** states that human beings are at the centre of concern for sustainable development, and are entitled to a healthy and productive life in harmony with nature.

- **Principle 3** recognises the right to development, but insists that it can be met in an equitable way that considers future generations, as well as present participants in development.

- **Principle 10** underlines that all concerned citizens must be involved in handling environmental issues, and must participate in the decision-making process. This participation must be accompanied by effective access to relevant information, and by opportunities to seek redress and remedy, in case agreements are not respected.

- **Principle 15** states that the precautionary approach shall be widely applied by states, according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

- **Principle 22** recognises the vital role of indigenous people, and other local communities, in environmental management and development. It entrusts states with ensuring their effective participation in the achievement of sustainable development.

Furthermore, sustainable development could be regarded as a dynamic process to gain a healthy, prosperous and stable life for mankind. Constanza, Alperrovitz, Daly, Farley, Franco, Jackson, Kubiszeski, Schor and Victor (2012:128) state that people are recognised as part of nature and constraints imposed on all of nature. The sustainability only becomes feasible if the development processes are appropriately considered in the context of economy, environment and culture. Similarly, Flint (2004:41) stated that the sustainable development of large dams therefore grants equal weight to, and balances, the social, economic and environmental needs of development, based on economic vitality.

Nevertheless, most African countries have failed to balance the social, economic and environmental needs of development; thus, they were exploited, as stated by dependency theory. The dependency theory of underdevelopment was formulated by several Latin-American economists and social scientists in the 1960s, including Marxist social thought on capitalism. The theory suggests that the underlying causes of Third World underdevelopment was caused by exploitation of the industrial Western World (Burkey, 1993:28; Madziakapita, 2003:88). Western Europe and the United States of America (U.S.) have unmatched economic prosperity and liberal democratic stability, since they are the most advanced nations in the world, and are models that latecomers in development should emulate (Ajei, 2007:23).

Ajei (2007:39) adds that this dependence is part of a continuous process which poor countries are drawn into after being exploited and given aid. Knack (2001:310) noted that aid creates dependency by causing weaker countries dependent on stronger ones, making

them become poor in economic matters. The World Health Organisation (2015:4) reports that an estimated 826 million people are suffering from chronic hunger in developing countries, while more than one billion lack access to safe drinking water, and 2.5 billion do not have adequate sanitary facilities.

Development and Agenda 21 implemented in Lesotho, the community associated with Metolong dam will be able to protect water and the environment for the benefit of the poor, their present and future needs. Protection can be achieved through Water Resource Management which comprises protection, planning, developing, distributing and managing the use of water resources. Water related policies and legislations provide the framework within which water resource management is undertaken. Array of policies and legislations dealing directly with water and the management of natural resources in Lesotho include: the Water Resource Act 1978 (Act 22 od 1978) ammended in 2008, the treaty on the Lesotho Highlands Water Project 1986 and the Constitution of the Kingdom of Lesotho, Section 36 (Kingdom of Lesotho, 2008a).

In the same notion, Kingdom of Lesotho (2007) states Water and Sanitation Policy approved by the Ministry of Natural Resources in 2007 deals with water resource management. Protection to the environment for the benefit of the poor, their present and future needs can be achieved by implementing the Environmental Act 2008 (Act 10 of 2008) (Kingdom of Lesotho, 2008b).

2.4. Gap existing in large dam theories

The theoretical foundation showed that, after many nations got their independence, they wanted to accelerate their national development to improve people's lives, and opted for the construction of dams. However, a barrier was identified, for nations do not emphasise local people's participation fully by having a voice over decision-making, planning,

implementation and evaluation. Treurnicht (2000:68) stated that this limitation is caused mostly by the way development institutions are structured.

It is in this regard that the study advocates for greater attention to be given to development facilitation of people in areas where large dams are constructed. This strategy will help people to be aware of their situation and the possibility of breaking down all the barriers that limit their participation, making them gain equal opportunities in decision-making processes. Hence, Martinussen (1995:333) posited that this will be possible when communities are organised into smaller units.

2.5. Empirical literature review section

2.6. Positive impacts associated with construction of large dams

During all the phases in construction of large dams, there are benefits and disadvantages; those that the thesis will discuss are provided in the ensuing sub-sections.

2.6.1. Creation of employment opportunities

Creating employment is one positive impact associated with large dam construction. Both skilled and unskilled labour is employed when large dams are constructed. According to Richter, Postel, Revenga, Scudder, Lehaner, Churchill and Chow (2010:14), many people are employed when large dams are constructed, and some depend on them for their welfare, survival and employment matters. Job opportunities in this regard are experienced at different stages: at the beginning of the feasibility study, in pre-construction, during construction and post-construction. The Asian Development Bank and Dams (2006) and the World Commission on Dams (2000:99) reported that on the construction of the Kariba and Grand Coulee dams, there were 10,000 and 15,000 workers, respectively.

With the numbers of the Basotho working in South Africa, especially in the mines, LHWP was ideal for providing jobs for the returnees as well as for others still in the country. The project's main contracts created a high number of job opportunities generating up to 22 000 person years of employment in Phase 1A and 15 400 in Phase 1B of which the affected people were mostly considered (Mofokeng, 2013:45). During peak construction at Phase 1B there were more than 8 000 jobs for local and regional workers (South Africa.info, 2004).

2.6.2. Improvement of infrastructure

When large dams are constructed, roads, power lines, clinics, police stations and schools are developed. Skinner, Niasse and Haas (2009:7) agree, when contending that the advanced infrastructure holds long-lasting benefits to the local communities, as their place was inaccessible and isolated before. A good example is the LHWP, citing Mohale Dam, where roads, hospitals, clinics, primary schools, lodges and commercial centres were developed (Hitchcock, 2015:528).

2.6.3. Reliable water supply

Through construction of large dams, people have been able to collect water and store it in reservoirs. Stored water in a reservoir is very important for areas experiencing drought, or in areas having rainfall that is seasonal. The Aswan Dam in Egypt is an example which experiences unreliable rainfall (Bashir, Nossent, Bauwens & Batelaan, 2011:1). The same authors add that the dam regulates the water flow with 80%, in the Nile River, during the flood season from August to October.

2.6.4. Regulation of river flow

Constructed reservoirs are also important, in the sense that they prevent floods downstream of the dam, for they hold water and regulate the flow during flood events. Reservoirs also

balance the flow of the dam during different weather conditions (Lindstrom, Granit & Weinberg, 2012). During heavy rainfall, they hold water back and decrease the flow, while during drought they release more water. Nevertheless, flood problems have become a serious concern worldwide. From the point of view of Dajun (2003:144), in 2003, floods had cost about U.S.$3,000 million dollars per annum, while in Asia alone, four million tonnes of crops were destroyed yearly. On average, 17 million people have been affected during these floods.

The flood of the River Nene, near Wisbech, Cambridgeshire, swept away and killed people, including many farm animals (Environmental Agency, 2011:1). The same agency reports that transport and communication links were disrupted. Conversely, other people see benefits from floods of dams, reservoirs and rivers; for example, the flood that occurred in 2010 in Nigeria (Lagos and Orun states) had a positive effect on fishermen's business, for they did not need to paddle their canoes to the far end of the river to catch fish, as the water level increased the fish (Etuonovbe, 2011:6).

2.6.5. Improvement in women's economic efficiency

Through large dams, construction of hydroelectric power is generated. Grassi, Landberg and Huyer (2015:2) state that provision of hydroelectric power through construction of large dams reduces the burden on women to fetch fuel wood and water to meet domestic needs. For them, to obtain fuel wood and water, they must walk long distances; therefore, Barwell (1996:22) stated that African women transport goods three times more than men do, and head-load large portions of fuel and water to be used in households. Grassi *et al.* (2015:10) state that women are fulfilling social and economic roles through their domestic labour, and their capacity as child-bearers, care-givers and socialisers of the next generation.

2.6.6. Cheaper energy and improvement of well-being

As previously mentioned, through large dam construction, hydroelectric power is generated. This type of energy is cheap, and, as a result, financially accessible to many people. The Aswan Dam in Egypt is an example. People in Egypt use this cheap energy, and areas are no longer forced to buy fossil fuel that was expensive abroad. Revere and Menders (2000) give another example of an area where cheaper hydroelectric power is generated, and mentions Tucurai in Brazil. These authors state that electricity prices were low, because of subsidisation from the government were made when buying power at US$ 24 per MWh.

2.6.7. Improvement in food production through irrigation

Construction of large dams and reservoirs help with water that is enclosed, which can be used for irrigation purposes. In many regions, especially during dry seasons, irrigation is required for growing crops as a way of increasing productivity. This view is supported by Vorosmarty, Douglas, Green and Revenga (2005:230), who stated that out of 100%, 64% of the total population in Africa use water for different purposes. During the nineteenth century, according to Gleick (2000:127), 'irrigated land worldwide was 50 million hectares but after dam's construction it increased to 267 million hectares'. Tilman, Balzer, Hill and Befort (2011:108-109) and Regmi and Meade (2013:166) aver that the increase of irrigated land worldwide was due to increasing population and changing diets, and, by 2025, 20% of food would come from irrigated land with the help of large dam construction.

2.6.8. Industrial usage

Water plays an important role in production processes, as the world's industries need large amounts of water. About 400,000 liters of water are needed in car manufacturing industries to make just one car (Barlow & Clarke, 2002:201). Large amounts of water are also needed for making aquaculture facilities. Lake Nasser, found at the border between South and

North Sudan, is a good example of where an aquaculture facility is conducted with water collected in a large reservoir (Hamza, 2014:350).

2.6.9. Cleaner energy

Hydroelectric power produced from a power-house with the help of large dams, produces cleaner energy compared with energy that comes from thermal power production. This is because of carbon dioxide emissions produced by thermal power, which contributes to several diseases. Wargo and Hogan (2006:359-361) gave some of the diseases: asthma, chronic obstructive pulmonary diseases (COPD), diabetes, cardiovascular diseases and lung cancer. Conversely, Goklany (2015:55) contends and deprecates the problem of carbon dioxide emitted from thermal power, but sees the benefit out of it, as thousands of experiments show that the majority of plants grow faster and larger, both above and below ground, if they are exposed to higher carbon dioxide concentration.

2.7. Negative environmental impacts of large dams

Negative environmental impacts of large dams were polarised at the beginning of the 1960s, when large dam construction started (Kotelo-Molaoa, 2007:56). The following subsections will describe, in detail, negative environmental impacts of large dams.

2.7.1. Large dam impacts on the climate

In most areas of the world where large dams are constructed, local climate is affected positively or negatively. Reservoirs with large surface areas in most cases tend to influence the temperature of an area by lowering it. Kotelo-Molaoa (2007:62) states that, in Moscow, the Rybinsk Reservoir ‘had caused changes in the local weather where [the] frost-free period was extended by 5 to 15 days per year’. In addition, the change in weather in turn affected the geomorphology, flora and fauna of the reservoir and the river; hence, the change may also bring the introduction of new species that may thrive in lowered

temperatures, while the older species disappear. Baidu, Amehudzi, Aryee and Annor (2017:2) state that, Lake Volta in central Ghana had shifted the rainfall season from October to July or August. On the other hand, Hamdan and Zaki (2016:13) state that, construction of large dams in Egypt had an effect on the microclimate for moisture level in the area ultimately increases resulting in dry ecosystem being converted into areas with seasonal rains as was the case with Lake Nasser.

2.7.2. Soil erosion and soil degradation

If water stored in the reservoir overflows, a large number of crop lands are affected, and soil is degraded and washed away. Abrol and Oman (2002:283) defined soil erosion as the removal of topsoil from one place to another by various agents such as moving water, blowing winds, strong waves, snow and the force of gravity. The soil erosion caused by running water is a global environmental concern, for it causes loss of fertile topsoil; hence production capacity is at risk. Because of soil erosion, global food security is at risk. The Food and Agricultural Organisation (FAO) (1998) stated that 0.3% of human food was obtained from the ocean and other aquatic ecosystems, while 99.7% came from the land.

Tripathi and Singh (2001:11) estimated that 0.5 centimetres of soil and sediments is washed away by running water. Lal (2001:519) averred that the situation is bad in least developing countries, where farmland is limited. Abrol and Oman (2002:283) gave a more comprehensive view of the effects of soil erosion on farming land, and state that, in Africa, production has decreased from 2% to 40%, with a mean loss of 8%. Due to that loss, Von Braun, Swaminathan and Rosegrant (2004:59) predicted that if soil erosion and degradation continued, by the year 2025 the African continent would not be able to feed 25% of its population.

Soil erosion and soil degradation in Lesotho dates back to the late 1800s when early missionaries reported the development of gullies (Couzens, 2003:22). Today, the state of

land is described as critical and the country is known for its prominant soil erosion. Soil erosion is a major threat to the dependency of the Basotho on the land resources. Leduka, Crush, Frayne, McCordic, Matobo, Makoa, Mphale, Phaila and Letsie (2015:31) state that, 85% of the population derive their livelihood from agriculture and livestock rely heavily on rangelands for fodder.

2.7.3. Loss of soil nutrients

Soil erosion and soil degradation are two processes that are closely related to nutrient depletion (Cobo, Dercon & Cadisch, 2010:1). This is because most soil nutrients are found on topsoil–that is, 5-10cm deep in soil (Nkonya, Pender, Jagger, Sserunkuuma, Kaizzi, & Ssali, 2004:136). Those nutrients that are easily eroded include nitrogen, phosphorous, potassium and calcium. Troech, Hobbs and Donahue (1991:87) gave a more comprehensive idea about how many kilograms of nutrients are lost, and state that 1-6 kilograms of nitrogen, 1-3 kilograms of phosphorous and 2-3 kilograms of potassium are lost per hector when topsoil is eroded. After soil is eroded and nutrients are depleted, the remaining soil has fewer nutrients, whereas eroded soil has three times more nutrients (Young, 1989:146). As a matter of fact, Pimentel, Harvey, Resosudarmo, Sinclair, Hurtz, McNair, Crist, Sphpritz, Fitton, Saffouri, and Blair (1995:1119) stated that the remaining soil, containing less nutrients and plants, is going to be stunted, hence a decrease in production. Langdale, West, Bruce, Miller and Thomas (1992:81) concurred with the preceding stance, and stated that soil containing less nutrients produces yields that are 15-30% lower.

2.7.4. Decrease of soil organic matter

Soil erosion and soil degradation also cause soil organic matter to be lost. Soil organic matter helps with the formation of soil aggregation, and increases soil porosity (Langdale *et al.,* 1992:84). Soil with good organic matter is found close to the soil surface. It is good

because of the decaying leaves and stems. This decaying leaves and stems contribute 95% of soil nitrogen and 50% of phosphorous in topsoils (Allison, 1973:77).

2.7.5. Reduced soil depth

For plants to grow well, they need adequate depth for their roots to extend (Wardle, Bardgett, Klironomos, Setala, Putten, van der & Wall, 2004:1629). It is in this respect that, when soil depth is reduced, plants roots are limited, and that has a negative impact on production as well. In most soil, depth is reduced from 30cm to les/s than 1 centimetre by running water.

2.7.6. Storms and seismicity

A large mass of water inside a large dam or/and reservoir may apply pressure to the geological structure of an area where they are constructed; as a result, an earthquake may follow. Gupta (2002:279) stated that Lake Mead, California, was the first reservoir in 1935 to experience seismicity and an earthquake. Adding to the preceding stance, Hull (2009:3) states that ten years after the filling of Lake Mead Reservoir, shocks experienced covered an area of 8, 000 km^2. The earthquake started along the slope of Mont Toc, above the lake, and resulted in many people's deaths and injuries, houses and other properties being damaged.

Magadza (2006:206) states that, the construction of the resevoir in Kariba resevoir with a total mass of 180 billion metric tons has increased the valley's seismic activity with earth tremors increasing substantially after the filling. The author states the highest concentration of seismicity being around the dam wall.

The Senqu seismic belt in which Lesotho lies is considered seismically active zone. Malephane (2007:15): states the belt including the southern boundary of the Kaapvaal

province, the Namaqua-Natal province, the Karoo basin. The author continues and states that, the region Senqu seismic belt has a record of a magnitude 5.9Mb which occured in July 1, 1976 in the Koffiefontein. Resevoir induced seismicity has been observed during the filling of the Katse dam under the Lesotho Highlands Water Project. The largest earthquake was recorded on January 3, 1996 5km upstream of the main dam (Katse) with a magnitude of 3.2Mb. Several houses had been damaged by road works and blast vibrations or dam earthquakes during construction of Katse, 'Muelsa and Mohale dams (Transformation Resource Centre, 2004: 15). In the middle of the night, Tilt, Braun and He (2009:252) state tremors shook the village of Mapeleng the hardest, scaring people out of their homes as they ran in fear for safety. Some homes suffered moderate damage while others experienced their belongings falling off the walls unexpectedly. Government of Lesotho-Department of Water Affairs Lowlands Water Supplt Unit (2008:45) states 10% probability exists that a seismic event if VI on the Modified Merchalli scale existing at least once over a period of 50 years at Metolong dam.

2.7.7. Loss of plants species when clearing the land

Land that is covered is essential in protecting the soil from being moved by any form of erosion. Schulze (2000:13) gave the definition of land cover as the biological and physical state of the earth's surface. Planting cover crops or using crop residue (mulching) can help to maintain land cover (Mose, Nzabi, Onyango, Gor, Moruri, Makworo, Okoko, & Kwach, 2000:23). Nevertheless, it is a most widespread practice, in the least developing countries where population is increasing, for land cover to be removed to make way for building large dams (Pimentel, 2006:119). Bishaw (2001:1), Mitiku, Herweg and Stillhardt (2006:22) and Gebrehiwet (2004:18) maintained that about 150,000 to 200,000 hectares per year are cleared worldwide.

Muchena, Onduru, Gachini and Jager (2004:23) reported that 65% of African agricultural land comprising 31% permanent pasture land and 19% forest and wood-land has been degraded due to land clearing. Karkee (2004:13), Kaimowitz (2003:199) and Sunderlin,

Angelsen, Balcher, Burgers, Nasi, Santoso & Wunder (2005:1384) stated that, in the least developing countries, poor rural people move for their livelihood to be sustainable and are dependent on wild fruits, vegetation, bush-meat, medicinal plants, wood for fuel, and timber. Furthermore, Yasuoka and Levins (2007:450) believe that when land cover is cleared, it has a negative impact on the local ecosystem (micro-climate, soil, aquatic condition) as well as on flora and fauna.

Conversely, Wen (1993:63) stated the advantages of land cover before it could be cleared for large dam construction. The author states that crop residue and trees harvested are used for cooking and heating homes–not only for that, but also for construction purposes and production of farm implements and household furniture. Bekele (2001:10) gave a more comprehensive idea of percentages of fuel wood use, and states that 78% of energy in least developing countries comes from wood, while crop residue and dung provide 16% of energy. In China and Bangladesh, crop residue provides 60% and 90% respectively (Wen, 1993:68).

The opportunity cost of losing some vegetation in exchange for water and electricity which can be used in the houses and in agriculture for many years to come had a painful effect to the community associated with Metolong dam. Lands were used for income generation as fresh food was produced by families and sold to generate household income. Transformation Resource Centre (1999:1) states part of the losses encountered by some villagers and the resettled people in LHWP were trees that were sold as wood.

2.7.8. Impacts on the Aquatic ecology

When large dams and reservoirs are constructed, the flow of the river is affected. Richter *et al.* (2010:15) state that when the flow of the river changes, running water is replaced by still water ecology. Lessard and Hayes (2003:721) stated that when water is enclosed in large dams and reservoirs, the water temperature is altered, and oxygen within both the

dam and the reservoir is dissolved. If the situation is such, fish species thriving in the river, the dam and the reservoir will be adversely affected. Tapela, Britz and Roulani (2015:14) state that, in Pongola River with the dam wall close to Jozini water level fluctuated and the dam resulted in regulated water released to the floodplain, hence fish species were affected. Fish has always been an important source of food for people in the floodplain. They use baskets called *Imfonyo* to catch fish. The same incident may occur as time elapses in Metolong dam if the flow of the river may change. Fish assemblage in the Phuthiatsana River including Smallmouth yellowfish (*Labeobarbus aeneus),* Largemouth yellowfish *(Labeobarbus kimberleyensis),* Rock catfish *(Austroglanis sclateri)* and Chubbyhead barb *(Barbus anoplus)* is going to be affected.

Similarly, still water ecology can also result in the dam and reservoir being filled with aquatic weeds. Akinyemiju (1987:24-26) stated that three years after the damming of the Congo River, aquatic weeds were spread over a 1,600 km^2 area of the river. In another instance, after its filling, Brokopondo Reservoir in Surinam had aquatic weeds over 50% of its surface (Kotelo-Molaoa, 2007:54). Once aquatic weeds decay, they use a great deal of oxygen, hence increasing fish mortality. Not only do they use oxygen, but also prevent sunlight both on the surface of the dam and the reservoir, and in the waters below (Lancer & Krake, 2002:20).

2.7.9. Impacts on the terrestrial ecology

The construction of large dams and reservoirs negate the terrestrial ecology of the river. This is the fact for river fisheries, for they are replaced by the reservoir fisheries (Beck, Claassen & Hundt, 2012:73). An example is the Balbin Dam in Brazil (Kotelo-Molaoa, 2007:59).

2.7.10. Change in the flow of the river

The flow of rivers in the 1980s was researched by Richter, Baumgartner, Powell and Braun (1996), Richter *et al.* (1997) and Poff, Allan, Bain, Karr, Prestegaard, Richter, Sparks and Stromberg (1997). According to Poff and Matthews (2013:3-4), flow of the river is defined as follows:

> ... the amount of allocated flow that is released to mitigate the negative consequences of dams and river constructions on the hydrological regime of the river in question to reduce the ecological impact of flow alteration.

Construction of large dams and reservoirs tend to affect the flow of the water in the river. Vogl and Lopes (2009:331) state that once large dams and reservoirs are constructed, the frequency and size of the river's flow is affected. Flow of the water in a river is important for many aspects, such as aquatic ecological health–which includes water quality, energy sources, physical habitat and biotic interaction (Figure 2.1). Baron, Poff, Angermerer, Dahm, Gleik, Haiston, Jackson, Johnston, Richter, and Steinman, (2002:1) stated that good water quality helps produce healthy stream communities, for poor water quality causes survival problems for stream life.

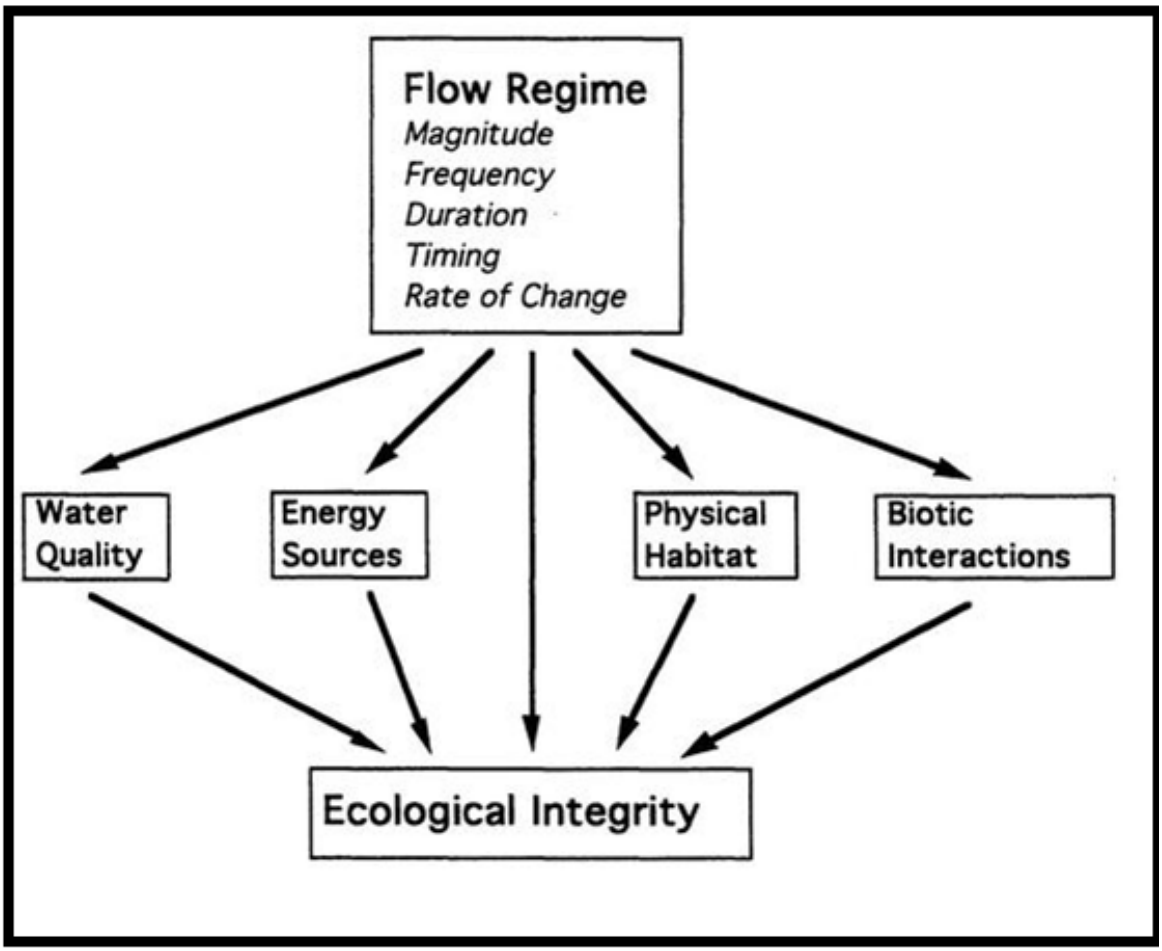

Figure 2.1: The natural flow regime affects many aspects of ecological integrity.

Source: Adapted from Poff *et al*., 1997:773.

Magilligan and Nislow (2005:61) stated that U.S. hydrologic characteristics in rivers were changed, due to large dam and reservoir construction. In this regard, Poff (2010:147) states that large dams and reservoirs should be constructed, but modern techniques should be implemented for the flow of water in a river, and, as such, include the Ecological Limits of Hydrologic Alteration Approach. On the other hand, Richter *et al.* (1996:1163) and Poff *et al.* (1997:769) suggested five flows that need to be considered in the flow of a river: magnitude, frequency, duration, predictability and rate of change (Figure 2.1). Levick, Fonseca, Goodrich, Hernandez, Semmens, Stromberg, Leidy, Scianni, Guertin and Kepner (2008:116) give the different patterns in a river as follows:

(a) **Ephemeral:** a stream which flows in direct response to precipitation, and whose channels are at all times above the groundwater reservoir.
(b) **Intermittent:** a stream that flows seasonally.
(c) **Perennial:** a stream that flows throughout the year.

2.7.11. Water quality in a reservoir

There are factors that affect water quality in the reservoir where large dams are built. These include eutrophication, pollution, nutrients and waste, and are described in the following sub-sections.

2.7.12. Eutrophication

Chapra (1997:30) defined eutrophication as an ancient Greek word *ευ* which means plenty and *τροφοσ* meaning food, and together meaning over-enrichment of large dams by nutrients of phosphorous and nitrogen. These nutrients do not support growth of green plants. Rast and Thornton (1996:295) maintained that eutrophication occurs due to natural and human activities.

In this regard, large dams and reservoirs with water in a hypertrophic state block sunlight, which hinders photosynthesis for aquatic plants production from occurring. Pace and Cole (2000:487) added that the hypertrophic state does limit the food production for aquatic plants and organisms. In large dams and reservoirs that are over-fertilised with nutrients, there is visibility of green plants and seasonal algae blooms, which is followed by oxygen decrease and poor water quality. Fuggle and Rabie (1996:220-221) stated that visible green plants in large dams and reservoirs may include alien floating plants *(Eschhornia crassipes)* and seasonal algae, including blue-green algae (*hyperscums)* that can have an effect on aquatic ecology.

2.7.13. Pollution and nutrients

Pollutants are defined as any material that could be released and be harmful to the environment of water living species (Fuggle & Rabie, 1996:286). Pollution may impact on quality, which is a measure of "environment ability" to sustain life (Prepas, Pinel-Alloul, Planas, Méthot, Paquet. and Reedyk, 2001:421). On the other hand, nutrients are inorganic compounds that do not support life in aquatic systems (Dodds, 2002:671). The nutrients can be categorised as macro and micro, whereas pollutants and nutrient sources can be classified as natural and man-made. Observation from Fuggle and Rabie (1996:295) showed that natural pollutants are generated when plants decay and decompose, and when animals excrete, and all those are washed into large dams or reservoirs during the rainy season. Man-made sources may come from agriculture and husbandry, industries, urban drainage, and from waste generated within the communities. Two examples from the above list are briefly described in the succeeding paragraphs:

(a) Agriculture and husbandry

The use of fertilisers on arable land seems to be the main source of nutrients, for during wet seasons they are washed into the rivers (Cooke & Prepas, 1998:2292). On the other hand, when people wash floors of cattle steads, piggeries and chicken farms, all these practices produce large volumes of waste liquors (Brisbin & Runka, 1994:1; Sharply, Chapra, Wedepohl, Sims, Daniel and Reddy, 1994:437).

(b) Industries

Nutrient-rich effluents that are used in industries, together with fertilisers from cultivated land, can pollute the watercourses if they are washed into the rivers during rainy seasons.

2.8. Summary

In this chapter, an attempt was made to describe in detail theories that have emerged due to the construction of large dams. It is from these studied theories a gap was identified and a recommendation was provided. Empirical literature was explored in this chapter that

included positive impacts associated with the constrcution of large dams and the negative environmental impacts associated with large dam's construction. The construction of large dams like all other development initiatives has both positive and negative aspects as discussed above. Chapter 3 presents the discussions on the international reactions and responses to construction of large dams.

CHAPTER 3

INTERNATIONAL REACTIONS AND RESPONSES TO CONSTRUCTION OF LARGE DAMS

3.1. Introduction

Chapter 3 focuses on the international reactions and responses to construction of large dams when development is enhanced. The chapter will also discuss protests against large dam development, and social movements which emerged due to protests. Furthermore, the chapter will explore declarations, conventions and protocols dealing with the sustainable use of water resources. Finally, the chapter will explore international treaties on shared water systems, as Lesotho has a river that flows in more than one country.

3.2. International reactions and responses to construction of large dams

The World Commission on Dams (2000:356) stated that the building of large dams began in Europe and Northern America around the nineteenth century, but had increased throughout the twentieth century, to the whole world. In the twentieth century, large dams, worldwide, were constructed through the interest of politicians, development banks, companies, and officials in governments (Imhof, Wong & Bosshard, 2002:11). During this century, in the 1980s, protests against large dam development were polarised, for water was harnessed through construction of dams. This was similar to what Barlow and Clarke (2004:67) regarded as theft from nature. The protest of this time brought social movements into full functioning. Table 3.1 shows social movements that existed from the seventeenth to the twentieth century. Social movements were protesting on behalf of the citizens against the governments which were not protecting the people's rights, and, on their platforms, people were showing their grievances against injustice, towards the governments. A good example is that of the Hungarians, in September 1988, protesting on the streets, opposing the damming of the Danube at Nagymaros (Raina, 2000:147).

When protesting, people in social movements were using two strategies (Dubrow, Slomcznski & Dubrow, 2008:36). One was a conciliatory tactic, which uses lobbying, petitions or/and letter writing. Subsequently, Richards and Heard (2005:23) mentioned that conciliatory tactics were persuaded through conversation and debate. The second strategy was a confrontational tactic, that uses marches, sit-ins and strikes. Among the two strategies, Rootes (1999:155) stated that confrontational tactics were predominantly used during protests, but were replaced by conciliatory tactics in this century. In many parts of the world democracy prevailed, but Goldstone (2004:333) asserted that this democracy did not get rid of social movement organisations.

Table 3.1: Social movements protest against construction of large dams.

Region and name of the movement	**The main area of focus and examples**
IN AFRICA REGION: Network for Advocacy on Water Issues in Southern Africa – NAWISA.	Reparation and retrospective compensation, resettlement and development for people affected by large dams, e.g. Kariba Dam and LHWP.
SOUTH AMERICA: Latin America Network Against Dams, Rivers, Communities and Water.	The impacts on the local communities, compensation, resettlement and protection of the wetlands, e.g. Santa Isabel Dam, Yacyreta, Urra I and II Dams.
NORTH AMERICA: (a) Pimicikamak. (b) Cultural survival. (c) Environmental Defense. **(d)** International Working Group for Indigenous Affairs – IWGIA.	(a) Rehabilitation of tribal people's livelihoods, e.g. Hydro-Quebec. (b) Cultural survival, e.g. Manitoba Hydropower. (c) Preservation of biodiversity and protection of human rights for local people affected by large infrastructure projects. (d) Concentration on indigenous people issues, e.g. Theodosia.
EUROPE:	Dams decommissioning, river restoration and preservation of the biophysical

European Rivers Network.	environment.
ASIA: (a) Rivers Watch East and South East Asia formed in 2000. (b) Narmada Bachao Andolan. **(c)** South Asia Solidarity for Rivers and People – SARP.	(a) Resettlement, threatened cultural heritage, loss of assets such as rice fields, e.g. Mekong Basin and Rasi Salai. (b) Impacts on the culture and livelihoods of the indigenous people, e.g. Sardar Sarovar. (c) Facilitate dialogue for conflict resolution and impact assessment.

Source: Adapted from Wong and Wesly, 2003:8-10.

More so, Khatun (2013:8) states that 'people protesting were putting pressure on governments to see how they can negate the impacts of large dams'. In 1997, all dam opponents' campaigners met in Switzerland, with 39 delegates from the private sector, civil society organisations, affected people, financial institutions such as the World Bank, the International Union for the Conservation of Nature and Natural Resources IUCN, the World Conservation Union, and others with diverse interests, to discuss issues pertaining to large dam development. It was from this meeting that a recommendation was made for the establishment of the World Commission on Dams. World Commission on Dams (2000:20) gave the main objectives of the Commission as follows:

- To conduct a global review of the development effectiveness of large dams, as well as to assess alternatives for water resources and energy management.
- To develop internationally acceptable standards, guidelines and criteria for decision-making in planning, design, appraisal, construction, monitoring operations and decommissioning of dams.

This Commission was established in 1998 (World Commission on Dams, 2000:30), and began its work in the same year, while in November 2000 it released its report under the

Chairmanship of Professor Kader Asmal who was the RSA's Minister of Water Affairs and Forestry at that time. Within the Commission functions a consensus was reached, as adapted from Imhof *et al.* (2002:9):

- Dams have made an important and significant contribution to human development, and the benefits from them have been considerable.
- In too many cases, an unacceptable price had been paid by those people who had been involuntarily displaced.
- Lack of equity in the distribution of benefits had called into question the value of many dams.
- The commission should bring together to the table all peoples rights associated with different options as water and energy resources development.
- Negotiating outcomes will greatly improve the development effectiveness of water and energy projects.

After the Commission had reached an agreement, it proposed a framework for decision-making based on five core values: equity, sustainability, efficiency, participatory decision-making and accountability. Opinions raised by the World Commission on Dams (2000:33) argue that if these core values are well implemented, large dams will deliver benefits to all. After the proposal was established on decision-making, the Commission reviewed the following (World Commission on Dams, 2000:29):

- In-depth case studies of eight large dams on four continents, together with two countries' review studies (India and China)
- A cross-check survey of large dams located in 52 countries across the globe
- 17 thematic reviews grouped along five dimensions of the debate
- Four regional consultations
- Over 900 submissions from interested individuals, groups and institutions

In-depth case studies of eight large dams on four continents, together with two countries' reviewed studies, were assessed using a standard framework 'right-and-risks based approach' (Imhof *et al.,* 2002:11), with six questions at its core (World Commission on Dams, 2000:30):

- What were the projected versus actual benefits, costs and impacts?
- What were the unexpected benefits, costs and impacts?
- What was the distribution of costs and benefits–who gained and who lost?
- How were decisions made?
- Did the project comply with the criteria and guidelines of the day?
- How would this project be viewed in today's context in terms of lessons learned?

The Commission revealed that portion of large dams do fall short of physical and economic considerations of the community for large dams and do create irreversible impacts on communities and their environment. Conversely, 30-40 years after large dams began operation, some do continue to generate benefits both to the developer and the community, as stated by Yen (2003:1). In November 2000, the World Commission on Dams was terminated, and the Dams and Development Project (DDP) subsequently started to function in 2001. The DDP was established to take forward the works of the Commission, and to overcome problems that were met by it (United Nations Environment Programme Dams and Development Project (UNEP-DDP), 2004).

3.3. Declarations dealing with the sustainable use of water resources

Besides the World Commission on Dams and DDP establishment, declarations were put in place and enforced. The following sub-section gives details of the declarations:

3.3.1. Vulnerable groups and their rights

The World Commission of Dams (2000:16-17) stated that the social and environmental effects of large dams were affecting the poor and vulnerable groups. The poor and the

vulnerable groups were involuntarily resettled, and their rights were violated in the process- especially the elderly people, women and children. According to Annan (1997:1), human rights means–

> the foundation of human existence…., they are universal, indivisible and interdependent. It is the universality of human rights that gives them their strength. It endows them with the power to cross any border, climb any wall and defy any force.

3.3.2. Rights of the elderly

Elderly people's needs are not considered by programmes drawn when involuntary resettlement is done (United Nations, 2009:10). This is a serious problem for some people, as they have lived in an area for a long time, and their means of livelihood are negated. As a matter of fact, it is difficult for them to adjust or adapt in the new environment with all its advantages.

3.3.3. Women's rights

Adding to the preceding stance, there is a lack of attention to women's needs, as that stems from a lack of gender awareness among the developers when involuntary resettlement is done due to construction of large dams. Elson (1991:198) stated that this lack of gender awareness in the least developing countries is caused by the fact that a farmer is usually referred to as "he", although, in fact, the farmer is a woman. In addition, when developers construct large dams, in most cases women are excluded from various aspects of development and benefits that may arise from resettlement. Also, gender biasness may be a result of development theories such as Marxism. Anker (1997:321-323) averred that most women are working in secondary sector employment, where they earn low wages and work under poor conditions, for they are unable to compete with men on an equal footing as they do not have equal educational levels.

3.3.4. Children's rights

As with women, children receive very little consideration and attention, let alone being allowed to participate in the decision-making process when large dams are constructed. As a matter of fact, this perpetuates the violation of children's rights. World leaders could follow the framework given in the United Nations Children's Fund (UNICEF) (2003b:2), to commit themselves to provide a better future for the children and to ensure that the rights of children are prioritised in all the development.

3.4. The Hague Ministerial Declaration of 2000

The Hague Ministerial Declaration of 2000 is an output of a conference for the council of ministers that was held on water security in 2000 in The Hague. From The Hague Ministerial Declaration, water was considered as a basic requirement for the development of countries, essential for the life and health of the people. Though the importance has been prescribed for water, Jolly (1998:2) stated that women, men and children are all lacking access to adequate and safe water. The United Nations Educational, Scientific and Cultural Organisation (UNESCO) (2006) stated that due to the lack of access to adequate water and sanitation, about seven million people die every year, due to waterborne diseases.

3.5. United Nations Declaration on the Right to Development of 1986

During development and construction of large dams, developers must consider the fact that everyone has a right to development. Van Weerelt (2001:141) stated:

> Right to development allows for the recognition of the ties between various human rights and enables integration of the body of rights from the perspective of the individual's participation in sustainable development.

The United Nations declaration on the Right to Development of 1986 aims at improving the well-being of the people, based on their active, free and meaningful participation in development. In addition, the declaration aims at fair distribution of benefits resulting from construction of large dams. From the point of view of Sengupta (2002:837), this declaration takes each person as being a central subject to development, as a person that should be an active participator and benefit a great deal from development.

3.6. The Universal Declaration of Human Rights of 1948

The Universal Declaration of Human Rights was established in 1948, and in 2017 is its 69th year of implementation. Despite the time frame, Arzabe (2001:29) stated that this was a short time in which to change norms, practices and cultures, and practise legal actions. The declaration advocates for affected communities to be holistically integrated in the planning, implementation and decision-making on large dams' construction. In addition, the declaration has nine preamble paragraphs and 30 articles. For this research study, articles 1, 3 and 25 are relevant:

Article 1: All human beings are born free, equal in dignity, and rights and should be treated with conscience in a brotherhood spirit.

Article 3: Everyone has the right to life, liberty and security.

Article 25: Everyone has the right to a standard of living that is good for oneself and the family. Good standards include food, clothing, housing, medical care and necessary social services. In addition, everyone has the right to security in the event of unemployment, sickness, disability, widowhood and old age.

3.7. The Curitiba Declaration of 1997

The Curitiba Declaration of 1997 was approved at the first international conference of campaigners affected by large dams. The conference was held on 11-14 March 1997 in

Curitiba, Brazil. Khangram (2000:6) stated that the conference was attended by more than 100 people, speaking 12 languages, from 18 countries. The countries included Argentina, Bolivia, Brazil, Chile, France, Germany, India, Lesotho, Mexico, Norway, Paraguay, Russia, Spain, Sweden, Switzerland, Taiwan, Thailand and the United States. According to the World Commission on Dams (2000:28), this declaration stated that 'people should have a right to life and livelihood like before large dams are constructed'. Anti-dam campaigners met in Curitiba shared a common experience that formed their base for the decision to be reached against dam developers, who pay less attention to social, economic and environmental impacts (French, 2007).

Kotelo-Molaoa (2007:120) concurs that if the construction of any large dam does not have the approval of the affected people to be resettled, such a project should not proceed. Earlier, Gay (2001:112) had stated the following:

> Anti-dam people affected by large dams' impacts commited themselves to intensifying the fight against destructive dams from the villages of India and Brazil and the Kingdom of Lesotho to the boardrooms of Washington, Tokyo and London, where they forced dam builders to accept their demands. They reinforced their movement by building and strengthening regional and international networks. These people symbolised their growing unity by declaring 14th March as Brazilian Day of Struggles against large dams' impacts.

In summation, the Curitiba Declaration advocates that when large dams are constructed, more attention should be paid to local communities, for the project may affect them socially, psychologically, economically and environmentally.

3.8. The World Summit on Sustainable Development of 2002

At the Earth Summit held in Rio de Janeiro in 1992, it was agreed that each country should review and examine itself as to how far it has progressed in implementing the principles contained in Agenda 21. In 2002, the RSA hosted the World Summit on Sustainable

Development, to focus international attention on various issues in development, including water, **e**nergy, health, agriculture and biodiversity conservation (WEHAB). The five sectors were reviewed, in order to improve access to safe drinking water and sanitation, provide affordable, reliable and cleaner energy sources, minimise diseases and deaths caused by waterborne diseases, improve food security by using sustainable agricultural practices, and to protect ecosystems–particularly those that relate to water stress (Guerguin, Ahmed, Hua, Ikeda, Ozbilen & Schuttelaar, 2003:1).

3.9. The Manibeli Declaration of 1994

In 1994, the Manibeli Declaration was established, and was attended by 326 groups with a coalition of 44 countries. The main aim for this gathering was that the funder, the World Bank, had to see to it that large dam developers meet certain criteria before funding is given. Goodland (2010:384) gives the conditions that were to be adhered to by developers of large dams, before World Bank would give out the funding. The conditions include among others, the correct number of people who are going to be resettled, and how the funds are going to be administrated with transparency and accountability. In conclusion, another criterion was that large dams were to be part of a locally approved river basin management plan.

3.10. San Francisco Declaration of 1998

In 1998, 26 countries met in San Francisco to discuss ways on how they could protect the world's rivers, how those who are to be resettled would be compensated, and so forth. It was in this meeting where it was discussed that, when large dams are constructed, people, irrespective of their position, upstream or downstream, should be provided with information concerning the impacts of the dam and the reservoir. In the same notion, public consultation with local people had to be done all the way from pre-construction to post-stage of the project. It is in these consultation processes that local affected communities will voice their opinions. Political movements, such as the Green Party, provide a platform

where local affected communities can voice their opinions regarding large dam impacts (Hofmeister & Grabow, 2011:6).

3.11. The Rasi Salai Declaration of 2003

The meeting for this declaration was held in Rasi Salai, Thailand, in 2003, and was attended by 300 people from 62 countries, that were affected by the construction of large dams. These people who gathered in Rasi Salai were fighting against large dams' impacts. The declaration calls for traditional methods of protecting water, such as rainwater harvesting and drip kits for irrigation (Kotelo-Molaoa, 2007:123). According to Rooney (2004:1), the declaration called for rehabilitation of ground cover, in order for water to be collected. Furthermore, the declaration advocates for sustainable equitable water and energy management, affirming the principles of the Curitiba Declaration of 1997 and the Dams and Development Forum meeting.

3.12. Conventions and protocols that deal with the sustainable use of water resources

Due to people in social movements protesting the development of large dams, pressure was placed on the governments to see how they could negate the impacts emanating from their development. Hence, governments have established conventions and protocols dealing with the sustainable use of water resources. The following sub-section gives details of the conventions and protocols.

3.12.1. The convention on climate change

Chasek (1997:1) stated that the convention on climate change originated from the United Nations Conference on Environment and Development held in 1992 in Rio de Janeiro, Brazil, known as the Rio Earth Summit. Although the convention was established in 1992

it only started to function on 21 March 1994. This convention divides the countries into two groups: developed countries and countries in economic transition. The agreement from this convention was that all countries were to report their greenhouse gas emission and climate change activities to the conference of the parties (COP) for it to assess countries' effectiveness. The United Nations Framework Convention on Climate Change (UNFCCC) (2006:1) declared that the Convention on Climate Change was to see to it that atmosphere conservation of greenhouse gases were lowered at all levels to prevent the dams and reservoirs interfering with the climate system.

3.12.2. The Convention on Biological Diversity of 1992

The Convention on Biological Diversity of 1992 originated from the Earth Summit in Rio de Janeiro. It came as a response to the loss of national and international species, habitats and ecosystems, which are very important in the lives of human beings. This was reiterated by the Convention on Biological Diversity (CBD) (2010:1-2) which states that the aim of the CBD of 1992 was to conserve and promote sustainable use of fauna and flora species in an equitable way.

3.12.3. The Kyoto Protocol of 1992

The Kyoto Protocol of 1992 was developed by the United Nations, and adopted at the third Conference of Parties (COP3) held in Kyoto, Japan, in December 1997, but came into force in February 2005, when it was signed with 84 signatures. During the drafting of this protocol, the following countries attended: the European Union, Switzerland, Russia and Japan. This protocol supplements and strengthens the Convention on Climate Change of 1992. According to Gang (2007:10), the Kyoto Protocol was established to ensure that worldwide greenhouse gas emission was reduced. Only countries that are part to this protocol can play a part, and commit themselves to it.

3.13. International treaties on shared water systems

Treaties on shared water systems were established after governments had dealt with large dam impacts. McCaffrey (2003:156) and Fischhendler (2004:281) stated that the international treaties over shared water resources establish rules, regulations and decision-making procedures regarding delivery of water and usage. The treaties help in the sense that when each country is persuing its economic development, it should think about the interests of the neighbouring environment. For the purposes of this study, the following sub-section describes, in detail, treaties on shared water resources relating to Lesotho.

3.13.1. The Orange-Senqu River Treaty

Chapter 1 states that the Orange-Senqu River originates in the Lesotho highlands. It cuts through several countries, and stretches 2,300 km from the source to its mouth, passing through the RSA, while its estuary runs through Namibia into the Atlantic Ocean at the southern border of Namibia. To begin, there are many treaties on the Southern African Shared Water Resources (Table 3.2), but there are two relating to the Orange-Senqu River: the bilateral treaties (Table 3.3) and the Southern African Development Community Revised Water Protocol (3.13.3).

Table 3.2: Bilateral treaties on river basins in Southern Africa.

River	**Treaty**	**Year signed**
Maputo	UMBELUZI Joint Water Commission-JWC	1983
Angola and Namibia	KUNENE Permanent Joint Technical Commission-PJTC	1990
Okavango	Okavango River Basin Water Commission-OKACOM	1994
Limpopo	Limpopo Watercourse Commission-LIMCOM	2003
Zambezi	Zambezi Watercourse Commission-ZAMCOM	2004
Maputo	INCO-MAPUTO	2004
Mozambique and Tanzania	ROVUMA-JWC	2008

Source: Adapted from Ramoeli, 2007:5.

3.13.2. Bilateral treaties on the Orange-Senqu River

There are four riparian states sharing the Orange-Senqu basin. Four of them have signed and agreed on the seven bilateral treaties on the Orange-Senqu River (Table 3.3).

Table 3.3: Treaties about the Orange-Senqu River.

Year	Parties	Agreements	Institutions
1983	Botswana and Republic of South Africa	Agreement between the Government of the Republic of South Africa (GoRSA) and Botswana, establishing the Joint Permanent Technical Committee	Joint Permanent Technical Committee (JPTC)
1986	The Kingdom of Lesotho and the Republic of South	Treaty on the Lesotho Highlands Water Project (LHWP)	1. Lesotho Highlands Water Commission (LHWC) 2.Trans-Caledon Tunnel

	Africa		Authority (TCTA) 3. Lesotho Highlands Development Authority (LHDA)
1987	South West Africa (Namibia) and the Republic of South Africa	Agreement between Republic of South Africa and Namibia concerning the control, development and utilisation of the water of the Orange River	Permanent Water Commission (PWC)
1990	Botswana and Namibia	Agreement on the Establishment of a Joint Permanent Water Committee	Joint Permanent Water Committee (JPWC)
1992	Namibia and the Republic of South Africa	1. Agreement on the Vioolsdrift and Noordoewer Joint Irrigation Scheme 2. Agreement on the Establishment of a Joint Permanent Water Commission	1.Joint Irrigation Authority (JIA) 2. Permanent Water Committee (PWC)
1999	Namibia and the Republic of South Africa	Agreement on Water-Related Matters Pertaining to the Incorporation of Walvis Bay in the Territory of Namibia	
2000	Botswana, the Kingdom of Lesotho, Namibia and the Republic of South Africa	Agreement on the Establishment of the Orange-Senqu River Commission (ORASECOM)	ORASECOM

Source: Adapted from Kistin and Ashton, 2008:385.

3.13.3. The Southern African Development Community Revised Water Protocol

The Kingdom of Lesotho signed a protocol on a Shared Watercourse System in the Southern African Development Community Region: Revised Protocol on Shared Watercourses in August 1995, as a member of the Southern African Development Community (SADC). This was revised, adopted and signed by the member states in March 2000 in Windhoek, Namibia. Nevertheless, Ramoeli (2007:5) states that this revised

protocol came into force in September 2003, recognising all developments that are taking place in international water laws, such as the following:

- The Helsinki Rules–1992
- The Dublin principles–1992
- Rio Earth Summit, Chapter 18, Agenda 21
- The UN Convention on the Law of Non-Navigational Uses of International Watercourses, April 1997.

Ramoeli (2007:5) further states that the SADC protocol covers all uses of surface and groundwater including agricultural, domestic, industrial and navigational uses.

3.14. Summary

Negative consequences emanating from the construction of large dams have resulted in many local communities mobilising popular uprisings against some dam projects. These anti-dam campaigns and pressure exerted on some of the financial institutions have demanded that they review their policies so that they advocate for the protection of human rights and the environment. Chapter 3 entails a report regarding the international mobilisation against the construction of large dams, specifically focusing on the social movements and international declarations on the protection of human rights and the maintenance of ecosystems. Thereafter, the discussions dealt with the establishment of the WCD that reviewed the performance of projects on large dams in terms of their impacts on the people and the biophysical environment.

Given the title and the objectives of the study, a number of international instruments such as Manibeli Declaration, Right to development and Agenda 21 all allude to the importance of ensuring a free flow of information and participation of interested and affected parties in

the decisions affecting them. If all international instruments are well implemented in Lesotho, participants in the study area will provide their perception on the socio-environmental impacts of Metolong dam and reservoir for they will have information and they play part on decision making. Chapter 4 presents the discussion of the case studies on large water projects.

CHAPTER 4

LESOTHO HIGHLANDS WATER PROJECT AND OTHER INTERNATIONAL CASE STUDIES IN WATER PROJECT MANAGEMENT

4.1. Introduction

This study is about the investigation of the perception of the community on the socio-environmental impacts of Metolong dam and reservoir in Lesotho. The construction of the Metolong project is not the first large dam project to be constructed in the Kingdom of Lesotho, for there had been construction of large dams before citing Lesotho Highlands Water Project (LHWP). Chapter 4, hence, provides the exploration of the case studies on social and environmental impacts of large dam projects on an international level. The chapter concludes with the information about LHWP phases, dams involved in the project, information on the Lesotho Highlands Water Project treaty, management structure and its review, and impacts emanated from the project.

4.2. Environmental impacts of large dams on international level

Water development case studies in the Developing World have been specifically selected in order to make comparative studies of somewhat compatible developments. Case studies of projects from Highly Developed countries like USA or Japan would not favourably compare to that of Lesotho because the levels of national economic and social developments were vastly incompatible, therefore, the socio-environmental impacts would not necessarily be similar or comparable.

4.2.1. Kariba Dam in Zambia-Zimbabwe

Kariba Dam is built on the Zambezi River, on the border between Zambia and Zimbabwe. It has a height of 128m (Bollaert, Munodawafa & Mazvidza, 2012b:627). The dam also

has six floodgates, each of which is 9m high and 9m wide to allow a flow of 9000m^3/s (Bollaert, Duarte, Pfister, Schleiss and Mazvidza, 2012a:630). Figure 4.1 shows the six gates of Kariba Dam:

Figure 4.1: Overview of Kariba Dam with six floodgates.

Source: Adapted from Bollaert *et al*., 2012b:628.

Austin (1968:155) affirmed that Kariba Dam was the first large dam that received finances from the World Bank. However, the dam's construction resulted in unacceptable impacts. Soils Incorporated (Pty) Ltd. (2000:13) stated that during the construction period there was a high incidence of sexually transmitted infections, and several people were infected by STDs that increased at an alarming rate at that time. Also, the project had caused people to be resettled. Concurring with the preceding stance, Scudder (2005:327) stated that Tonga people numbering up to 57, 000 were to be resettled. In the process some were affected psychologically and culturally, directly or indirectly.

4.2.2. Tucurai Dam in Brazil

Tucurai Dam in Brazil was constructed in two phases: Phase 1 and Phase II. In Phase 1, 12 turbines were installed to produce four million kilowatts (Tundisi, Matsumura-Tundisi, Arantes-Junior, Tundisi, Manzini, and Ducrot, 2003:231). It was during Phase 1, that half of the power plants and lock systems were installed. Millikan (2011:138-140) states that Phase II was to generate electricity for industries' establishment in the Amazon region. This phase was completed in June 1998, and 11 turbines were added in a new power station (Keiser, Caldas De Castro, Maltese, Bos, Tanner, Singer and Utzinger (2005:392). When Tucurai Dam was constructed, according to Tinotenda and Wellington (2014:71), the livelihood means of the community, and their lifestyle, were not considered (Matli, 2005:79).

4.2.3. Yacyreta Dam in Argentina

Yacyreta Hydropower Project is one of the world's largest projects between Argentina and Paraguay. It is a multi-purpose infrastructure, aimed to improve navigation on the Parana River and to provide irrigation to farming nearby. Walsh (2004:61) stated that the main objective of the Yacyreta Hydropower Project was for generation of hydroelectric power (2,700 megawatts) for the entire Argentina and for irrigation purposes.

The construction of Yacyreta Hydropower Project had affected local communities negatively, as 5,000 people were resettled when flooding occured at Patana River banks. These people had to abandon their households and lose their livelihood means (Stockholm International Water Institute (SIWI), 2005:13). In addition, water in the reservoir became polluted, for it was stagnant, and the sanitary system was also destroyed due to groundwater levels being raised. Matli (2005:78-79) stated that when the reservoir was full, crossing Yacyreta Dam was a struggle; hence, children and workers did not reach their destinations on time.

4.2.4. Chixoy Dam in Guatamala

Chixoy Dam, constructed on the Alta and Baja Verapaz rivers, and was completed in 1982, after funding was given by the World Bank, at a cost of US$ 2.5 billion (Johnston, 2010:341). Johnston adds that during the project construction, the community of Rio Negro village refused to be resettled, for they did not want to leave their ancestral lands to settle in a new place provided by the government. As a result, the army forced them to resettle, and killed 400 people (Johnston, 2010:341). Concomitantly, the indigenous Maya Achi Indian group agreed to be resettled, as they had lived in the area for hundreds of years.

4.2.5. Hoa Binh Dam in Vietnam

Hoa Binh Dam in Vietnam is one of the largest hydroelectric projects in Southeast Asia built on the Black River 75km west of Hanoi and 2km upstream of Son Binh province (Hirsch, 1992:9). There are positive impacts that the creation of this project had brought to the local communities. Hirsch stated that the reservoir behind Hoa Binh Dam was 770 km^2 with a volume of 9.5 billion $m^{3,}$ and in 1991 it had reached a maximum level of 115m. Yen (2003:22) stated that, through the construction of the dam, 8.4 billion kWh were being produced, and it was important for the whole country. Le, Garnier, Gilles, Sylvain and Van Minh (2007:199) state that the reservoir had created a change in the climate of the area, where winters are warmer and summers are cooler, compared with the climate before the creation of the reservoir. Conversely, the creation of the dam and the reservoir have taken up an area of about 200km^2 and displaced 56,294 people (Yen, 2003:22).

4.2.6. Tarbela Dam in Pakistan

Tarbela Dam is the largest dam in Pakistan, having a length of 2,750m, a height of 88 km and was built in the 1970s on the Indus River (Khan, Hameed, Qazi, Sharif and Tingsanchali, 2011:213). The Tarbela Dam Project was constructed to regulate the seasonal flow of irrigation (50%) in the Indus plains, and to generate hydropower (Roca, 2012:897). The dam has five tunnels; tunnels 1, 2 and 3 are generating a capacity of 3,470 MW, and

tunnels 4 and 5 are reserved for irrigation flow (Khan *et al.,* 2011:213). Tarbela Dam had resettled 96,000 people in 120 villages, and Asianics Agro-Dev. International Ltd (2000) stated that life expectancy and literacy rate had increased after the construction of the dam.

4.3. Lesotho Highlands Water Project

The LHWP is one of the biggest water transfer schemes Africa and in the world. The project is joined by the government of Lesotho (GoL) through the Ministry of Natural Resources and the government of the RSA (GoRSA) through the Department of Water Affairs and Forestry (Matete, 2006:11). The LHWP was established in 1986, and governed by the treaty put together by the two governments (GoL and GoRSA), though the treaty did not have a plan of how water would be distributed (Conley & van Niekerk, 1997:11). Turton (2004:274) stated that the LHWP treaty of 1986 was broad in scope, and was a detailed water agreement in sub-Saharan Africa. Makoro (2014:24) states that the treaty was signed on 24 October 1986 in Maseru at the Setsoto Stadium. On that day, Makoro states that the treaty was signed by Colonel Thaabe Letsie who was the representative of the Kingdom of Lesotho, and Mr Pik Botha, the representative of the RSA; however, the signing of the treaty was handled in a secretive way, on the side of Lesotho. Tsikoane (1991:119) stated that the signing was handled secretively, because it was not open for national debate; hence, this was against promises made by King Moshoeshoe II in 1986.

The governments of Lesotho and South Africa signed a Treaty for the implementation of the project starting with the first phase (Mashinini 2010:1). In the construction of phases 1A and 1B, the RSA was the one to pay, though Lesotho was introduced as a borrower from financial institutions (Tsikoane, 1991:112). Lesotho Times (2012) states the refund covered the period from 1986 to 1999. Tompkins (2007:11) states that information in the treaty detailed the volume of water to be delivered to the RSA in a year, and how much should be paid as royalties to Lesotho. In terms of the royalty payments, the procedure was that the GoL should issue a monthly invoice to the GoRSA, for it to settle the money within

30 calendar days, failing which, 6% interest would be added per annum. Paragraph 26 of Article 12 states that 'the royalties in terms of paragraph 18 shall be deposited in an account of Central Bank of Lesotho designated by the Kingdom of Lesotho'. Lesotho repaid R341 million accrued in tax to RSA (Tlali 2013). Paragraph 18 makes it explicitly clear that the agreement in a treaty would expire on 31 December 2044, making it a 50-years contract, starting from January 1995.

According to Monyake and Lillehammer (2011:6), the LHWP consists of different phases that are used to transfer water from Lesotho, on the Senqu River System, to the Vaal River in the RSA. The Vaal region is a vitally region for the economy of the RSA, for most industries are found there (Matete, 2006:4). Wolf and Newton (2009:3) state that water is delivered through the first phase of the project, as the treaty of 1986 does not cover phases 2, 3 and 4. Subsequently, Willemse (2007:457) states the main objectives of the treaty as:

> The purpose of the Project shall be to enhance the use of the water of the Senqu/Orange River by storing, regulating, diverting and controlling the flow of the Senqu/Orange River and its affluents in order to effect the delivery of specified quantities of water to the Designated Outlet Point in the Republic of South Africa and by utilizing such delivery system to generate hydro-electric power in the Kingdom of Lesotho.

In the same vein, when the LHWP began, people were affected, and compensation was given to them according to the compensation plan in the treaty. The plan was based on social welfare–health and environmental care. According to the Lesotho Highlands Development Authority (LHDA) (2014), it was agreed in the treaty that the RSA was responsible for paying affected people who had lost houses, commercial premises, grazing and arable land. The treaty further stipulates on Article 15 – about the Social and Environmental Considerations that:

> The Parties agree to take all reasonable measures to ensure that the implementation operation and maintenance of the Project are compatible with the protection of the existing quality of the environment and, in particular, shall

pay due regard to the maintenance of the welfare of persons and communities immediately affected by the Project.

Hitchcock (2015:526-528) informs that the LHWP had affected local people around the project where they lost their land of a total area of 4,720 hectares, which accounts for 15% of Lesotho's cultivation land at that time. In the same notion, regarding public health care, the LHDA (1990:22) informed that all arrangements were made before the commencement of the project, to handle accidents and sickness within the project.

4.4. Dams in Lesotho Highlands Water Project

The LHWP involved the construction of four large dams in the Senqu River Drainage System. Phases 1A and 1B are completed, while phases II, III and IV are yet to be constructed (Blanchon, 2003:154). Table 4.1 shows dams in each phase and Table 4.2 shows the time frame on the expected completion dates for each phase.

Table 4.1: Dams involved in each phase of the LHWP

PHASES	DAM
Phase 1A	Katse
Phase 1B	Mohale
Phase II	Polihali
Phase III	Tsoelike
Phase IV	Ntoahae

Source: Own.

4.5. Phases of Lesotho Highlands Water Project

Table 4.2 gives the activities that were carried out in completed phases, and activities that are to be done in the upcoming phases:

Table 4.2: Phases of LHWP.

PHASE(S)	**ACTIVITY**	**Completion date**
PHASE IA Constructed on the confluence of the Malibamatso River and Bokong River	- Wall construction of 185m high - 45km long Transfer Tunnel to 'Muela -15km Delivery Tunnel-south -22km Delivery Tunnel-north - 72MW 'Muela Hydropower Station and Tail Pond - Wall construction of 55m high on 'Muela Dam - 98m high Intake Tower at Mphorosane - Pelaneng and Hlotse adits - 45km Delivery Tunnel -Catchment area 1860km^2	1997
PHASE IB Constructed on the confluence of Senqunyane River and Likalaneng Rivers	- Wall of 145m high concrete face rock-fill embankment - 947 million m^3 Mohale Reservoir - Mphale/Katse interconnecting tunnel - 180m long Matsoku Weir and 5,6m long diversion tunnel - Mohale Access roads	2001
	- Mohale Intake - Compensation Outlets - 32km long Mohale-Katse Tunnel -Catchment area 938km^2	2003
PHASE II To be constructed on the confluence of Senqu River and Khobelu River	-Polihali Dam 163.5m high rockfill dam with 49.5 saddle dam -Additional transfer tunnel and the upgrading of the 'Muela Hydropower Station -Kobong pump storage [101m high]	2020
PHASE III To be constructed on the confluence of Tsoelike River and Senqu River	- Tsoelike Dam - Pumping Station -Catchment area 10 375km^2	2019

Phase IV To be constructed on the confluence of Ntoahae River and Senqu River	-Ntoahae Resevoir	2021

Source: Adapted from LHDA, 2006:2-4.

4.6. Phase 1A of Lesotho Highlands Water Project

Phase I involved construction of three dams: Katse Dam–1.95 km^3, Mohale Dam–86 km^3 and 'Muela Dam–6 million m^3 (LHDA, 2006:2). More details about the dams is provided in Section 4.6.1. In addition, in this phase, 82 km of tunnels of 5m in diameter, and a power station, were constructed. This phase was constructed in two phases: phases 1A and 1B (Mashinini, 2010:2). Phase 1A transfers $18m^3/s$ of water to the RSA, and generates 72 megawatts of electricity for Lesotho (Lewis, Browne, Quayle, Oosthuizen & Peerbay, 2015:2). From the tunnel outlet, water flows northwards via Saulspoort Dam, Liebenbergsvlei River and the Wilge River, to Gauteng (LHDA, 2005:16) Figure 4.2:

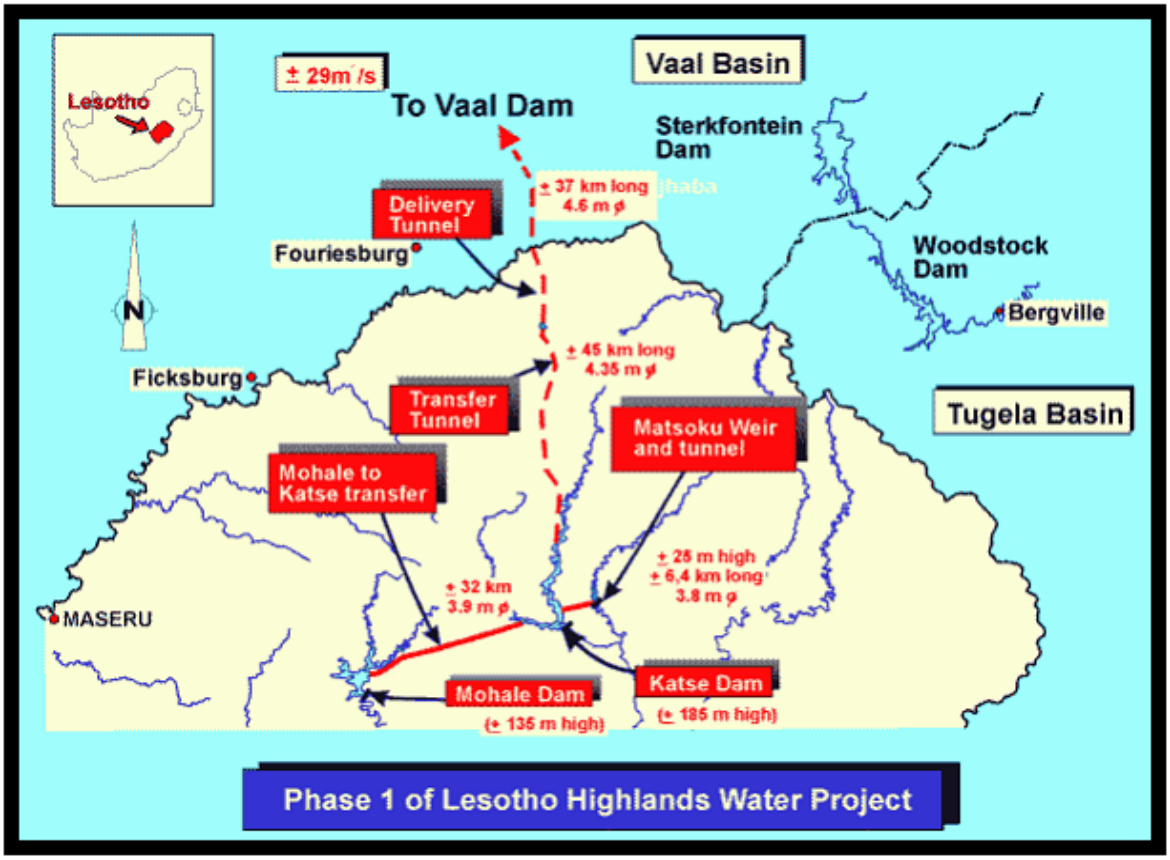

Figure 4.2: Transfer of water in Phase 1 of Lesotho Highlands Water Project.

Source: LHDA, 2005:16.

According to the 1986 treaty, R11 billion was split between phases 1A and 1B as R8 billion and R3 billion, respectively (Matete, 2006:5). Nevertheless, R550 million was funded by the Development Bank of Southern Africa, and other local financial institutions, for the infrastructure construction in Phase 1 (South Africa, 2012:2).

4.6.1. Katse Dam

Katse Dam is built at the confluence of the Malibamatso and Bokong rivers. The construction of this dam began in 1991, while other works had begun in 1986 (Matli, 2005:14). Devitt and Hitchcock (2010:64) assert that Katse Dam was dedicated in 1996,

after its completion in 1995. Matli (2005:14) maintains that the Katse Dam is the major dam in the LHWP, and is the largest curved dam in Africa, with a height of 185m, 700m long, and having a reservoir of 1950 million m^3. Figure 4.3 shows Katse Dam wall, while Table 4.3 shows the highest dams in Africa, by height.

Figure 4.3: Katse Dam wall.

Source: Letsebe, 2012:40.

Table 4.3: The six largest dams in Africa by height.

NAME	RIVER	COUNTRY FOUND	DAM WALL HEIGHT
Katse Dam	Malibamatso	Kingdom of Lesotho	185m
Cahora Bassa Dam	Zambezi	Mozambique	171m
Hassan 1	Lakhdar	Morocco	145m
Akosombo Dam	Volta	Ghana	134m
Bine El Ouidane	El Abid	Morocco	133m
Kariba Dam	Zambezi	Zambia/Zimbabwe	128m

Source: Adapted from Alhassan, 2008:114.

4.6.2. 'Muela Dam

'Muela Dam was constructed in February 1994, whereas the concrete work was completed in 1997. According to Matli (2005:14), 'Muela Dam has a height of 55m, and it can enclose a total water of 6Mm$^{3'}$. It was previously stated that water from Katse Reservoir passes through 'Muela hydropower to generate electricity and the same water is delivered to the RSA. Figure 4.4 shows 'Muela hydropower station and all processes involved in the production of hydropower. Wolf and Newton (2009:3) state that 'Muela Hydropower Station was financed by the European Development Fund, the European Investment Bank, European commercial banks and the Development Bank of South Africa. The same author states that the power station is designed in such a way that it would be able to supply electricity needs in the construction of Mashai Dam in Mokhotlong, or in any future project.

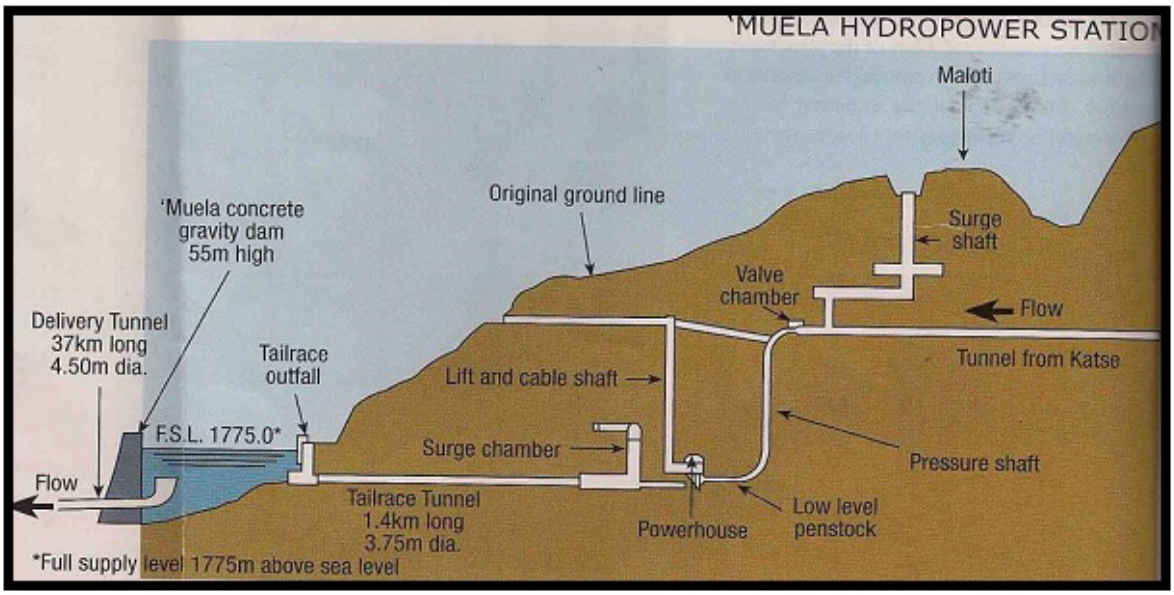

Figure 4.4: 'Muela Hydropower Station.

Source: Adapted from Matli, 2005:15.

4.6.3. Mohale Dam

According to Devitt and Hitchcock (2010:65), Phase 1B began in 1998 but it was officially opened on 22 January, 1999. The LHDA (2006:1-22) informed that Mohale Dam is found in Maseru at the confluence of the Senqunyane and Likalaneng rivers. This dam is the second-largest dam in the LHWP, with a 37.6 km tunnel weir to transport water to Katse Dam on Malibamatso River (Letsebe, 2012:40). Adding to the preceding stance, the dam has a water capacity of $958\times10^{6}m^{3,}$ a height of 145m, and is the highest rock-fill wall in Africa, at $7.8\times10^{6}m^{3}$ (Matli, 2005:15). Figure 4.5 shows Mohale Dam and its wall:

Figure 4.5: Mohale Dam wall.

Source: Adapted from Matli, 2005:15.

4.7. Phase II of the Lesotho Highlands Water Project

Phase II of the LHWP involves the construction of Polihali Multipurpose Dam that will transfer water to Katse Dam through infrastructure made during construction of 'Muela Hydropower Station (Trans-Caledon Tunnel Authority, 2015). In April 2014, the Youth League Forun of Lesotho held demonstration near the official residence of the Prime Minister to protest against the construction of Phase II dam in Polihali, demanding that it be built in Mashai (Public eye, 2013). The construction of Polihali began in January 2016, and is expected to be finished in March 2020. The LHWP (2014) states that Polihali Dam is constructed in Mokhotlong district, 1km downstream on the confluence of the Senqu and Khubelu rivers. On the other hand, Letsebe (2012:42) states that the RSA has funded Polihali Project with US$ 100 million, while Lesotho contributed 0.9 million Maloti for production of hydropower. Monyake and Lillehammer (2011:5) point out that

infrastructure development in this project would include a 60km access road, a 38km long tunnel to Katse Reservoir, power-lines, transmission lines, administration centres and many more. For these infrastructures to be constructed, Salomao (2011:2) shows that 3,300 families–up to 17,000 people–from 72 villages, will be relocated.

4.7.1. Phase III of the Lesotho Highlands Water Project

Phase III of LHWP is yet to be constructed (Matli, 2005:16). The phase will involve the construction of Tsoelike Dam ($2{,}223x10^6m^3$) on the confluence of the Tsoelike River.

4.7.2. Phase IV of the Lesotho Highlands Water Project

Phase IV will involve the construction of Ntoahae Dam, and the project is to begin in 2020. The project will provide $70m^3/s$ by the year 2021 (Matete, 2006:12). This author added that the project will also include a 125m high storage dam, a pumping station and a reservoir.

4.8. Management structure of the Lesotho Highlands Water Project

The World Bank funded and supervised the LHWP. The aim of the LHDA was to implement the project in the soil of Lesotho (Detter & Gunnewig, 1994:9). The LHDA is responsible for implementing the project in Lesotho while the TCTA implements the project in South African. Devitt and Hitchcock (2010:5) state that the LHDA was also responsible for resettlement, compensation issues, environmental protection, and construction logistics in general. During implementation of the project it was observed that the project was exceeding the capacity of the LHDA. As a result, the Joint Permanent Technical Committee (JPTC) was formed to supervise the finances and administer the project in general (Mohammed, 2003:226). Figure 4.6 shows the management structure of the LHWP:

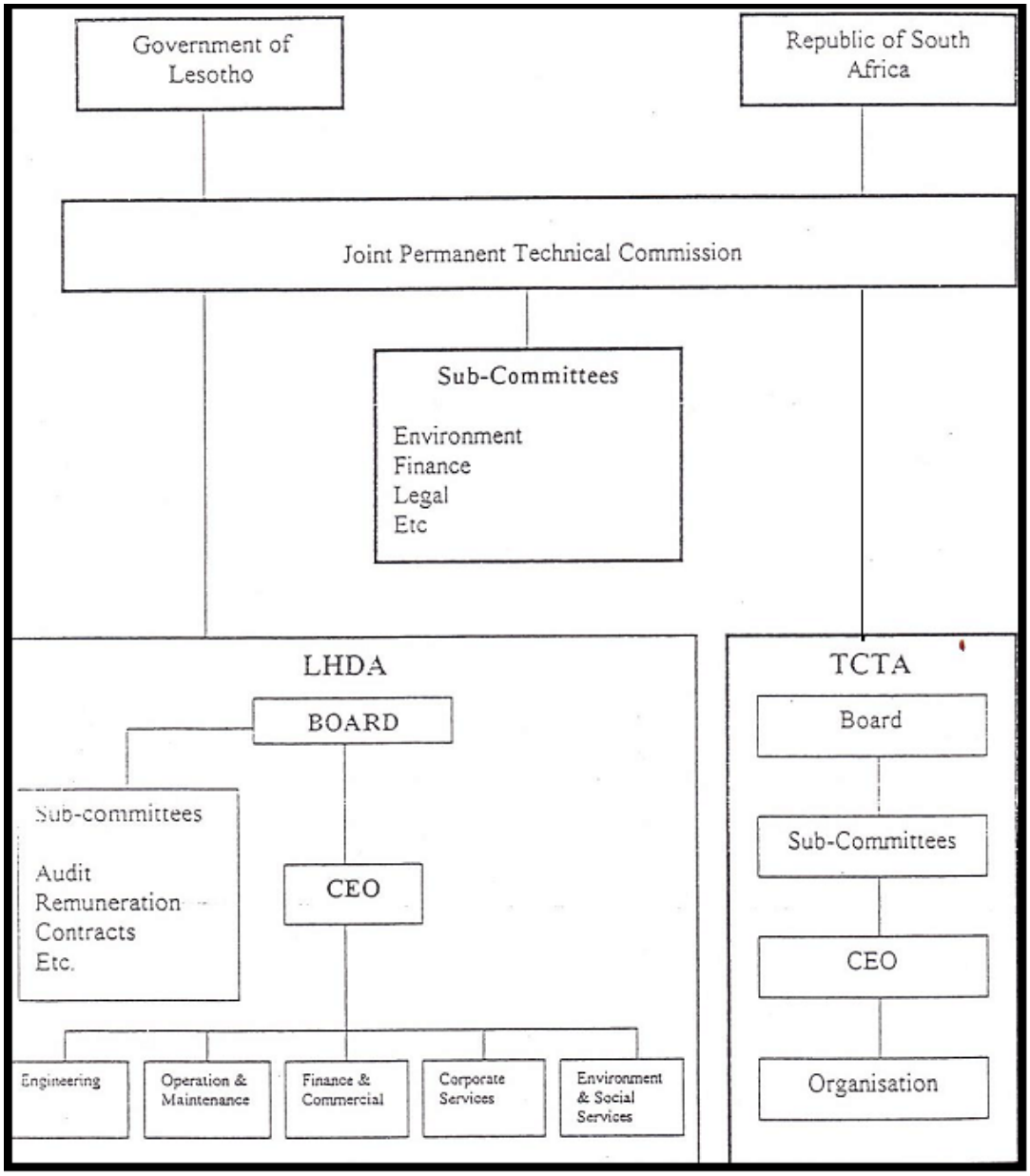

Figure 4.6: Management structure of the LHWP.

Source: Adapted from Klaphake, 2005:37.

4.8.1. Reviewed management on Lesotho Highlands Water Project

Through functioning of the JPTC, it was observed that there was a need for management of the LHWP to be reviewed. In 1999, a review was done, and resulted into changes in the following:

- Article 1 –Definitions
- Article 2 – Changing the name of JPTC
- Article 3 – Restructuring the functions, powers and obligations of LHDA
- Article 4 – Institutional arrangements in the Republic of South Africa
- Article 5 – Restructuring the functions, powers and obligations of the Lesotho Highlands Water Commission (LHWC)
- Article 6 – The prevention and settlement of disputes
- Article 7 – Privileges and immunities
- Article 8 – Entry into force

Adding to the preceding stance, it was upon the review where the JPTC's name was changed LHWC. LHWC was to govern two bodies: LHDA and Trans-Caledon Tunnel Authority. Bildhaeuser (2010:15) states that renaming had occurred before Phase 1A was completed. According to Devitt and Hitchcock (2010:69), the chief delegate of the commission was from Lesotho, while governmental management agencies involved the Ministry of Natural Resources in Lesotho and the Ministry of Water Affairs and Forestry in the RSA. This commission was made up of six delegates, three each from Lesotho and the RSA.

4.9. How LHWP recipients perceive and experience the new development

This chapter explored the socio-environmental impacts of LHWP and Table 4.4 provides how recipients of the LHWP perceive and experience the new development. This cited

literature review will form a base on the investigation into the perception of the community on the socio-environmental impacts of Metolong dam and reservoir project.

Table 4.4: Summary of perceptions and experience of recipients of the LHWP

Community	**Views**
Ha Maphutseng	Would be satisfied if LHDA: - Gave them their due cash compensations without dictating to them on how to spend their money – LHDA only acting as an adviser; - Should permanently repair and/or rebuilt fallen buildings; and - Bituminized village roads to entice public transport operators.
Mphorosane	Current skills training for self-help was insufficient and narrow-minded. More training of wider scope was requested. LHDA officials played too much chicanery (*ke makutu-kutu*) and were not to be trusted. LHDA had introduced the water project and its troubles in their midst but had proven itself untrustworthy - it must fulfil promises and provide jobs for crop fields losers. Otherwise LHWP was like a roulette gambling on their livelihoods.
Ha Mohale	LHDA are not standing to their initial word that affected people would live better life. Those who benefited are few and the losers are many!
Ha Nyakane	A good project but useless to locals because it was run by a bunch of crooks! Land resource Compensation to be longer than LHDA's time limits.
Ha Ramokoatsi	Paying R500 yearly for lost trees would be better and realistic. The payment of compensation should not be delayed unduly.
Ha Sepinare	LHDA should introduce ways of employment in the affected areas to create the needed jobs. Communal resources were accessed by all including the poor people alike. Therefore, excluding the poor from communal fund for being unable to contribute for release of community money was not only unfair but condemned them to live and die in poverty.
Ha Theko	Had no faith in LHDA – it was foxy and deceitful: *"LHDA came like a fox in a sheep's skin".* Community projects would collapse because they were forced on people who did not know about them.
Ha Tšiu	'LHDA officials are snakes and slippery. They should be changed or else local people will suffer even worse'.

Source: Matli, 2005:66.

4.10. Impacts of Lesotho Highlands Water Project

According to Mashinini (2010:4), the Katse, Muela and the Mohale dams jointly occupied 5000 hectors of grazing land and 17 hectors of garden land. According to International Rivers (2005), LHWP is the largest infrastructure project constructed in Africa. The project cost rural communities their houses and homes. When two reservoirs and infrastructure were built, Phase 1 acquired 300 hectares of arable land that could have been used for grazing, while Phase II acquired 3,400 hectares (LHDA, 1997:2). Musonda (2008:16) points out that the reservoir and infrastracture construction resettled 27,000 people– approximately 1.5% of the population of Lesotho at that time. 71 households were resettled and these families lost property in the process; 40 hectors of arable land, 2.15 hectors of garden land, 0.03 hectors of stable, 0,25 hectors of kraal, 450 trees and 110 graves (Mashinini 2010:4). Between 1988 and 1996, 152 villages at Katse and 'Muela lost 16.5 hectors of garden land. (Mashinini 2010:4). Table 4.5 shows the number of families relocated to the foothills and Maseru, while others remained. Subsequently, Monyake and Lillehammer (2011:9) give a more comprehensive idea of numbers that were resettled, and state that Phase 1 had resettled 20,573 people, 573 were directly affected, and 20,000 were indirectly affected.

Still on impacts of the LHWP, Devitt and Hitchcock (2010:200) reveal that Phase 1B had affected people in three stages, as follows:

- **Stage 1 – Pre-construction phase:** 99 households from six villages were affected. These households were affected in the years 1996 to 1998. These houses were affected for the way for the construction of the dam, roads and the tunnels. During this stage, 38 households were resettled to the foothills, 24 households were resettled to Maseru, and 37 households were resettled to Mohale Basin.
- **Stage 2 – Post-inundation phase:** 225 households from nine villages were affected in the years 2001 to 2006. These households were resettled to the lowlands.

- **Stage 3 – Post-inundation phase:** 165 households from eight villages were affected; these were from Lebiletsa, Phomolo, Ponts'eng, Ha Montsi, Ha Mokhathi, Khamolane, Masaleng and Letsatseng.

Conversely, the LHWP had affected local communities with positive impacts, such as creating new infrastructure that included schools, clinics, roads and houses (Adu-Aryee, 1993:133).

Table 4:5: Families relocated by destination and stages in LHWP Phase 1A and 1B.

Stage	**Destination**	**Foothills**	**Maseru**	**Total**
Phase1A Katse (1989-1990)	**Katse Basin**			
	71 (25 in cash programme in 1995)	0	0	0
Phase 1B Mohale	**Mohale Basin**			
Stage 1 (1996-1998)	37	38	24	99
Stage 2 (2002-2006)	27	180	18	216
Stage 3 Post-inundation, 2006	161	4	0	101
People who lost over 50% of their land under Stage 3	72	0	0	72
Total	**296**	**222**	**42**	**488**

Source: Adapted from Hitchcock, 2015:528.

4.11. Summary

This section part of the research discussed a case study LHWP. The part contains the project objectives, its implementations (main construction and contracting parties during phases) and specifically the application of project governance principles as well as the impact of the Treaty on promoting project governance. International water development case studies have been discussed specifically in order to make comparison of some what compatible development. It is from this chapter analysis of socio-environmental impacts of large dam construction seems to illustrate that the greater good emanating from projects outweigh the negative impacts. Chapter 5 presents a discussion of the research methodology used to explore the perceptions of the community on the socio-environmental impacts caused by the construction of Metolong dam and reservoir.

CHAPTER 5

RESEARCH METHODOLOGY AND DESIGN

5.1. Introduction

The current study followed a qualitative approach. This method is used to study human experience from the viewpoint of the research participants in the context in which it occurs. When using qualitative approach the researcher let data suggest a theory called grounded theory generation. The chapter also outlines the study area, study population, sampling procedure and sample, sampling size, how the study was piloted, data collection procedure and instruments, measures to ensure trustworthiness, data analysis, research ethics, and problems met during data collection.

5.2. Empirical study

5.2.1. Research study

The study was conducted in Maseru at Ha Seeiso village (Figure 5.1). The research area was where the study had evaluated at the perceptions of the community on the socio-environmental impacts caused by the construction of Metolong dam and reservoir, and not the whole of Lesotho. The research area had therefore provided the information about perceived socio-environmental impacts of the Metolong dam and reservoir.

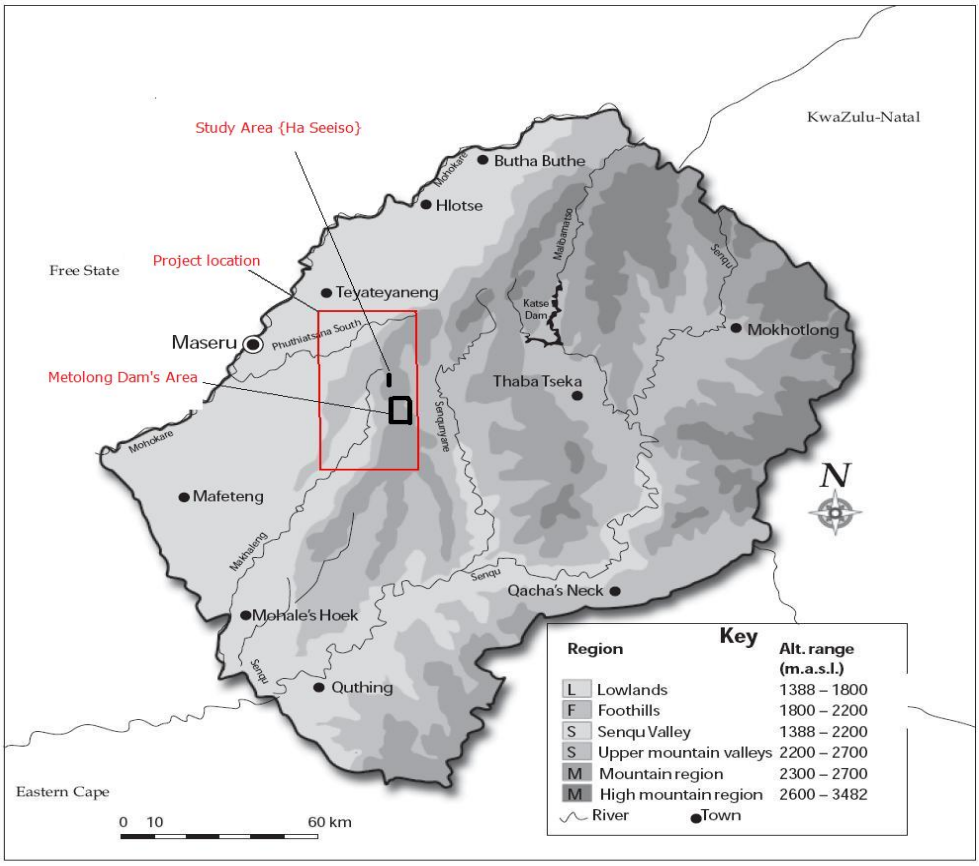

Figure 5.1: Map of the study area.

Source: Adapted from Mokuku (1997:145) and Kobisi (2005:163).

5.2.2. Background information about Ha Seeiso village

Since the focus of the study is on perception, Table 5.1 provides demographical information or background information about Ha Seeiso village. This information will assist in exploring the perception of the inhabitants in an environment where they reside.

Table 5.1: Background information about Ha Seeiso village.

Number of inhabitants	690
Gender	Gender mix
Age & population profile	A lot of independants and few dependants
Language proficiency and spoken at home	Southern Sotho, English and few speak French
Religion	African Tradition religion & Chritianity

Housing infrastracture (types of houses)	Traditional houses owned (Rontabole & Heisi) and Modern houses owned (Polata & Optaka). There are also rental houses.
Facilities	No recrational facilities
Appliances in the house	TV, electricic stoves, gas stoves, primes
Means of transport	Animals & vehicles
Access to banking & financial services	efficient
Distance from dam	Very near
Residents located and are living in the village	All relocated are still around but at a different venues
Infrastructure	Tarred road available
Local authority	A Chief is taking responsibility with a councillor
Business community & employment	Information is provided in Table 6.6

Source: Own.

5.2.3. The location of the study area

Ha Seeiso village and Metolong dam and reservoir are situated between 27^{o}_{E} and 28^{o}_{E} longitude and 29^{o}_{N} and 30^{o}_{N} latitude. The dam and the reservoir are built on the south Phuthiatsana River (Little Caledon).

5.3. Research methodology and design

'Research methodology' and 'method' are two terms used interchangeably in this research study. Research methodology is a plan of how a researcher in a study is going to collect data, discuss and interpret it, and how that data will be analysed by the researcher to obtain knowledge of whatever is being researched (Myers, 2009:517). According to Mouton (2005:56), research methods focus mainly on steps taken to collect data and techniques used. Research methodology revolves around two or three approaches, namely qualitative, quantitative and mixed research methodologies. A qualitative research methodology was used in this study, to answer the research questions and attain the objective stated in Chapter 1.

Through usage of a qualitative research method in this study, the researcher was able to study the life of various participants in their environment during study visits. Denzin and Lincoln (2003:4) stated that, through the use of a qualitative research method, the researcher is able to study people in their environment where one will interpret their circumstances in their settings. Through the use of a qualitative research method in this study, the researcher was able to collect actual words from the participants using the face-to-face technique. However, a qualitative research methodology used in this study has some disadvantages as well. Hancock, Ockleford and Windridge (1998:14-16) contend that through usage of this method, the findings obtained from the study cannot be generalised. Adding to the disadvantage, Smith (2008:32) states that through a qualitative research method, it is difficult to prevent researcher's bias.

The research design helps the researcher with the overall approaches to the study, as it is a blueprint controlling all factors that may come against the outcome of the study (Babbie & Mouton, 2012:74; Grove, Burns & Gray, 2013:42-43; Yin, 2010:75). The research design can be taken as a master plan that can be followed in answering the research questions and objectives. For the purpose of answering research design, related literature and filling the gap highlighted in the literature review in this study, interview schedule (Appendix A) was designed into sections to characterise the perception of participants regarding the socio-environmental impacts of Metolong dam.

The researcher let the data suggest a theory called grounded theory generation when using a qualitative research method. Strauss and Corbin (1998:12) described grounded theory as a theory that was derived from data, systematically gathered and analysed through the research process. Data collection, analysis and eventual theory stand in close relationship to one another. Grounded theory, according to Robson (2002:79), aims to generate theory from the data that is collected during the course of the study. Robson further states that grounded theory is useful in a new study where there is little theory currently available to

describe and explain a phenomenon. In this study, the grounded theory approach was enhanced, as stated in the following sub-sections.

5.4. Research population

A research population is defined as all the elements that meet the set criteria for them to be part of the explored study (Grove *et al.,* 2013:44). In carrying out this study, the researcher acquired information from participants from Ha Seeiso village in Maseru.

5.5. Sampling procedures

Sampling procedures are essential, and become critical factors in the success of the study. There are two main methods of sampling, namely probability sampling and non-probability sampling. Each of them can be used in the study, depending on whether the research study is qualitative or quantitative in nature, or both can be applied in a particular study, as in the case of mixed research. Neuman (2006:220) stated that in probability sampling, the chances of members of the wider population being selected for the sample are known, whereas in non-probability they are unknown.

According to Adams and Schvaneveldt (1991:181), purposive sampling is a procedure for building a sample based on cases or/and individuals chosen as being appropriate for the study under way. Brink, Van der Walt and van Rensburg (2012:131) state that through purposive sampling technique, a sample is selected in a delibarate manner whilst keeping the purpose or focus of the study as pivotal to the sampling. Sampling decisions must revolve around whom to interview, what to observe, in which settings and by which processes (Punch 2009:162). As researchers, it is impossible to ‘study everyone everywhere doing everything’. Participants from the study area were chosen using purposive sampling method.

5.6. Sampling Size

Sampling size is the total number of people drawn from the entire population for the researcher to solicit responses from (Levy & Lemeshow, 1999:13). The choice of one's sample size depends on the degree of accuracy required, the degree of variability, and the number of different variables examined in data analysis (Kelly, 2007:775-776). Extending the line of thought, Sarantakos (2005:464-465) cautions that the choice of one's sample size depend on the paradigm that guides the research, the underlying methodology, the nature of the target population, available time, and the purpose of the study.

It was desirable for the researcher's team to have a large sample, but it was not possible, due to time and resources constraints (Black, 1999:136; Brewer & Hunter, 2006:80). In this study, it was difficult for the researcher to know, exactly, the number of people to be interviewed beforehand, for that might change in size, due to the objective of the study. The sample was done until saturation was achieved and no new information was generated, as depicted by Holloway (1997:142). A total number of 50 participants were potential participants, but 40 participated in the study, as some were not available in the village during the interviews.

5.7. Reseacher's team

The researcher's team played a major role during the survey process of this study. The team composed of a 38 years old man and a 40 years old woman. Language and literacy proficiency of these people is good for they are able to speak and write both English and Sesotho. A 38 years old man had high level of training for he is holding a Post Graduate Diploma in Inclusive Education while a 40 years old woman holds Magister Education in Policy Studies and Governance in Education. In the same vein, they had acquired a certificate in Deafness and Deaf Education (Teaching Handwriting, Reading and Spelling Skills). It is with this respect the team was chosen for their role was to assist the researcher in all aspects of the research together with participants who have physical defects. In

addition, they were to assist with Oralism emphasasing on use of the spoken word in synchronicity with speech reading (previously known as lip- reading) for those who are deaf. Stobbart (2006:3) states, the poor levels of literacy attained by participants who are deaf have troubled educators and researchers equally. Prior to the interviews, the researcher's team including the researcher, shared skills on how they were going to provide support to all participants who are normal and physical challenged.

5.8. Target sample

There are no rules in selecting sample size when conducting qualitative research, for the size may differ from the researcher's point of view and the population's characteristics (Patton, 2002:224). A sample, according to Grove *et al.* (2013:44), is defined as a subset of the population that is selected to participate in a study. Neuman (2006:241) states that when selecting a sample size, once the population is smaller, the sample ratio should be bigger, in order for the sample to be accurate. Nevertheless, Adams and Schvaneveldt (1991:181) maintained that the sample size should depend on the purpose of the study, design, data collection, and the type of population available for the research problem.

The researcher's team targeted all the people who had lived in the study area either their entire life, that is, over 21 years, and between 11 and 20 years, while children below the age of 18 years were purposively excluded, for they were deemed too young. Forty study participants were interviewed, until no more new information was discovered. Hence, data saturation was reached, upon which the researcher's team terminated the interviews.

5.9. Piloting the study

Piloting is very important, for it improves the methodology and techniques to be used when collecting data (Babbie & Mouton, 2007:345). The researcher's team had piloted the interview questions with four participants, prior to the actual interviews. Piloting was done

to get to grips with some practical aspects of interviewing, as well as with the types of answers that might be received (De Vos, Strydom, Fouché & Delport, 2005:273). More so, piloting was done to ensure that the final set questions on the interview schedules were neither deficient nor lacking in any research questions or important aspects thereof. In a similar notion, Brink *et al.* (2012:174) state that piloting should be done to help the researcher rephrase instructions or wording having more than one possible meaning.

Four participants used in piloting helped the researcher's team to rectify and check the response time. In the same vein, they helped the researcher's team to get multiple perspectives of the participants as depicted by Glesne (1999:5-6) that it should be. During piloting, errors were identified regarding the formulation of some of the questions, and these were rectified. More so, the questions which were found to be misleading were rephrased. However, remarks were obtained from participants that enabled the researcher's team to eliminate some items and to rephrase some of the questions.

5.10. Data collection

Data collection is essential in any research, for gathered data is meant to contribute to a better understanding of the empirical framework of the study (Tongco, 2007:147). Fowler (2009:69) states that the researcher, when deciding over which method to employ in data collection, should ensure that the method is directly related to the research topic and resources that are available. Section 5.3 stated the multiple tools used in this study. Twumasi (2001:29) emphasises the importance of using more than one tool, in that they help to evaluate data sources and check inconsistent answers.

5.10.1. Semi-structured interviews

Semi-structured interviews were the primary source of data in this study. 'Interview' is defined by Twumasi (2001:35) as a method of investigation in which the researcher meets

with the participants, observes what is going on, and develops understanding as participants express themselves. It was through interaction with the participants in their group format, that the researcher was able to ask questions to find answers to the research problem.

Based on the degree of the structure, interviews can be categorised as structured where questions are pre-set, or unstructured-where there are no set questions. Subsequently, Hannabuss (1996:22) cautions that each of the types of interviewing has strengths and weaknesses, and each may be more or less suitable for a particular area of research. Semi-structured interviews were used in this study, and 40 study participants from the study area took part. When using semi-structured interviews, the researcher's team were the central instrument of investigation, but were guided by interview schedules (Weis & Fine, 2000:16). It was from semi-structured interviews held that the researcher's team was able to get a fuller picture about the phenomenon under study.

5.10.2. How semi-structured interviews were conducted

A total of 40 participants were interviewed using a semi-structured technique that lasted from 30 to 40 minutes. The 40 participants were categorised in groups of ten (10) and were all neighbours. There were four (4) groups all in all. In all the groups, the participants had enough time to express themselves within available time. It was believed that the researcher's team was unknown to the participants, for the rapport between the team and the participants was good. The interviews were held in the participants' homes, in order for the researcher's team to observe the way participants were living, and to enhance the comfort of the participants.

5.10.3. Fieldwork

Fieldwork was the secondary type of data in this study. Notes were taken throughout whenever the researcher's team observed and focused on what was seen during the field-

work. It was during the fieldwork that the researcher's team noted phenomenon participants were not aware of, or were unwilling to discuss.

5.10.4. How fieldwork was conducted

Field notes are included in data analysis, not on data collection, as advised by Bogdan and Biklen (2007:117). The fieldwork for the study was done between October and December, 2016.

5.10.5. Document analysis

'Document review' was also a secondary type of data in this study. Document analysis is the exploration of documents written before the investigated study was established (Berg, 2007:48). Strauss and Corbin (1998:73) asserted that, through document analysis, the researcher is able to collect relevant data (background and historical context) of a phenomenon being studied, which can contribute positively to the study at hand. De Vos, Strydom, Fouché and Delport (2012:377) and Creswell (2007:130) give examples of documents that can be analysed, and named the following: letters, study reports, minutes of meetings, journals, chart audits, agendas, internal office memos and newspapers.

Bowen (2009:27) gives the advantages of document analysis, and states that this method is more efficient and cost-effective, and less time-consuming than conducting research or experiments. In similar vein, Letsebe (2012:75) states that, through usage of document analysis, the researcher is able to obtain exact details concerning dates and other relevant details of events which, in turn, give a broader coverage of issues being studied. Conversely, Letsebe (2012:76) states that the potential disadvantage of a document review is that some documents are not retrievable, and some are biased in their selection.

5.10.6. How document analysis was conducted

The researcher's team while they were at Metolong Offices, requested formal and structured documents in which original information had not been interpreted, but presented in their original form. Various documents were reviewed from Metolong Office, Library and Information. The researcher's team compared the responses from collected data with what was contained in the documents regading socio-environmental impacts of Metolong project. The purpose of comparison was to eliminate the researcher's team biasness.

5.11. Measures to ensure trustworthiness

Validity and reliability are two concepts emanating from quantitative research, and there is a need for them to be incorporated in qualitative research. Validity and reliability in qualitative research are conceptualised as measures to ensure trustworthiness. Reliability refers to consistency, while validity means 'truthful' (Neuman, 2006:196). Table 5.2 shows measures adopted in qualitative research as opposed to what they are known as in a quantitative study, when ensuring trustworthiness.

Table 5.2: Notions of trustworthiness in qualitative and quantitative study.

Qualitative	**Quantitative**
Credibility	Internal validity
Transferability	External validity
Dependability	Reliability
Confirmability	Objectivity

Source: Adapted from Babbie and Mouton, 2012:277.

Trustworthiness in qualitative research is defined by Rubin and Babbie (2010:89) as ‘the degree of consistency in measurements’. Measures were taken by the researcher’s team to see to it that collected data was impartial and trustworthy. This was done by comparing whether there was an agreement between the views of the participants and reality. More so, trustworthiness was enhanced in this manner; all the sources that were used in this study are cited as a means of reference.

5.11.1. Credibility

'Credibility' means the actions taken by the researcher during fieldwork. In this study, credibility was enhanced, as elaborated in the following paragraphs. These were done according to the prescriptions or guidelines laid down by Babbbie and Mouton (2012:276).

5.11.2. Prolonged engagement

The researcher’s team had prolonged interaction with the participants, to enhance credibility, to win the trust of the participants, to know more about them, and to eliminate any incorrect conceptions they might have. According to Babbie and Mouton (2012:277), the researcher must have prolonged engagement in the fieldwork, until data saturation is reached. In this study, the researcher’s team had prolonged engagement with the participants in the following manner: when delivering the permission letter to conduct interviews at the study area on 29-08-2016, when they met with participants for the first time on 01-09-2016, during face-to-face interviews held on 25-10-2016 to 17-11-2016 with different groups and when the researcher’s team was establishing trust and a rapport on 16-10-2016 while still adhering to ethical issues. All the above engagements helped the researcher to develop an understanding of the phenomenon under study, as suggested by Royse (2008:280).

5.11.3. Persistent observation

The researcher's team carried out continual observation during the fieldwork, to enhance credibility. Royse (2008:280) states that observation should be done, and recording of what transpired is essential if the researcher is focusing on answering the research objective(s) and question(s). After each data collection session, the researcher's team sat down and reflected on what had happened in the sessions, while the information and incidents were still fresh in their minds.

5.11.4. Triangulation

Credibility was also enhanced through the usage of triangulation – which is defined as the use of two or more techniques of data collection in the study when dealing with human behaviour (Cohen, Manion & Morrison, 2000:112). Patton (2002:247) stated that the use of two or more techniques strengthens a study. Extending with line of thought, Hussein (2009:3) states that the approach also increases credibility, accuracy and validity of the research results. More so, multiple data-gathering techniques were combined, so that the researcher's team had a clear and complete picture of the study, for a single technique can not achieve such (Ngulube, 2005:140). Guion (2002:1) named five types of triangulation which can be used in a qualitative study: data triangulation, investigator triangulation, theory triangulation, methodological triangulation and environmental triangulation. The study used methodological triangulation, and adopted three data collection strategies – document analysis, semi-structured interviews and fieldwork, as each technique has its limitations, and the only way to overcome the limitations was to apply the other techniques to counteract the limitations.

5.11.5. Referential adequacy

Referential adequacy entails the usage of instruments to be archived. The researcher's team used a cell phone recorder to capture data in semi-structured interviews, and an A4 college

exercise book to record the fieldwork observations. Data captured using a cell phone recorder will be stored in a Compact Disc and will be stored through Microsoft Office. Data will be stored for 5 years and whoever wants to re-use it, consent would be obtaind from University of South Africa for that will be their property. The device (cell phone recorder) used helped the researcher's team to capture a unique level of information that was not to be missed. The researcher had used the instrument to test the validity of the findings (Babbie & Mouton, 2012:277).

5.11.6. Member checking

This involves requisition of someone outside the study to review the researcher's study, but the person should have a similar status to the researcher (Babbie & Mouton, 2012:277). Member checking was done in this study, where the researcher's team shared participants' viewpoints with the member (Ms Ntlhokoe) who was checking; hence, that gave the researcher's team the chance to clarify obscurities and uncertainties with the participants, as the comments received improved and increased the truth value of the study. Few amendments were made. The member checking affirmed the correctness that participants' names were not mentioned, but rather concealed by numbers.

5.12. Transferability

Transferability in qualitative research is defined as the extent to which the results obtained can be used in other settings using different participants (Babbie & Mouton, 2012:277). Transferability was enhanced by providing detailed descriptions of all the research processes that were followed, thereby creating a foundation for transferability to other contexts.

5.13. Dependability

Dependability in qualitative research is defined as the consistency of obtaining the same results under similar circumstances (Terre Blanche, Durrheim & Painter, 2006:92). Dependability in this study was enhanced through auditing. The findings of the study were clarified and verified by the researcher's team.

5.14. Confirmability

Confirmability in qualitative research is defined as the degree to which the findings of the study are given evidence by all the fieldwork undertaken, and not the researcher's assumptions (De Vos, Strydom, Fouché & Delport, 2011:421). The researcher's team realised that all collected data was archived in a well-organised manner, would assist in case the information needed to be retrievable when the need arose. In similar notion, meaning in data, and its interpretation, was not a figment of the researcher's team's imagination (Mertens, 2010:184), as the team had reviewed the data until concordance was reached.

5.15. Ethical consideration

The responsibility of the researcher was to see to it that the study was planned in an ethical, acceptable way. According to Neuman (2006:129), the researcher has a moral and professional obligation to be ethical, even when the research subjects are unaware of, or unconcerned about, ethics. Jegede (2009:80-82) states that ethical principles which govern the treatment of humans participating in the study should be the foundation for the methodology to be used. The ethical measures in this study included informed consent, confidentiality and anonymity, privacy, protection from harm, respect for human dignity, and the right to withdraw from the study.

5.15.1. Informed Consent

Before data was collected, the researcher's team observed the following ethical standards: approval was sought and granted by the University of South Africa's Research Ethics Committee (Appendix C) and an introductory letter from the supervisor to the study area, requesting permission to conduct the study (Appendix B). A clearance certificate was also obtained by the researcher from the study area, giving the researcher permission to conduct the study (Appendix D). Informed consent (Appendix F) was sought from participants, for them to take part in the interviews (Polit & Hungler, 2004:151). All these were done to ensure that relevant research permits were obtained before the commencement of data collection. After all permits were obtained, the researcher's team visited the study area for formal introduction of the research objective and for piloting the study.

As soon as the potential participants were identified, interview requests were made, including a letter of introduction about the topic of interest and research. In order for the reader to gain a clear picture of the research potential participant how they were identified and to relate their background information to the data processing and analysis, as well as the interpretation of findings, it is pertinent to equip the reader with this background information of the research participant. As states earlier, these people were chosen using porposive sampling and their age, gender and their qualification is provided in Chapter 6.

Guidelines for the interview questions were given to the participants' weeks before the actual interviews, to enable them to prepare. From information obtained, it was shown that the participants gave their own answers without corcision or has not discussed the questions earlier for there were no similar possible answers obtained that show answers influenced by one another. The second visit involved the conducting of the real interviews, and participants were interviewed in their homes, allowing the researcher's team to observe how participants lived, meet family members, and enhance the comfort of the participants. The interviews were conducted in English as an official language in the Kingdom of Lesotho (Appendices A and G) though some answers were given in Southern Sotho.

5.15.2. Confidentiality and anonymity

Confidentiality simply means that no information that participants give should be available to others without their consent (De Vos *et al.,* 2011:119; McMillan & Schumacher, 2010:122; Anderson, 2009:75). Throughout the research project, the researcher saw to it that the participants' identities were not disclosed. Since the research dealt with human beings, the names and identities of the participants were not revealed in the report findings. McMillan and Schumacher (2001:469) stated that participants should rather be coded, than being referred to by name. Numbers were used to conceal the names of participants in this study. For example, participants were addressed as participants 1, 2, 3 etc. The use of numbers was to ensure that any person who read the research report would not be able to link the responses to a particular participant.

5.15.3. Privacy

According to De Vos, Strydom, Fouché and Delport (2002:67), privacy means the agreement between people who give out information and that the one receiving the information may not divulge it to other people. In this study, the privacy of the participants was protected, and the information given was handled in a way that it could not be associated with any participant. This was done in accordance with Mertens (2010:342). Finally, participants' names and personal details in this study have remained anonymous.

5.15.4. Protection from harm

There are three principles, according to Holloway and Jefferson (2000:100-102), that are main to any research dealing with human beings. These include honesty, sympathy and respect. That is why all research has the obligation to respect the rights, needs, values and desires of participants in the study (Creswell, 2003:201). In similar notion, Corti, Day and Backhouse (2000:2) stated that the research study should not only respect informed consent, confidentiality, anonymity and privacy, but should treat participants with honesty.

In this study, the participants were informed as to what the study was about. No harm was intended, as the researcher's team guaranteed the participants that they would not be put in a situation where they would be harmed, either physically nor psychologically, as a result of their participation (Collins, 2010:83).

5.15.5. Respect for human dignity

According to Polit and Beck (2010:140-141), respect for human dignity involves the participant's right to a course of action without compulsion on their own activities. In this study, participants' right to self-determination and full disclosure were considered, as suggested by Polit, Beck and Hungler (2001:77).

5.15.6. The right to withdraw from the study

According to Leedy and Ormrod (2001:107), research participants should be told the nature of the study to be conducted, and be given the choice of either participating or not. Participants in this study were provided with sufficient information about the study, to allow them to read, query and sign, or be against participating (Appendix F). Sieber as quoted by Joungtralkul and Allen (2012:2) explain how the consent information provided should be: 'The consent statement of the research should be explained well, be simple, friendly in tone, use simple every-day language and omit all details that are unimportant.'

Subsequently, in this study, emphasis was placed on the fact that participants had the right to refuse and withdraw from the study at any time, without penalty, and to contact the researcher with any queries at any time during the study. Springer (2010:95-96) states that participants should be allowed to either give or withhold consent to participate, without coercion. Springer further states that if they agree to participate, they must be aware that they have the right to withdraw from the study at any time. The interview appointments were then scheduled with participants who agreed to participate in the study.

5.16. Data analysis

McMillan and Schumacher (1993:479) defined data analysis as a way of organising collected data, giving it a structure to derive a meaning out of it. Braun and Clarke (2006:77), on the other hand, defined thematic analysis as a method that the researcher uses to classify and present themes within data. Data collection and analysis are linked and influence one another, as analysis is an ongoing part of the study. Extending the line of thought, Holloway and Wheeler (2002:235) cautioned that data analysis occurs at the same time as data collection. After data was collected from the study area, the researcher translated and transcribed the tape recordings (Appendix G). Some answers were given in Southern Sotho, as a result, translations were made and the researcher represented the true content free of bias. The interviews were read and re-read in their entirety, and summarised. It was found that more than one theme existed in a set of interviews. As a result, thematic analysis was used to analyse collected data from the study area. All collected data in the interviews which were in a language other than English, were translated by the researcher.

The following seven steps were undertaken when analysing collected data in a thematic way:

5.16.1. Familiarisation and immersion with data collected

The researcher's team familiarised themselves with the data collected, by engaging with it, and reading, re-reading and transcribing the fieldwork. Terre Blanche *et al.* (2006:323) stated that once this step is done, the researcher will be able to know exactly what collected data entails.

5.16.2. Inducing themes in data collected

In this step, the researcher's team identified phrases that represented the topic under study, as well as formulating themes and sub-themes from them. It is here that the researcher's team grouped and named concepts that were similar to the research topic, using the same

language of the participants and not abstract theoretical language (Terre Blanche *et al.,* 2006:323).

5.16.3. Numbering of collected data

After themes and sub-themes were formulated, numbers were given to themes depending on their position. Tuckett (2005:75) stated that once a number is given to a theme, it helps a researcher to organise data into a full, meaningful scope.

5.16.4. Elaboration of collected data

In this stage, the researcher's team revisited the collected data and revised it. The obtained themes were explored in more depth than in the previous step. Terre Blanche *et al.* (2006:326) stated that this step helps the researcher to have continuous elaboration of collected data until no new insights emerge.

5.16.5. Reviewing the themes

Through this step, the researcher's team reviewed the themes, for refinement of them.

5.16.6. Defining and naming themes

After the themes were reviewed, the researcher's team defined the themes, and refined them so that the data within was analysed.

5.16.7. Producing a report

After the themes were fully worked out and collected, the data was sufficient to enable the researcher's team to answer the research questions. A summary of the findings, as well as

conclusions, recommendations, future research, and a new poposed model, were detailed. An article will be produced from all gathered findings of the study.

5.17. Problems encountered during data collection

Several problems were encountered by the researcher's team during data collection. These included time constraints and distance, as it was perceived that it would be beneficial to extend the period of research for the purpose of acquiring a better understanding on the perception of the community on the socio-environmental impacts of Metolong Dam and Reservoir.

5.18. Summary

This chapter entails a report regarding the research methodology applied in the study. A comprehensive description of the goal, objectives, research design, population and sampling, including ethical considerations are presented in this chapter. A detailed account of the data collection and analysis processes are provided. The interpretation of the findings is provided in chapter 6.

CHAPTER 6

EMPIRICAL ANALYSIS AND DISCUSSION

6.1. Introduction

The chapter gives information on a discussion of the collected data. The collected data was arranged according to specific objectives and research questions. In Chapter 6, the presentation of collected data does not follow the order in the interview protocol, but the data does address a particular question. Data collected from the study area was analysed using thematic analysis. Themes were taken from semi-structured interviews, reviewed documents and fieldwork. The themes include the personal data of the participants, the time frame of the project, supplied areas by Metolong project, educational levels of the participants, the period lived by the community, informed decisions, socio-economic and environmental benefits reaped by the community, and the perceived negative environmental impacts. All the data presented in this chapter was provided with the voluntary consent of the participants, as they were not guided on how they should answer to questions.

6.2. Reviewed and analysed documents

Secondary data were received from various sources and are listed in Table 6.1.

Table 6.1: Reviewed sources of Secondary data from Metolong Offices, Library and Information.

Government of Lesotho-Department of Water Affairs-Lowlands Water Supply Unit. 2008
Lesotho Electricity Company (PTY) Ltd, 2008.
Metolong Authority, 2008.
SSI Engineers and Environmental Consultants, 2009.
Government of the Kingdom of Lesotho. Ministry of Natural Resources. Water Commission, 2010.

Government of Lesotho, 2011.

Source: Own.

6.3. Collected data from the study area

When primary data were collected the researcher bore in mind the fact that the study was a follow-up of socio-environmental impacts that occurred in the pre-construction phase to the operational phase of Metolong dam and reservoir. All collected data was compared to what was predicted (Government of Lesotho, 2008). Data analysis and data collection occurred simultaneously in this research. This was stated by Baxter and Jack (2008:554), in that the two should occur simultaneously as the researcher interacted with the participants. Firstly, before data was collected, the researcher prefaced the interviews by briefing the participants about the purpose of the interviews (Appendix F), defining the situation for the interviews (confidentiality), what the researcher was doing, for the research, and why the researcher was interested in talking with participants from the study area as the participants for the study. Secondly, the researcher's team introduced themselves and asked the participants whether they had any questions before the interviews were conducted. Appendix G contains the transcripts of interviews conducted with participants from the study area.

Personal data of the participants in this study covered the age and gender. Firstly, the researcher asked participants to mention their names. The question was optional for participants to give their names. The names participants gave in this thesis were changed, to protect their confidentiality.

Section1: Personal details

The following categories of age of the participants were obtained from the study area (Table 2) and participants 17 years old and below, were purposely excluded from the study,

as they were considered to be too young. From the interviews held, the researcher's team were able to identify and analyse the number of males and females who attended (Table 6.2). Gender is one factor that makes men and women perform different work within their societies (Mehta, 2008:5). From a total number of forty (N=40) study participants, 22 (55%) were males and 18 (45%) were females.

All the participants stated knowing how to read and write, as they had received formal education. From 40 study participants, collected data revealed that 24 participants had not completed secondary school, of which 13 participants reported not having had the opportunity to finish primary school. In similar notion, collected data revealed that two study participants had attained full secondary school level, one participant had completed at least two years of university education (Table 6.2).

From collected data, the reasons participants gave for their not being able to access higher education, resulting in drop-out from school included the following: expensive school fees, expensive educational materials (uniforms and stationery) and long walking distances. It was observed by the researcher's team that the majority of the participants who reported being herd-boys had not had the opportunity to attend school for successive days, months or years, for their entire time was spent in mountain areas rich with grass, for their livestock.

For the study is a follow-up, comparing age, gender and level of education with data listed in Government of Lesotho (2008:72-75) males are dominate in all categories except in senior secondary level and pos-secondary level. For the educational level have been established, educational level together with knowledge from observation added value to establishing perception.

Table 6.2: Age, gender and educational level of the sample population in Ha Seeiso, Maseru: n=40.

Age	**26-35 years**	**36-45 years**	**40-45 years**	**56&above**
	6	14	8	12
Gender M	22			
F	18			
Level of Education	**Males**	**Females**	**Overall**	
Primary level	8	5	13	
Lower secondary level	14	10	24	
Senior secondary level	0	2	2	
Post-secondary level	0	1	1	

Source: Own.

Section 2: Time lived in the study area

Question 7: Asked participants how long they had lived in the study area.

It was observed by the researcher's team that, out of the 40 study participants involved in the study, 16 participants had lived in the study area their entire lives, while 13 participants stated that their families had lived in the study area for many years previously. Only two study participants had lived in the study area for less than 25 years, while the remaining nine study participants had lived in the study area for more than 40 years.

It should be noted that participants who had lived in the study area for less than 25 years were all females who had moved to the study area after marriage. From Basotho culture and tradition, a woman has to shift to the male's family site, after marriage. This information, which is included in this study for experience before and after the construction of Metolong Dam and Reservoir, may show whether the establishment of the project had socio-environmental impacts.

Section 3: Knowledge about Metolong construction

Thirty-eight study participants' reported being informed by the Project Authority about the construction of Metolong Dam and Reservoir and they were aware of, whereas two study participants stated that they were not informed and aware. One participant reported not having been informed, for he was at work in the RSA, while the second participant reported having been admitted to hospital at that time, as being very sick. The 38 study participants were told about the upcoming project on 3 August 2007, during the public gathering that took place at Ha Seeiso village. The participants added that it was during this gathering that the community was told about the nature, objectives and benefits of the project; however, the participants disclosed having been discontented concerning benefits mentioned previously, as some did not materialise.

The community around Metolong dam played a minor role whereby they were engaged as workers or labourers and were excluded in any development positions. All 40 study participants who attended the interviews stated that the project began towards the end of 2009 and in one of the meetings with the developers, it was stated that the project is expected to be constructed within a period of nine years, from 2009 to 2018. Among the participants, only five knew to which areas water was to be supplied. They stated that, water is to be supplied to Maseru, Teyateyaneng, Mazenod, Roma, Morija and Matsieng.

Section 4: Livelihood of the participants

Krantz's (2001:6) definition of livelihood gives the capabilities, assets and activities needed for a living. Livelihood can be explained in terms of a person and society. Personal livelihood involves individual daily activities in generating an income, and those activities include farming, fishing and trading, while society livelihood comprises all activities done for members of the society (Brugère, Holvoet & Allison, 2008:6).

From the collected data, it was observed by the researcher's team that all 40 study participants had been engaged in different livelihood means. Participant 6 stated that she was living by remittances from her husband who is working in the RSA. Devitt and Hitchcock (2010:62) state that it was a habit for young Basotho men to leave their communities and go to the mines in the RSA until their late manhood. Posel (2001:165) reported that male labour migration rates to the mines of the RSA began in the 1970s, and towards the end of the 1970s it was very high.

Participant 2 stated that he was earning an income from selling of clothes bought from the RSA and some in Lesotho. In similar notion, Participant 3 stated that he owned a spaza shop, while Participant 7 stated that he earned an income from selling gathered fruits. More so, Participant 8 stated that he was a pensioner living on his pension money. Eleven participants stated that they were earning a living from keeping livestock and selling them. Participants stated that they rear animals such as cattle, sheep, donkeys, horses, pigs and chickens. Adding to the preceding livelihood means, Participant 11 stated that he owned a general dealer, while Participant 13 stated that he made a living from selling vegetables grown in his backyard and also some bought in Maseru.

In addition, Participant 14 stated that he made a living from selling timber. Participant 21 stated that he made a living from savings that were saved for him while still working. On the other hand, Participant 25 made a living from selling other people's animal products, while Participant 28 made a living by selling other people's timber. Moreover, Participant 29 stated that he made a living from the sale of handicrafts, while Participant 30 stated that he made a living from selling fruits that were bought, and those grown in the fields before trees were uprooted. In the same vein, Participant 40 made a living from selling other people's fruits, while Participant 33 made a living from a mini-salon owned, and Participant 34 made a living from the renting of houses. Participant 39 made a living from selling traditional beer.

Out of the 40 study participants interviewed, few we aware of the negative impacts of Metolong dam on the livelihood of the community. 23 participants felt that their lives and livelihood means were not improved, while 17 participants stated that they were improved. Scudder (2005:35) stated that in a recent survey of 50 large dams on five continents, resettlement living standards had improved in about 7% of all cases, and 11% had had their livelihoods restored. The remaining 82% were worse off than before resettlement.

All mentioned means of livelihood, according to Tuner (2001:2-4), are not helping the Basotho to achieve a sustainable livelihood; as a result, poverty is their outcome. However, Tuner (2001:11-13) identified the following general elements that the Basotho think make up a sustainable livelihood:

(1) Land (important in rural areas, but less so in urban areas)
(2) Income sources (some kind of employment)
(3) Skills, capabilities and education (including the capability to send the children to school)
(4) Assets (farm equipment, vehicles, furniture, big house and livestock)
(5) Food security (possibility to eat variety of foods three times per day)
(6) Health (people from wealthy households are always in good health, despite the sickness they are living with)

Participants' who were aware of the negative impacts of Metolong dam stated that, they are aware people have lost their properties. Three study participants reported being affected by the project construction, as, during the preliminary construction, trees at their homes were depleted. Among the participants, Participant 18 mentioned that peach trees *(Prunus persica)*, gum trees *(Genus eucalyptus),* pine *(Genus pinus),* apple trees *(Malus pumila),* willow trees (*Genus salix*), apricot trees *(Prunus armeniaca)* and poplar trees *(Populus)* were uprooted and depleted.

Subsequently, 15 study participants reported that their fields were taken by Metolong Project, for their areas were acquired for building of the small and higher storage facilities. Mashinini (2010:4) states that Katse Dam and 'Muela Dam, respectively, had led to the loss of about 1900 hectares of arable land in Lesotho. Collected data also revealed that, within the village's culture, inheritance is still used, and this pertains to fields, livestock and other worthy property which is passed on to children by parents, if alive, or by family consent, if parents are dead.

Participant 30 stated that, traditionally, the eldest son gets most, if not all, of the inheritance, but nowadays the younger son's daughters, even, are considered. Weissman (2005:48) stated that in West African societies, a woman's right to own and inherit property has been increasingly recognised over the past century, and laws have changed to reflect this recognition. More so, Gupta (2010:123-152) informs that in Europe, women could inherit land if their parent had no sons. Participant 22 alluded to the fact that inheritance constitutes both an important traditional pride and a sustainable livelihood, which keep family bonds intact from generation to generation. The same participant stated that during boyhood, male children were taught and groomed to be responsible in caring for their family's wealth of fields and livestock, for it is from these that they will maintain the welfare of their own families when they too become men. In this regard, the participants mentioned that their fields were lost and livestock was diminished – which causes tradition to die.

Collected data revealed that taken fields had an effect on the animals kept, as some villagers were forced to sell them, for range was reduced. Participant 18 stated that to take animals for grazing to nearby villages was a difficult task, for most of the people were advanced in years. On the preceding stance, Participant 33 stated that the absence of animals kept had caused some kraals to fall. During fieldwork observation, the researcher's team saw remnant kraals such as the one in Figure 6.1:

Figure 6.1: A remnant kraal.

Source: Own. (Fieldwork, 2016)

Collected data showed that people who had lost assets, temporary and permanent, were promised to be compensated. Nevertheless, Participant 2 revealed that not all the people had been compensated up to the day that the interviews were held. The locals who were not compensated typify the situation that occurred in Gariep and Van der Kloof dams on the Orange River, as some locals were not paid together with the farm workers (World Commission on Dams, 1998:14). In similar vein, two study Participants stated that a compensation amount of 49,106,914 LSL was said to be given to the affected people, but collected data revealed that 36, 713, 414 LSL was to be given to those who had lost their assets.

Section 5: Impacts of Metolong project

From collected data, some promises that were made at the public consultation became a reality and were fruitful. Participant 15 stated that before the dam's construction there were places that were accessible only by rough dirt roads and footpaths, but with the development of Metolong Dam, came the roads. Participant-16 stated that roads that were constructed included the branch-off access road from the existing Mohale access road between the villages of Nazareth and Ha Nqheku.

In the same vein, Participant 16 added that the branch-off access road had been an important development, because people's mobility was enhanced, allowing people to travel more easily and quickly. Collected data revealed that the 8.5km road north of Metolong had ended people's tribulation of having to walk longer distances to reach the nearest public transport point. Detter and Gunnewig (1994:15) stated that after the road was constructed from Ha Lejone that joins Ha Mensel in LHWP, people were able to reach Leribe by tarred roads. As a matter of fact, public transport accessibility was enhanced.

Participant 14, on the other hand, mentioned that gravel wear courses with two lanes were constructed. The gravel wear courses helped a lot, for it was difficult to access roads, especially during rainy seasons, as access roads leading to the villages were located among the crop fields. This was stated by Participant 11, who stated that during rainy seasons the roads were becoming muddy and potholed. Kotelo-Molaoa (2007:22) stated that one advantage of improving roads in Lesotho was to provide new improved access opportunities for many isolated communities. In similar vein, Participant 31 reported the bridge constructed across Phuthiatsana River (Figure 6.2) had caused villagers to walk a long way round the reservoir to reach a place just across from them. Subsequently, the participant added that before the dam's construction, the community of Ha-Motsoeneng would walk about 8km from their village to cross over Phuthiatsana River to Ha-Seeiso, but after the dam's construction they were obliged to walk several more kilometres.

Furthermore, collected data revealed that the project of Metolong had caused disruption in the daily life of people around the dam and reservoir, as it had divided the villages, impeding interdependence of movement between them, as people crossed the Phuthiatsana River on a regular basis. Participant 35 averred that the dam was crossed to access services at Ha Seeiso and Sefikeng-Ha Fako, and also to access transport to Maseru or/and Teyateyaneng. Concurring on the preceding stance, Participant 31 stated that the villagers were no longer crossing to see their friends and relatives (kinsmen), attend their fields, funerals, and going about their routine activities, crossing with their animals for auctioning, ploughing, or other activities.

Figure 6.2: The bridge constructed on the Phuthiatsana River to Ha Makhoathi.

Source: World Bank, 2009:1.

Collected data also revealed that, advanced infrastructure constructed by Metolong Authority Project had caused two police stations at Sefikeng and Ha Matela, within the study area, to be refurbished. Participant 21 stated that the walls and the floor of Sefikeng police station were cracked but were now renovated. More so, the same participant stated

that, the whole building was re-plastered and painted immediately after fixing the walls and the floor. However, Participant 28 added that 'the chimney was also replaced together with the rafters and sheets'.

Still on refurbishment of the police stations, Participant 30 stated that Ha Matela police station block's walls were well built, but were then plastered and painted. Participant 22 concurred with the preceding stance, and added that the chimney, sheeting and roof structure were replaced as well.

Section 2.5.1.1 of the literature review revealed that the creation of jobs was one positive impact associated with the construction of large dams, for both skilled and unskilled labour markets. The job opportunities associated with the construction of large dams were being experienced at different stages of the project. Collected data showed that Participant 10 had worked in Metolong Authority Project since the inception of the project, and was involved in large water projects of higher magnitude, before citing Katse Dam and Mohale Dam, respectively. Participant 7, on the other hand, stated that since the establishment of Metolong Project, jobs had been created in various forms (customer base with various businesses such as shebeens, sale of home-made beers, rental of living quarters, the sale of fat cakes, sale of handicrafts, creation of general dealers and spaza shops), whereby 350 people were employed from the local communities. Adu-Aryee (1993:149) stated that local residents in Ghana benefitted from jobs in different forms, from the construction of hydro-electricity at Kariba Dam, as factories and industries emerged nearby the project.

However, collected data revealed that the creation of Metolong Dam and Reservoir had acted as a pull factor for migrants to the study area, as some were employed in the project. It was perceived that these migrants brought an increase in health problems, and had caused a loss of social cohesion. Participant 40 added to the preceding stance, and perceived that it seemed that a striking number of migrant workers caused an increase in HIV in the

community, which was seen where the migrant labourers were in relationships with local teenagers.

The LHWP (1993:7) stated that the same situation had occurred during the construction of Katse Dam. HIV/AIDS prevalence in the study area typifies the worldwide experience. Hence, Tilt *et al.* (2009:249) inform that extra-marital affairs between local female residents and construction workers at Katse Dam became all too common, whereby young schoolgirls were bribed to engage in sexual relations with men working on the dam, and HIV/AIDS infection rates skyrocketed in the construction area. Participant 36 further mentioned that the relationships girls had with workers had resulted in teenagers' behaviour changing, and their not respecting the parents, ending with some of the families splitting because of the money that the operators and builders no longer gave to their wives but to teenagers around the project. The same participant reported this being a serious case, because as the construction phase continued, teenage pregnancies became more common, and family conflict became rampant, bringing extra-marital affairs.

Table 6.3 shows the study participants' educational level with respect to their employment in Metolong project:

Table 6.3: Participants' educational level vs employment.

Educational Level	**Employment**
1 Participant completed 2 years of university	• Formal work
2 Participants completed Cambridge Overseas School Certificate	• Drivers for Metolong Authority
13 Participants did not finish primary school	• Two participants owned spaza shops • Ten participants were unemployed
24 Participants completed secondary school	• Two participants have worked for Lesotho Electricity Corporation,

	digging pits for poles • Seven participants owned hairdressers • Fifteen participants were and/or are shepherds

Source: Own.

Collected data revealed housing infrastructure constructed by Metolong Authority was not adequate for the whole staff. Housing infrastructure in Phase I was for immediate construction staff, Phase II for operation and maintenance staff, and Phase III for additional needs. Because accommodation at Metolong Project was not adequate for the whole staff, employees were to hire houses nearby. Participant 36 stated that employees from Metolong Authority had rented her houses; therefore, the participant stated being able to buy food and clothes with the money, while before the project's construction it was difficult to do so. More so, the same participant averred that, mine workers gave women money after washing their clothes.

Section 2.5.1.2 revealed that in the construction of Mohale Dam under the LHWP, there were commercial centres and lodges built. Collected data showed that, due to the Metolong Dam and Reservoir construction, the visitors' centre was constructed north of Metolong Dam wall. This was constructed as a circular structure, allowing panoramic views around the centre. Participant 17 stated that the roofing material for this visitor’s centre was primarily local natural materials taken from the mountain nearby. Collected data also revealed that before Metolong Project could start, there was no electricity within the study area. The study area therefore typifies the situation in most Southern African countries, with no electricity.

As a matter of fact, the United Nations World Water Assessment Programme (WWAP) (2014:2) documents that 2.5 billion people in developing countries have no access to sanitation and electricity. All the study participants stated that it was expensive to connect electricity at the study area, for there were no electric pipelines installed across the village. Participant 3 stated that electricity was installed by the Lesotho Electricity Corporation. Fernea (1998:8) stated that, due to the construction of the Aswan Dam in Egypt, the Kom Ombo people had obtained electricity. Figure 6.3 shows households with installed electricity in the study area:

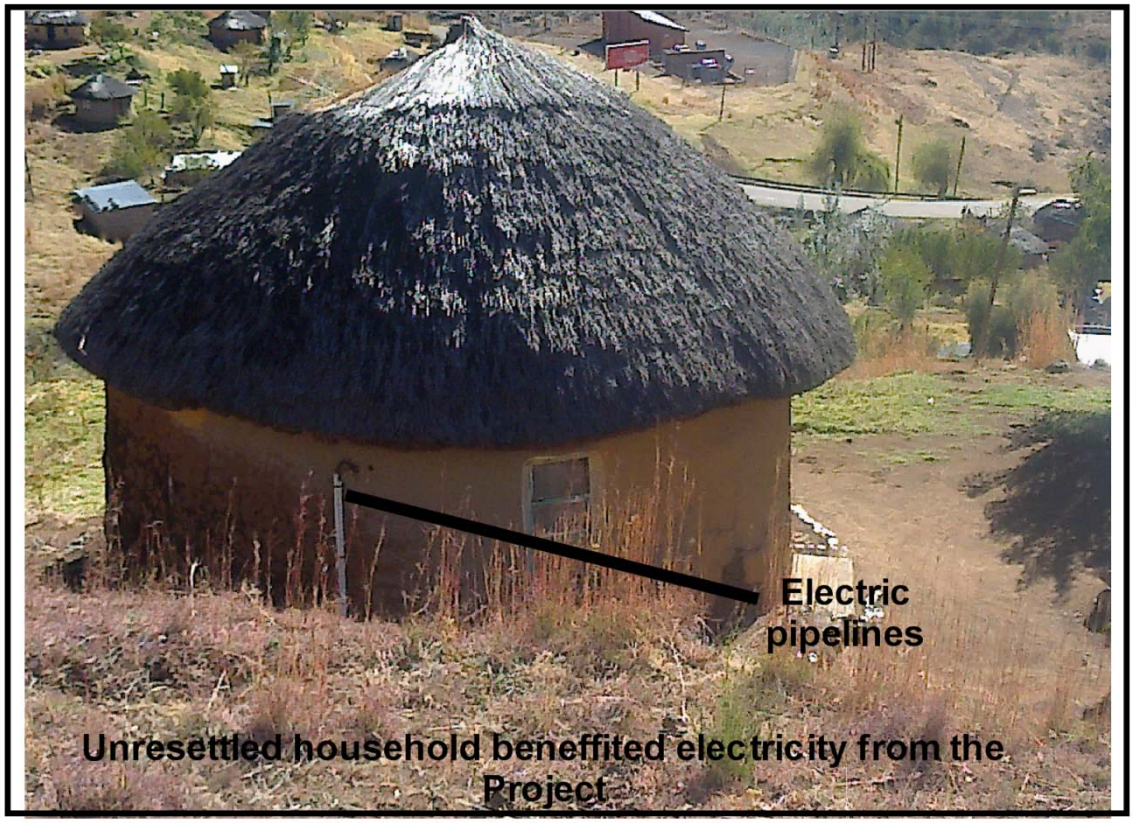

Figure 6.3: Household installed electricity within the study area.

Source: Own. **(**Fieldwork, 2016)

Participant 3 further stated that, electricity installed at the study area was needed for Metolong to construct its buildings and offices, and for functioning of the infrastructure at the dam project. Participant 5 stated that with this new type of energy (electricity), their

standard of living had improved generally, as now they were using electric heaters, ovens, and other apparatus that eased their lives and improved their standards. The education of their children was also raised, as they were now obtaining higher grades that helped them to move to higher education. Two participants stated that the villagers were either using *patsi* (firewood), *khapane* (dried cow droppings) or *lisu* (dried compacted cow dung from the kraals) inside the small houses to produce heat for cooking, lighting and heating during cool and cold seasons. Grimm, Munyehirwe, Peters and Sievert (2006:4) stated that 2 billion people still have no access to electricity at all, worldwide – which is why about 1 billion people are still using uneconomic electricity supplies such as dry cell batteries, candles or kerosene.

Section 2.5.1.9 indicated that hydroelectricity schemes are believed to produce cleaner sources of energy, if compared with the fossil fuel that increases air pollution through carbon dioxide. Participant 10 averred that burning, breathing incidents, and risk of death are occurring due to poisonous smoke and carbon dioxide emitted inside villagers' small houses. The World Health Organisation (2015:8) posits that, when using wood, there are health problems that may occur, such as burns and eye and respiratory diseases. Adding to the preceding stance, the Organisation for Economic Co-operation and Development (OECD) (2007:20) maintains that access to modern sources of energy is therefore not only essential, but also critical, in achieving sustainable development, the Millennium Development Goals (MDG) and reducing carbon emissions.

In the same vein, Participant 24 mentioned that the village had benefitted from safe water that they were obtaining from individual standpipes. Construction of Metolong Dam and Reservoir, however, typifies areas where large dams are established. Fernea (1998:8) stated that in Nangbeto Project Scheme in Togo and/or Benin, locals had obtained piped water in their homes, but the time the pipes were worn out, they broke down, and the supply of water was worse than before the project was established. Participant 24 added that before the emergence of the project, local villagers were obtaining water from springs that were

unprotected. More so, Participant 30 averred that villages such as Ha Khabele, Ha Letela, Ha Masakale, Ha Mothomotsoana, Ha Tlele and Nkokomohi were obtaining water from unprotected springs as their main source of domestic water, while Ha Seeiso, Ha Khabele, Ha Kapa, Ha Ramakabatane, Ha Sekantsi, Ha Takalatsa, Ha Makotoko, Ha Makhale, Ha Makrika and Ha Maimane were washing their clothes in the rivers and small streams outside the villages where people and animals drink. UNESCO (2006:2-4) reported that, due to a lack of access to adequate water and sanitation, about 7 million people die every year because of waterborne diseases, including 2.2 million children under the age of five years.

Participant 11 stated that before Metolong Project could be constructed, the community was using the bush or/and open field for sanitation purposes. The participant added that the area which was used for sanitation purposes was unhealthy. Subsequently, the participant stated that pit latrines were available, within the village, to those who could afford to buy them. However, the participant stated that the pit latrines were very poor in quality, for they were never serviced. As a result, the participant stated, the toilets were overflowing, while in some other households one would find a bowl into which males urinated. Figure 6.4 Diagram A, shows pit latrines that were available within the study area, before Metolong Project could be constructed.

Participant 17 stated that after the project implementation, they were now using their own ventilated pit latrines provided by Metolong Project (Figure 6.4 Diagram B). The participant added that, the toilets provided were in good condition, efficient and non-offensive to the people and to the environment.

Figure 6.4: Toilets before and after Metolong Dam construction.
Diagram A: Source: Government of Lesotho, 2008**. Diagram B**: Source: Own. (Fieldwork, 2016)

Section 2.5.1.2 of the literature review revealed that in the construction of Mohale Dam, under the LHWP, there were hospitals and clinics established. Collected data revealed that Ha Seeiso and the surrounding villages have benefitted from a clinic called St Michael, at Ha Khabele. On a similar notion, Participant 4 stated that St Magdalena and Bethany clinics were also built where people within the village walk 5-6km to reach them. Other clinics were reported built, including Thaba-Bosiu Red Cross Clinic, Ha Makhalanyane Clinic, Ha Makhoathi Clinic and Ha Jobo Clinic.

Section 2.5.1.2 also revealed that after Mohale Dam was constructed, primary schools began to be available within the village. Collected data revealed that high schools, primary and preparatory schools were now available in the study area and nearby villages, due to the Metolong Project. Ayeni, Roder and Ayanda (1992:119) stated that in the Kainji Project Scheme in Nigeria, different levels and forms of school were established, due to the development of the project. Particiant 21 stated that children willing to attend high school

in Ha Seeiso, if it was full, they were to reach the nearest villages. Participant 24 reported that this had a negative effect on the village, as they had to walk 15km and, correspondingly, the same distance back to the village. Table 6.4 shows schools that were available before Metolong Project:

Table 6.4: Schools that existed before the construction of Metolong Dam and Reservoir.

NAME OF THE SCHOOL	LEVEL
Letsie High School	High School
Lefikeng Training Centre	Secondary
Thaba-Bosiu Lesotho Evangelical Church of Southern Africa built by L.E.C.S.A.	Primary
Mosalla Roman Catholic Church built by R.C.C.	Primary
Ikaheng	Primary
Ntlo-Kholo built by L.E.C.S.A	Primary
Jehova Shalom	Primary
Lesoiti Anglican Church of Lesotho built by A.C.L	Primary
Falimehang Community	Primary
Boqate built by L.E.C.S.A.	Primary
Boqate built by A.C.L.	Primary
The Hope of Generation	Primary
Tumelo	Primary
Lenono	Primary
St Leo built by R.C.C	Primary

Source: Sechaba Consultants, 2006:26.

Two participants stated that four households were resettled, the main reason being that Metolong needed to acquire temporary and permanent usage of the lands. In the same vein, collected data revealed that temporary land was acquired for construction of transmission pipelines, and for a quarry site south of Metolong Reservoir to the west of the study area, for the substation and its yard. Subsequently, Participant 19 stated that land was acquired

permanently for the construction of a road to the dam wall, to the water treatment plant and drying beds, to operation offices, and to pump stations.

Two participants stated that four relocated households were resettled towards the eastern edge of the study area, and the households amounted to 24 people. In similar notion, Participant 20 averred that Household One consisted of four people, having one other person not living with them. Household Two consisted of eight people that were living with two other relatives. Household Three consisted of seven people; and, Household Four consisted of five people.

Collected data further revealed that five households were also resettled due to quarry activities at Ha Makhale within the study area. Participant 18 stated that the five households were within a 1km radius of quarry activities. The same participant reported that resettled people at Ha Makhale amounted to 41 people in total. Participant 8 stated that Household One had 11 people, Household Two–10 people, Household Three–9 people, Household Four–5 people, and Household Five–6 people. The same participant averred that all these five households were resettled on the eastern edge of Ha Seeiso village as well.

Through data gathered, the researcher's team conducted an audit to evaluate the accuracy of the initial EIA by comparing actualities with what was predicted. The researcher's team found that the number of households predicted to be affected seemed to be less, and the households seemed not to be in predicted areas. Metolong Dam and Reservoir construction is not exceptional in resettling local communities, as it typifies major dams in Africa, and around the world, that have resettled people where large dams and reservoirs are to be constructed. Table 6.5 shows major large dams that have resettled people:

Table 6.5: Major large dams in Africa and around the World that have resettled people.

Name of a dam	Country	Displaced persons
Akosombo Dam	Ghana	84,000
Volta Dam	Ghana	80,000
Aswan Dam	Egypt	Hundreds of Nubians and others
Aswan High Dam	Egypt and Sudan	120,000
Meroe Dam	Sudan	70,000
Roseires Dam	Sudan	10,000
Kainji Dam	Nigeria	44,000
Kariba Dam	Zambia and Zimbabwe	57,000
Katse Dam	Lesotho	20, 000
Mohale Dam	Lesotho	10,000
Kiambere Dam	Kenya	7,000
Kossou	Cote d'Ivoire	75,000
Maguga Dam	Swaziland	480
Manantali Dam	Mali	11,000
Sélingué	Mali	15,000
Volta Dam	China	80,000
Sanmenxia Project	China	410, 000
Three Gorges Dam	China	130 000
Nangbéto	Togo/ Bénin	10,600
Garafiri	Guinée	2,140

Source: Adapted from Ficatier, 2008:9-10.

Collectively, participants stated that the Metolong Project had affected their livelihood means. Kotelo-Molaoa (2007:69) states that the project of Volta River had affected people's livelihood, as the project had taken 848 200 hectares of land, while 510 000 hectares were lost to Kariba Dam, and 380 000 hectares were lost to Cabora Bassa Dam. The lands were providing and enhancing the livelihood means of the community.

Fourteen study participants reported that their fields were taken by Metolong Project. ‘I used to grow wheat and peas on my taken field,’ said Participant 1. Participant 8, on the other hand, stated that he used to grow maize only, and currently he lives on bought mealie-meal, which is expensive. Pederson (2007:8) states that maize is the major cash crop in Lesotho, but the Lesotho climate is not suitable for growing it. In similar vein, Participant 22 started planting beans and sorghum, depending on the season, but currently the participant is forced to buy these two foodstuffs. Moreover, Participant 32 stated growing potatoes which are either consumed and/or sold if a surplus remains.

The collected data revealed that affected fields had an effect on livestock rearers. Participant 18 admitted being forced to sell livestock, for there was no grazing land, and is bored nowadays for he is entertaining himself by following the animals. Pederson (2007:11) states that women in Lesotho are engaged in agricultural activities, while men herd animals, hunt, and build stone houses and kraals. Four women participants stated that taken fields have caused men to be moving around in the village, or 'hang out' at the corners of the village, whereas they were supposed to follow the animals. The women felt trapped by these men, who were around from morning until evening. Participant 15 concluded by stating that “men are drinking beer from morning till evening for they have no employment”. Bartolome, De Wet, Mander and Nagraj (2005:3) maintained that in many dam cases, cash compensation is often quickly depleted by fraudsters, repayments of debt, theft, liquor and conspicuous consumption once given to affected communities. Table 6.6 gives information concerning livelihood means in Metolong and Ha Seeiso village:

Table 6.6: Livelihood means in Metolong and Ha Seeiso village, units of measurement % (n=40).

Income Source	Male-headed households	Female-Headed household
General dealer	0.9	1.1
Hairdresser	4.3	3.8
Income from sale of beer	11.2	9.9
Income from sale of handicrafts	2.3	1.1
Income from savings/stokvel	15.0	11.0
Other	2.3	4.4
Pension	11.5	20.3
Remittances in Lesotho	17.3	14.8
Remittances in South Africa	32.3	18.1
Rent of house	2.6	1.6
Salary	36.6	25.3
Sale of fish (caught by others)	2.9	1.1
Sale of fish (self caught)	2.3	4.9
Sale of other persons' vegetables	6.1	3.8
Sale of other persons's timber	1.2	1.1
Sale of own animal products	7.5	6.6
Sale of own fruit	8.6	3.3
Sale of own livestock	9.8	6.0
Sale of own timber	10.4	9.3
Sale of own vegetables produce	25.1	18.7
Spaza	4.3	0.5
Welfare grant	21.3	34.1

Source: Government of Lesotho. Department of Water Affairs, 2008:111**.**

Four participants stated that the dam project had effects on the weather of the study area, for they were now experiencing cooler, and cold, temperatures with frequent snowfalls. Collected data typifies the situation that occurred previously in Moscow (Rybinsk

Reservoir), as it changed the local weather by extending the frost-free period from 5 days to 15 days per year. Participant 14 stated that cooler and cold temperature seasons in the study area seemed to be experienced earlier by a month, and end later by a month. That is, cooler and cold temperatures were starting in May, but, towards the completion of the project, it changed to April and ended in July, as opposed to August. Four participants stated that towards the end of the project, the village started to have fog on some days, while before there was no fog. Fog was observed by the researcher's team during the fieldwork (Figure 6.5):

Figure 6.5: During fog-day in the study area.

Source: Own. (Fieldwork, 2016)

Collectively, participants reported that the construction of the project did have impacts on plants and animals in the study area. When land was cleared for the way to the dam, to the wall and to the reservoir; habitats were degraded, and the presence of fire in some areas was visible, said Participant 5. The participant added that the reptiles were killed by developers once they were in contact with them. More so, the participant stated that all these actions had caused the number of reptiles to decrease in the study area. Collected data

from (Table 6.7 & Table 6.8) concurred with information contained in Government of Lesotho. Department of Water Affairs, 2008:58 and 60.

Table 6.7: Reptiles that used to exist in the study area.

Reptiles name	**Scientific name**
Puff-adder	*Bitis arientans*
Rinkhals	*Haemachatus haemachatus*
Cross-marked sand snake	*Psammophis notostictus*
Brown house snake	*Lamprophis fuliginosus*
Slug-eater	*Lycodonomorphus rafulus*

Source: Government of Lesotho. Department of Water Affairs, 2008:60.

Collected data revealed that when infrastracture was built, Red grass (*Themeda triandra)* and Old Wood grass *(Lecanactis abietina)* were depleted. Collected data also revealed that traces of baboons *(Papio ursinus)* were seen in large numbers before land was cleared for the construction of the dam and the reservoir, while after construction their numbers decreased. Concurring with the preceding stance, Participant 23 stated that mammals such as the Cape hare *(Lepus capensis)* and Small grey mongoose *(Galerella pulverulenta)* were seen in great numbers on a daily basis before the dam project, but after the land was cleared their numbers decreased. Table 6.8 shows mammals that used to exist in the study area:

Table 6.8: Mammals that used to exist in the study area.

Mammal name	**Scientific name**
Yellow mongoose	*Cynictis penicillata*
Small spotted genet	*Genetta genetta*
Striped polecat	*Ictonyx striatus*
Rock rabbit	*Pronolagus crasscaudatus*
Porcupine	*Hystrix africaeaustralis*
Clawless otter	*Aonyx capensis*
Cape hare	*Lepus capensis*
Feral domestic cat	*Felis catus*
Small grey mongoose	*Galerella pulverulenta*
African wild cat	*Felis lybica*
Water mongoose	*Atilax paludinosus*
Rock dassie	*Procavia capensis*

Source: Government of Lesotho. Department of Water Affairs, 2008:58.

Collected data also revelaed that Bitter root *(Lewisia rediviva)* had decreased in number, as it was plentiful where the road to the dam wall was made, while Participant 5 stated that Thatch grass *(Hyparrhenia hirta),* which was used to thatch houses, and Merxmuellera *(Monocotyledons),* normally used for broom-making, was abundant, but since the pre-construction phase, its numbers were very limited. Collected data also revealed that Bitter-bush *(Adriana quadripartite)* was present all over the study area, but the project construction had caused it to be seen no more, though some people started seeing it in other areas within the study area. Giving a more comprehensive idea, Participant 8 stated that the Spotted-necked otter *(Hydrictis mecurlicollis)* was seen more often in the village, and the participant thought that the sound of the machinery was the main cause of the animals vanishing or relocating, as they were no longer seen in the study area.

Collected data revealed that the development of Metolong Project had caused water to be enclosed within the reservoir. Two participants stated that the enclosure of water had caused flow in the Phuthiatsana River to be reduced, and this had impacted greatly on the aquaculture facility that used to function in the river. Nevertheless, Participant 19 stated that enclosed water in the Metolong Reservoir had resulted in new species being reared, including Rainbow trout (*Oncorrhynchus mykiss*). Participant 19 added that the enclosed water within the reservoir had caused the aquaculture facility to be possible for the Project Authority only, while disadvantaging the community that used to work it on a daily basis in the Phuthiatsana River.

Four participants stated that the enclosure of water had also caused sand extraction in the Phuthiatsana River to be a 'mission impossible', as the community used to extract it on a daily basis. Adding to the preceding stance, Participant 6 gave a more comprehensive idea, and stated that people were now travelling a longer distance to carry out sand extraction, whereas the community used to obtain it 5-7km downstream of the Metolong Dam wall. Giving the functions of sand extracted, Participant 4 stated that it was used for building and plastering. On the same notion, Participant 10 stated that sand was fetched by men, using animals, by women, on their heads, and in other instances it was fetched by trucks.

Section 6: Added information

Question 20: Asked participants if there is any information they are willing to add.

Collected data revealed that, from pre-construction activities, the project had caused noise and air pollution that were unbearable to the community round about. Participant 3 stated that noise was so high that they could not bear it, for it was for the first time they were exposed to this level of noise. Participant 15 stated that much of the noise came from blasting in quarry extraction at Liphiring River, near the road to Ha Makotoko which crosses the Phuthiatsana River on the southern side. The same participant stated that noise pollution in this area was accompanied by dust pollution from heavy vehicles (Figure 6.6).

Figure 6.6: A large truck transporting pipes.

Source: SSI Engineers and Environmental Consultants, 2009:77.

Furthermore, Participant 23 gave the information that pipelines installed several kilometers from Ha Motsoeneng to Ha Seeiso near the tarred road at Ha Nchela village and Phuthiatsana River, to divert water to areas of Maseru, Teyateyaneng, Roma and the airport at Moshoeshoe II, had caused sheet erosion. Collected data revealed that the ocurrence of sheet erosion was due to the removal of vegetation. Chakela and Stocking (1988:181) stated that Lesotho has the highest rate of erosion taking place, compared with the rest of Southern and Central Africa. The researcher's team, during fieldwork, observed terrain that was affected, resulting in dongas forming, as shown in Figure 6.7:

Figure 6.7: Eroded area near the road at Ha Motsoeneng to Ha Seeiso.

Source: Own. (Fieldwork, 2016)

Gathered data also revealed that local individuals who were resettled had suffered psychological and cultural losses. Kotelo-Molaoa (2007:133) states that people uprooted from their ancestral land and resettled elsewhere, suffer physical, psychological and emotional problems, particularly the elderly, women and children. Gathered data showed that resettled locals had lost access to their ancestral grounds which were regarded as sacred in the northern part of the Metolong area, for the larger Metolong Reservoir Storage had inundated seven graves. Braun (2005:29) posited that, in most cases, host-settler conflicts occur in some villages, particularly over the allocation of burial space areas.

Participant 38 stated that the Basotho, and most Africans, have a high regard and reverence for their ancestors, as they are seen as intermediaries to the Supreme Being that takes part

in the affairs of their living families. The participant added that ancestors are regarded as living in the invisible world of the dead. Rakotsoane (2001:128-129) stated that the family land is the ancestors' property, that should be consulted when land is left or let out to other people. From the point of view of Radzilani (2010:33), in African culture the ancestors are believed to be the mediators between God and the living. They are also believed to be overlooking and taking care of the living (Mbiti, 1975:120).

Concurring with the preceding stance, Participant 33 stated that it was true that the project negotiated with the family of the deceased, to reach an agreement on exhumation and reburial. Although negotiations were accepted, the participant added that the deceased were divorced from their ancestors, and were forced to be placed onto foreign ancestral spirits in the new resettlements, without rituals being performed in accordance with the applicable culture.

During exhumation and reburial, Participant 38 stated that people were supplied with the caskets, and new graves were dug. Nevertheless, Participant 38 added that locals regarded this as a token which was culturally unconvincing and not substantive. Minority Rights Group International (2012:3) reports that reburying disturbed people's spiritual world which they regard as a source of blessings in life, thereby jeopardising their future, deteriorated cultural family structures and village unity.

6.4. Summary

In this chapter the findings of the study were presented and discussed. The findings confirmed that the project of Metolong had benefitted the people in the study area for they had reaped components that are socio-economic and environmental. Nevertheless, the community of the study area encountered negative environmental impacts from Metolong Projects. Chapter 7 consists of a discussion of the findings of the study and recommendations are made based on the empirical evidence obtained in the study.

CHAPTER 7

SUMMARY, CONCLUSION, RECOMMENDATIONS AND A NEW MODEL

7.1. Introduction

Chapter 6 dealt with the empirical analysis and discussion of the study. The main purpose of the discussion in Chapter 6 was to search for the broader meaning of the research findings. Chapter 7 provides a summary of the findings, conclusions and recommendations of the study, based on the data presented and interpreted in a previous chapter. The study further suggests future research that could help in elucidating some of the questions that remain. The summary and conclusions are presented in relation to the research objective, research questions and problem statement of the study, in order to determine whether they have been achieved during the study.

7.2. Methodology and instruments validation criteria

In this study, grounded theory within a qualitative research paradigm enhanced validity and reliability in the sense that the conducted research and the practical world of the participants were incorporated, and were not disentangled from each other. In a quantitative research study, researchers put into consideration the reliability, objectivity and validity as a means of ensuring the trustworthiness of the study. In Chapter 5 it was stated that qualitative research methodology was used to answer the research questions and attain the objective stated in Chapter 1.

Data collection strategy, included grounded theory within a qualitative research paradigm was adopted, with different measures, to ensure the validity and reliability of the study. Measures that the researcher's team considered include dependability, credibility and transferability as trustworthiness criteria for a qualitative investigation. Different methods

were employed to ensure the rigour of the inquiry. In this study, credibility, transferability, dependability and confirmability were put into consideration, to ensure the trustworthiness of the inquiry and ensure the integrity of the findings of the study. Credibility in this study was enhanced in various ways, as actions that were taken by the researcher's team during the research processes. The following sub-sections show all that had been undertaken.

7.2.1. Prolonged engagement

Prolonged engagement with the participants in this study area was enhanced when the researcher's team sent the permission letters to the designed area, and stayed the whole day with the participants. Secondly, the researcher's team had prolonged engagement with the participants when piloting the interviews, prior to the real interviews. Thirdly, prolonged engagement was enhanced during the introduction day between the participants and the researcher's team. Lastly, prolonged engagement was enhanced during the semi-structured interviews that took place between October and December, 2016.

During prolonged engagement, the researcher's team started to know more about the participants as they interacted, and, vice versa, the participants started to know more about the study. The researcher's team had informal discussions with individual participants by explaining the purpose of the study, the limitations of the study, the ethical issues that guided the study, and how the investigation did not have any relation with Metolong Project. These informal conversations helped to ease the tension of the participants, with regard to Metolong Project.

7.2.2. Persistent observation

The researcher's team enhanced persistent observation in all research steps, from the beginning of the study all the way to the end of the study. Persistent observation in this study helped the researcher's team to understand the participants' worldview. The team did

this in order to have in-depth knowledge of the study, as well as understand participants' prevalent qualities and unusual characteristics.

7.2.3. Triangulation

The study used methodological triangulation to reduce the systematic bias and to cross-examine the integrity of participants' responses. The use of different techniques in this study (document analysis, semi-structured interviews and fieldwork) brought different perceptions into the inquiry, helped to strengthen the integrity of the findings, and enhanced the quality of the data from different sources.

7.2.4. Referential adequacy

Referential adequacy in this study was enhanced through keeping the electronic records used (tape recorder) and non-electronic records (field notes and documentary materials) during the whole research project. The researcher kept these materials in order to reflect on them, so as to make tentative interpretations. These records helped to cross-check the data.

7.2.5. Member checking

A member check was used to improve the quality of data in this study, as it is the heart of credibility. In this study, when data was analysed and interpreted, the researcher's team included the voices of the participants. The reason for doing a member check was to control the bias of the researcher's team during the analysis and interpretation of the results. This means that whatever the researcher interpreted should be the participants' viewpoints, and if they felt resentment about interpreted data, they should suggest changes. Moreover, in this study, member checks were done to ensure that all data had no internal conflict, and analysis and interpretation were carried out against documents that were used

during data collection. Lastly, a member check was used before final production of the findings.

7.2.6. Transferability

Transferability in this study was enhanced by providing detailed descriptions of all the research steps that were followed to create a foundation for collected data to be transferred to other settings with other participants.

7.2.7. Dependability

Dependability was enhanced through auditing, to stabilise the findings over time. For the researcher's team to conduct an audit trail, the team made available documents containing raw data, data from interviews, observational notes and documents used for cross-checking the inquiry process. This audit trial also helped to establish confirmability of the study.

7.2.8. Confirmability

Confirmability in this study was enhanced in such a way that all the data gathered and interpreted, and the findings, were not figments of the researcher's team's imagination, but derived from the data. Confirmability was also achieved through an audit trail, triangulation and referential adequacy, as stated above.

7.3. Research findings

Results of the study showed that men were more available than women during the interviews. Table 6.2 made this point clear as well. The gender difference in this study was attributed to two factors. Firstly, gender division within Basotho culture determines that men and women should take part in social activities in their different walk of life. Men

were more approachable and easier to talk to, as they were found in groups in the different walk of life. In this study, the researcher's team was composed of young males who were approachable. The second factor relates to the timing of the study when data was collected. The study was conducted after the ploughing season (October to December, 2016) – which is mainly a male task.

Analysed data in 6.3-Section 2 shows that, some participants had lived in the study area their entire lives, and some more than 40 years, while few had lived there for many previous years. Subsequently, the results showed that some of the participants had lived in the study area for less than 25 years and were all women who had moved to their husbands' homes or areas after marriage. Participants below the age of 18 years were purposely excluded, for they were deemed too young.

The names of the participants were given in the interview schedules that were conducted at the designated study area. The results showed that the researcher had seen to it that the participants' identities were not disclosed, and, rather, were coded. Adding to the personal data of the participants, the results revealed that the majority of the participants' ages were between 36 and 45 years, while the minority were between 26 and 35 years of age. This was also confirmed by data discussed in the previous chapter.

Moreover, among the other factors that were mentioned was the educational level of the participants. Results showed that all the participants knew how to read and write, as some had managed to go further than primary school, completed secondary school, and completed at least two years of university.

Socio-economic and environmental benefits were reaped at the study area 6.3-Section 5. The benefits were promised during the public consultations, and they became a reality and were fruitful. Discontent was seen, when two participants stated:

> "Before the dam's construction there were places that were accessible only by tarred rough roads and footpaths. The conditions of these roads were not pleasant whenever it rains for the roads were muddy and potholed."

In addition, results showed that satisfaction was also seen when one participant stated:

> "The branch access road from Nazareth to Ha Nqheku had helped people's mobility and allows people to travel easier and quicker".

The roads constructed in the designated study area were beneficial to the area, as were those that were constructed in the LHWP. In the same notion, results showed that a bridge was constructed in the study area (Figure 6.2), and it enhanced a quick catch of transport to nearby places. The bridge was not a solution as planned, for people are now going a longer distance just to come to a nearby place to attend funerals, their fields, cross their animals, for example. This was confirmed in the semi-structured interviews. The barrier caused by the bridge in the study area typifies the situation that occurred at the Yacyreta Dam in Argentina.

Results showed that police stations were refurbished in the study area. The walls, roofs, chimney and floors, etc. were changed. This was confirmed by two participants, respectively:

> "The walls and the floor of Sefikeng Police Stations were cracked but were renovated; the chimney, rafters and sheests were refurbished."

On the other hand, employment was created in various forms for both skilled and unskilled labourers in the study area. The previous chapter showed that employment created had caused migrants from all the districts of Lesotho to move to the study area. Subsequently, one participant perceived the following:

> "A striking number of migrant workers brought up the increasing HIV in the community which was seen where the migrant labourers were in relationship with teenagers."

The same situation occurred during the Lesotho Highland Water Project, as had occurred in the construction of Katse Dam. Extra-marital affairs between local female residents and construction workers at Katse Dam became all too common, whereby young schoolgirls were bribed to engage in sexual relations with men working on the dam, and HIV/AIDS infection rates skyrocketed in the construction area.

The results also indicated that people were relocated. Individuals who were resettled were reported as having suffered psychological and cultural losses, for they had lost access to their ancestral grounds that were regarded as sacred in the northern part of the Metolong area, for larger Metolong Reservoir storage was set up there. In the same vein, the results revealed that these people had also lost strong ties to their home – which was the reason they were suffering. 57,000 people both in Zimbabwe and Zambia were displaced, which in turn led to the breakdown of kinship ties among the Gwembe Tonga people.

Still on cultural losses, results indicated that the Basotho, and most Africans, have a high regard and reverence for their ancestors. The ancestors are seen as intermediaries to the Supreme Being to take part and interest in the affairs of their living families. The results also revealed that the ancestors are regarded to be living in the invisible world of the dead. Semi-structured interviews confirmed that Metolong project had negotiated with the family of the deceased, to reach an agreement on exhumation and reburial. Participants felt discontent concerning this, as rituals were not performed in accordance with the applicable

culture. This was confirmed in the semi-structured interviews; however, the results showed that caskets were supplied after new graves were dug for reburial.

Adding to the preceding stance, some of the relocated people had lost their properties, as the project had to acquire their land. This was clear from Section 6.3. In addition, results showed that some of the community members were not compensated until the day the interviews were held. Those, to whom compensation was given, managed to build rental houses that the staff of Metolong project had acquired for houses, as the project was not adequate for the whole staff. In Nangbeto in Togo/Benin villagers were compensated in monetary terms for the loss of property such as granaries, kitchens and trees. Nevertheless, the results showed that, before the project women would go to the mine workers where they would be given money after washing clothes, but now some own rental houses and that is the history.

The result showed that the visitors' centre was constructed north of the dam wall, due to the emergence of Metolong project. The project is not exceptional in the construction of buildings essential to the local community, in the development of Mohale Dam, a commercial centre were built that benefitted the community. Satisfaction was shown, from results, that the visitors' centre was roofed with locally available materials.

Results also revealed that the study area had no electricity before the establishment of Metolong project. This was confirmed by the semi-structured interviews. It was stated during the interviews that it was expensive to connect it. Results showed that electricity within the constituency was brought by the emergence of Metolong project. Section 6.3 confirmed that it is cheaper and easier for the community to connect electricity nowadays. In Aswan Dam in Egypt, Kom Ombo people were able to connect electricity in a cheaper way due to the establishment of the project. In addition, the previous chapter showed that participants were satisfied and happy with electricity provision, as their means of livelihood

was improved because they were now using new apparatus which makes the means of heating, lighting and cooking easier.

Individual standpipes were obtained in the study area. After the Aswan Dam was constructed, villagers obtained piped water. Availability of individual standpipes was confirmed in the semi-structured interviews. In the study village, ventilated pit latrines were provided by Metolong project. These helped a lot, as the community was using the bush or/and open field for sanitation purposes before the emergence of the project. The semi-structured interviews made this point clear as well. Results showed that ventilated pit latrines provided by Metolong Project are in good condition, efficient, and non-offensive to the people and the environment.

Results showed, in the study that is there are many clinics built by the project. The villagers walk 5-6km to reach them. New clinics were built in Nangbeto Project Scheme, but the clinics ran short of staff and drugs.

The results revealed that ‘primary, secondary and high schools are avilable in the study area’. Various school levels were developed in the Lesotho Highlands Water Project in the construction of Mohale Dam. The results further showed that only one high school used to exist in the study area, and it had problems when learners were applying, as once it was full, they had to search for nearby schools at the nearest villages. Participants were not happy with the situation, because if their children were not admitted, they had to travel 15km and, correspondingly, the same distance back to the village.

On negative environmental impacts on the study area, participants perceived that the livelihood means of the community were lowered. Section 6.3 and Table 6.5 confirmed livelihoods means in which the community of the study were engaged. The results showed

that both resettled and non-resettled people were affected. This was confirmed in the semi-structured interviews, as follows:

> During the preliminary construction, trees such as Peach trees (Prunus Persica), Gum trees (Eucalyptus), Pine (Genus Pinus), Apple trees (Malus Pumila), Willow trees (Genus Salix), Apricot trees (Prunus Armeniaca) and Poplar trees (Populus) were uprooted and depleted.

Bujagali hydropower dam in Uganda had effects on the local livelihoods, as the dam's construction had affected assets the livelihoods depended on. Discontent about lowered means of resident's livelihood was seen where participants stated that 'the project had not improved our livelihood means'. The results confirmed this, as 57% of the study participants felt their lives and livelihood means were not improved, while 43% stated that their lives had improved. The 57% stated 'not improved', because they were making a living out of their fields, selling fruits grown on trees, and grazing animals in the range. In a similar manner, results showed that households were resettled, as the project needed to construct transmission pipelines, land for a quarry site, a substation and its yard, roads to the dam's wall, water treatment plant, drying beds, operation offices and pump station. In Kainji, people were resettled, but basic services were available to them in their new settlements.

Results showed that the project had effects on the weather of the study area. The semi-structured interviews made this point clear as well. In Moscow, the Rybinsk Reservoir had caused changes in the local weather, where the frost-free period was extended by 5 to 15 days per year.

Results also showed that, when land was cleared for the way to the dam, to the dam wall and to the reservoir, habitats were degraded, and presence of fire in some areas was visible. Esxtensive clearing for large dam development removes the natural retardance, resulting in reduced surface roughness, high runoff volumes, modification, and loss of natural

vegetation. The results also showed that reptiles were killed by project developers once they were in contact with them. Their numbers were perceived to decrease. In addition, baboon, spotted-necked otter, and mammals such as Cape hare and Small grey mongoose were also affected. The results also revealed that grasses such as Red grass, Wood grass, Bitter root, Thatch grass, Merxmuellera and Bitter bush were depleted.

The establishment of Metolong Project and the enclosure of water from the reservoir had caused flow in the Phuthiatsana River to decrease. Semi-structured interviews confirmed this:

> "enclosure of water in the reservoir had negative impacts on the aquaculture facility that used to take place in the river by the community members."

Sand extraction in Phuthiatsana River also became a 'mission impossible' for the community who used to extract sand on a daily basis. Without sand there can be no buildings, no glass, no electric chips and no ceramics, while, in its extreme, there will be no sandy beaches, no rivers and perhaps no oceans. Semi-structured interviews confirmed that sand extraction was used for building and plastering, and was fetched by men, using animals, or by women, on their heads, while sometimes it was fetched by trucks. Discontent about sand extraction was seen when participants reported that–'the community now had to travel 5-7km downstream of Metolong dam's wall to extract it'.

On information added by the participants, results showed that, from pre-construction activities, Metolong project had caused noise and air pollution that were unbearable to the community round about. Environmental noise, as with other forms of pollution, has a wide range of adverse health, social and economic effects. In addition, the results showed that noise pollution came from blasting in quarry extraction, while dust pollution came from heavy vehicles passing by. The semi-structured interviews confirmed these points.

Results showed that sheet erosion had occurred in the study area, due to pipelines that were installed near the tarred road at Ha Nchela village and Phuthiatsana River. These pipelines had caused removal of vegetation, which is why sheet erosion had occurred. This was also confirmed by semi-structured interviews. 1,848,000 hectares of land in all agro-ecological regions in Zimbabwe have eroded, and an average of 76 tonnes of soil is lost per hectare.

7.4. Participants perception of Metolong socio-environmental impacts

The study area participants perceived the socio-environmental impacts being both negative and positive. Perceived positive socio-environmental impacts had improved few community lives and they had discontent regarding this belief on the improvement of the community well-being in general, for their perceptions were:

- **Poor education level**: A school built uses subtle way to prevent learners from attending. One way in which a school prevented participants from accessing higher level of education is through charging expensive school fees. School fees increase annually. Many are unable to access higher level education due to fees for they are orphans. Although the government of Lesotho, through the Ministry of Education, is making an effort to pay for orphans through *social welfare* it seems as if many orphans do not further their studies because of fees.

- **Alcoholism in a community around Metolong dam**: Alcoholism is largely a result of frustration due to an accumulation of factors but most important unemployment; as the unemployed are idle and resort to drinking as a hobby and as a means to help divert their attention from the challenges of everyday life. A majority of Basotho women, especially in the rural areas resort to either brewing traditional beer or sell other alcohol to earn a living and so alcohol is always abundantly available in the villages.

- **Knowledge about Metolong construction**: Many knew about the project but, the effectiveness of participation was largely impended by cultural constraints, dominated by the patriarchal structures on the land and decision-making. Nothing

was done to change women and children status quo. The power imbalances were therefore not addressed.

- **Livelihood means of the community**: The livelihood means of the community around Metolong dam deteriorated for compensation policy was not honoured by project developers. The money was inadequate and short-lives as opposed to long-term such as land. Compensation lacks transparency mainy due to little or no public participation in project; represents lack of open, unhidden agenda and sustainable processes towards the end, which are attributes of effective community participation. The food community produced has lessened; the compensation food and money are insufficient and unsustainable and to crown it all, the compensation money cannot be guaranteed that it will purchase the grain to substitute the forgone harvest due to the project.

- **Impacts of Metolong project**: Socio-environmental impacts were evaluated that are both positive and negative. The project had the greatest strength of economic advantage it has brought to Lesotho. This is a subject of further study. The weakness of the project lies in the managerial or admnistractive aspects for bountiful promises were not fulfiled. The loss of life-support resources of arable and pastoral land together with other dependable resources has resulted in reduced income and livelihood and has greatly harnessed the affected community.

- **Impacts on plants and animals**: It has been noted that affected communities find themselves unable to grow other types of crops especially wheat, beans, peas and maize. Lack of wheat straw coupled with loss of bamboo reeds and thatching grass in the inundated valleys has made house thatching increasingly difficult to accomplish. There is no solution given to this problem.

- **Other issues:** Some issues have not been addressed at all, for example cultural damage, loss of livestock and loss of building sand. Others had been partially dealt with for example livestock fodder and planting of trees whilst community projects are just being given a blind eye.

- **Weather and climate:** Few or none of the participants have proceeded till post-tertiary level. The level of education of the participants versus overall dynamic on climate is complex for dynamics are much less well understood. Participant's level did not provide enough information on change in rainfall, impacts of the project on temperature change evapotranspiration and reservoir evaporation.

7.5. Conclusion of the research findings

The study aimed to investigate the perception of the community on the socio-environmental impacts of Metolong dam and reservoir in the Kingdom of Lesotho. The main research questions (Section 1.6) were as follows:

- What are the positive perception of the community on the socio-environmental benefits of Metolong Dam and reservoir?
- What are the negative perception of the community on environmental impacts of Metolong Dam and reservoir?

In the problem statement of this research study (Section 1.5), it was depicted that large dams are constructed at an alarming rate at this time in this century, as nations are trying to develop people's lives. In the process, benefits and disadvantages are both brought to the communities where they are constructed. This is why there are debates nowadays about large dam impacts. Based on the objective of the study, the researcher intended to conduct an audit to evaluate the accuracy of the initial Environmental Impact Assessment (EIA) by comparing actual to predicted impacts. The audit undertaken for the study was a follow-up on socio-environmental impacts that occurred in the construction and operational phases of Metolong dam and reservoir. The researcher attempted, in this direction, to close the gap which appears not to have been addressed by the Government of Lesotho, Department of Water Affairs, Lowlands Water Supply Unit (2008).

When comparing actual to predicted impacts, the study found that the project of Metolong benefitted the people in the study area, for they had reaped components that are socio-economic and environmental. This is the new and important finding, for it will contribute to the pool of knowledge. Findings show that the community were happy with the benefits, but were not happy with the project, for they were not incorporated fully in the construction processes, and only considered as labourers. In addition, the study found that, the community of the study area encountered negative environmental impacts from Metolong Project. This is also an important finding, as it will contribute to the pool of knowledge. Regarding the objective of the study, research questions and statement of the problem, the study had achieved all.

7.6. Grounded theory methodology

The qualitative research paradigm was used in this study. Use of the qualitative paradigm in this study was ideally suited for the investigation at hand. Through the qualitative research paradigm used in this study, the researcher let the data suggest a theory, so called grounded theory generation. Grounded theory helped the researcher to discover a model (Local Community Based Project Execution and Observation Model (LCBPEOT) from the data obtained and analysed. This is because the researcher was looking for emergent knowledge, rather than 'tightly prefigured' ideas. Methodology was linked to a model and data more thoroughly. Methodology was also improved by overemphasis of description into what was seen as a more useful realm of the model, and making it more rigorous. The researcher tried to be open as possible in apprehending the data, remained unbiased by the model, and was faithful to the data. The researcher also insisted on shunning preconceptions, and relied upon an inductive process of generating a model from data.

Through grounded theory, the researcher made a close examination and analysis of the data, for the purpose of inductive building up of meaning. Meaning was grounded in the data, emerging from the data through one inductive process of analysis and interpretations. A new model, LCBPEOT, is described in the next section, as it fits data, and works practically for

the research, as it was generated during research, not before, nor after, but through a process of ongoing examination, re-examination and tentative theorising.

7.7. A new proposed model

From the findings of this study, local affected people from the study area were not incorporated in management and supervision of Metolong Project. They were engaged as labourers only. It is from this perspective, therefore, that a new model – LCBPEOT – was developed. The model was developed from sampling, data collection and analysis, and was linked to, and grounded in, the data, for it was not deduced from logical assumptions, speculations and common sense. This model will incorporate local affected communities in the management processes of all projects within the community.

The community task will be the enhancement of the resource management, environmental protection, habitat restoration and preservation of the environment, when large dams are constructed. Most models researched previously had mobilised people as labourers, rather than empowering them to make decisions. An example is the Natural Resource Management (NRM) in Lesotho. In the same vein, several research studies were conducted prior to this research study on projects resource management. These were conducted by Ostrom (1990), Comaroff and Comaroff (2012), Agrawal (2001), Boudreaux and Nelson (2011) and German and Keeler (2010). In previous five researchers' studies, it was observed by Measham and Lumbasi (2013:649) that the governments and projects stakeholders had failed to incorporate local communities. They were reluctant to devolve powers to the communities.

These previous pieces of research conducted were against what is stated in Section 3.3.4 on the Universal Declaration of Human Rights of 1948 that advocates for local communities to be integrated in planning, implementation and decision-making. The LCBPEOT proposed

is structured in Figure 7.1, regarding the management, supervision of large dam development and run by the local community.

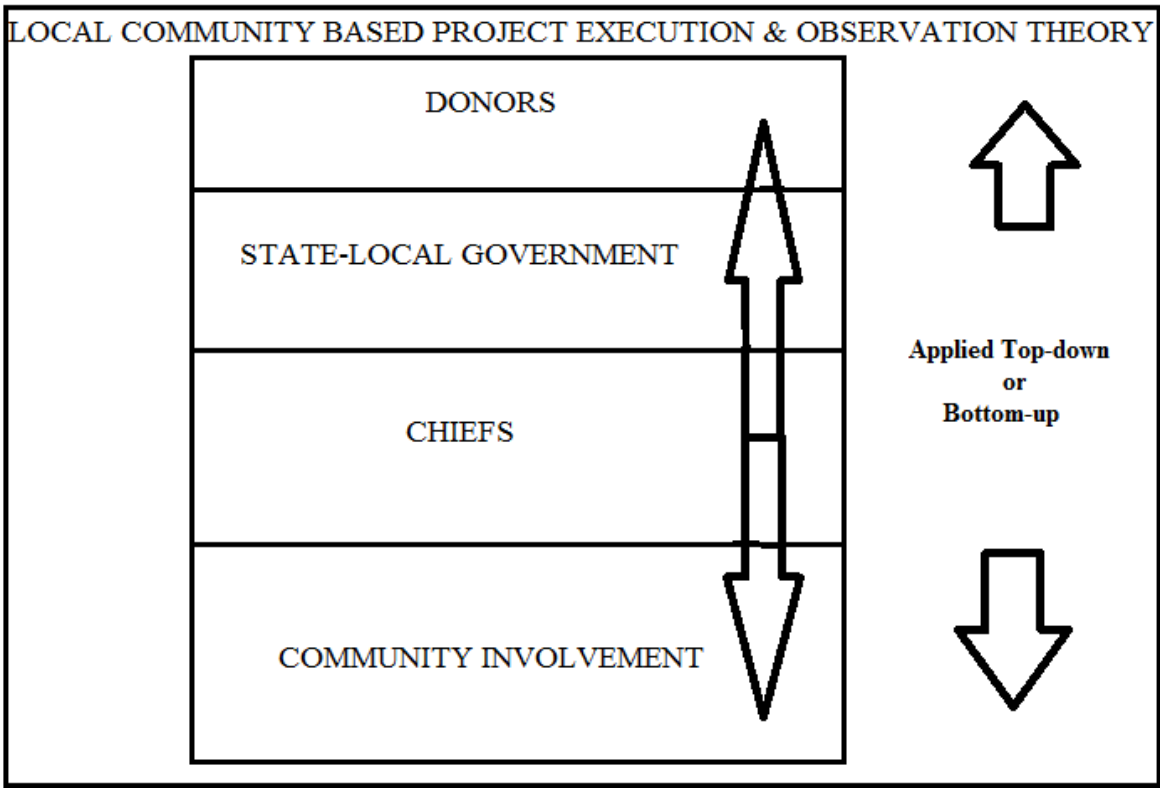

Figure 7.1: Flow chart of Local Community Based Project Execution and Observation Model.

Source: Own.

People closest to the projects have better knowledge on how to manage them sustainably. The proposed theory stems from Common Property Management Theory (CPMT) which promotes resource ownership, control and use by local communities. Sebele (2010:137) posits Zimbabwe as being the pioneer in applying the theory, followed by Namibia. Nevertheless, this theory in these countries lacked devolving power to the local community.

The LCBPEOT model will function in a top-down or bottom-up structure (Figure 7.1). The donors will provide aid, and the state will be the project proprietor. The traditional political forms and institutions–Chiefs/Traditional leaders will be in charge of the projects. The proposed model will give local community the power to plan large dam projects as a means of minimising the socio-environmental impacts of large dams. Having knowledge of the fact that R11 billion was budgeted in 1996 for the development of the LHWP, 22 years later collected data from Ha Seeiso village, Maseru showed that 92% of the participants have only primary and secondary education. Funds from LHWP didnot eradicate poverty in Lesotho for R11 billion was managed only by the corrupt Chief Executive who lacks effective communication and involvement of local community. Once participation is denied, humanity is left drifting, open to the terror at the meaningful and contigency of being.

Local community main role within the LCBPEOT model is to cooperate with the state, by monitoring the project processes and evaluating its implementation, in order to check whether the projects are indeed being carried out as planned, to achieve its objectives. The local community should be empowered to manage projects and resources without permanently damaging, depleting and degradation to the environment. In other words, the community will assist in a joint management with state authorities.

Adding to the preceding stance, through the proposed model, local communities will have power to adjust the project implementation systems and make changes where there is a need to do so as the project progresses. They can make decisions about their usage and access, in order to manage and conserve the environment, based on their own social and economic interests. It is here that they will design rules and procedures to manage the projects. With the implementation of the proposed model, local communities should be supported by technical, economic and socio-economic development experts when running the project. The proposed model will incorporate the experts to implement what is contained in Section 3.3.5 on the Curitiba Declaration of 1997. The model the researcher

proposes will be very useful in eradicating poverty, but still ensuring that the natural environment is not destroyed.

7.8. New model and its aid in the future

The LCBPEOT model proposed will be applicable to other settings where large dams are constructed. In this study, a new proposed model will account for much of the relevant impacts, and not provide a perfect description of an area. Subsequently, the model covers issues essential to minimise socio-environmental impacts of large dams, which will be beneficial to future research or suggestive for further research.

7.9. Recommendations

The recommendations contained herein are intended to ensure that, when large dams are constructed in future, developers should think constructively and provide a clear articulated plan of action in order to have satisfying outcomes. For this to happen, recommendations are provided, based on the conclusions drawn from the findings that address the study objective, problem statement and each of the research questions.

7.9.1. Recommendation 1

Based on the conclusions reached from the findings, the study recommends that when large dams are constructed, local villages should not be given promises that are dressed with many enticing commitments. The reason is that, communities never asked for the project, but it is set forth authoritatively as obligatory upon them. More so, project authorities should hire competent people that will handle project issues well, in a transparent way, as agreed before the project commenced. These people have to fulfil promises made to be realistic and achievable, and honour affected people so as to win the trust of the community, and gain reliability from them. In the same vein, these people should increase their efforts to fulfil promises made. Not only that, these people should have respect,

compassion, care and dedication when dealing with affected people. In summation, these people should have time to listen to the people's complaints and views, as their properties were affected and lost.

7.9.2. Recommendation 2

Large dam projects should not be implemented for political reasons. They should be well thought out, in terms of careful planning and analysis, so that identification and evaluation of negative environmental impacts are well articulated, with necessary action plans to mitigate them. In this study, many negative environmental impacts were perceived to have occurred. As a result, the following recommendations are given: More crossing points over the Phuthiatsana River should be constructed, so that villagers can cross whenever they are willing to do so. In the same notion, a revision should be made of the compensation method. The study recommends 'land-for-land compensation,' to maintain people's livelihood means, although arable land in Lesotho is continuously shrinking, making this option quite difficult.

7.10. Production of an article

The findings, conclusions and recommendations suggested will assist the researcher in producing an article.

7.11. Suggestions for future research

On the basis of the analysed and interpreted data, the results, findings and the conclusions in this study, the study did not research negative socio-economic impacts emanating from the construction of Metolong dam and reservoir. It is recommended that a follow-up on negative socio-economic impacts be made concerning planning and design, and both the construction and operational phases of Metolong dam and reservoir. It is also

recommended that studies be more in-depth on some of the perceived ideas given in the empirical data, such as the changes in the weather of the study area.

7.12. Summary

It became evident that the project of Metolong had benefitted the people in the study area for they reaped components that are socio-economic and environmental. The viewpoint regarding the socio-economic and environmental components was affirmed by the data collected, analysed and interpreted. It is subsequently concluded that the community livelihoods were improved. It appeared that the community of the study area affirmed that they encountered negative environmental impacts from Metolong dam. In this regard, the people were unhappy regarding the project for their livelihoods means were lowered.

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Appendix A: Questions for participants at Ha Seeiso village

Section 1: Personal details

Q1. Name of the participant (optional).....

Q2. Range of age of the participant.....

Q3. Gender 1-[ ] Male

2-[ ] Female

Q4 (a) Have participants received any formal education?

1-[ ] Yes

2-[ ] No

Q5 (b) If the answer to (4a) is yes, what is the highest level of education you have received?

1. Primary [ ]
2. Lower secondary Forms (Form 1-III) [ ]
3. Senior secondary school (Form IV-V) [ ]
4. Post secondary e.g Diploma, Degree, Honours, Masters etc [ ]

Q6 (c) If the answer to (4a) is no, do you know how to read and write?

1-[ ] Yes

2-[ ] No

Section 2: Time lived in the study area

Q7 How long have you lived in this area?

1. Less than 10 years [ ]

2. Between 11-20 years [ ]

3. Over 21 years [ ]

4. Came after marriage [ ]

5. Entire years [ ]

Section 3: Knowledge about Metolong construction

Q8 (a) Were participants aware of Metolong project?

(b) Were participants informed about the upcoming of the Metolong project?

1-[ ] Yes

2-[ ] No

(c) If yes, how were they informed?

Q9 Were the community around Metolong dam having any role to play in the project?

Q10 (a) When did the construction of Metolong Dam and Reservoir begin?

(b) When is the project expected to be completed?

Q11. Which areas are to be supplied by the project?

Section 4: Livelihood of the participants

Q12 (a) Are participants having any means of livelihood?

1-[ ] Yes

2-[ ] No

(b) If yes, mention the livelihood means.

Q13. Are participants aware of the negative impacts of Metolong dam on the livelihood of the community? If yes, explain.

Q14. Are participants aware of people who have lost their properties due to Metolong project? If yes, explain.

Q15 Were people who have lost their properties, deteriorated and lowered livelihood means compensated?

Section 5: Impacts of Metolong project

Q16. Are there socio-economic and environmental benefits reaped by the community of Ha Seeiso from the construction of the Metolong Dam and Reservoir? If yes, explain.

Q17 (a) Before the project could commence, were there people who were resettled?

(b) If yes, how many and what were the reasons for their resettlement?

(c) To which areas were they resettled?

Q18 Did the construction of Metolong Dam and Reservoir have any impacts on the weather of the study area? Explain, if 'yes'.

Q19 Did the construction of Metolong Dam and Reservoir have any impacts on plants and animals of the study area? If yes, explain.

1-[ ] Yes

2-[ ] No

Q20 Did the construction of Metolong Dam and Reservoir have any impacts on the flow of Phuthiatsana River? If yes, explain.

Section 6: Additional information

Q21 Is there any information participants are willing to add?

Thank you for your time

Appendix B: An introductory letter from the supervisor

Prof W.A.J. Nel
Chair of Department
Department of Environmental Sciences
University of South Africa
FLORIDA, Roodepoort
1710

25 August 2016

Ha Seeiso Village
P/Bag 9137
The Maseru District
Lesotho

REQUEST FOR PERMISSION TO UNDERTAKE RESEARCH WITHIN THE HA SEEISO VILLAGE

Dear Sir/Madam

My name is Professor WAJ Nel a research supervisor to Mr Sekamane Thabang, student number 44944977. Mr Sekamane is a registered Doctorate student in the subject field of Environmental Management with the University of South Africa (UNISA).

In his proposed research he plans to explore the topic: **"The Environmental impacts in construction of Metolong dam and reservoir"**.

On behalf of the University, I wish to submit this request to Ha Seeiso Village in the Kingdom of Lesotho to assist Mr Sekamane to conduct this study by granting him permission to collect data. We hope the village will be able to contribute positively in assisting the University of South Africa to help Mr Sekamane to complete his research.

Yours sincerely

Prof. WAJ Nel (Supervisor)
Department of Environmental Sciences
College of Agriculture and Environmental Sciences
University of South Africa
(Tel): +27-114712324
Email: nelwaj@unisa.ac.za

UNISA
Departmental Secretary
Department of Environmental Sciences
2016 -08- 25
Signature: .....

i

UNISA university of south africa

Appendix C: Ethical clearance letter from UNISA

CAES RESEARCH ETHICS REVIEW COMMITTEE

National Health Research Ethics Council Registration no: REC-170616-051

Date: 25/11/2016

Ref #: **2016/CAES/135**
Name of applicant: **Mr T Sekamane**
Student #: **44944977**

Dear Mr Sekamane,

Decision: Ethics Approval

Proposal: An exploration of the environmental impacts of Metolong Dam reservoir in Lesotho

Supervisor: Prof WAJ Nel

Qualification: Postgraduate degree

Thank you for the application for research ethics clearance by the CAES Research Ethics Review Committee for the above mentioned research. Approval is granted for the project.

Please note that the approval is valid for a one year period only. After one year the researcher is required to submit a progress report, upon which the ethics clearance may be renewed for another year.

Due date for progress report: 30 November 2017

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the CAES Research Ethics Review Committee on 24 November 2016.

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should*

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa

be communicated in writing to the CAES Research Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.

3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

Note:

The reference number [top right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the CAES RERC.

Kind regards,

Signature

CAES RERC Chair: Prof EL Kempen

Signature

CAES Executive Dean: Prof MJ Linington

UNISA university of south africa

Appendix D: Clearance Certificate from the study area

RESEARCH ETHICS CLEARANCE CERTIFICATE FROM THE CHIEF OF HA SEEISO

16th September, 2016

Maqhaka
P.O. Box 3
Majara's 110
Lesotho
Email: thabangsekamane@gmail.com

Attention: **T. Sekamane +26658988097**

Dear Sir

RE: CLEARANCE LETTER TO DO PHD STUDIES: AN EXPLORATION OF ENVIRONMENTAL IMPACTS IN CONSTRUCTION OF METOLONG DAM AND RESERVOIR IN THE KINGDOM OF LESOTHO.

We acknowledge receipt of your letter dated 25th August, 2016 on the above captioned matter.

The Chief of Ha Seeiso area in Metolong has approved your request to visit villagers within the community and collect data. The period for which permission has been granted is from 20th September to 20th December, 2016. He also wishes to inform you that the study is very importatnt to the village and will be glad to share your study findings.

You are however reminded to ensure ethical considerations for the research participants throughout the project study cycle.

Thank you.

The Chief of Ha Seeiso in Metolong Area

MORENA OA BOITHATELO LE MACHACHE
2016 -09- 16
METOLONG
TLABA-BOSIU, MASERU

Appendix E: Reservoirs involved in the construction of Metolong Dam

Bethany	375m^3 steel reservoir on a concrete base and located outskirts of Bethany on open fields south west facing slope.
Boinyatso	375 m^3 on a low rounded hill north of the road to Nazareth
Boleka	375m^3 steel reservoir on a concrete base
Koali	650m^3 steel reservoir on a concrete base, located on west of tar road between Teyateyaneng and Sefikeng
Kolo	1 500m^3 rectangular concrete reservoir
Koro-Koro	375m^3 steel reservoir on a concrete base located on west of gravel road past Koro-Koro village
Koro-Koro Sump	40m^3 located in Koro-koro
Lekokoaneng	500m^3 steel reservoir on a concrete base
Makhake Booster pump station	40m^3 steel reservoir
Makhakhe	650m^3 concrete reservoir, 10m in diameter and 4m high
Makhanyeng	375m^3 steel reservoir on a concrete base, located 150m west road to Makhanyeng village
Mants'ebo Command Reservoir	5 000 m^3 circular concrete reservoir, 25m in diameter and 5.1m high, located on steep mountain slope west of Mants'ebo Town
Mants'ebo pump station	5 000 m^3 circular concrete reservoir,13m diameter and 4m high located directly east of a soccer field
Maputo	375m^3 steel reservoir on a concrete base
Matelile	650m^3 circular concrete reservoir
Matelile	75m^3 reservoir on concrete base
Matsieng	1 000m^3 circular reservoir 13m in diameter and 4m high, located on flat-topped hill within Matsieng Town
Mauteng	375m^3 steel reservoir on a concrete base, located on north westerly facing slope close to Department of Rural Water

	Supply reservoir
Mazenod Airport	5 000 m^3 located opposite the Moshoeshoe airport
Mofoka	375m^3 steel reservoir on a concrete base, located on the crest of plateau at Ha Mofoka
Mokema	375m^3 steel reservoir on a concrete base located on a north westerly trending ridge south west of Mokema village
Mokhalinyane	5 00m^3 steel reservoir on a concrete base
Morija	1 500m^3 rectangular concrete reservoir
Moruthoane	375m^3 steel reservoir on a concrete base
Motsekuoa	650m^3 circular concrete reservoir, located north west facing slope within Motsekuoa Town
Mpilo at Maseru	75 000m^3 rectangular concrete reservoir located of flat-topped hill in central Maseru near new parliament buildings.
Ntsi and Nazareth	750 m^3 located on the top of a hill on Nazareth village
Popa Ha Maama	375m^3 located directly above Popa Ha Maama Moreneng village
Ramokoatsi	375m^3 steel reservoir on a concrete base
Ramokotjo	375m^3 reservoir on a concrete base
Roma	2 000 m^3 circular concrete reservoir 18m in diameter and 4m high located near to Water Supply and Sewerage Authority concrete reservoir
Rothe	750m^3 located on north of communication tower in Rothe
Sefikeng	375m^3 steel reservoir on a concrete base, located on south westerly facing slope
Sefikeng Command Reservoir	3 000 m^3 circular concrete reservoir, 18m in diameter and 6m high, located within basalt borrow pit 800m south of Sefikeng village
Sefikeng Transfer	1 000 m^3 circular concrete reservoir, 18m diameter and 4m

Booster pump station	high, located 1.1km north east of Sefikeng
Senekane	350m^3 steel reservoir on a concrete base, located on the main road between Senekane and Maseru
Tebang	1 000m^3 circular concrete reservoir, located above Tsita's Nek Ha 'Notsi
Teyateyaneng	2 000m^3 circular concrete reservoir, 18m in diameter and 4m high, located near exiting WASA Reservoir in Teyateyaneng
Thaba-Bosiu	375m^3 located on the side of Thaba-Bosiu directly above Information Centre
Thaba-Khupa	375m^3 steel reservoir on a concrete base located on a flat narrow saddle
Tlebere	375m^3 reservoir on a concrete base
Tsa Kholo	500m^3 steel reservoir on a concrete base

Source: SSI Engineers and Environmental Consultants, 2009:129-132.

Appendix F: **Information Sheet and consent Form**

Title: The perception of the Environmental impacts of Metolong Reservoir in Lesotho.

Student research project

My name is Thabang Sekamane and I am doing research with Prof. W.A.J. Nel, a Chairperson in the Department of Environmental Management, towards the degree of PhD at the University of South Africa. We are inviting you to participate in the study entitled **'The perception of the environmental impacts of Metolong Reservoir in Lesotho'.**

The purpose of the study

The purpose of this study is to find out the Environmental impacts caused by the construction of Metolong Dam and Reservoir in the Kingdom of Lesotho in Ha Seeiso.

Invitation to the participants

The research would like to have your opinions on the environmental impacts caused by the construction of Metolong Dam, because you are adjacent to the project area; therefore, the researcher thought it will be essential to have your opinion in this regard. Permission to collect data was obtained from the Chief of Ha Seeiso prior to this meeting, and forty to fifty participants will be part of the interviews in this study.

Nature of participants in this study

The participants are expected to give out the experienced impacts, without any coercion put on them. This study involves semi-structured interviews that will be audio-taped, and will use open and closed questions such as, "Does Metolong Dam and Reservoir have negative environmental impacts or positive socio-economic impacts?" The semi-structured interviews are expected to last 30-40 minutes with each group of participants.

Withdrawal clause

Participating in this study is voluntary, and you are under no obligation to consent to participate. If you do decide to take part, you will be given the information sheet to keep, and be asked to sign a written consent form. You are free to withdraw at any time, without giving a reason.

Potential benefits of taking part in this study

The research project will benefit the participants, in the sense that the community will be able to know impacts that occurred in the village that are positive and negative. The outcome would also contribute to present and future areas where large dams are to be constructed.

Negative consequences for participating in the research study

In this study, there is no harm intended, and participants will be protected from harm.

Information obtained will be kept confidential

Participants' opinions will be viewed as strictly confidential, and only the researcher's team will have access to the information. No data publication in this research will contain any information through which participants in the interviews will be identified. Participants' answers will be given a code number, and will be referred to in this way in the data. Participants' anonymity is therefore ensured.

Researcher's protection on the security of data

Collected data will be stored in a compact disc. It will be stored for five years, through Microsoft Office. It will be used to explore impacts caused in pre-post construction of Metolong Dam and Reservoir. Future use of the stored data will be subject to further Research Ethics Review and approval, if applicable. After five years, the disc will be permanently destroyed, in order to delete the information.

Payments or incentives for participating in the study

There will be no payments, awards offered, financial or otherwise, that will be given out for participating in the study.

Ethics Approval

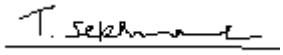
The study has received written approval from the CAES Research Ethics Review Committee – *see Appendix C.*

Findings or results of the research

Participants, if they would like to be informed of the final research findings, can contact the researcher on cell number +266 58988097. Should participants have concerns about the way in which the research has been conducted, they can contact my supervisor Prof. WA.J. Nel on +277114712324.

Thank you for taking time to read this information sheet and for participating in this study.

Thank You



Thabang Sekamane-A researcher

CONSENT TO PARTICIPATE IN THIS STUDY

I ……..… (full name) confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation. I have read (or had explained to me) and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and I'm prepared to participate in the study. I understand that my participation is voluntary and that I'm free to withdraw at any time without penalty (if applicable). I'm aware that the findings of this study will be processed into a research report and/or journal publications, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the audio-tape for the interviews. I have received a copy of this informed consent agreement.

Participant Name and Surname.....

Participant Signature .....Date.....

Researchers's Name and Surname.....

Researcher's Signature.....Date.....

Appendix G: Interview Transcripts

Semi-Structured Interviews Data

The appendix contains the transcripts of semi-structured interviews conducted with participants from Ha Seeiso village. Names of participants have been changed to protect confidentiality of them. Firstly, the researcher prefaced the interview by briefing the participants about the purpose of the interview, defining the situation for the interviews, what the researcher is doing for the research and why the researcher was interested in talking with participants. The researcher's team then introduced themselves and asks if the participants have any questions before the interviews. The following abbreviations were used as the key during the interviews:

P: Collective ideas from all participants in all groups

P1: Participant 1

P2: Participant 2, etc

P1-P10: Group 1

P11-P20: Group 2

P21-P30: Group 3

P31-P40: Group 4

Q1: Question 1

Q2: Question 2, etc

Interview transcripts with all participants started with the greetings and briefing of the participants. The set up for the interviews was at the participants homes. The sessions were agreed to last not more than 30-40 minutes.

Q1: In which range of age do you belong?

GROUP 1

P1, P3 and P9: over 56 years

P2, P6 and P10: 40-55 years

P4 and P5: 36-45 years

P7 and P8: 26-35 years

GROUP 2

P11, P14, P17 and P19: Over 56 years

P12 and P15: 40-55 years

P13, P16 and P20: 36-45 years

P18: 26-35years

GROUP 3

P22, P26 and P29: over 56 years

P23 and P25: 40-55 years

P21, P27 and P30: 36-45 years

None were found between 26 and 35 years.

GROUP 4

P33 and P36: over 56 years

P31: 40-55 years

P32, P34, P35, P37, P39 and P40: 36-45 years

P38: 26-35 years

Q2: When did the construction of Metolong Dam and Reservoir begin?

P: It started towards the end of 2009.

Q3: When is the project expected to be completed?

P: It was stated in one of the meetings with the developers that the project is expected to be constructed in a period of nine years-2009 to 2018.

Q4: Which areas are to be supplied by the Project?

P12, P25, P26, P27 and P28: Maseru, Teyateyaneng, Mazenod, Roma, Morija and Matsieng.

Q5: Have participants received any formal education?

P: Yes

Q6: What level of education do participants have?

GROUP 1

P1, P3, P4, P6, P8 and P9: Have not completed secondary school

P2, P5 and P7: Did nost have the opportunity to finish primary school

P10: I have received a full secondary school level

None of the participants had completed at least 2 years of university

GROUP 2

P11, P13, P16 and P19: Have not completed secondary school

P12, P15, P17, P18 and P20: Did not have the opportunity to finish primary school

None of the participants had received a full secondary school level

P14: I have completed at least 2 years of University.

GROUP 3

P22, P23, P25, P26, P27 and P30: Have not completed secondary school

P24, P28 and P29: Did not have the opportunity to finish primary school

P21: I have received a full secondary school level

None of the participants had completed at least 2 years of university

GROUP 4

P31, P33, P34, P35, P36, P38, P39 and P40: Have not completed secondary school

P32 and P37: Did not have the opportunity to finish primary school

None of the participants had received a full secondary school level

None of the participants had completed at least 2 years of university

Q7: Much of the participants did not achieve higher level of education. What is the cause of that?

P: 1. Expensive school fees and educational materials (uniform and stationery)

2. Long walking distance to schools

3. Being sherpads a lot of time is spent on mountain areas, no time to attend schools for successive days, months or years.

Q8: How long have participants lived in this area?

GROUP 1

P1, P4, P5 and P7: Lived their entire lives

P3 and P6: Lived more than 40 years

P2, P8 and P10: Lived many previous years

P9: Lived less than 25 years

GROUP 2

P14 and P16: Lived their entire lives

P11: Lived more than 40 years

P12, P13, 15, P17, P18, P19 and P20: Lived many previous years

None had lived less than 25 years

GROUP 3

P21, P22, P25, P27 and P29: Lived their entire lives

P23, P24 and P28: Lived more than 40 years

P30: Lived many previous years

P26: Lived less than 25 years

GROUP 4

P31, P34, P37, P39 and P40: Lived their entire lives

P33, P35 and P38: Lived more than 40 years

P32 and P36: Lived many previous years

None had lived less than 25 years

Q9: Were participants informed about the up-coming of Metolong Project? If yes how so?

P: Yes, except two participants

P30: I was not informed for I was at work in the Republic of South Africa.

P37: I was not informed for I was very sick and I was at the hospital at that time. But, I heard from my colleagues that such a meeting was held.

P1-P29, P31-P36, P38-P40: We were all informed on 3-08-2007.

P22 and P28: We thought our lives were going to be improved from the hearing of the up-coming of the project. But from that point it started to be lowered.

P38: I have a discontent about the previously made promises for some did not come up.

Q10: Are there Socio-economic and Enviromental benefits reaped by the community of the study area from the construction of Metolong Dam and Reservoir? If yes, explain.

P12: We were promised plenty of benefits at the public consultation and majority of them came to be fruitful.

P16: Within the village we obtained branch off access road from the existing Mohale access road between the villages of Nazareth and Ha Nqheku.

P15: The road was only accessible through dirt roads and footpaths.

P16: Ja, the branch off access road helped people's mobility, stopped their lamenting as it allows them to travel easier and quicker.

P19: Another road was constructed north of Metolong and that road ended people's tribulation of having to walk longer distances to reach to the nearest public transport point.

P14: Gravel wear courses with two lanes were constructed too. This allows easy movement for it was difficult to access roads when it rains; for the roads were located among crop fields.

P11: The roads were also muddy and potholed whenever it rains.

P31: A bridge constructed to cross Phuthiatsana River did not help villagers for they are now taking a long way around the reservoir to reach a place just across. Before the dam construction, the community of Ha-Motsoeneng would walk about 8km from their village to cross over Phuthiatsana River to Ha-Seeiso but after the dam construction they were obliged to walk more several kilometers.

P35: Metolong Dam Project had caused disruption in daily life of people around the dam and reservoir. The dam had divided the villages impeding interdependence of movement

between them as people cross the Phuthiatsana River on their regular basis. The dam is crossed to access services at Ha Seeiso and Sefikeng Ha Fako also to access transport to Maseru and Teyateyaneng.

P31: The villagers are no longer crossing to see their friends and relatives (kinsmen), attend their fields, funerals and go about on their routine activities, cross their animals for auctioning, ploughing or other activities.

P24: Advanced infrastructure caused police stations to be refurbished. I mean a police station at Ha Matela and Sefikeng were refurbished.

P21: mmm….walls and floor were renovated at Sefikeng Police station. The whole building outside was then re-plastered and painted afterwards.

P28: The chimney, rafters and sheets too were replaced.

P30: Matela Police station blocks were built well but were plastered and painted for refurbishment.

P22: The chimney, sheeting and roof structure of Ha Matela Police Station were removed to renovate the building.

P7: Jobs were obtained in various forms whereby about 350 local communities were employed.

P40: The creation of Metolong Dam and Reservoir acted as a pull factor for migrants to the study are where some were employed in the project. These migrants brought increase in health problems and caused loss of social cohesion. It seems a striking number of migrant workers brought up the increasing HIV in the community which was seen where the migrant labourers were in relationship with teenagers.

P36: Relationship with teenagers had resulted in teenager's behaviour changing and not respecting the parents. Even some of the families have split because of the money that the operators and builders gave to the teenagers who no longer care for their wives. This is serious because as the construction phase continued, teenage pregnancy became more common and family conflict became rampant bring extra-marital affairs.

P3: Jobs created include customer base with various business such as shebeens, sale of home-made beers, rental of living quarters, the sale of fat cakes, sale of handicrafts, creation of general dealers and spaza shops.

P34: Housing infrastructure for the staff was not adequate as a result; the staffs were to hire houses around. Housing infrastructure in Phase I impose the housing for immediate construction staff, Phase II for operation and maintenance staff and Phase III for additional needs.

P10: I have worked in this project since its inception and I have worked on project of this magnitude before and I can cite Katse Dam and Mohale Dam respectively.

P36: Well, I benefitted a lot for the staffs were hiring my houses as you can see I have plenty of hiring houses. I have been able to buy food and clothes with such money. Long time ago, I had to go to the mine workers where I will be given some money after washing their clothes, but that is a history to me.

P17: We benefitted a visitor's center within the village towards the northern side. It was build using the locally available material, e.g. thatch grass which was used for roofing and it was taken from the mountain up there.

P: We benefitted electricity that was connected within the study area for before the project there were no pipe-lines moving across the area. To install this type of energy it was difficult and expensive.

P3: The electricity installed was supplied by Lesotho Electricity Corporation. It was installed for easy operation of the project for it was required when building offices and infrastructure.

P5: With the emergence of the electricity, our standards of living have improved in general. For now, new apparatus are used in our houses and such are heaters and ovens. Electricity also improves the education of our children for now they are obtaining higher grades and moving to higher education.

P8 and P16: Esh! It was expensive to connect electricity within the villages. Traditional, *Patsi, Khapane and lisu* were used in houses and huts and those were used for cooking, lighting and warming the houses during cool and winters seasons.

P10: Burning of these local available resources sometimes cause breathing problems to people and sometimes people die due poising smokes and greenhouse gases emitted.

P24: We are obtaining water from individual stand-pipe after the emergence of the project. Before the project we were obtaining water from springs that are protected and unprotected.

P30: Villages such as Ha Khabele, Ha Letela, Ha Masakale, Ha Mothomotsoana, Ha Tlele and Nkokomohi they are having unprotected springs where water is or/and used for drinking etc. In Ha Seeiso, Ha Khabele, Ha Kapa, Ha Ramakabatane, Ha Sekantsi, Ha Takalatsa, Ha Makotoko, Ha Makhale, Ha Makrika and Ha Maimane they are washing clothes in small streams in which animals and people drink from.

P11: Long time before Metolong Dam could be constructed; we were using the bush or/and open field for sanitation purposes. The areas were unhealthy. Those who were affording to buy pit latrines; the quality of them was very poor for they were not serviced not even once. As a result, they toilets were overflowing. In some households, one would find bowels were male urinate. All these acts were unhealthy.

P17: Ventilated Pit Latrines are now available within the villages that were provided by Metolong Authority. The toilets are in good conditions, efficiently and have no offense to the people.

P8: Clinics are available within the village; these are brought by the emergence of Metolong Project. The farthest person can walk about 5 to 6km within the village to reach the nearest clinic.

P4: St Michael, Thaba-Bosiu Red Cross Clinic, Ha Makhoathi, Ha Makhalanyane, Ha Jobo clinic to mention the few are now available within Ratu A02 constituency.

P21: There was one high school, one secondary school and a lot of primary schools before Metolong can come up. A child willing to attend a high school level was to go to the nearest village if the one existing was full.

P24: Unfortunately, this impacted a lot to the children as they had to walk 15km and correspondingly the same distance back to the village.

P21: Due to construction of Metolong project, a quite number of the high schools are now available where it's up to one to choose the one that suite their children.

Q11: Before the project could commence were there people who were resettled?

P3 and P33: Four house-holds were resettled and these house-holds were resettled for Metolong Authority had to acquire land for temporary and permanent usage.

P2: Temporarily Metolong Authority was to construct transmission pipe-lines, have land for quarry site south of Metolong Reservoir to the west of Ha Seeiso and to build the sub-station. Permanently, the project was to construct the dams' wall and the reservoir.

P19: Also, land was acquired permanently by the project for infrastructure development such as roads to the dam wall, operation office and pump station, to the water treatment plant and drying beds.

P6 and P33: The house-holds were resettled towards the eastern edge of Ha Seeiso village. The four house-holds were having 24 people all in all.

P20: If I remember quite well, one house had four people living with and one person not living with them. Second house had eight people and two relatives that were living with. The third household had seven people and household four had five people.

P18: Five households were also resettled due to quarry activities at Ha Makhale. The houses were one kilometer radius from the quarry activity. The five houses were amounting to 41 people in total.

P8: House-hold one was having eleven people, house-hold two was having ten people, house-hold three was having nine people, house-hold four was having five people and

house-hold five was having six people. All five house-holds were resettled on the eastern edge of Ha Seeiso village.

Q12: Are participants having any livelihood means?

P: yes.

P6: I'm living by money given by my husband who is working in the mines of the Republic of South Africa.

P2: I earn income from the selling of clothes that I buy in the Republic of South Africa and locally.

P3: I have a spaza shop

P7: I have income from selling of gathered fruits

P8: I'm a pensioner so I'm living by pension.

P3, P7, P8, P17, P18, P20, P24, P28, P29, P32 and P37: We are earning living by keeping livestock and selling them. We rear animals such as cattle's, pigs, sheep, horse, donkeys and chicken.

P11: I have a general dealer

P13: I'm making a living by the selling of vegetables products that are grown at the backyard of my side and some I'm buying them in Maseru.

P14: I'm earning income from making bricks

P19: I'm making a living by selling timber.

P21: I'm living by my savings that I saved for myself when I was still working.

P25: I'm selling other people's animal products

P28: I'm selling other people's timber

P29: I'm obtaining income from the sale of handicrafts

P30: I'm making a living by selling fruits that I used to grow before my trees were up-rooted and some I used to buy and sell them.

P40: My job is to sell other people's fruits.

P33: I have a mini-salon.

P34: I'm earning a living by renting my houses

P35: I'm earning income from sewing, which I did ever-since I was young

P39: I'm selling traditional beer

Q13: Did the construction of Metolong Dam and Reservoir have negative impacts on the livelihood of the community?

P: Yes

Q14: Describe how the project have negatively affected your livelihood means

P2, P8, P11, P18, P20, P22, P26, P29, P30, P32, P33, P35, P36 and P37: Metolong Dam Project had affected us real for our fields were taken. In these fields we used grow various crops.

P1: I used to grow wheat and peas on my fields taken

P8: I used to grow maize only on my fields. Nowadays, I'm living by bought meal mill which is expensive for me.

P22: I used to plant beans and sorghum depending on seasons; I have to buy them currently.

P32: I used to grow potatoes which I either sell them or use them for family purposes.

P17: Taken fields have affected animals I used to rear for now there is no grazing land for them.

P18: I was forced to sell my livestock for there is no grazing land. I used to entertain myself by following the animals. To take them to the nearby village was a difficult task for me.

P9, P33, P35 and P39: Once fields were taken, men started to move around in the village and hang in corners whilst were supposed to follow the animals. We felt trapped by these men who are around morning till evening.

P35: Men are drinking beer from morning till evening for they have no employment.

Q15: Are there people who have lost their properties due to the construction of the project? If yes explain.

P9: There are people who have been affected by the project.

P15, P18 and P28: We have been affected by the project since its inception. Trees at our homes were uprooted.

P18: Among the few I can mention the following trees: Peach trees, Gum trees, Pine trees, Willow trees, Apricot trees and Poplar trees.

P2, P8, P11, P14, P18, P20, P22, P26, P29, P30, P32, P33, P35, P36 and P37: Our fields were taken by the project for the areas were needed for building of smaller storage and higher storage.

P33: On my side the absence of animals have caused my kraal to fall.

P30: Within the village, cultural inheritance is still used and this pertains to fields, livestock and other worthy property which are passed onto children by parents if alive or by family consent if parents are dead. Traditionally, the eldest son gets most of the inheritance if not all; but nowadays, the younger son's even daughters are considered.

P22: Inheritance constitutes both an important traditional pride and a sustainable livelihood which keeps family bonds intact from generation to generation. During boy-hood, male children were taught and groomed to be responsible in caring for their family wealth of fields and livestock for it is from these that they will maintain the welfare of their own

families when they too become men. Fields lost and livestock diminished have caused our tradition to die.

Q16: Were participants who have lost properties and impacted negatively on their livelihood by the project compensated?

P2: People who have lost assets temporary and permanent were promised to be compensated. Some local villages were paid whereas some were not paid till today as we talk.

P8: We were told that compensation amounting to Forty-nine million, one hundred and six thousand and nine hundred and fourteen Maloti will be given to affected people.

P17: On one public meeting with the developers', we were told that, thirty-six million, seven hundred and thirteen thousand and nine hundred and fourteen Maloti will be given to those who have lost their assets temporary and permanent.

P18: I heard that some were paid whereas some were not.

P26: I'm not sure if people were paid but to my knowledge, some are not paid. It was said that, those who have lost properties especially land and they have formal right to land which is required under Lesotho Law will be compensated.

P29: The Project Authority promised the villagers to build structures to those their houses will be affected and cash compensation will be paid given on exceptions.

P33: People who have lost assets temporary and permanent were promised to be compensated. Some local villages were paid whereas some were not paid till today as we talk.

P39: We were told that compensation amounting to Forty-nine million, one hundred and six thousand and nine hundred and fourteen Maloti will be given to affected people.

Q17: Did the construction of Metolong Dam and Reservoir have any effects on the weather of the study area?

P4, P14, P23 and P28: The dam's project has effects on the weather of our area. We are now experiencing cooler and cold temperature.

P6, P25, P28 and P30: In winter it is snowing but before the project we were experiencing such once after a long time.

P14: The cooler and cold seasons are experienced in April and last till August. This means the season for winter has now become longer whilst before the project it was shorter, for it starts in May and ends in July. Before the project, winter months were May to August but after the project establishment, winter months starts on April and last till early September.

P6, P25, P28 and P30: We are now having fog in some daily basis while before the project the area wasn't having such.

Q18: Did the construction of Metolong Dam and Reservoir have any impacts on plants and animals of the study area? If yes, explain.

P: Yes it has.

P5: When land was cleared, habitats were degraded and presence of fire in some areas was visible. The reptiles were killed by developers once they are in-contact with them. The actions have caused numbers to decrease within the study area.

P12: The project construction had caused Red grass (*Themeda triandra*) and old wood trees (*Lecanactis abietina*) to be deplete. These were depleted when the land was cleared for the way of the infrastructure.

P17: Traces of baboons (*Papio ursinus*) were seen in large numbers in the study area but as the land was cleared, their numbers decrease and were seen no more.

P23: Cape hare (*Lepus capensis*) and Small grey mongoose (*Galerella pulverulenta*) were seen in great numbers in daily basis before the dam's project; but after land was cleared their numbers decreased.

P28: Bitter root (*Lewisia rediviva*) had decreased in its numbers for it was plentiful where the road to the dam's wall is now made.

P5: Thatch grass (*Hyparrhenia hirta*) used to thatch houses and Merxmuellera (*Monocotyledons*) normal used for brooms-making were abundant but after the project construction, their numbers are very limited.

P8: Spotted-necked otter (*Hydrictis mecurlicollis*) was seen more often in the village, I think the machinery sound had made these animals to relocate.

P37: Bitter-bush (*Adriana quadripartite*) was present all over the study area; the project had caused them to be no seen in the project area. To other areas I heard that the plant is still available.

Q19: Did the construction of Metolong Dam and Reservoir have any impacts on the flow of Phuthiatsana River?

P38: The development of Metolong Dam and Reservoir have caused water to be enclosed within the reservoir. The closure of the water had caused flow in the Phuthiatsana River to be reduced. The reduced flow of water in the Phuthiatsana River had impacted a lot in the aquaculture facility that is used to take place.

P19: Enclosed water in the reservoir has resulted into new species being reared and such include Rainbow trout (*Oncorrhynchus mykiss*). It had caused aquaculture facility to be possible for the project authority only disadvantaging the community that used to do it in daily basis in Phuthiatsana River.

P2, P6, P8 and P26: Enclosure of the dam and the reservoir had impacted sand extraction in Phuthiatsana River not to be easily extracted.

P6: I think the enclosure of Metolong Dam's water is making sand extraction to be a very difficult task and more painful as people have to take a longer distance to get sand. Sand extraction used to take place 5 to 7 km downstream of Metolong Dam's wall.

P4: The sand was and is used for building and plastering.

P10: It was fetched by men using animals, fetched by women on their heads and sometimes fetched by trucks

Q20: Is there any information participants are willing to add?

P: Yes

P6 and P14: Since pre-construction activities, the project had caused noise and air pollution that were unbearable.

P3: The noise was so high and I couldn't bear with it for it was the first time to hear such.

P15: Much of the noise was from blasting in quarry extraction at Liphiring River near the road that crosses to southern part of Phuthiatsana to Ha Makotoko. At later stage, the noise was coming from Ha Makhale on the northern side of Phuthiatsana River for quarry activities were shifted there. Noise pollution in this area was accompanied by dust pollution.

P23: The reason given for occurrence of sheet erosion in this area was due to removal of vegetation. I can mention pipelines installed several kilometers near the tarred road at Ha Seeiso to Ha Nchela and Phuthiatsana River had caused sheet erosion to occur.

P33: Local community that was resettled has suffered psychological and cultural losses. The same people lost access to their ancestral grounds that were regard as sacred in the northern part of Metolong area for larger Metolong Reservoir Storage had inundated seven graves.

P38: Basotho and most Africans have a high regard and reverence for their ancestors. Ancestors are seen as intermediaries to the Supreme Being to take part and lively interest in the affairs of their living families. Ancestors are regarded to be living in the invisible world of the dead.

P33: It's true the project negotiated with the family of the deceased to reach an agreement on exhumation and reburial. But, they were divorced from their ancestors and forced to be placed onto foreign ancestral spirits in the new resettlements without rituals performed in accordance with the applicable culture.

P38: People were supplied with the caskets, new graves were dug so that the deceased could be reburied; but, locals regarded this as a token which was culturally unconvincing and not substantive.