LEARNING SUSTAINABLE CONSUMPTION OF HEP THROUGH LOAD SHEDDING AMONG SELECTED RESIDENTIAL AREAS IN CHIPATA DISTRICT OF EASTERN ZAMBIA

By

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A Dissertation submitted to the University of Zambia in partial fulfilment of the award of the Degree of Master of Education in Environmental Education

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DECLARATION

I, **Sibiziwe Masendeke,** do hereby declare that this dissertation represents my own work. It has not been submitted by anyone for a degree or any other award at the University of Zambia. I whole heartedly confirm that all published materials used in this dissertation have been acknowledged.

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APPROVAL

This dissertation by Sibiziwe Masendeke is approved as a fulfilling part of the requirements for the award of the degree of Master of Education (MEd) in Environmental Education by the University of Zambia.

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ABSTRACT

The need to learn sustainable consumption of hydroelectric power (HEP) became very popular with increasing incidences of load shedding in the world today. Load shedding is a situation where the available power supply fails to meet demand. Among many factors, effects of climate variability caused lower water levels at Zambia' s major HEP stations and led to Zambia's major electricity company rationing power to its clients. Unsustainability in the HEP production, supply and consumption patterns represented a significant problem in all sectors of the economy and posed a challenge on the attainment of a sustainable and efficient HEP sector. This ignited the need to investigate on how the learning on sustainable consumption of HEP through load shedding may promote efficiency and sustainability in the HEP sector. The objectives of the study were to ascertain households' perceptions on load shedding, determine how load shedding transformed households' lifestyles, investigate the sustainability of the adopted energy sources, determine a learning opportunity on sustainable consumption of HEP and propose a learning guide on sustainable consumption of HEP. The study was underpinned by the Explanatory – Sequential mixed design. Transformative Learning Theory by Mezirow (1978) guided the study. Target population was 100 households from Kapata and Chipata Motel Compounds where 90 respondents were sampled using simple random technique and the 10 key informants were homogenously expert purposively sampled. The semi – structured interview schedule, observation guide and questionnaire were used to collect data. Descriptive statistics, thematic and mixed analysis were used to analyse data with the aid of Micro - Soft Excel. Between- method triangulation was used to validate data. Results showed that 90% of the households perceived load shedding as a detriment that affected households' operations and financial viability. However, 80% of the respondents reported to have learnt sustainable consumption of HEP through adoption of energy efficient gadgets, energy diversification, hydroelectric power conservation and adoption of Renewable Energy Technologies. This led to the reduction in the hydroelectric power dependence syndrome. In conclusion, load shedding promoted sustainable consumption and production patterns and positively transformed households' lifestyles in the way they viewed and utilized HEP. The study recommends that the proposed learning guide should be used to empower households with knowledge and skills and further help promote sustainable consumption of HEP among households in Chipata District.

Keywords: Load shedding, Sustainable consumption, Energy diversification, load shifting behaviour, Sustainability and conservation.

DEDICATION

This document is dedicated to my children and all knowledge seekers.

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ACRONYMS AND ABBREVIATIONS

CSO Central Statistical Office

EE Environmental Education

ERB Energy Regulatory Board

ESC Education for Sustainable Consumption

GRZ Government of the Republic of Zambia

HEP Hydroelectric power

MOGE Ministry of General Education

NGOs Non-Governmental Organizations

OECD Organizations for Economic Cooperation and Development

PACRA Patents and Companies Registration Agency

REA Rural Electrification Authority

RETs Renewable Energy Technologies

UNESCO United Nations Educational Scientists and Cultural Organization

YMCA Young Men's Christian Movement

ZDA Zambia Development Agency

ZESCO Zambia Electricity Supply Corporation

CHAPTER ONE

INTRODUCTION

1.1 Background

The need to learn sustainable consumption of hydroelectricity became more pronounced with increasing environmental problems such as load shedding that affected Zambia and many other countries in the world in the past recent years. Load shedding in itself is a deliberate shut down of electricity in part or parts of a power - distribution system to prevent failure of the entire system when electricity demand outstrips supply [Energy Regulation Board] (ERB, 2016).

From the world perspective, a lot of effort was made to empower HEP consumers on the importance of sustainable consumption and production in achieving a health planet [Organization for Economic Co-operation and Development] (OECD, 2008). China was among many other countries in the world that spearheaded a program "Green Life Consume with Wisdom'', aiming to raise awareness about sustainable HEP consumption, promoting conscious consumption decisions and created enabling policies for responsible HEP production patterns (UNESCO, 2014). There was a loud cry from most parts of the world to encourage people to consume HEP with care and it further encouraged people to rethink their lifestyles and through conscious consumer decisions, decrease humanity's collective impact on nature's HEP resources [United Nations Educational Scientific and Cultural Organization] (UNESCO, 2014).

Despite technological advances that promoted energy efficiency gains, HEP use in many countries in the world was anticipated to continue to grow another 35 per cent by 2020 (OECD, 2008). This was majorly attributed to unsustainable consumption patterns that affected many countries in the world. Many environmental problems faced by the world today were created by irresponsible production and consumption patterns in most sectors of the economies. The biggest problems faced by many countries including Zambia were that people consumed to forget their worries and their anxieties (OECD, 2008)). However, Goal 12 of the Sustainable Development Goals (SDGs) of the United Nations

was to ensure sustainable consumption and production patterns. This meant to be mindful about what, how and how much was produced and consumed so that the earth's resources were used judiciously and preserved for future generations (OECD, 2008).

In Zambia and, particularly Chipata District of Eastern Province, load shedding has been a serious challenge since 2014/2015 rainy season. Among many other factors, effects of climate variability resulted into lower water levels at Zambia's major hydroelectric power (HEP) stations such as Kariba, Kafue, Itezhi – tezhi and Victoria Falls, leading to Zambia Electricity Supply Corporation (ZESCO) rationing power to its clients (ERB, 2017). The demand for HEP outstripped supply and led to power cuts in most parts of the country (ERB, 2016). Load shedding was therefore received with a lot of mixed feelings especially at household level. Early studies conducted by Musademba (2012), Muhammad, (2014), Dhlamini et al. (2016) and Ngoma et al. (2016) focused on the negative impact of load shedding. However, this study also focused on the positive effects and showed that load shedding provided an opportunity for households to learn sustainable consumption of hydroelectricity.

In order to ensure that HEP sector in Zambia and particularly Chipata District addressed the need of all people while removing excessive stress on the sector, adoption of sustainable patterns of consumption and production was imperative. Sustainable HEP consumption lifestyles in its truest sense may be achieved only if there was a radical change in peoples' consciousness as far as HEP consumption was concerned. Whether it was checking population growth or letting go of all peoples' wants and desires (beyond the basic necessities), debating roles of the economy and technology or rethinking current systems and institutions (OECD, 2008). These big questions were too difficult to be answered and even more complicated to achieve. However, in the absence of such a transformational shift in Zambia and specifically in Chipata District, adopting sustainable consumption and production practice may be a viable and immediate solution in alleviating of peoples' pressure on the hydroelectric power sector (OECD, 2008).

There was need for the Zambian government therefore, to formulate policies that would promote sustainable consumption and production patterns in order to alleviate power

deficit that hit the country since the 2014/2015 rainy season. Education for Sustainable Consumption is one of the most powerful tools for providing individuals with the appropriate skills and competencies to become sustainable consumers. UNESCO designated 2005 – 2014 as the Decade of Education for Sustainable Development, to which the OECD would contribute by highlighting good practices in all educational settings for sustainable development (UNESCO, 2014). Information and awareness – rising through public communications campaign were cardinal in promoting sustainable consumption (OECD, 2008). Diverse consumer campaigns could be among many efforts to mitigate climate change issues with personal lifestyles particularly electricity consumption modes.

In Zambia, the ramifications of the government' s failure to diversify its electricity generation mix came to the fore in 2015 when the HEP deficit resulted in unprecedented levels of electricity supply rationing to all consumers. This situation was largely a result of inadequate and delayed investments in generation and transmission infrastructure as well as failure to diversify energy generation sources over the last 40 years (ERB, 2016). Zambia was highly dependent on HEP despite the envisaged growth of other sources of energy to about 15 per cent by 2030. To increase supply, there was need to promote investment in hydro, nuclear, geothermal, wind and solar energy generation as well as creating sound policies that would encourage people to become sustainable consumers of electricity (ERB, 2017).

In the past years, the supply of electricity was hampered by over reliance on a single source of electricity generation leading to unsustainability in the HEP consumption practices and hydro generation. Hydropower contributed to more than 95 per cent of electricity generated in the country (Mukanga, 2015). Therefore, the need for learning sustainable consumption of HEP in Chipata district through diversification of electricity generation to include thermal, solar, wind, biogas and nuclear energy was inevitable (ERB, 2017). Demand for electricity stood at 1,949 megawatts (MW) in 2017. However, the sector was only able to generate 1,281 MW (ERB, 2016). This situation was largely a result of inadequate and delayed investments in generation and transmission infrastructure. The deficit was further exacerbated by unsustainable HEP

consumption patterns by consumers and the effects of climate variability, in particular low rainfall, given that Zambia was highly dependent on HEP despite the envisaged growth of other sources of energy to about 15 per cent by 2030 [Seventh National Development Plan] (SNDP, 2017 – 2021). To increase supply, there was need to promote investment in hydro, nuclear, geothermal, wind and solar energy generation as well as creating sound policies that would encourage people to become sustainable HEP consumers (ERB, 2017).

The peak demand for hydroelectricity in the country was projected to be 3,000 MW by 2021 and was expected to increase to over 4,000 MW in 2030 (ERB, 2017). The rising HEP demand was attributed to rapid increase in population and industrial expansion (ERB, 2016). In view of this, measures to grow and diversify the electricity sub- sector and enhance its contribution to economic diversification by expanding power generation and transmission capacities was to be implemented. The Zambian government, in the SNDP outlined broad strategies and reforms to enhance the supply of electricity for economic development. The objective was to expand and improve electricity generation, transmission and distribution as well as encouraging the development of small scale and micro hydro power stations (SNDP, 2017 – 2021). It was clear that economic activities and population growth had outstripped power generation capacity. This was so because at independence, there were three million people as compared to the current population of over 13 million people (CSO, 2010). In 1992, ZESCO had 200,000 customers as opposed to the current number of 900,000 customers (ERB, 2017). The company needed to grow by meeting demand of its customers. Zambia intended to meet its rising electricity demand through investment by involving public and private sector participation (ERB, 2017).

Hydroelectricity power is the major source of energy for industrial operations and domestic use in Zambia accounting for 94.1 per cent of the national installed capacity (ERB, 2017). It is the major dependable and clean renewable form of energy and able to provide continuous supply of energy provided there is sufficient water available and people use it responsibly. However, most of the HEP consumers do not have the

knowledge on the impact of their daily HEP consumption practices on the environment. Lessons on sustainable consumption of HEP would help households acquire knowledge, skills, values and competencies on how to best use HEP sustainably (Chisala, 2015).

In Zambia, the responsibility of electricity generation, transmission and distribution is vested in ZESCO. It was established in 1970 under Zambia Electricity Act of 1969. ZESCO was established to be responsible for generation, transmission and distribution of electricity in Zambia. As early as 2006, ZESCO installed capacity was about 1,631MW against total demand of 1,200 MW. This gave the company a surplus capacity of 431 MW, some of which was exported within the region (Chisala, 2015). However, by early 2007, ZESCO's generation capacity dropped to 1,000 MW while demand increased to 1,300 MW resulting in a shortfall of 300 MW [Engineering Institute of Zambia] (EIZ, 2015).

Like many other developing countries, the demand for electricity in Zambia, was on the increase while power generation had remained fairly stable. This situation created a big problem as far as meeting HEP demand was concerned. Electricity demand outstripped supply (shortage). Consequently, in order to cope with the electricity crisis during the peak periods, ZESCO, the major electricity power generating company in the country resorted to power rationing. Before the inception of load shedding, government did not attach much importance on educating HEP consumers on the need to use HEP wisely. With load shedding in place, there was increasing need to empower households with skills, knowledge and morals to help them become sustainable HEP consumers (Mukanga, 2015).

The demand for HEP in Zambia was growing at an average of about 3 per cent per annum mainly due to the increased economic activities especially in the agriculture, manufacturing and mining sectors as well as increased activities in the region. However, there were no major additions to the country's generation capacity in the last 20 – 30 years despite the huge potential in hydro resources (ERB, 2016). Zambia had about 6,000 MW unexploited hydro power potential, while only about 2,177 MW had been

developed (Electricity Demand Profile Forecast in Zambia, 2005 to 2020). On the other hand, the demand for power in the various sectors of the economy had grown rapidly over the years with per capita electricity consumption of 598.95 KWh in 2011 (World Bank, 2017). These among many other factors caused a lot of stress in the HEP sector characterized by untimely blackouts on a continual basis given its heavy dependence on hydroelectricity (ERB, 2016). The ideal situation however, was to have HEP sector that was to meet the electricity demand for the present generation without compromising the ability of the future generation to meet their own HEP demand. There was great need therefore for the problem of unsustainable HEP consumption to be resolved through deliberate programs that would impart skills and knowledge to households and help them become sustainable consumers of electricity through energy diversification and conservation techniques.

Government however, made a lot of efforts in addressing the problem of power deficit by ensuring the 120 MW Itezhi – tezhi power station was commissioned and hopefully be followed by 150 MW Maamba powered station (EIZ, 2016). The country further targeted to increase power generation from 3,100 MW to 6,000 MW by 2030 in an effort to meet energy demand from its growing population and industries (ERB, 2016). Even if there was progress in addressing power deficits, the situation was not likely to change as energy demand kept on growing. Since Zambian electricity supply was heavily dependent on HEP and to ensure that it would be used most effectively in the future, there was need to critically examine how people were using it then and what could be done to maximize its positive aspects in the future.

Rising demand for power posed a serious challenge on how the future generation would meet its energy demand. ERB (2017) states that most people use HEP in a cruel and wasteful manner through unsustainable HEP consumption practices contributing to the problem of load shedding. This created a problem because the HEP consumption rates in the country were not compatible to the rate at which HEP infrastructure was expanding. Therefore, Load shedding posed a serious challenge on the attainment of a safe, clean and sustainable energy sector as outlined in the ‘2030 vision’.

The impact of load shedding was felt in so many sectors of the economy such as health, education and farmers were experiencing reduced productivity and poultry keepers experienced reduced revenues. Further, the Water utility companies began rationing water because of electricity shortages (ERB, 2015). Where electricity supply failed to meet household' HEP demand, the consumption of fuel wood and charcoal prices increased and in turn increased pressure on forest products as long as other forms of energy remained unexploited (Dhlamini et *al*, 2016). As a short term measure to curb the underproduction of electricity, the government of the Republic of Zambia imported between 150 and 200 Megawatts of electricity at a total cost of US$250 million dollars to compensate for the intolerable power deficits among many other efforts (ERB, 2016).

Generally, domestic HEP consumption was closely interrelated to the consumer's HEP saving awareness which was also related to the selection of new energy efficiency appliances (Linda, 2008). According to Linda, (2008), a huge amount of electricity was misused everyday by unconscious HEP behaviour of the consumers especially at household level. Numerous studies showed the effects of human behavioural change on HEP conservation and environmental sustainability. They further argued that HEP conservation through the change of human behaviour only, without any capital cost could be a great option to meet demand instead of increasing generation. However, because of unpredictable nature of human behavioural change, long term individual and organizational involvement was essential for energy efficiency achievements and this was mainly dependent on how well informed households were on the importance of consuming HEP sustainably (World Bank, 2017).

Linda (2008) was of the view that a huge amount of electricity loss was incurred everyday due to lack of awareness and this in the long term resulted to load shedding as well as inadequate electricity supply. Therefore, HEP conservation through responsive consumption practices was an alternative way that could mitigate HEP crisis in Zambia. Exploring household electricity power consumption through human behavioural change could open a pathway towards an energy-efficient future Zambia. All renewable energy

sources like solar, wind, geothermal, hydropower and tidal energy could be explored as they are sustainable, stable and available in plenty (OECD, 2008. Linda, 2008 further states that consuming HEP sustainably could provide solutions to load shedding and help conserve HEP for the future use.

Sustainable consumption of HEP therefore entailed people "doing more and better with less" increasing net welfare gains from economic activities by reducing energy along the whole lifecycle while increasing the quality of life with manageable collateral environmental effects as emphasized by 'Vision 2030' (UNESCO, 2014)**.** Further, promotion of sustainable HEP consumption required regulating HEP consumption behaviour through acquisition of skills and competencies to become sustainable consumers (OECD, 2008).

1.2 Environmental Education Context of the Study.

UNESCO (2014) floats Education for Sustainable Consumption (ESC) within the broader frames of Environmental Education (EE) as one of the tools that would provide knowledge, competencies, values and skills to enable individuals and social groups become actors of change towards more sustainable consumption lifestyles (UNESCO, 2014). Generally, education supports people in making the right and more responsible choices while meeting their needs and aspirations on HEP consumption. People get empowered with appropriate information on the impact of their daily HEP uses and choices as HEP consumers as well as for workable solutions and alternatives to environmental problems such as load shedding (UNESCO, 2014). ESC therefore, can be used to promote sustainable HEP consumption lifestyles through media, advertising, and marketing sectors. These can shape HEP consumption patterns and help individuals transition to a sustainable society (UNESCO, 2014).

The Gothenburg Recommendations (2001) strengthens Education for Sustainable Development (ESD) and emphasizes on all educational settings to practice values and principles of sustainable development and enable learners and households participate in and model solutions to sustainable development issues such as load shedding and wasteful HEP consumption behaviours. Teachers and educators can help households

and learners to understand better the world they live in and help them provide solution to problems of load shedding, environmental degradation and climate change. Promotion of sustainable HEP consumption lifestyles requires regulating HEP consumption behaviours through acquisition of skills, knowledge, competencies, values, morals and attitudes. Therefore, the whole purpose would be to reorient the education settings towards promoting a sustainable future for a common good of the present and future generations and recognize the interdependence of environmental, social and economic perspectives and the dependence of humanity on a healthy and sustainable biosphere. A lot of emphasis is placed on human beings being empowered with knowledge and skills to have the desire of maintaining a healthy planet (UNESCO, 2014).

1.3 Statement of the Problem.

Load shedding is a challenge that affected Zambia and particularly Chipata District since 2014/2015 rainy season. Unsustainability in the HEP production, supply and consumption patterns represented a significant problem in all sectors of the economy and posed a challenge on the attainment of a sustainable and efficient HEP sector. The question is, how can the learning on sustainable consumption of HEP that can take place through load shedding promote sustainability and efficiency in the HEP sector? This ignited the need to investigate the learning on sustainable consumption of HEP through load shedding among selected households in Chipata District in order to improve efficiency in the HEP supply and sustain a health planet (OECD, 2008)

Optimization of the current HEP systems demanded more effective protocols such as adoption of energy – efficient gadgets, RETs, energy diversification, HEP conservation and reduction on HEP dependency syndrome. The Government of Zambia made efforts and compensated for the power deficits through the construction of the 120 MW Itezhi – tezhi, the 150 MW Maamba collieries, Kafue gorge Lower hydroelectric power stations and further imported between150 to 200 Megawatts of electricity amounting to US$250 Million (EIZ, 2016). Despite several efforts made to compensate for the power deficits, load shedding still persisted (ERB, 2017). Hence, the study was undertaken.

2014).

1.4 Purpose of the study

The general purpose of the study was to investigate the learning on sustainable consumption of HEP through load shedding among selected residential areas in Chipata District of Eastern Province.

1.5 Specific objectives

Arising from the general purpose of the study were the following specific objectives:

(i) To ascertain households' perceptions on load shedding among selected household Chipata District.

(ii) To determine how load shedding transformed households' lifestyles among selected households in Chipata District.

(iii) To investigate on the sustainability of alternative sources of energy adopted by households during load shedding.

(iv) To determine a learning opportunity on sustainable energy consumption through load shedding.

(v) To propose a learning guide on sustainable consumption of HEP among selected households in Chipata District.

1.6 General Research Questions

What sustainable consumption lessons can be learnt through load shedding?

1.6.1 Specific Research Questions

The specific research questions were as follows:

(i) What households 'perceptions can be ascertained on load shedding among selected households in Chipata District.?

(ii) In what ways did load shedding transform households' lifestyles among selected households in Chipata District?

(iii) How sustainable were the alternative sources of energy adopted by households during Load shedding?

(iv) What sustainable HEP consumption learning opportunity can be determined based on Load shedding among selected households in Chipata District?

(v) What should constitute a learning guide on sustainable consumption of HEP through load shedding among selected households in Chipata District?

1.7 Significance of the Study

The study is important because it is hoped that it may help households and other stakeholders make informed decisions on sustainable consumption of HEP as they adopt innovative methods to manage the limited power available thereby strengthening energy conservation and promoting sustainability in the HEP sector. Secondly, the knowledge gap existed on the learning for sustainable consumption of HEP through load shedding in the context of Zambia as many scholars that looked at load shedding like Mwewa (2013) Ngoma et al. (2016) and Dhlamini, et al. (2016) did not take into consideration the learning opportunity on sustainable consumption of HEP that could take place through load shedding. Through this study, it is also hoped that it may help households reflect on their HEP consumption practices as households encounter challenges in the daily management of limited power available. Responsibility in the daily usage of electricity in the long term may promote the attainment of a sustainable and efficient HEP sector. This study may further help households and other stakeholders provide solution and alternatives to the problem of load shedding and unsustainable HEP consumption lifestyles exhibited at household level. It is also hoped that this study may provide a basis to other future studies on load shedding.

1.8 Operational Definitions of Terms

Detrimental: Having a negative effective or harm

Learning: Acquisition of knowledge and skills to solve real Life situations gained within daily actions and experiences.

Load shedding: The deliberate shutdown of electric power in a part or parts of Power-distribution System, generally to prevent the failure of the entire system when demand strains the capacity of the system.

Sustainability: The process of maintaining change in balanced fashion in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional changes are all in harmony and enhance both current and future potential to meet human needs and aspirations.

Sustainable consumption: The use of products and services in a way that minimizes the impact on the environment, so that human needs can be met not only in the present but also for future generations.

Sustainable Management: The application of sustainable practices in the environment, and personal life by managing them in a way that will benefit the current generations and future generations.

Perceptions: It is the organization, identification, and interpretation of sensory formation in order to represent and understand the presented information, or the environment.

Transformative: Causing a major and important lasting change to something especially in a way that makes it better.

1.9 Thesis statement

Load shedding is not detrimental but rather, a transformative phenomenon that may be used at household level to learn sustainable consumption of HEP. The innovative methods of managing the limited power available and the exploration of alternative energy sources adopted during load shedding may further reduce overdependence on HEP and provide a good basis for a sustainable and efficient HEP sector through regulated HEP consumption behaviours and practices for sustainable living.

1.10 Conceptual Framework

A conceptual framework is a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Jackson, 2002). The Conceptual frame work on figure 1.1 helped give a clear picture and overview of the

general intention of the study and this served as a compass in directing the researcher during the actual study process not to go astray of the intentions of the study and this contributed to fruitful findings. In this framework, households' divergent views were taken into consideration. It further provided room for the researcher to accommodate both households' detrimental and transformative perceptions with the view that they adopt sustainable HEP consumption lifestyles.

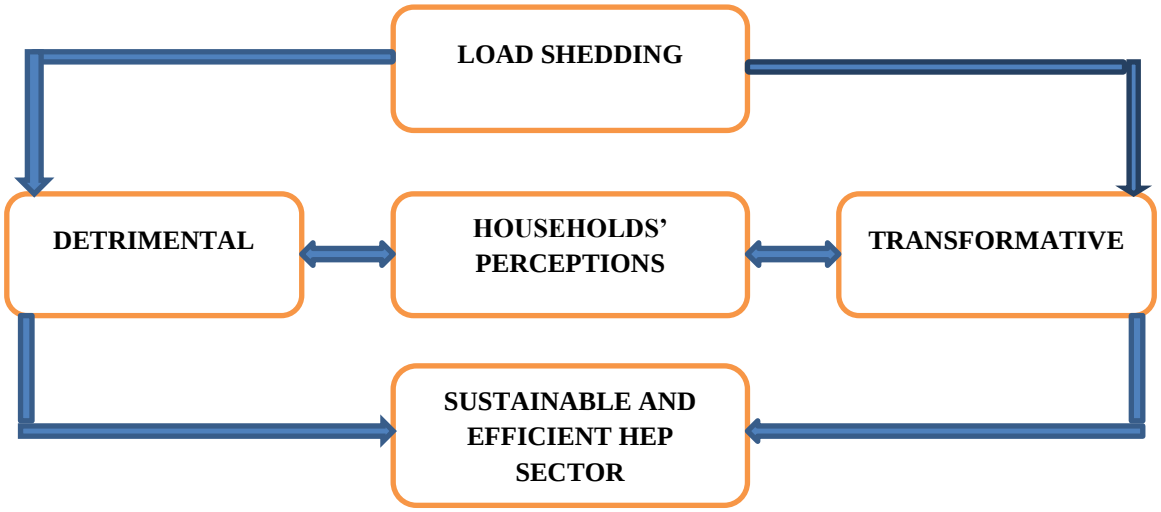


Figure1.1: Conceptual framework on Sustainable consumption of HEP

The expected outcome in the conceptual framework was to have households who would promote a sustainable and efficient HEP sector where they would meet their present HEP demand without compromising the ability of the future generations to meet their own HEP. For clarity purposes, concepts such as load shedding and perceptions were defined.

Load shedding is the shut-down of the electric power in part or parts of power-distribution system to generally prevent the failure of the entire system when demand strains the capacity of the system (ERB, 2015).

Perception is the process by which people translate sensory impressions into coherent and unified view of the world around them (Goldstein, 2009). Perceptions therefore may vary from person to person and people perceive different things about the same situation and assign different meanings to what is perceived.

Sustainable HEP sector entails a situation where HEP systems meet the present generations' HEP demand without compromising the ability of the future generation meeting their own HEP demand.

1.11 Theoretical Framework

The study was guided by the Transformative Theory of Learning which was developed by Mezirow (1978) and shows that predicaments promote transformation in peoples' understanding and meaning of their experiences and make their own interpretations about predicaments differently other than acting on purposes, beliefs, judgments and feelings of other people (Mezirow, 1978). The theory was applicable to this study as load shedding is a 'disorienting dilemma' that triggered change in households' lifestyles as they critically reflected on the limited power available and consciously made and implemented plans that brought about new ways of compensating for power deficits.

Mezirow stated that people cannot always be assured of what they know or believe. He was of the view that it is imperative for adults to develop a more critical world view as they seek ways to better understanding the world (Mezirow, 1978). The transformative learning theory has specific assumptions about reality and knowledge. From the ontological point of view, reality existed out there and varied from one place to the other and from one person to the other. In respect of these views, the study embraced diverse views of the respondents who had different experiences, attitudes, perceptions and beliefs about load shedding and these divergent views were respected. The assumptions in the transformative Learning Theory directed the study into fruitful findings as it kept the researcher attached to the paradigm orientation and finally to the outcome of the study that showed a positive transformational shift in the households lifestyles.

1.12 Organization of the Dissertation

The dissertation comprises of six chapters. Chapter one consists of the back ground of the study, problem statement, purpose and specific objectives. The significance of the study, thesis statement, conceptual and theoretical frameworks, operational definitions as well as the organization of the dissertation is also highlighted in this chapter.

Chapter two presents existing literature on global, continental and regional perspectives of load shedding. Chapter three gives the detailed description of the study area with emphasis to physical characteristics, climate and hydrology, population size and energy load factor. Chapter four of the dissertation presents the methodology of the study consisting of the philosophical orientation, ontological and epistemological assumptions of the study. The chapter further presents the research design, target population, sample size, sampling design, methods and tools of data collection, Primary and secondary data, data analysis techniques as well as ethical consideration, data validity, credibility and trustworthiness. Limitations, delimitation and the selection criteria of the study area are also presented in this chapter.

Chapter five presents the study results with reference to households' perceptions on load shedding, transformation of households' lifestyles through load shedding, sustainability of energy alternatives adopted during load shedding, sustainable HEP consumption learning opportunity through load shedding and learning guide on sustainable HEP consumption through load shedding in Chipata District. Also provided in this chapter is the relationship of the study finding with the Transformative Theory of Learning by Mezirow (1978). Chapter six provides the discussion of study results with respect to themes in the objectives; conclusions and recommendations are also included in this chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Chapter two presents literature review on learning sustainable consumption of HEP through load shedding from the global, perspectives and regional perspectives. Additional information on this topic was drawn from already existing written materials such as books, magazines, brochures, journals and video reviews.

2.2 Global Perspectives of Load shedding

Load shedding was perceived differently by many countries in the world and these perceptions varied from one country to the other. Muhammad (2014) conducted a study in Pakistan. His study investigated the consequences of load shedding on people's daily routine using the qualitative approach. Video recorded interviews and comment based interviews from twin cities of Islamabad and Rawalpindi of Pakistan was conducted. The targeted population consisted of students, housewives, businessmen and professional workers who were affected by electricity shortage. The findings revealed that power outages in Pakistan caused unemployment, decrease in export contracts and increased commodity prices. It was concluded that load shedding negatively impacted on people's lives and this made many Pakistanis perceive load shedding negatively.

Contrary to the study findings by Muhammad, this study used mixed method research design where the Explanatory Sequential mixed design was specifically utilized. The target population was Chipata District and the sample size was 100 of which 90 were households who were homogenously purposively sampled and 10 were policy makers who were expert purposively sampled from Chipata Motel and Kapata Compounds. Semi–structured interview guide, observation guide and questionnaire were used to collect primary data. Thematic analysis, mixed analysis and descriptive statistics were used to analyse data. This study focused much on the positive effect of load shedding.

Results by Muhammad (2014) showed that the majority of the respondents reduced their daily expenses as a coping strategy to load shedding.

Therefore, this gap was closed by study taking into consideration lessons on sustainable consumption of HEP learnt through load shedding.

Findings by Muhammad (2014) also revealed that as load shedding worsened, several coping strategies were adopted by households. Significantly, respondents incurred additional expenditures as they purchased energy alternatives such as biomass, wind mills, coal-fired plants and rubber. As much as results from Muhammad's study revealed massive alternative sources of energy adopted in Pakistan, it did not however, state how sustainable the adopted alternative sources of energy were and this created a gap in knowledge. Therefore this study addressed this gap by investigating on the sustainability of alternative sources of energy adopted during load shedding as this information seemed critical in determining the durability and future energy efficiency in Chipata district.

Verplanken and wood (2006) also conducted a study on Changing Energy Consumption behaviour through Sustainable Product Design in the United Kingdom (Verplanken and Wood, 2006). The study examined the possible causes that may promote energy-conscious practice in energy consumption to take place to prevent load shedding using the interview method. The findings showed that improving the technical efficiency and editing consumers' purchase and choice hardly raised the environmental awareness to reach the radical change of energy usage. The findings further showed that a range of information awareness campaigns have to be effective in creating the long- term behavioural shift in enhancing HEP- conscious practice in everyday life of the people. It was further revealed that the practices ingrained in peoples' life patterns were carried out without conscious deliberation. However, the study did not propose a learning guide on sustainable consumption of HEP through load shedding. This study therefore bridged this gap by proposing a learning guide which aimed at promoting sustainability in the HEP consumption and production patterns among households in Chipata District.

2.3 Africa's perspectives on Load shedding

From the African perspective, TNS survey (2008) conducted a study on the metropolitan residents in South Africa and the purpose was to ascertain households' perceptions on load shedding. It was conducted among 2000 South African adults using face to face structured interviews. The study revealed that half of the Metropolitan residents were affected by load shedding in their social and personal lives. Some people were caught up in lifts and others on traffic jam and this made the residents hate load shedding. Second, on service delivery issues; residents' anger levels became serious and were directed to both the government and the electricity utility company as people felt both carried the blame for the power deficits. However, TNS study findings showed a gap in knowledge in the sense that it did not address the positive perceptions on load shedding. TNS (2008) study findings, revealed that it did not consider the impact of household's home energy use on the environment. It was for this reason that this study was undertaken to address the gap left by TNS survey (2008) and ascertained the positive perceptions of load shedding.

The South African Marketing Research Association (SAMRA, 2008**)** also conducted a study on 'Load shedding - how it affected households' lifestyles and alternatives adopted in Metropolitan areas of South Africa with the use of the interviews (SAMRA, 2008). The findings showed that from the 2000 residents interviewed openly, a lot had taken a number of actions to cope with load shedding. The residents purchased equipment such as standby lights, candles, gas equipment and solar equipment to provide an alternative during load shedding hours. However, a gap was noticed in this study in that it did not consider finding out how sustainable the adopted energy alternatives were. This study filled this gap by finding out how sustainable the generators, standby lambs, torches, gas equipment and solar equipment were to determine their sustainability. The knowledge gained from this study was also very helpful in providing the basis for RETs that proved beneficial in this study.

Musademba (2012) conducted a study in Chinhoyi, Zimbabwe to establish effects of load shedding in Chinhoyi residential area. A questionnaire was used to assess the

effects and establish the HEP pattern and usage of alternatives fuels during load shedding. The survey established that 60 per cent of the residents stated that load shedding contributed to land degradation, 15 per cent reported a decline in production of ice colds with 10 per cent complaining of increased poverty levels among the women folk. This contributed to thinning the living standards of the residents. The survey further established a peculiar HEP pattern and usage of alternative fuels for cooking and lighting during load shedding. Households in the low density areas of Chinhoyi displayed wide energy matrix of relatively high quality fuels for both cooking and lighting. When compared to households in the high density areas 55 per cent of the households in low density cooked mainly with electricity gadgets whereas 93 per cent of the households in the high density areas cooked exclusively with firewood. Use of candles was common for lighting in both residential sectors.

The income for the residents was disproportionally eroded as a result of load shedding. The fraction of energy cost to income was found to increase from 16 per cent without load shedding up to 64 per cent for those in the low density and up to 49 per cent for those in the high density areas. This consequently impoverished the residents. Load shedding was also found to have coined households' thieves with 65 per cent for those being women who harvested wood illegally from farms and forests. This form of harvesting was uncontrolled and therefore unsustainable.

The survey therefore, concluded that women were unduly burdened by the power outage exercise and people in general were reduced to poverty levels as they were left with dwindled income. A gap is noticed in the study by Musademba in that his focus was negative as the study revealed that women were unduly burdened by the power outages and that people were generally reduced to poverty. However, this study also focused on the positive effect of load shedding.

2.4 Zambian Perspectives on Load shedding

Dhlamini et al. (2016) conducted a study on Implications of load shedding on forests, charcoal production and households in Zambia. A sample population of 400 respondents was interviewed and a focus group discussion was conducted to the household heads.

The study revealed that load shedding soured consumer prices and in the long term brought about unsustainable forest resource utilization due to increased cutting down of trees for charcoal and firewood leading to localized deforestation, forest degradation and lose of biodiversity (Dhlamini. et al. 2016). Dhlamini et al. study findings showed much focus on the detrimental aspects of load shedding and did not address the transformative role it played at household level. This study closed up this gap by focusing much on the transformative dimension of load shedding with respect that people interpret predicaments, experiences and the world differently.

Ngoma et al. (2016) also conducted a study in three townships of the Copper belt Province of Zambia using a study survey. This study examined how load-shedding affected residential consumers in three townships of Kitwe representing low, medium and high income areas. The surveys explored how energy-intensive activities such as cooking, lighting and water heating, among others changed since the onset of the load-shedding program. Particular interest was given to coping strategies involving fuel switching. The study covered five topical areas. These areas were preparation of food, conservation and refrigeration of food, household lighting, use of hot water and daily activities such as leisure, work and religious activities. The study availed that the three residential areas were load shaded at least once a week from 06:00 to 14:00 hours. Slightly over 90 per cent of the households were disconnected from 14:00 to 22:00hours. Most residents preferred to be disconnected from 06:00 to 14:00 hours, and least preferred being disconnected from 14:00 to 22:00 hours. This was anticipated because most people would be at work in the morning and would obviously want to use power when they returned home. This could be the reason why the preferred schedule was 14:00 to 22:00 hours.

Over 80 per cent of people switched to the use of charcoal. Eating of convenience foods accounted for less than 25 per cent on average. Convenience foods in this context meant any foodstuff that was ready to be eaten with minimal preparation, in most cases without further preparation. This included bread, roasted nuts, salad dishes; factory pre-prepared and pre-packaged food stuff. The study further showed that very few people, less than 5 per cent, used gas. This was so because in Zambia, generally people had the conception

that charcoal was less expensive than gas. It is also presumably thought to be expensive due to their initial cost of buying the gas stove and its accessories as compared to the traditional brazier.

Furthermore, findings from Ngoma et al. availed that some residents, though very few, were not affected by the load-shedding program. The study on alternative means of household lighting showed that it was dominated by the use of kerosene lamps. The study further focused on religiously related sectors of daily life. With regard to religious activities the lower income class was least affected.

The study told a compelling story of how residents of Kitwe, Zambia were affected by and had coped with load-shedding. The analysis showed that load- shedding had affected most aspects of life, including work, leisure, worship and even sleep-a reminder of the silent yet important role that electricity plays in society. For each energy-intensive activity covered in the survey, very few respondents did not adopt a coping strategy, and many adopted more than one. The coping strategies adopted by the residents of Kitwe can be generally classified as "fuel switching" and "energy reducing". Switching to charcoal raised concerns related to the in-direct environmental consequences of load-shedding, presumably as additional trees were cut down to produce the charcoal along with the added carbon dioxide emissions from its combustion.

The study by Ngoma et al. (2016) further availed that the transformation that Kitwe residents underwent was perceived from the negative dimension while this study viewed this transformation as an opportunity for learning sustainable consumption of HEP which Ngoma et al. (2016) overlooked. This study filled this gap by determining a learning opportunity on sustainable consumption through load shedding.

Mwewa (2013) also conducted a quantitative study entitled Peak – load Shifting Utilizing Load Factor Optimization: A Centralized Microprocessor- Based Smart Metering Demonstration involving two households in Lusaka, Zambia. The purpose of the study was to establish household power- usage pattern in Lusaka District. Her study used two main methods for obtaining data; automated methods and survey based methods of data collection through a qualitative approach. The findings of her study led

to the development of load management software which was implemented on the Arduino Mega Microcontroller (Mwewa, 2013).This system automatically regulated water heating and provided energy- usage information to the consumer at peak periods. These two interventions minimized peak- power usage, an outcome that has helped minimize load shedding. A gap in knowledge was noticed in Mwewa's study in that as much as it provided feedback to customers through computer visualization, nothing much was mentioned on how household HEP consumers could be motivated to help enhance sustainable consumption of HEP. This study filled this gap by proposing a learning guide that aimed at motivating household' sustainable HEP consumption practices.

2.5 Gaps in the Reviewed Literature

The reviewed studies indicated gaps in knowledge in that they focused on the negative effects of load shedding. This study bridged up this gap by also focusing on the transformative implications of load shedding. The households' positive transformational shift was anticipated to make a remarkable move towards the attainment of a sustainable HEP sector where people "do more and better with less" increasing net welfare gains from economic activities by reducing energy along the whole lifecycle while increasing the quality of life with manageable collateral environmental effects as emphasized by 'Vision 2030' (Seventh National Development Plan 2017 – 2021).

The focus of the reviewed literature was much on additional expenses households incurred as they purchased alternative energy sources. Little did these studies pay attention to the opportunity that load shedding could have availed to households. This particular study however, approached load shedding as a challenge in disguise. From what other studies saw as a challenge this study saw an opportunity for households to learn sustainable consumption of hydroelectricity.

As much as Muhammad (2014) findings revealed massive alternative sources of energy adopted during load shedding, it did not state how sustainable these alternative sources were and this study addressed this gap by investigating the sustainability of alternative sources of energy that were used during load shedding as this information was critical in

determining the durability and future energy efficiency in Chipata. Further, most of the reviewed studies such as that of Musademba, (2012), Mwewa, (2013), Muhammad, (2014), Ngoma et al. (2016) and Dhlamini et al. (2016) did not consider load shedding as a learning opportunity that would help motivate and enhance households' behavioural change towards sustainable HEP consumption and production..

This study bridged this gap by proposing a learning guide that aimed at equipping households with knowledge, skills, competencies, attitudes, morals and values that would help them become sustainable HEP consumers.

In conclusion, this study approached load shedding as a 'challenge in disguise', where households mind set was transformed.

2.6 Summary of reviewed literature

Analysis of the reviewed literature indicated that there was a growing consensus by households to transition to sustainable consumption lifestyles worldwide. It was also clear that some households lacked a good understanding that heavy reliance on hydroelectricity as a sole source of electricity was one of the factors that contributed to load shedding in many parts of the world. Therefore, load shedding was received generally with a lot of detrimental feelings. The studies concluded that load shedding accelerated deforestation and environmental degradation. This idea was supported by Musademba (2012) where he argued that load shedding made residents experience a lot of expenses in compensating for power deficits. However, nothing much was revealed on lessons on sustainable consumption of HEP through load shedding. This study bridged up this gap by showing that load shedding was transformative and this aspect was overlooked in most of the reviewed studies on load shedding from the global, African and regional perspectives.

From studies such as Dhlamini et al. (2016), Muhammad (2014) and Ngoma et al. (2016), load shedding was viewed as a detrimental phenomenon that impacted negatively on the general welfare. It is further argued that the majority of the households cut down their usual budgets on food in-takes, children's education and medical expenses to add to energy budgets as they bought alternative energy sources. The

reviewed studies therefore concluded that load shedding affected households psychologically and made their lives unbearable in certain instances. Households changed their modes of living as they tried to cope with load shedding. The reviewed studies indicated that most households viewed load shedding as a challenge that inconvenienced their daily household chores.

CHAPTER THREE

DESCRIPTION OF THE STUDY AREA

3.1 Introduction

This chapter provides the description of the study area (Kapata and Chipata Motel Compounds) in Chipata District. The chapter further gives a detailed description of the study area with focus on the climatic features and socio- economic characteristics of the study area.

3.2 Physical characteristics

The study was conducted in Kapata and Chipata Motel compounds of Chipata District in Eastern province of Zambia. Chipata is the provincial headquarter of Eastern province and the fifth developed city in Zambia behind Lusaka, Ndola, Kitwe and Livingstone. The name Chipata comes from the Ngoni word 'Chimpata' meaning 'large Space' in reference to the towns location in a shallow valley between hills (Chipata, Music Network). Chipata is located 130 km away from Lilongwe and lies on the Great East Road 550km east of Lusaka, Zambia's capital city. Chipata is located between latitude 13^{o} and 39' South of equator and between longitude 32^{o} and 38' east. Its population stood at 455,428 people, with a population density of 68.1/km^2 in 2010 (CSO, 2011).

Chipata District has tremendously grown in the past recent years. The municipality of Chipata boasts of a town, a modern market, two big hospitals, two shopping malls, one University, five colleges and 319 schools (Chipata Media Network). It is the business and administrative hub that serves the region and hosts three (four) star hotels, a golf course, an airport and a mosque. Developed residential areas include Kalongwezi, Moth and Bombay with a lot of high residential areas (Chipata Music Network, 2018). Chipata is electrified and the majority of the housing units are connected to the national grid with the exemption of the newly acquired stands which are still under construction. Like any other town in Zambia, the demand for electricity has been on the increase while power generation has remained fairly steady. Currently, the town suffers from excessive load

shedding. One of the longest recorded blackouts in Chipata lasted seventeen (17) days in November, 2016 (The Daily mail, 2016). This was majorly attributed to increased HEP demand that was characterized by wasteful HEP consumption behaviours and practices by households leading to overconsumption of hydroelectricity. Unsustainability in the HEP energy consumption practices and also in the hydro generation systems posed a great threat on how the future generation was going to meet their energy demand. This created need to implore the learning for HEP consumption through load shedding, especially among households in Chipata Motel and Kapata Compounds. Load shedding is a temporal solution by ZESCO to manage the limited power available in the district. Issues relating to hydroelectricity were among the most important and difficult challenges confronting Chipata District. Providing sufficient hydropower to meet the requirements of a growing population like that of Chipata, with rising living standards would require major advances in hydropower supply in order to meet hydropower demand and efficiency. Doing this while mitigating the risks of climate disruption would be an even more challenging undertaking. It would require a significant shift in the historic pattern of home HEP use and a major transformation of the country's HEP system, hence the study.

3.3 Climate and Hydrology

Chipata experiences a mild tropical climate with three distinct seasons; the warm- wet season which runs from November to April with temperatures ranging from 27^{o} c to 34^{o} c; cool dry cold season which covers the period of May to August with temperatures varying from 4^{o}c to 25^{o}C and a hot dry season which runs from August to October with temperatures of between 26^{o}C to 38^{o} C. Rainfall ranges from 600mm to 1500mm (Environment and social Affairs Unit (2012). The average temperatures vary between 14^{o}c and 30^{o}C. The hot dry season is experienced in the month of September and October. The annual rainfall averages 1240mm and most of which falls in the month of December to February (Environment and social Affairs Unit, 2012). This amount of rainfall is adequate enough to generate the amount of hydropower needed in the District. However, the District also suffered the effects of climate variability in the 2014/2015

rainy season and led to power deficits that impacted on the welfare of households and the economy at large to date (ERB, 2017).

Chipata city is mainly drained by Lusiwasi and Luangwa rivers with their various streams, some of which are perennial. Lusiwasi HEP station was the main supplier of power and the dam rarely filled up and its contribution to power generation was minimal (Line Project EIA for Proposed Pensulo – Msoro, 2005) This situation was worsened by effects of climate variability that was common in the past recent years. In addition to this, water from the dam was mainly lost from the basin at high lake level by overflowing into the nearby catchment area, thereby compromising on the availability of adequate water for use in power generation (Line Project EIA for Proposed Pensulo – Msoro, 2005). The headwater wetlands are significant for the hydrology of hydro electricity generation.

There were many speculations surrounding load shedding in Chipata that time. Some people associated it to leadership failure while others felt it was natural occurrence that would pass. In the past recent years, effects of climate variability greatly contributed to poor rainfall that caused low water levels at Zambia's main HEP stations such as Kafue, Victoria, Kariba and Itezhi - tezhi compromising the hydropower generation in the District and the country at large (ERB, 2017).

3.4 Population

Population growth determines the HEP consumption forecast. The population growth rate for Chipata was 2.1 per cent in 2000 and this contributed to an electricity demand that out stripped the energy supply (shortage). This situation worsened the already stressed HEP sector that was impacted on by the effect of climate variability leading to excessive load shedding in the District (ERB, 2016).

3.5 Energy load and load factor

Energy load in Chipata District grew from 21.8 Gig watts (GWh) per hour in 2000 to 40.5 GWh in 2010 (Environment and social Affairs Unit, 2012). A detailed sect oral consumption obtained for the period 2000 to 2010 showed a pattern of growth and this

was erratic with domestic load showing a strong upward trend. The HEP consumption at household level was expected to grow as population growth increased energy demand (ERB, 2015).

In the last 10 years, the generation capacity of the station drastically reduced from the installed capacity of 12 MW to 5 MW. This was mainly due to the deteriorating state of the generators and turbines (Chisala, 2015). The power system in the District also experienced voltage fluctuation characterized by load shedding since 2014 and this was attributed to the effects of climate variability, unsustainable HEP consumption behaviours and obsolete generators at the power stations (ZESCO, 2015). The load forecast for Chipata was rapidly growing, majorly caused by the rapid growth in the city population and industrial sector and therefore created pressure on the limited amount of hydroelectricity which was available leading to load shedding ((Environment and social Affairs Unit, 2012).

Among many other efforts put in place to address power deficits in Chipata, government through ZESCO undertook the Lusiwasi – Pensulo Project to increase power in the district. The Msekera Chinese HEP scheme was also commissioned to increase HEP supply in Chipata District (Chipata Media Network). Despite several efforts put in place to compensate for the limited power supply in the district, load shedding continued, characterized by high levels of unsustainable consumption practices and behaviours. As much as the 2014/2015 power deficit was majorly associated to effects of climate variability, power deficits continued to occur despite the district recording heavy rainfall in the 2016/2017 rainy season (ERB, 2017). The incompatibility in the HEP consumption styles and in the HEP generation capacity continued posing a big threat on how the future generation in Chipata district was going to meet its electricity demand. This ignited the need to implore the learning on sustainable consumption of HEP through load shedding in order to help households become sustainable consumers through promotion of energy efficient homes and energy diversification for a sustainable HEP sector.

3.6 Selection Criteria

The reason as to why Chipata District was selected as an area of study in the province was because of its unique style of growth. The town attained its municipality status in the year 2016 and officially declared a city in 2017 Chipata Media Network, 2018). Chipata showed a tremendous growth in HEP consumption at both household and commercial levels in the past recent years characterized by unsustainable consumption practices. Population grew at a rate of 2.1 per cent in 2010 (CSO, 2011). The increase in HEP demand and effects of climate variability in the 2014/2015 rainy season contributed to massive load shedding in Chipata District. This was worsened by rapid growth in population, industrial expansion and increased residential areas that put pressure on the fairly stable HEP generation system. This unique style of growth influenced the selection of Chipata as the most preferred area of study in the province.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter provides the methodology of the study which includes the paradigm used, research design, target population sampling techniques, sample size, data collection tools, ethical considerations, data validation and anticipated limitations.

The chapter discusses in detail how data was collected, processed, analysed and presented to address research objectives and questions. The research paradigm, ontological and epistemological assumptions were outlined. Instruments of data collection and techniques were discussed and their use justified. The ethical consideration and data validation were discussed too.

4.2 Philosophical Orientation of the study

The study was underpinned by the Analytical Eclecticism school of thought that advocates for mixed method approach and methodological pluralism. The researcher endeavoured to make intellectual and practical useful connections among clusters of analyses that are substantively related but normally formulated in separate paradigms. The integration of material reality and non – material reality that are posited in separate paradigm – bound theories provided rich explanations about lessons on sustainable consumption of HEP through load shedding. This is because knowledge about sustainable consumption of electricity through load shedding was constructed in different analytical perspectives through divergent techniques and methodologies (Creswell, 2007).

4.2.1 Ontological assumptions

Ontology is a branch of philosophy concerned with articulating the nature and structure of the world (Fay, 1996). In the ontological assumptions, mixed methods research assumed that both material (objective stance) and non- material reality (subjectivity stance) existed out there (Fay, 1996). It was for this reason that the study used

quantitative approach alongside the qualitative one. This was so because quantitative approach provided objectivity in dealing with events that do not change (Creswell, 2003) while Qualitative methods dealt with subjectivity and believed in divergent views about lessons on sustainable consumption of HEP through load shedding. Therefore it was justifiable that mixed method design was to be used in this study and provided more comprehensive and divergent views, ideas and information about lessons of sustainable consumption of electricity that was acquired through load shedding.

4.2.2 Epistemological Assumptions

Epistemology is the study of the theory and scope of knowledge, justified beliefs and ways of generating knowledge (Creswell, 2007). It analyses the nature of knowledge and how it relates to similar notions such as truth, belief and justification (Creswell, 2007). Epistemology generally stipulates how knowledge is generated. The study applied this assumption based on how methods and instruments of data collection were to generate knowledge from different participants. The mixed method research design involved the collection and analysis of quantitative data first followed by the collection and analysis of qualitative data and the findings were integrated during the interpretation phase of the study and results generalized to the entire Chipata District.

4.3 The Research Design

The research design refers to the overall strategy that was chosen to integrate the different components of the study in a coherent and logical manner, thereby, ensuring the effective address of the research problem. It contributed to the blueprint for the collection, measurement and analysis of data (Creswell, 2007).

The study used mixed methods research design whose key feature is its methodological pluralism. The Explanatory sequential mixed design was specifically used. This design was characterized by the collection and analysis of quantitative data first followed by the collection and analysis of qualitative data. The findings were integrated during the interpretation phase of the study and results were generalized to the entire District. The integration of material reality and non – material reality that are posited in separate

paradigm – bound theories provided rich explanations about lessons of sustainable consumption of electricity through load shedding in Chipata District.

Questionnaires were administered to ninety (90) respondents of 18 years and older and were connected to HEP national grid. The age of 18 was preferred in this study because, at this age, people are responsible enough to make informed decisions especially in regard to household HEP consumption. The semi- structured interview schedules and observation guides were administered to ten (10) participants of 18 years and older and were key informants in the study area. The study considered the ten key informants because they were custodians of information and had expertise knowledge in the area and spoke both of their own experiences about load shedding and indeed that of their own people. This provided a deeper understanding of the problem through probing the participants where responses were not clear. The observation guide captured visual and facial responses by the households. This provided a deeper understanding of the problem through probing the participants where responses were not clear.

These instruments of data collection complemented each other and closed gaps left by one method, thereby providing richer information about sustainable consumption of HEP through load shedding in Chipata District. Mixed analysis was used to analyse the data collected using both approaches and the final data base represented both qualitative and quantitative information. Results were then generalized to the entire Chipata population.

4.4 Target Population and sample size

The Universal population was Chipata District and the target population was Chipata Motel and Kapata Compounds. The sample consisted of ninety (90) respondents who were selected using simple random sampling technique; 45 from Chipata Motel Compound and 45 from Kapata Compound and this meant that every member in the population stood a chance of being selected. Homogenous expert purposive sampling technique was used to arrive at 10 key informants who were key policy makers and consisted of one staff from ZESCO Limited, one from Ministry of General Education (MOGE), one from ERB, one member from Patent and Companies Registration Agency

(PACRA), one from ZESCO limited, one from Young Men's Christian Association (YMCA) and four residential leaders who were custodians of information in Kapata and Chipata Motel compounds. These households had expertise knowledge on load shedding Households were used as sample units because they were the basic electricity consumption unit from which meaningful inferences on lessons of sustainable consumption through load shedding were to be retrieved.

4.5 Sampling Design and Sample

Sampling design are techniques that are widely used in research as a way to gather information about a population without having to measure the entire population (Creswell, 2007). The study employed probability sampling techniques, specifically simple random sampling to come up with the 90 respondents; 45 from Kapata and the other 45 from Chipata Motel Compounds. This implied that every household stood a chance of being selected. Non probability sampling design was also used specifically homogenous expert purposive sampling technique to arrive at the 10 key policy makers who were the custodians of information in the area of study In this case this sample consisted of individuals that had particular expertise on load shedding and HEP supply. The following was the distribution; one staff from the MOGE, one from PACRA, one from ZESCO, one from ERB, one from REA, one from YMCA and the last four were the leaders from Kapata and Chipata Compounds. These households were selected based on their houses connected to the national HEP grid and were 18 years and older because at this age people are able to make informed decisions on electricity consumption.

4.5 Methods and Tools of Data Collection

Methods of data collection refer to various strategies and techniques applied in generating primary and secondary data (Creswell, 2007). The study employed both qualitative and quantitative tools that included the semi – structured interview schedule, observation guide, and questionnaire.

4.5.1 Primary sources of data

Primary data sources consisted of information obtained through first hand investigation (Jackson, 2000). The study used primary data which consisted of information generated from semi - structured interviews, questionnaires and observations. Primary data was used in order to provide latest information and development on the topic of study.

A questionnaire was used to collect primary data. This is a research of gathering information from respondents and it consists of a series of questions for the purpose commonly involved in research that employs questionnaires. The questionnaire was administered to 90 individual household participants in order to generate information about how households perceived load shedding and how it transformed household lifestyles. This enabled the researcher to collect information from a wide population and further helped confirm assumptions about occurrences. Qualitative data collected was analysed using codes and further converted into descriptive statistics. The Microsoft Excel computer software aided in tabulating data into statistical diagrams from which interpretations and meanings were drawn.

Further, semi–structured interview schedule was administered to ten (10) key informants to generate information on learning sustainable consumption of HEP through load shedding. This instrument provided room for the researcher to probe and gain a deeper understanding of the research problem and further allowed participants thorough explain their own experiences. This tool was designed using key questions derived from objectives. The semi – structured interview schedule was applicable in this study because of the following reasons; it provided the opportunity to generate rich data, simple language use and interpersonal contacts with participants and this helped the researcher gain an insight on households' perceptions and values about load shedding. This tool further allowed the interviewer to listen to the participants attentively, pause, probe further and encourage the interviewee to talk freely, making it easy for the interviewee to respond. This enabled rich and detailed information to be collected and it enriched the study findings. Data generated from the semi – structured interview was grouped into themes that were derived from the objectives and analysed thematically.

Observation guide was used to collect data arising from participants' facial and verbal cues. Facial expressions were collected using live observations and were coded and analysed manually. Questions were derived from themes on household perceptions and alternative sources of energy. Visual and content analytic techniques were used to analyse data. It involved classifying, coding and indexing data into themes including verbal and observed behaviour. Mixed analysis enabled the researcher make sense of the data collected and it helped highlight the important features of the findings.

4.5.2 Secondary data

Secondary data involved the analysis of documents and records relevant such as books, magazines and brochures on learning sustainable consumption of HEP through load shedding. This approach provided a rich background on learning sustainable consumption of HEP through load shedding. Secondary data was used to complement the field generated data so that it is in line with already existing one. The University of Zambia main library and the online internet services were used to review conceptual literature. The video showing energy Crisis in Cuba was also watched in order to learn, appreciate and identify gaps in knowledge on what other researchers did in line with load shedding. Further, articles such as '*Load shedding: here is how to protect your electronics and appliances' and 'Load shedding across South Africa dominates newspaper front pages'* provided data too. Magazines, brochures and books on load shedding in South Africa also provided secondary rich data for the study. Among books reviewed were '*Load shedding; Writing on and Over the Edge of South Africa'*.

Empirical data was derived from theses, Newspapers and Journals that were analysed in order to create a rich and detailed basis for the study. Document analysis was of critical value to this study where analyses of documents such as books on load shedding from the Zambian, African and global perspectives that proved relevant to learning sustainable consumption of HEP through load shedding were analysed and data generated was interpreted. This assisted the researcher to know what was done and what was not done about learning sustainable consumption of HEP through load shedding. Reading what others did further sharpened and enriched the methodologies and content of the study.

4.6 Ethical Consideration

According to Murray (2006), research ethics is specifically interested in the analysis of ethical issues that are raised when people are involved as participants in research. Therefore, the study was undertaken in consideration of the following ethical considerations.

An ethical clearance certificate was sought from the University of Zambia. Information was discussed with designated representatives and participants. Confidentiality of the information was adhered to and ethics such as respect for persons, knowledge, democratic values and the quality of education were taken into consideration (Murray, 2006). The study paid particular attention to negotiations of access and prior informed consent. A letter from the University of Zambia was sought to present to local authority for permission to access Kapata and Chipata Motel Compounds. The participants were briefed about the purpose of the study and their roles as participants and promised that their names were not going to be used anywhere so as to gain confidence among the participants. Pseudo names were used were it was necessary.

Notification was given to the relevant local authorities to enhance safety and reassure participants that the study was highly official and a visit to the City Mayor was done prior the commencement of the study. Permission was sought from some individual participants and respondents to allow the researcher capture photos where it deemed necessary.

4.7 Data Analysis

Mixed analysis is a technique that involves the use of both quantitative and qualitative analytical techniques within the same framework (Onwueghuzie and Combs, 2010)**.** The study utilized mixed analysis to analysed the data collected using mixed methods on analytical decisions that occurred both prior and during the study to respond to the research questions and objectives. Table 4.1 shows the procedures that were used to analyse both quantitative and qualitative data sets from the preparation of data up to the stage of representing the data. The Microsoft- Excel computer software was used in aiding the analysis process.

Tables 4.1: Analysis procedures for qualitative and quantitative data sets.

Steps	Data Analysis procedures	For Quantitative Data	For Qualitative Data
1.	Preparation of data	Data was coded and numeric values were assigned to prepare for computer analysis	Data was organized through transcription of texts. This was largely inductive.
2.	Reviewing and exploring data.	Descriptive analysis was done through looking for trends and distributions.	Data and notes were read to develop themes (qualitative codes) through thematic analysis.
3.	Analysing data	Descriptive analysis. Used of statistical software (Micro - soft Excel) to record confidence intervals.	Data was coded and assigned labels; Data was further grouped into related themes and statistical diagrams drawn with the aid of statistical software (Micro-soft Excel).
4	Representing data	Results were represented in tables, graphs and figures with the aid of Micro – soft Excel	Findings were presented in discussion form through use of figures to represent themes.

Source: Field Data, 2018.

4.7.1 Data Consolidation.

This was achieved by jointly reviewing both qualitative and quantitative data types and was consolidated through the use of numeric codes or narratives. It typically involved transforming quantitative data set so that it could be compared to qualitative data set.

Findings from both data types were integrated at the interpretation stage and results generalized to the entire Chipata population.

4.8 Validity and Trustworthiness of Findings

Triangulation is a technique that facilitates validation of data through cross verification from two or more sources (Ahmed, 2007). Trustworthiness of data involved how consistent the findings were across the area of study and data validity was done through triangulation

The study specifically employed between - method triangulation to provide means of leveraging the strengths of several methods while mitigating weaknesses based on triangulation of data from semi – structured interviews and questionnaire. This was done to maintain the factual accuracy of the account so as to enhance the validity, consistency and reliability. Between-Method triangulation was used. The researcher used the semi – structured interviews on respondents who had used questionnaires for their responses. Later on the researcher had to compare the responses on the questionnaires and on the semi- structured interview schedules if they were consistent. The researcher discovered that the findings were consistent, therefore it was validity and trustworthy.

4.9 Limitations

Limitations are conditions that may impact on the utility and generalization of the findings (O' Leary, 2010). This study had a number of limitations. With the use of the homogenous expert purposive sampling techniques, it was difficult to generate results that would be used to create generalization pertaining to entire population. However, this was overcome by additional convincing through findings obtained from the quantitative data set; hence the research questions were fully answered and results were specific and they were generalized to the entire Chipata population. The nature of study and timing of the study also affected the response rates. This was because most households were at places of work during day time and it was difficult to find them at their respective homes. This reduced cooperation as respondents were committed at work and this impacted on responses given. This limitation was overcome by following some of the respondents during weekends when they were a bit free. The other limitation was that

the researcher exercised judgment on the informants' reliability and competency. However, this limitation was overcome by the researcher finding out more of the knowledge and skill of the informants. The limitations were also seen in form of biasness on the part of informants especially a representative from ZESCO. This bias could have influenced the data and provided false findings. However, this limitation was overcome by referring to the quantitative findings.

4.10 Delimitation of the study

Delimitation implies a study's boundaries or how the study was deliberately narrowed by conscious exclusions and inclusions (O' Leary, 2010). The study was confined to households of Kapata and Chipata Motel Compounds and strictly to those who were connected to the national hydroelectricity grid. The study was further confined to respondents of 18 years and above. This was so because at this age, people are able to make informed decisions on HEP consumption.

In conclusion, explanatory sequential design was applicable to the study as it allowed the collection and analysis of both quantitative and qualitative data sets. The mixed design was advantageous because it provided strengths that offset the weaknesses of both quantitative and qualitative methods.

CHAPTER FIVE

PRESENTATION OF RESULTS

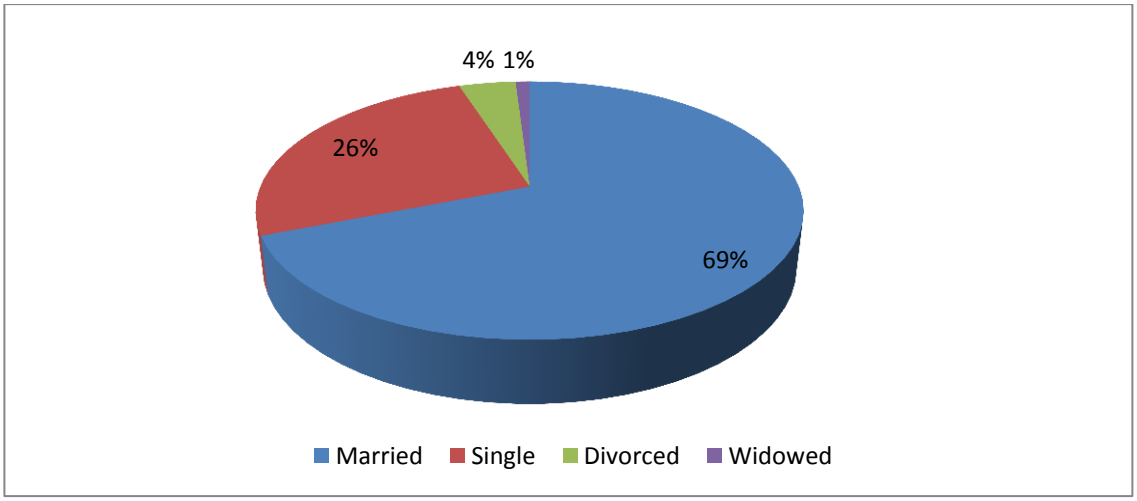
5.1 Introduction

This chapter presents study results on the households' perceptions on load shedding, transformation of households' lifestyles through load shedding, sustainability of alternative energy sources adopted during load shedding, lessons on sustainable consumption of HEP through load shedding and proposing a learning guide on sustainable consumption of HEP in Kapata and Chipata motel Compounds in Chipata District of Eastern Province.

5.2 Demographic Characteristics

This section presents households' demographic characteristics as outlined in the study findings. Generally, 90 respondents were sampled using simple random technique in Kapata and Chipata Motel Compounds of Chipata District. Of this number, 62 per cent were males and 38 per cent were females. Out of the 90 households administered with questionnaires, 69 per cent were married, 26 per cent were single, 4 per cent were divorced and I per cent was widowed as shown in figure 5.1.

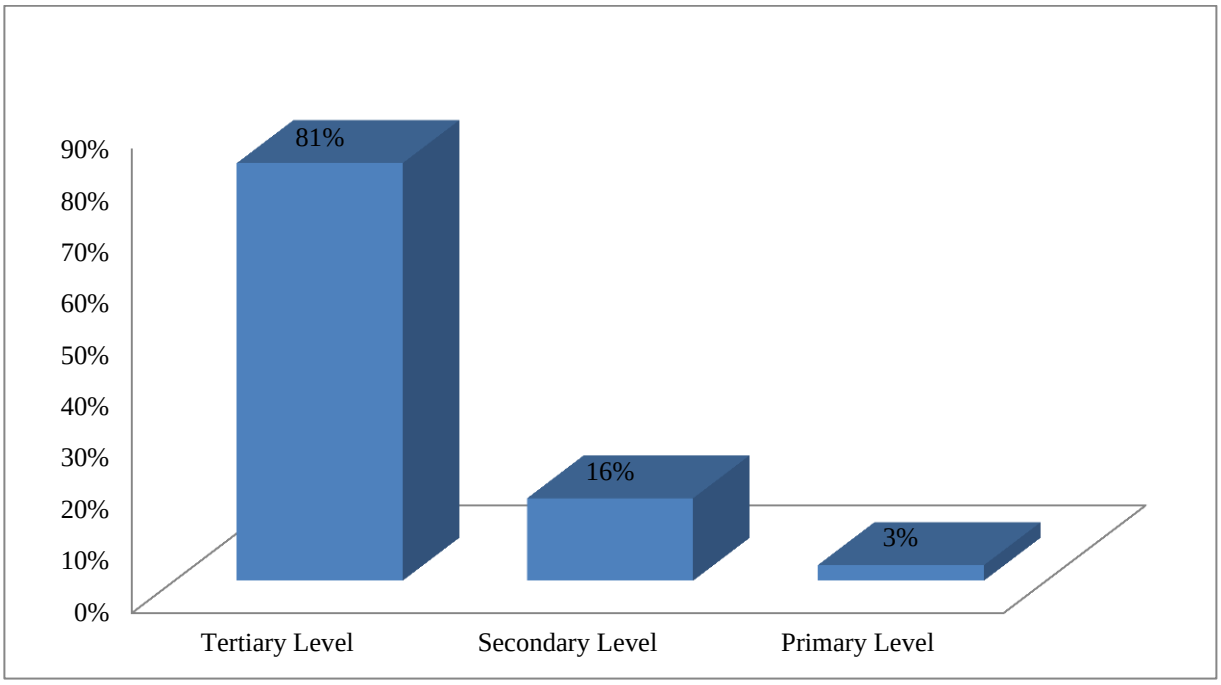
Figure 5. 1: Marital Status of respondents



Source: Field Data, 2018

Most of the respondents (81 per cent) attained education to tertiary level, 16 per cent attained education to secondary level and 3 per cent attained education to primary level as indicated in figure 5.2.

Figure 5.2: Education attainments of respondents



Source: Field Data (2018)

5.3 Households' Perceptions on load shedding

Based on objective one, this section presents households' perceptions on load shedding in Chipata District. Results showed that 62 per cent of the respondents perceived load shedding as a detrimental phenomenon that negatively affected their social, personal and financial lives. Respondents stated that load shedding made them incur extra expenses as they purchased energy alternatives such as solar lamps, standby lights, torches, mini mottos, candles, charcoal and generators. It was for this reason that households perceived load shedding as detrimental. They also complained that load shedding soured their work relationships as it was very difficult to prepare for work for the next day. However, 38 per cent of the households' perceived load shedding as a transformative phenomenon that positively changed their mind set and made them be innovative through the adoption of alternative energy sources to compensate for the power deficits.

This encouraged households to diversify energy sources instead of heavily depending on HEP.

Most households (62 per cent) reported that they perceived load shedding as detrimental because they could not meet for social gatherings such as kitchen parties, dinners and other functions that needed hydroelectricity to run facilities that would support these gatherings. From households' personal perspectives, they found it very difficult to prepare for the following day in terms of meals and work and this created a lot of back locks as far as work was concerned. Households further complained that load shedding posed security threats in the sense that whenever there was load shedding, water would stop running and this increased incidences of diseases such as dysentery and other water borne diseases.

Other households felt that load shedding posed security threats because thieves took advantage of the dark and this reduced people's mobility in the night for the fear of being attacked and murdered. Most of the households (90 per cent) reported that they could not withstand the load shedding frequency. Only 10 per cent of the households did not agree that load shedding was a common phenomenon and these were from the well to do homes. Table 5.1 shows the frequency of load shedding in Chipata District.

Table 5.1: Frequency of Load Shedding.

Occurred Frequently	Rarely Occurred	Never Occurred
70 per cent	20 per cent	10 per cent

Sources: Field data, 2018.

Most of the respondents (62 per cent) stated that they developed negative perceptions towards load shedding because ZESCO did not adhere to load shedding schedules and this made households find it difficult to plan ahead especially that some gadgets got burnt down due to unscheduled power outages.

As evidenced from the interviews, eight out of 10 key informants also stated that load shedding affected them greatly especially in their financial lives, social programs, family

gatherings and entertainment with their families. One of the participants complained that their small scale businesses went down especially broiler keeping, ice colds and frozen food stuff sales. They further said that saving of monies became very difficult and almost every coin went towards the purchase of energy alternatives as they tried to compensate for the power deficits. One of the participants sadly stated that it was very difficult to sit and chat with families in the evenings especially when load shedding reached its climax in August, 2017 and recorded 17 consecutive days of total darkness. One pastor had this to say;

> *Our resident was attacked and beaten to death by unknown people in his own house. It was very difficult for the family of the victims to identify the culprit since there was no power. Load shedding has increased incidences of insecurity as far as theft and murder is concerned in our compounds. This has made the people* to *have a negative attitude towards it as much as it has reduced dependence on HEP. I now encourage my people to use other sources of energy other than depending on HEP* (Participant, 20th January, 2018, Interview).

A Head teacher in Kapata Compound also had this to say;

> *I hate load shedding because it has made preparations for work quite difficult. Most of the times, people go for work late without meals and this has impacted negatively on their work culture to the extent that supervisors misunderstand things* (Participant, 20th January, 2018, Interview).

However, one of the Education representatives had a contrary view and had this to say;

> *As much as load shedding has made us incur a lot of costs, painfully and slowly, it has taught us to adjust our mind sets and adopt new ways of living where renewable energy sources such as solar, generators, braziers, solar lambs, torches, candles and charcoal are used and have helped reduce the dependence on HEP that we have solemnly depended on for a long period of time* (Participant, 20th January, 2018, Interview).

Having presented results on households' perceptions on load shedding in Kapata and Chipata Motel Compounds, the following section presents results based on transformation of households' lifestyles through load shedding.

5.4 Transformation of households' lifestyles through load shedding

Based on objective two, this section presents results on how load shedding transformed households' lifestyles in Kapata and Chipata Motel Compounds in Chipata District in reference to lifestyles cited by respondents as well as those observed in the field.

Table 5.2 shows how load shedding transformed households' lifestyles in Kapata and Chipata Motel Compounds. Households' lifestyles transformed as 66 per cent of the respondents adopted energy alternatives such as solar, gas cookers, stand by lights, charcoal, firewood, mini motto, candles and generators to be used during load shedding times, 11 per cent of the households conserved HEP through 'switch' and 'save' techniques, the other 11 per cent adopted traditional methods of preserving food such as sun drying and smoking, while 6 per cent purchased energy efficient appliances such as energy saving bulbs and cookers and the remaining 6 per cent switched off gadgets whenever they were not as shown in Table 5.2.

Table 5.2: Transformation of Households' lifestyles through load shedding.

Transformation of Households' Lifestyles through load shedding	**Number of Respondents**	**Percentages (%)**
Adopted energy alternatives	60	66
Conserved HEP through 'switch' and 'save'.	10	11
Adopted traditional food preservation.	10	11
Purchased energy efficient appliances	05	06
Switched off appliances when not in use	05	06
TOTAL	**90**	**100**

Source: Field data, 2018

Of the 10 key informants interviewed, 8 of them said that load shedding had transformed their lifestyles positively in the sense that it made them use and view HEP responsibly.

One of the Civic leaders in Kapata Compound had this to say;

> *"Load shedding has changed our lifestyles in the homes in terms of HEP usage. We now use electricity wisely through switch and save knowing that HEP has become scarce in the homes today. When we have it, we use it responsibly as much as load shedding has made us spend more on energy alternatives sources, it has reduced the stress subjected on HEP than it used to be before the inception of load shedding"* (Participant, 30th January, 2018, Interview).

Households also stated that there was so much dependence on hydroelectricity because energy alternatives were not seen to be very necessary as HEP was always available by then. With the coming of load shedding, households stated that they became innovative and creative on how they were going to manage the limited power available.

Eight out of ten key informants stated that electricity bills were very high before load shedding. However, they argued that with the coming of load shedding, they used HEP with a lot of caution as they responded to the messages by ZESCO, Energy Regulation Board (ERB) and Rural Electrification Authority (REA) knowing that HEP could be rationed any time. Some of the informants further associated the reduction of electricity bills to power cuts, responsible and controlled consumption behaviours and practices as most informants were now very careful with the use of electricity.

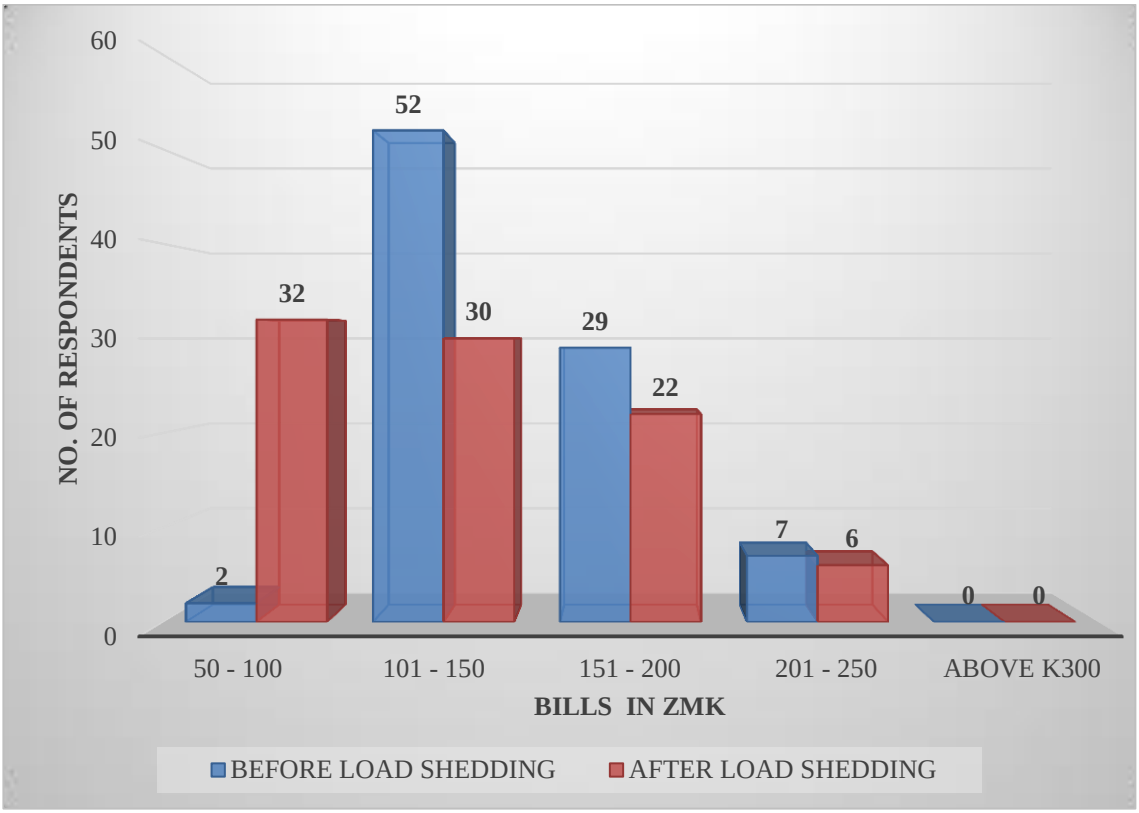
A parent had this to say;

> *With load shedding in place, we really account for electricity units we recharge every month in the home, when everyone is in the living room watching television, we make sure that power is switched off in rooms where there are no people. We also use gas cookers and other alternatives like braziers, firewood and solar stoves to prepare hard food stuffs that take long to cook such as beans and trotters. We do all this to*

prolong the electricity units that we recharge every month. As for perishable foods, we have resorted to sun drying most food stuffs as a way of preserving them (Participant, 30th January, 2018, Interview).

Figure 5.3 depicts a comparative bar graph showing households' electricity bills before and after load shedding. Households' electricity consumption was higher before the onset of load shedding as compared to the period after. This was partly caused by households' adoption of other energy alternative sources that partly relieved the stress on HEP. In general, load shifting behaviour reduced the consumption of grid-connected electricity.

Figure 5 .3: Households' electricity bills before and after load shedding.



Sources: Field data, 2018.

Shifting the time at which household activity occurred to when electricity was available was widely reported for food preparation and to a lesser extent, hot water use. HEP reducing coping strategies resulted in decreased HEP consumption. These strategies were more likely to be employed with food preservation (buying smaller quantities of

fresh food), using cold instead of hot water and adopting passive thermal regulation strategies. Respondents also stated that Zambia Electricity Supply Corporation (ZESCO) also played a key role in imparting knowledge and skills to households on how best to conserve HEP through switch and save techniques as well as through the use of energy efficient gadgets such as energy saving bulbs and cookers. Some of the households further stated that the information that was provided by ZESCO though television was also critical in motivating behavioural change towards sustainable HEP consumption lifestyles. Households further expressed desire to sustain low monthly electricity bills through the use of other energy alternatives and controlled HEP consumption practices.as indicated in table 5.2.

5.5 Energy Alternative sources adopted during Load shedding.

The majority households (83 per cent) adopted energy alternative sources as a copying strategy to load shedding while 17 per cent did not. Table 5.3 shows the types of energy alternatives adopted by households during load shedding. Most of the alternative energy sources adopted were; Solar gadgets such as standby lights, solar cookers, solar geysers and solar driven fridges, generators, candles, torches, energy efficient bulbs and cookers, mini mottos, charcoal braziers, firewood and gas cookers.

Table5.3: Energy alternatives adopted by households during load shedding.

Energy Alternatives Sources Adopted by Households to curb load shedding	**Frequencies**	**Percentages (%)**
Charcoal	23	26
Candles	18	20
firewood	14	15
Solar	14	15
Standby lights	10	12
Generators	05	06
Gas cookers	03	03
Torches	02	02
Mini motto	01	01
Total	**90**	**100**

Source: Field data, 2018.

From table 5.3, it is clear that out of all the responses given on various alternative sources of energy adopted, 26 per cent went for charcoal, 20 per cent of the total responses used candles while 15 per cent mentioned of firewood, 15 per cent used solar, 12 per cent adopted standby lights, 6 per cent of the total responses used generators, 3 per cent bought gas cookers while 2 per cent went for torches and 1 per cent adopted Mini motto.

Generally, 83 per cent of the total respondents stated that they adopted energy alternatives sources such as solar gadgets that included panels, solar fridges, solar stoves and solar geysers, generators, torches, candles, gas cookers, mini mottos and braziers to mitigate load shedding while 17 per cent of the respondents did not use any alternative energy sources. Figure 5.4 shows pictures of energy alternative sources and energy efficient gadgets as observed in the field.

Figure 5.4 (a): Energy saving bulbs adopted as energy alternatives during load shedding

Sources: Field data, 2018

Figure 5.4 (a) shows the types of energy saving bulbs that were adopted by households in Chipata Motel and Kapata Compounds of Chipata District in an effort to save electricity and create energy efficient homes. The energy efficient bulbs did not only conserve energy, but also relieved the stress the HEP sector suffered. Six per cent of the households used energy efficient gadgets. This was a very good move towards establishing energy efficient homes for a sustainable and efficient HEP sector. The only

problem households complained of was that energy saving bulb was more expensive than ordinary bulb and this factor limited many other households from accessing them. It was also observed that certain households used energy efficient gadgets like cookers, geysers, security lights and kettles. The reduction in electricity bills was also associated to such energy efficient gadgets that made some households spend less. Figure 5.4 (b) shows a solar driven fridge used during load shedding times. It consisted of an inventor that was used for charging the battery during day time. Households appreciated solar fridges for they proved very helpful especially during power cuts.

Figure 5.4 (b): Solar fridges used during load shedding

Source: Field Data, 2018

One respondents stated that solar fridges helped in the preservation of food stuffs during power cuts. He alluded that times became hard especially when the District suffered 17 days of load shedding. A lot of food stuffs went to worst and only those households with solar fridges managed to preserve their food stuffs for longer periods of time.

Figure 5.4 (c) shows the solar panels that households used to drive fridges, geysers, stoves, entertainment gadgets such as televisions and radios. The sizes of the panels detrmined how much sunlight was to be absobed by the panels. However, most of the households only managed to buy sizeable panels because the big ones were too expensive to be managed by household especially from medium income homes. Solar driven gadgets were also critcised on the basis that their effectiveness was dependent

much on the prevailing weather conditions. Figure 5.4 (c) shows solar pannel that were adopted during load shedding

Figure 5.4 (c): Solar panels used during load shedding

Source: Field Data, 2018.

Some of the respondents adopted generators as shown in figure 5.4 (d) in an effort to curb load shedding. Most households stated that generators were used for lighting, cooking, ironing purposes and also drive entertainment machineries such as televisiions and radios. However, respondents who owned these generators complained of high costs on fuel.

Figure 5.4 (d): Generators adopted as energy alternatives during load shedding

Source : Field Data, 2018.

Some households also complained that generators were not enevironmentally friendlly for they emmitted a lot of fumes to the environment and made a lot of noise that

disturbed neighbours. These factors compromised the sustainability of the adopted gadgets especially on the part of costs and spare part accessibility.

Most of the households did not manage to wait for electricity but used other energy altenative sources to carry on with their home chores. The majority respondents (60 percent) used charcoal during load shedding times for cooking and heating purposes. With permission, the respondents shown in figure 5.4 (e) was captured as observed from the field. High charcoal use significantly contributed to deforestation as many households easily accessed charcoal than any other energy alternatives in the District. Figure 5.4 (e) shows the brziers and braii stands used as energy alternatives.

Figure 5.4 (e): Braziers and braai stands adopted by households as energy alternatives

Source: Field data, 2018

Figure 5.4 (e) depicts a young businessman who said that he was used to the use of braziers although he complained of high charcoal prices whenever there was load shedding. He added that he also secured a braai stand in order to roast meet whenever there were power cuts in their locality. When asked as to whether they were using

braziers and braai stands before the onset of load shedding, the young man said that most of these gadgets were bought when load shedding just begun in 2014.

Besides charcoal, households easily accessed firewood too as shown in figure 5.4 (f). Permission was sought from the owner to capture her when she was cooking on fire. However, low- income households, who were neither in formal employment nor in business used more of firewood than other energy alternative sources. They used firewood for cooking and heating. When asked on where they fetched firewood to enable them cook on fire, some of the households complained of the distance they covered to fetch firewood. One of the maids interviewed stated that firewood had become scarce as most of the surroundimg areas were deforested through construction of settlements and industries, hence they had to cover long distances to access firewood. She further complained that load shedding had contributed to the increase of charcoal and firewood prices and use in the District especially when load shedding frequency increased. Some households also stated that firewood provided an alternative source of energy for cooking, boiling and heating during power deficits. Figure 5.4 (f) shows the use of firewood during load shedding.

Figure 5.4 (f): Firewood as an adopted alternative energy source to load shedding

Source :Field data, 2018

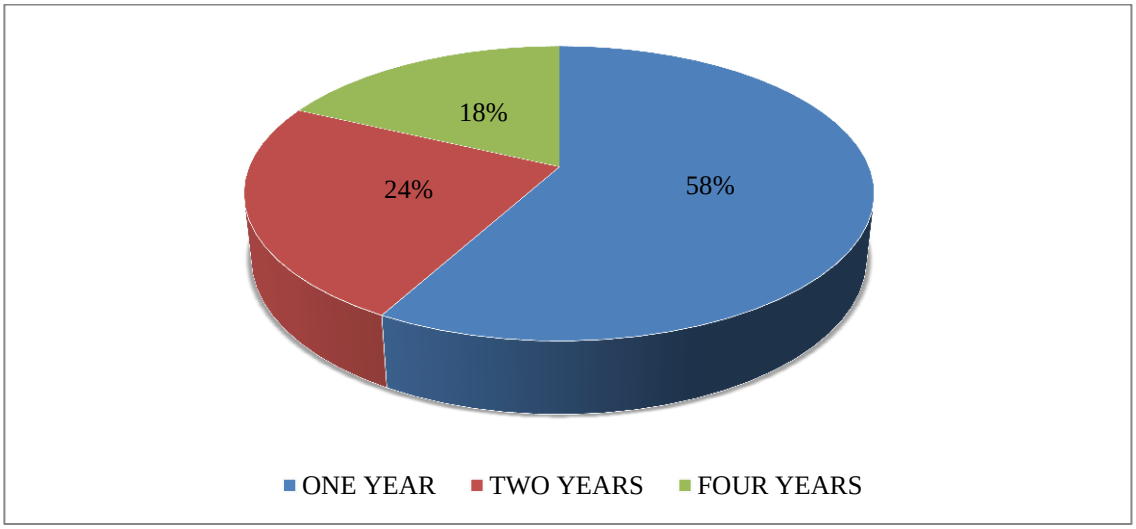
Having presented results on various energy alternatives that households adopted during load shedding' and further contributed to the reduction of their monthly electricity bills, the following section presents results on sustainability of energy alternatives adopted by households during load shedding based on the respondents' views and researcher's observations from the field.

5.6 Sustainability of adopted alternative energy sources by household during load shedding.

Based on objective three, this section presents results on how sustainable the adopted energy alternative sources were.

When asked on how long households used energy alternatives they had adopted during load shedding, 58 per cent of the them said that they had used the adopted energy alternatives for a period of one year, while 24 per cent used them for a period of two years and only 18 per cent had used the same for a period of four years. The major complaint registered by households was that most of the energy alternatives adopted lacked durability. Spare parts were inaccessible and very expensive to be afforded by most of them. Those who had adopted generators complained of noise pollution, fuel and maintenance costs. However, most households managed to do with the energy alternative sources they adopted regardless of the problems they incurred. Figure 5.5 shows the duration households used the adopted energy alternative sources.

Figure 5.5: Duration households used energy alternative sources



Source: Field data, 2018

As for the 10 key informants interviewed, 8 of them stated that they used the energy alternatives for a long period of time while two of them said that they only used alternative energy sources for an average period of time. Table 5.4 shows problems households incurred on energy alternatives during load shedding.

Table 5.4: Problems households incurred on adopted energy alternatives.

Problems incurred on adopted energy alternatives	**Frequency**	**Percentages (%)**
Expensive to maintain	40	44
Lack durability	20	22
Environmentally unfriendly	15	17
Had no problems	10	11
Not easily accessible	05	06
Total	**90**	**100**

Source: Field data, 2018

As evidenced from the respondents' views and observations in the field, 44 per cent of the respondents found the adopted energy alternatives very expensive such as generators, solar panels and invertors, solar geysers, solar fridges and gas cookers, 22

per cent of them said some energy alternatives such as solar standby lamps and torches were not durable, 17 per cent of the households said gas cookers and generators were environmentally un friendly and were costly to manage especially on gas, fuel and maintenance costs, 11 per cent had no problems with the adopted energy alternatives, and the other 6 per cent did not adopt any energy alternatives.

Of the 10 (ten) key informants interviewed, nine (9) adopted candles, generators, lamps, solar and charcoal as energy alternatives. All the 9 key informants incurred some problems with the adopted energy alternatives while one per cent did not. Problems incurred ranged from lack of durability, inaccessible spare parts to expensive gadgets. All the 9 informants said they would manage household chores with the energy alternatives they adopted even if load shedding was to last forever. They further commented that with the adoption of the RETs, they were no longer worried about load shedding because energy- mix helped them curb load shedding and this made their lives easier than before.

A 55 year old pastor had this to say;

> *We have solemnly depended on HEP since independence not until in the year 2014 when load shedding struck and we learnt that there was need to explore on other renewable forms of energy, that are sustainable. Now we know the value of diversifying energy sources. Life has become easier with the other alternatives energy sources* (Participant, 10th February, 2018, Interview).

Key informants further suggested that government should make spare parts for alternative energy sources readily available on the markets for easy accessibility. Most of the respondents desired to use these alternatives to energy sources but accessibility was of great challenge.

Having presented results on the sustainability of energy alternatives adopted during load shedding in Kapata and Chipata Motel Compounds, the following section presents results on lessons on sustainable consumption of HEP through load shedding in Kapata and Chipata Motel Compounds in Chipata District.

5.7 Learning opportunities on sustainable consumption of HEP through load shedding.

With reference to objective four, this section presents results on lessons on sustainable HEP consumption through load shedding.in Chipata District.

Eighty per cent of the households acknowledged that although load shedding was a challenge, lessons on sustainable consumption of HEP were acquired. They stated that information and knowledge on how to use hydroelectricity sustainably was given by ZESCO, ERB, REA and other NGOs through media, magazines and brochures. The effects of sustainable HEP consumption lessons were manifested in the reduction of monthly electricity bills. There were also changes in the mind sets of the households as they could even decide to cook hard cooking food stuffs like beans and dry fish on charcoal just to try and save HEP. This entailed a high degree of responsibility of HEP consumption practices by households.

Most respondents (66%) stated that they learnt to diversify energy sources through the use of solar gadgets, standby lamps, candles, firewood, charcoal, mini mottos and gas cookers, 17 per cent controlled HEP usage through ‘switch’ and ‘save’ techniques,11 per cent used traditional methods of food preservation and 6 per cent learnt the importance of using energy efficient gadgets such as energy saving bulbs and energy saving cookers that consumed less HEP and reduced the stress on the HEP generating systems. Households agreed that lessons on sustainable HEP consumption received from various Media systems empowered them with skills, knowledge, values, morals, attitudes and competencies on how best households would become sustainable consumers of HEP. Table 5.5 shows lessons on sustainable consumption of HEP through load shedding.

Table 5.5: Lessons on sustainable consumption of HEP through load shedding.

Types of lessons households received during load shedding	Frequency	Percentages (%)
To switch off gadgets when not in use	41	46
Control HEP usage through saving	18	20
Adopt clean and renewable energy sources	14	15
Use energy efficient appliances	09	10
Controlled HEP consumption behaviour and lifestyles	08	09
Total	**90**	**100**

Source: Field Data, 2018.

Nine (9) out of ten (10) key informants stated that through load shedding, they learnt to consume HEP sustainably through wise usage. They did this by switching off gadgets whenever they were not in use, used energy efficient gadgets and accounting for the HEP units they paid for each month.

One Senior Education Standards Officer had this to say;

> *We carefully utilize the electricity units we pay for each month and we control usage by restricting the cooking of hard food stuffs to braziers. No family members are allowed to leave lights on unless need arises. This has lowered our HEP consumption to sustainable levels. The lessons of sustainable HEP consumption have really changed our attitudes in the way we view and use HEP* (Participant, 20th February, Interview).

Having presented results on lessons on sustainable HEP consumption in Kapata and Chipata Motel Compounds, the next chapter presents results on the learning guide on sustainable HEP consumption through load shedding as an intervention in Chipata where some households still showed lack of a good understanding in the link between their home HEP use and environmental consequences.

5.8 Learning guide on sustainable consumption of HEP through load shedding

With reference to objective five, this section presents the learning guide on sustainable consumption of HEP in Chipata District based on the responses and contributions made by households and observations made from the field. The respondents' responses, contributions and observations were critical in the interventions that were put in place to enhance and motivate households' HEP consumption behavioural change to sustainable levels.

Majority households (80 per cent) felt that unsustainability in the HEP consumption and hydro generation as well as some households' lack of a good understanding of the link between HEP use and environmental consequences created need for a learning guide that would be used to create awareness among households of the need to adopt sustainable consumption lifestyles. The study revealed that the natural causes of load shedding were enhanced by anthropogenic factors such as wasteful HEP consumption practices. Therefore, promotion of sustainable HEP consumption among households required regulating HEP consumption behaviours through acquisition of skills and competencies to help households become sustainable HEP consumers. It is for this reason that the study proposed a learning guide that would act as an intervention to households and help them acquire skills, values, knowledge, morals, attitudes and competencies for them to move towards sustainable HEP consumption lifestyles. The following steps were seen critical by households in enhancing households' HEP consumption practices to sustainable levels.

5.8.1 Sound information techniques

In order to address the critical problem of unsustainability in the HEP consumption and hydro generation in Chipata District, learning guide was developed that consisted of activities and actions that households suggested would help them transition to sustainable HEP consumption. This was based on households' observations and experiences they had encountered with load shedding.

The most important activity some households advocated for was to put sound information techniques in place that would help increase awareness in the HEP

consumers on the need to use HEP sustainably. Most households (80 per cent) stated that this would be achieved through various media systems such as televisions, radios, brochures and live drama shows to the existence of over usage of HEP and necessary steps to solve the problem of wasteful HEP consumption practices. Eight out of 9 key informants were for the view that aggressive campaigns against abuse of HEP could be spearheaded by government and other stake holders such as Non- Governmental Organizations (NGOs), churches, ZESCO, REA, ERB and Civil Society.

As observed from the field, many households wished to transition to sustainable HEP consumption lifestyles, but did not know how best information techniques in that case could be appropriate and successful because households already held a specific goal to act sustainably based on the limited information provided by ZESCO by then.

5.8.2 Positive motivational techniques

When asked on how best the households would be motivated to become sustainable HEP consumers, 80 per cent of the them stated that monetary or social reinforcement could be applied to enhance households' behaviour seem more appealing while 20 per cent did not say anything. They further stated that monetary reinforcement would include social recognition or support such as socially recognizing the ''Super- HEP Conservers" or "HEP Stars" at household level. Most households felt that awards may also be given to the deserving households such as the issuance of RETS like solar, mini mottos, solar geysers and cookers as these may eventually motivate behavioural change.

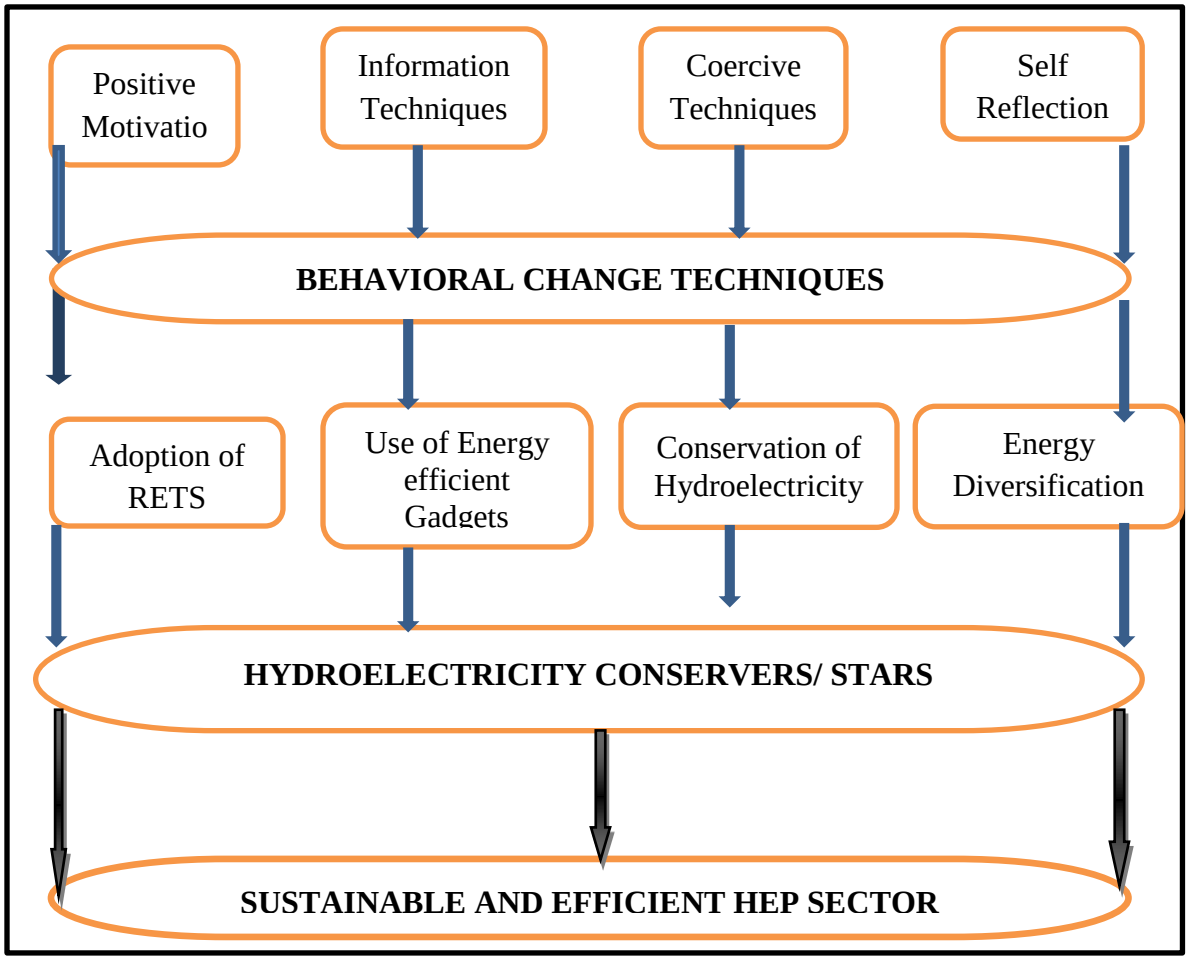
5.8.2 Coercive Techniques

When asked on how best households may be made to comply to sustainable consumption of HEP, some of the households (62 per cent) felt that coercive techniques may help compel actions by greatly constraining household's choice both physically or perceptually. They felt that this could be achieved through force, fear, intimidation, punishment or threats and set rules given to households who abuse HEP. Seven out of ten key informants further suggested that stiff punishment could also be given to those households who did not comply with a set of given rules and felt that this could prevent households from abusing HEP.

5.8.3 Self – reflection.

When asked on how best households could move towards sustainable consumption, majority of the key informants (Nine out of 10) stated that self- reflection by households would induce intrinsic motivation for living sustainably. Most key informants were for the view that households should create self - awareness of the uncomfortable feelings and thoughts about unsustainable HEP consumption habits. They further suggested that self - reflection should include a synthesis of new households' HEP practices with the households' old HEP practices and finally a perspective transformation of households' lifestyles was to be drawn where the final outcome was learning. Households proposed activities, actions and techniques to enhance and promote sustainable HEP consumption lifestyle and achieve a sustainable and efficient HEP sector as indicated in figure 5.6.

Figure 5.6: Learning guide on sustainable consumption of HEP



Source: Field data (2018)

Adapted from Mezirow's Transformative Learning Theory (1978).

In conclusion, households proposed interventions that they thought would help provide solutions to the problem of load shedding. The information techniques proposed aimed at increasing awareness among households on the need and importance of HEP consumers transitioning to sustainable living as a workable and viable solution to load shedding. Social reinforcement was also thought would help complement households' positive response to sustainable consumption lifestyles. Households further thought that Coercive techniques would also compel households to consume HEP sustainably through a set of rules, penalties and punishment to HEP abusers.

CHAPTER SIX

DISCUSSION OF RESULTS

6.1 Introduction

This chapter presents the discussion of the study findings with reference to themes embedded in the objectives. The following was the layout; households' perceptions on load shedding, transformation of households' lifestyles through load shedding, sustainability of alternative energy sources adopted during load shedding, learning opportunity on sustainable HEP consumption through load shedding and learning guide on sustainable HEP consumption through load shedding in Chipata District. This section will further present the relationship between the Transformative learning theory by Mezirow (1978) and the study findings.

6.2 Households' Perceptions on Load shedding

With reference to theme one that looked at households' perceptions on load shedding, the study findings showed that most households (90%) perceived load shedding as detrimental because it negatively affected households' social, personal and financial lives and reduced their financial viability and overall performance. In certain instances, load shedding was reported to have posed security and health threats such as murder, diseases, theft respectively. Socially, households could not meet for functions such as kitchen parties, dinners, and other events that needed the Public Addressee Systems (PAS) for celebration purposes. Households reported that their personal lives were affected as it was difficult for them to prepare for work, cook meals on time and plan ahead because of unfixed load shedding schedules. Households further stated that Load shedding increased demand and prices for charcoal and further caused deforestation. This implied that most households diverted their incomes to the purchase of energy alternatives. The study findings further revealed that the majority of the households associated load shedding to challenges such as murder, theft, stress and extra expenses and it was for these reasons that the households developed negative perceptions on load shedding.

Results established in this study were similar to findings from Studies by Musademba, (2012), Muhammad (2014), Dhlamini et *al* (2016) and Ngoma et *al* (2016) that showed that households' perceptions were detrimental as load shedding caused unemployment, decreased export contracts, increased commodity prices, caused loses in perishable food stuffs due to refrigeration failure and further caused production downtime in most home industries.

Contrary to study findings by Musademba, (2012), Muhammad (2014), Dhlamini et *al* (2016) and Ngoma et *al*, (2016), results of this study revealed that (38%) of the households perceived load shedding as a building phenomenon. Reasons for these positive perceptions were based on the fact that load shedding transformed households' mind sets of solemnly depending on HEP to adoption of other energy sources in an effort to compensate for power deficits. This implied that as much as most households (62 per cent) perceived load shedding with a lot of negativity, it is also very clear in this study that certain households still perceived load shedding as a 'blessing in disguise' as they were of the view that it availed an opportunity for households to diversify energy sources. Results established in this study present unique knowledge in the sense that what other studies perceived as a challenge, this study saw an opportunity for households to become innovative through skill acquisition. Having discussed results on households' perceptions through load shedding, the following section discusses results on transformation of households' lifestyles through load shedding.

6.3 Transformation of households' lifestyles through Load shedding.

With reference to objective two, that looked at transformation of households' lifestyles through load shedding, majority of the households were for the view that their lifestyles transformed through the process of load shedding as they adopted energy alternative sources such as solar, gas cookers, torches, generators, candles, firewood and charcoal, conserved HEP through 'switch' and 'save' techniques, adopted traditional methods of food preservations of sun drying and smoking and purchased energy efficient gadgets. The results of this study further indicated that households developed responsive and controlled HEP consumption practices that led to the reduction of HEP dependence syndrome among many other developments. It is also clear that households did away

with their old ways of living where they depended much on HEP to a situation where they revised their belief systems about HEP and adopted other energy sources such as generators, solar lambs, standby lights, charcoal, mini mottos and other sources of energy as a way of mitigating load shedding.

Results established by this study partly show conformity with study findings by Muhammad (2014) that showed that households compensated for the power deficits through purchase of energy alternatives as a coping strategy to load shedding. Instead of waiting for HEP to normalize, households opted to compensate for power loses through adoption of RETs and other sources of energy. This showed a high degree of innovativeness and creativity among and within households.

However, results established by this study also showed some contrast with results established by Musademba, (2012), Muhammad, (2014), Dhlamini, et *al* (2016) and Ngoma et *al* (2016) in that it showed households' on-going focus on creating energy efficient homes in an effort to transition to sustainable HEP consumption lifestyles for sustainable societies. Most of the households stopped using electricity stoves during load shedding times due to low voltage and used energy efficient appliances such as energy saving bulbs and cookers. The transformation in households' lifestyles through the adoption of energy alternatives posed a relief on the stressed HEP sector. This transformation in households' lifestyles was also associated to load shedding and was evidenced in the reduction of households' monthly electricity bills as indicated in figure 5.3. The reduction in households' electricity bills was also due to responsive and controlled HEP consumption behaviours that households exhibited. This was justified by observed households' HEP consumption practices in the field where households avoided cooking hard food stuffs such as beans, fish and trotters on electrical stoves even when HEP was available. It was further manifested in the load shifting behaviour and energy efficient gadgets that contributed to reduced monthly electricity bills.

Generally, load shifting behaviour reduced the consumption of grid-connected electricity. Shifting the time at which an activity occurred to when electricity was available was widely reported for food preparation and to a lesser extent, hot water use. HEP reducing coping strategies resulted in decreased HEP consumption. These

strategies were more likely to be employed with food preservation, using cold instead of hot water and adopting passive thermal regulation strategies. ZESCO also played a key role in imparting knowledge and skills to households on how best to conserve HEP through switch and save techniques as well as through the use of energy efficient gadgets such as energy saving bulbs and cookers. The information that was provided by ZESCO played a critical role in motivating HEP consumption behavioural change towards sustainable HEP consumption lifestyles. These findings clearly show the positive impact of lessons on sustainable consumption of HEP and the responsible HEP consumption behaviours households acquired due to challenges they faced from load shedding. The load shifting behaviour instilled responsibility as far as HEP consumption practices were concerned.

This indicated that households desired to save the limited electricity units planned for in a particular month. The observed households' attitudes were in tandem with Ship worth (2002) who said that changing HEP consumption behaviour is a psychological, social and cultural complex problem requiring drastic changes on how people think, view and use HEP.

Findings of this study further complement Mezirow's Transformative Learning Theory that shows that predicaments like load shedding transform households' psychological understanding where there were changes in understanding of the self in relation to load shedding problem. Households entered conviction about the problem of load shedding, made and implemented plans of how best they were to revise their belief systems about HEP. This saw households adopting other energy alternatives, RETs and energy efficient appliances in compensation for power deficits. The theory further showed that households defined their own experiences and predicaments differently from other people's beliefs, purposes and judgments. The households' behavioural transformation therefore promoted energy diversification and reduced HEP dependence syndrome.

Having discussed the results on transformation of households' lifestyles through load shedding, the following section discusses results on sustainability of energy alternatives adopted during load shedding.

6.4 Sustainability of energy alternatives sources adopted through load shedding.

Based on objective three that looked at the sustainability of the energy alternatives adopted during load shedding, the majority of the households (58%) used energy alternative sources for an average period of two years without experiencing major problems. This entailed that most of the adopted energy alternatives were user friendly. Some households however, reported that generators were too expensive to maintain as they needed fuel to drive them. In addition to this, generators were also were reported to be environmentally unfriendly as they emitted fumes and caused a lot of noise pollution. Households also observed that some gadgets like solar lamps lacked durability as most of them did not work for longer times. Other households complained that weather patterns disturbed the functioning of solar driven gadgets such as geysers, lamps, pumps and hammer mills as they needed abundant sunshine to recharge the batteries especially in the rain season. This compromised sustainability.

Some households (58 per cent) complained about lack of access to spare parts for lamps, generators, gas cookers and torches, and when accessed most of them proved to be very expensive. However, households wished for better and more improved generators that would produce less noise and fumes. This implied that sustainability of most of the adopted energy alternatives was a challenge due to inaccessibility of spare parts and durability. Households therefore called for help especially from government and NGOs to make RETs and their spare parts readily available on the local markets for accessibility and continuity purposes. As much as majority households complained of difficulties in sustaining and maintaining the energy alternatives adopted, they generally reported that they would still manage their lives with the energy alternatives they adopted even in situations that load shedding lasted forever. They also believed that the problems they experienced with most energy alternatives were manageable and expected improvements with time. Households also expressed great desire and passion to receive more lessons on the choices of the appropriate electrical gadgets that would consume minimal energy and in the long term promote energy efficient homes.

As much as prior studies by Musademba, (2012), Muhammad, (2014), Dhlamini, et *al* (2016) and Ngoma et *al* (2016) stated the types of energy alternatives adopted during

load shedding, nothing much was mentioned on how sustainable the alternative energy sources were. These studies overlooked the critical issue of sustainability that would determine continuity in the use of the adopted energy alternatives. This gap was addressed by investigating the sustainability of the energy sources adopted during load shedding as a way of determining the sustainability and continuity of the gadget use.

Having discussed results on sustainability of energy sources adopted by households during load shedding, the following section will discuss results on lessons of sustainable HEP consumption through load shedding.

6.5 Lessons on sustainable HEP consumption through load shedding?

With reference to objective four that presented a learning opportunity on sustainable consumption of HEP through load shedding; this section discusses results on lessons on sustainable HEP consumption acquired through load shedding in Chipata District.

The results of this study established that most households (80%) learnt sustainable HEP consumption through load shedding. Results showed that households learnt how to save HEP by switching electrical gadgets off whenever they were not in use and this reduced the stress on HEP. Households further learnt to diversify energy sources by adopting energy alternatives such as charcoal, generators, solar, firewood, candles, standby lamps, mini mottos, gas cookers, solar hammer mills and geysers. Energy efficient gadgets such as energy saving bulbs and stoves were adopted as energy efficient appliances. Sustainable HEP consumption lessons were conducted through various media systems such as televisions, radios, magazines, brochures and NGOs. The HEP consumption lessons changed most of the households' perceptions, mind sets, attitudes and lifestyles in regard to how they viewed and utilized hydroelectricity energy. Households started viewing HEP responsibly and controlled its usage more than it was before the lessons were given. Reduced households' monthly electricity bills were also as a result of lessons that were given to households during load shedding and the encounter with load shedding experiences as evidenced in figure 5.3. The lessons on sustainable HEP consumption led to energy diversification, HEP conservation and use of energy efficient gadgets that further contributed to the reduction of HEP dependence syndrome.

The findings established in this study were quite unique from prior studies by Musademba, (2012), Muhammad, (2012), Dhlamini et *al* (2016) and Ngoma et *al* (2016) that emphasized much on the negative impact of load shedding at household level and overlooked the learning opportunities load shedding could have availed at household level. This was clearly seen where the majority households (66%) transformed their lifestyles through controlled HEP consumption behaviours and practices such as switch and save, energy diversification and use of energy efficient appliances that led to the reduction of monthly electricity bills as indicated in figure 5.3. However, it was also clear from the findings that some respondents (10%) lacked good understanding of the link between their home HEP use and environmental consequences and this significantly contributed to over consumption of HEP. Some households (10 per cent) still heavily depended on HEP and took it as a symbol of wealth and pride. They underrated the use of energy alternatives such as solar, torches, charcoal, firewood, gas cookers standby lights as gadgets that would relief the stress on HEP.

Contrary to studies by TNS Survey, (2008), Musademba, (2012), Muhammad (2014), and Dhlamini et al. (2016) that viewed load shedding as detrimental, results of this study also showed that households learnt sustainable consumption of HEP through load shedding as much as prior studies viewed it as a challenge. Most households (80%) acknowledged that load shedding was building in the sense that it made them be innovative and creative as they adjusted to limited power supply. The lessons acquired helped households know the importance of energy diversification and the role it played in the reduction of HEP dependence syndrome. The secret lied in load shifting behaviour. The time households used other energy sources, HEP was saved.

Having discussed results on lessons on sustainable consumption of HEP through load shedding, the following section will discuss results on the development of a learning guide on sustainable consumption of HEP as a technique that would motivate households to become sustainable HEP consumers.

6.6 Learning Guide on Sustainable Consumption of HEP through load shedding

With reference to objective five that presented the learning guide on sustainable consumption of HEP, this section discusses results on the learning guide on sustainable consumption of HJEP

By the time the study was undertaken, no effective load shedding management measure existed in Chipata District. This could have been one of the contributing factors to the problem of unsustainability in HEP consumption and hydro generation.

Ship worth, (2002) stated that lack of good understanding of the link between home HEP consumption actions and the environmental consequences is one of the biggest challenges households face today and contributes to wasteful HEP consumption behaviours.

Despite the absence of the load shedding management measures in Chipata, this study proposed a learning guide on sustainable HEP consumption through load shedding. The learning guide aimed at enhancing households' behavioural change towards sustainable HEP consumption lifestyles especially that Chipata was faced with the problem of unsustainability in HEP consumption and hydro generation that posed enormous challenges on the socio – economic livelihood of the households. The information techniques would empower individual households with knowledge and skills and help them become actors of change towards sustainable HEP consumption lifestyles. This would further help households provide solutions and alternatives to the problem of load shedding and learn to consume HEP with caution without compromising the ability of the future generations meeting their HEP aspirations. However, information alone also may not always motivate households' behaviour as it does not consider other psychological, social and cultural factors (Doubt, 2008). Therefore, there was need that psychological, social and cultural factors also are brought into consideration. Ship worth (2002) states that aggressive campaigns and sensitizations may make households see the need for behavioural change towards sustainable HEP consumption practices.

As much as the study by Mwewa (2013) provided a feedback of households' HEP consumption behaviours through computer visualization, nothing much was however done on motivating the HEP users. This justified the reasons why the proposed learning guide considered motivating households' towards sustainable HEP lifestyles through various behavioural change techniques. The learning guide showed how information through various media systems could increase awareness and empower households with knowledge, skills, values and competencies and help households provide solutions and alternatives to the problem of load shedding. The whole essence was to foster sustainability in HEP consumption and hydro generation and in the long term prevent load shedding.

The behavioural change techniques encompassed a wide variety of methods such as persuasive prompts and material incentives to motivate households' behavioural change in the positive ways. Material incentive such as rewarding actions with money or material goods would help change households' HEP consumption behaviours quickly. As observed on figure 8. The outcome of this guide compliments the study results by Abrahamamse (2005) that stated that social reinforcement is critical in motivating households' HEP consumption behaviours. The implication was that when super HEP conservers are rewarded, the households would be motivated extrinsically. The best reinforcement would be to award them with material resources such as money, generators, standby lights, and solar driven gadgets such as cookers, geysers and fridges to encourage households' transition to RETs for energy - efficient homes. This action would encourage households to refrain from unsustainable HEP consumption behaviours thereby promoting sustainability in the HEP sector.

Contrary to studies conducted by Samboko (2009) and Muhammad (2014) that focused much on the detrimental side of load shedding and associated its existence to high population growth and overlooked lack of material prompts as some of the major causes of unsustainable HEP consumption practices. This study explored on how social reinforcement could be used to motivate households' behavioural change towards sustainable consumption lifestyles for sustainable societies. Muhammad (2014) and others did not pay much attention on the power of social reinforcement in providing

solutions to the problems of unsustainability in the HEP consumption and hydro generation. This action would be made possible through robust campaigns where households could be socially reinforced to become HEP conservers or stars and in turn promote energy efficient homes for sustainable communities.

Unlike studies by Muhammad (2014) and others that focused much on the negative impact of load shedding, this particular study revealed that load shedding was an opportunity for households to be empowered with knowledge and skills on how best to become sustainable consumers. Further, prior studies overlooked the learning on sustainable consumption that load shedding could have availed through energy diversification, HEP conservation and use of RETs and energy efficient gadgets. Aggressive campaigns against abuse of HEP by government and other stake holders such as NGOs, churches, ZESCO, REA, ERB, civil society would help bring a balance in the HEP generation capacity and HEP consumption, something that was overlooked by earlier studies by Musademba, (2012), Muhammad, (2014), Dhlamini, et al. (2016) and Ngoma et al. (2016).

In addition to positive motivational techniques are coercive techniques that compel actions by greatly constraining household's choice both physically or perceptually. This could be achieved through force, fear, intimidation, punishment, penalty or threats and set rules given to households who abuse HEP. Coercive techniques could be implored to reinforce positive behaviour in HEP usage. This however, has to be done with a lot of caution as it may provoke households to misbehave to the set of given rules. In this situation the electricity utility company could spell out set of rules and regulations through various media systems to reinforce wise usage of HEP. Stiff punishment may also be given to those households who do not comply to a set of given rules. This may prevent people from abusing HEP. In this case, fear campaigns can also be given to explain what households are expected to do in this case. The proposed learning guide complements the study findings by Ship worth (2002) that states that aggressive campaigns and sensitizations make households see the need for behavioural change towards sustainable HEP consumption behaviours. Results established in this study were unique from other studies by Musademba, (2012), Muhammad, (2014), Dhlamini et al.

(2016) and Ngoma et al. (2016) that narrowed their studies to the negative effects of load shedding and overlooked the need to propose a learning guide that could help motivate households HEP consumption behaviours to sustainable levels.

Similarly, Ship Worth (2002) stated that, in order for households to move towards sustainable HEP consumption lifestyles, households' consumption behaviour must change for the long term. One area that this guide aimed at exploring was the concept of self-reflection by households in Chipata District. The guide provided techniques that would induce intrinsic motivation among households for living sustainably. Reflection is the process of turning experiences into learning (Doubt, 2001). The stages in self - reflection included self-awareness of uncomfortable feelings and thoughts about unsustainable HEP consumption behaviours. In this case, households would be required to keep their monthly utility bills of HEP and the usage events could be used to enhance reflection practices.

Findings established in Chapata support study findings by Bond, 2001) that showed that computer visualizations were the major ways households were given their monthly HEP consumption bills. However, computer visualizations was ineffective at motivating sustainable HEP consumption behaviours among households because it was not accompanied by behavioural change techniques (such as persuasive messages), nor did it provide information as to the existence of unsustainable HEP consumption behaviours and the steps to solve them. Because HEP consumption bills come at the end of the month, households found it difficult to explore the link between home HEP use and the environmental consequences. It should be emphasized then that at every stage of motivating HEP consumption behavioural change, persuasive prompts are critical at enhancing this change as far as HEP consumption behaviour is concerned. It is for this reason that the proposed learning guide in this study critically utilized motivational factors that would encourage households to change their HEP consumption behaviour to sustainable levels.

The other activity proposed by households to be undertaken in this learning guide was to design actual feedback visualization of HEP use based on a combination of motivational methods outlined in figure 8. For instance they households proposed that pro- social

orientation could be encouraged through an ambient display located in public areas of Chipata Motel and Kapata Compounds that show how each household contributes to the overall HEP use, where social recognition is awarded for energy efficient behaviours. The actual information could be shown in multiple ways, each corresponding to differing utilities or values held by particular household members. The learning guide also encouraged self-reflection by letting household members annotate a visualization containing a history of their HEP consumption data. The expected outcome was a situation where households were empowered with skills, values, knowledge and competencies that would help them transition to sustainable HEP consumption lifestyles for a sustainable HEP sector. The essence of the guide was to provide an intervention to a community that was impacted by load shedding. The guide would provide households with skills and knowledge that would help them become sustainable HEP consumers and be able to provide solutions and alternatives to problems of load shedding and other environmental issues. The intervention also aimed at motivating households to adopt energy efficient appliances and RETs that would encourage energy mix and reduce HEP dependence syndrome among households in Chipata District.

In conclusion, the study showed a strong relationship between the findings and the Transformative learning theory. Results showed that households underwent a transformational shift that saw households review their belief systems, made and implemented plans on how they were going to compensate for power deficits during load shedding. As emphasised by the theory, the adjustment in households' lifestyles helped households promote energy diversification and later reduced HEP dependence syndrome and was evidenced in the reduction of households' monthly electricity bills as shown in figure 5.4. This transformation was a result of a learning experience during load shedding where households developed a more critical world view as they sought ways to better understand the problem of load shedding and provided solutions to its existence. The importance of the Transformative Learning Theory to the study findings cannot be over- emphasized. The theoretical assumptions kept the researcher attached to the paradigm orientation and finally to the outcome of the study that showed that households underwent a learning experience just as is the outcome of the Transformative learning Theory. This was evidenced by households' adoption of new lifestyles of using

energy – mix, use of energy efficient appliances, HEP conservation and use of RETs. Therefore, the Transformative Learning Theory proved to be of great significance to the study findings as it acted as a compass in directing the study into fruitful findings.

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

Having discussed the study findings, this chapter makes conclusions and gives recommendations based on the findings for the purpose of improved households' HEP consumption practices and lifestyles for sustainable living.

7.2 Conclusion

In Zambia, and particularly Chipata District of Eastern Province, load shedding was a serious problem caused by many factors such as effects of climate variability, unsustainable hydro generation and HEP consumption practices, increased demand on HEP from the growing populations and lack of rehabilitations and expansion of HEP infrastructure among many other causes.

The study findings established that most households perceived load shedding as detrimental because it negatively affected most households' social and personal operations and financial viability. Households were very much affected mainly due to their resilience and limited capacity to invest in alternative energy sources because of their limited financial muscles. In order to mitigate load shedding, most households employed strategies to compensate for the power deficits. The key mitigating strategies were; use of generators, solar gadgets, mini mottos, charcoal, firewood, candles, gas cookers, standby lights, torches and many more. In an effort to cope with load shedding, households further incurred a lot of expenses in buying energy alternatives and also in the replacement of electrical gadgets which were burned down by unscheduled power cuts. Many households especially the more affluent took various steps to ameliorate the effects of load shedding with other forms of energy sources. Load shedding further posed security threats such as murder and theft as culprits took advantage of darkness as the case was in Chipata District. All these negative experiences made most households perceive load shedding with a lot of negativity.

This study also focused on the transformative aspect of load shedding by showing that it changed households' mind-sets and made them creative and innovative by engaging households in energy diversification through the adoption of other forms of energy sources in order to compensate for the power deficits. Majority households testified that load shedding availed an opportunity through which households learnt sustainable HEP consumption through the exhibition of sustainable HEP consumption actions such as 'switch' and 'save', use of energy efficient gadgets such as energy saving bulbs, responsive energy consumption behaviours, adoption of other forms of energy such as solar, charcoal, firewood and gas cookers as households adapted to load shedding. The transformational shift that households underwent was an immediate solution to load shedding and positive move towards the attainment of a sustainable and efficient HEP sector.

With the myriad of opportunities that learning could offer in curbing unsustainable HEP consumption practices, the study reconsidered load shedding management to include the learning opportunity if sustainability in the HEP sector would last for a long period of time. It was for this reason that households proposed techniques to act as an intervention outlining actions and activities to be undertaken to empower households with knowledge and skills and help them become actors of change towards sustainable consumption lifestyles. Households hoped that the guide would help promote and enhance households' HEP consumption behavioural change to sustainable levels and in the long term have HEP conservers who would promote sustainable HEP consumption lifestyles through a diversified energy sector as a mitigate measure.

The study therefore, concluded that learning on sustainable consumption of HEP through load shedding was a serious preventive measure to load shedding as it empowered households with knowledge on the importance of consuming HEP in a sustainable manner through energy diversification and HEP conservation techniques. Therefore, load shedding provided an opportunity for households to learn sustainable consumption of hydroelectricity. Despite being a challenge, load shedding availed an opportunity for households to diversify energy sources, use energy efficient gadgets, conserve HEP and reduced HEP dependence syndrome The study viewed load shedding

as a ‘blessing in disguise’ as it availed opportunities for households to conserve HEP, acquire responsive HEP consumption actions, attitudes, values, skills, knowledge, competencies and practices that promoted sustainability in the HEP sector through reduction of HEP dependence syndrome. The positive transformational shift households exhibited was a positive move towards sustainable consumption lifestyles and this was an effective and workable solution to the problem of load shedding. Sustainable consumption of HEP therefore, entailed people “doing more and better with less” increasing net welfare gains from economic activities by reducing HEP along the whole lifecycle while increasing the quality of life with manageable collateral environmental effects. This provided a good basis for a clean, safe and sustainable HEP sector as outlined in ‘Vision 2030’.

7.3 Recommendations

Based on the results obtained, the following recommendations could be of great significance towards the wellbeing of the households and hydro generation and its sustainability.

1. Since the study established that learning on sustainable HEP consumption was critical in preventing load shedding and its consequences, the study recommends that adequate information should be provided to equip households with the knowledge and skills and help them become actors of change to sustainable HEP consumption lifestyles. This would be made possible by engaging various media systems to sensitize households on the importance of striking a balance between their home HEP use and the environmental sustainability. Government, ZESCO, REA, ERB, churches and NGOs can spearhead the campaign against the abuse of HEP through the creation of sound and supportive environmental policies.

2. The over dependence on hydro power coupled with inability by households to respond to any disasters in the electricity systems, makes it necessary for households to diversify the energy. The study recommends that government and other NGOs should outline pipeline projects for alternative sources of energy such as solar, wind power and biogas. Further, it is important for the households to adopt other energy

alternative sources so as to release the stress that the HEP sector faces currently. This can be made possible by creating a very enabling business environment for the private sector to invest in alternative sources of energy and enhance energy-mix for a diversified energy sector.

3. While the 2014/2015 power situation was induced by natural phenomenon such as poor rainfall, this study recommends ZESCO to improve on the quality of service delivery. A case in point is when households could not plan their household operations because the load shedding schedules that were published by ZESCO were not strictly followed. Additionally, households reported that they did not have access to information on load shedding schedules developed by the utility company. In this regard, this study recommends that ERB must enhance the key performance for ZESCO to cover the aspect of adherence to load shedding schedules to enable households plan ahead.
4. Furthermore, since the study established that the rate at which the population is growing and the rate at which HEP infrastructure is expanding is not compatible, HEP demand outstrips HEP supply, a situation that also contributed to load shedding in the District. It is for this reason that this study recommends that government should consider expanding HEP infrastructure by building more hydroelectric power stations to cope- up with the rapid increase in population.

5. The study findings further revealed that ZESCO was still the major supplier of electricity in Chipata District and indeed in most parts of the country. This created lack of competitiveness and efficiency in its operations and it compromised the delivery of service. This study recommends that ZESCO must be given other competing companies in the supply of HEP to enhance efficiency and competitiveness and improve on the power supply to its clients.

6. The study findings also availed that positive motivation through social reinforcement was critical in promoting sustainable consumption of HEP among households. This study therefore, recommends that further research must be conducted in order to

check if the suggested techniques in the proposed learning guide would promote sustainable consumption of HEP among selected households in Chipata District.

REFERENCES

Abrahammasse, W. (2005) *Review of Intervention Studies aimed at Household Energy Consideration.* J. W. Environmental Psychology/25273-291

Achieving Energy efficiency through Behaviour Change: What does it do? Energy Efficient Technical Power Report ISSN 1725-2237, No 5/2013 http://www.eea.europa.cu/publications/achieving-energy-efficiency-through-behaviour (Retrieved on 22nd April, 2017).

Ahmed, J, U,.(2007). *An Overview of Triangulation Research*. North South Business Review, volume 2, number 1.

Bond, T. *Impact of Energy Sources and Electricity Crisis on the Economic Growth: Policy Implications for Pakistan.*

Central Statistical Office of Zambia [CSO] (2012), ‘’The Monthly’’, (CSO), Zambia www.zamstats.gov.zm.

Chipata Media Network, Retrieved on August, 2018. https://www.iba.org.zm.

Chisala, M, (2015). The Simple Solution to Load shedding, Lusaka, Zambia. Chipata Musical Network. Retrieved on August, 2018.

Creswell, J, W. (2007). *Qualitative Inquiry and Research Design: Choosing among five Approaches*. (2nded). Thousand Oaks, CA: Sage.

Cresswell, J. W. (2003). *Research Design: Qualitative, Quantitative and Mixed Methods Approache*s. Thousand Oaks, Calif, Sage Publications.

Cresswell, J, W, (1994). Research Design; Qualitative and Quantitative Approaches, Sage Publications Ltd.

Dhlamini, C, Moombe, B, Syampungani, S and Samboko, P (2016). *Load shedding and Charcoal use in Zambia: What are the implications on Forest Resources*? Indaba Agricultural Policy Research Institute (LAPRI).Lusaka, Zambia.

Dewan, M, Sakhawat, B and Faisal, A. (2012), *Renewable Energy as a Sustainable Alternative for Ensuring Energy Security in Bangladesh.* BRAC University, Bangladesh.

Energy Regulation Board (ERB) (2016), "*Energy Sector Report 2016*", ERB, pp. www.erb.org.zm/48C1A355-967D-4C6222CD49944EA4B/FinalDownload/DownloadId-A79CD.

Energy Regulation Board (ERB) (2017). *Impact of Load shedding on Small scale enterprises,* Lusaka, Zambia.

Engineering Institution of Zambia (EIZ) (2015). Financial Sector. Lusaka, Zambia.

Engineering Institute of Zambia (EIZ) (2016). *The Impact of Power Rationing on Zambian Agricultural Sector, Lusaka. Zambia.*

Fay, B. (1996). *Contemporary Philosophy of Social Research,* Blackwell Publishers Inc., USA.

Goldstein, B. (2009) *Sensation and Perceptions*, International journal of Longitudinal and Life Course Studies, London.

Hughes, J. (1987). The Philosophy of Social Research, Longman, Singapore Publishers Ltd, Singapore.

Jackie, R. (28th October, 2008) *''India faulted for failure to Improve power supply*.'' The Wall Street Journal'. Volume2.

Jackson, T. (2005). *"Motivating Sustainable Consumption; A review of evidence on consumer behaviour and behavioural change"*: A report to the Sustainable Development Research Network as part of the ESRC. *Sustainable Technologies*

Program Centre for Environmental strategy, University of Surrey, Guildford, 2005.

Halder, P. K. and Khan, I International Journal of Renewal Energy Research, Renewable *Energy*. Volume, 16, No, 1, 2016.

Linda, S. (2008). *Promoting household's Energy consumption*. Energy Policy, 36 (12) 449-4453.

Line Project Environmental Impact Assessment Report for the proposed Pensulo – Msoro – Chipata West 330kv Transmission (2005).

Mezirow, J. (1978). *''Perspective Transformation''* Adult Education, 1978, 28, 100-110.

Muhammad, A. (2014). *Impact of Load shedding on Daily Routine*: A Study of Pakistan. Islamabad, Pakistan.

Mukanga, C. (2016). *Zambian Economist: Electricity Crisis*. Lusaka, Zambia.

Murray, S. (2006). *Ethics and research*. Research design course, Rhodes University, Education Department, Graham's town.

Musademba, A. (2014). Impact of Load shedding on Daily Routine: A Study of Pakistan. Islamabad.

Ngoma, R, Tambatamba, A, Oyoo, B; Lourie, R (2016). *Domestic Electric consumers' Response to load shedding*: A case of Kitwe, Zambia.

OECD (2008) *Environmental Outlook to 2030*, OECD Publishing, Paris

O' Leary, Z. (2010). *The Essential Guide to Doing Your Research Project*. Sage. London.

Onwuegbuzie, B, C, L. Mallette, M, H and Burgess, M, L (2010). *Doctoral Students' Perceptions of Barriers to Reading Empirical literature*: A Mixed Analysis, International Journal of Doctoral Studies. 5, 55-57

Samboko, P.C., Chapoto, A., Mweemba, B, Kuteya, A. N., Kabwe, S.A and Munsaka, E. (2016). *The Impact of Power Rationing on Zambia's Agricultural Sector*. Working Paper no195, Indaba Agricultural Research Institute, Lusaka. Retrieved February 2016, from http://fsg.afre.msu.edu/zambia/wp105.pdf.

Seventh National Development Plan.(2017 – 2021) *Accelerating Development Efforts towards 2030 Vision without Leaving Anyone Behind*, Lusaka, Zambia.

Ship Worth, M. (2002). *Motivating Home Energy Action: A hand book of what works*. Australian Green House Office.

Southern Africa Development Community, (SADC). (2013) *Renewable Energy Strategy and Action Plan,* SADC.

South African Marketing Research Association (SAMRA) (2008) *Load shedding- Hoe it has affected people in Metro Areas,* Pakistan.

Sunny, S. (2011**).** *Green Buildings, Clean Transport and the Low Carbon Economy: Towards Bangladesh's Vision of a Greener Tomorrow***.** German: Lap Publishers.

Sustainable Consumption Roundtable**,** *'I will if you will - Towards sustainable consumption', May 2006.Triandis, H.C, 'Interpersonal Behavior.'* Brooks / Cole, Monterey, CA, 1977.

TNS Survey Report (2008) Survey Report on *The Impact of Load shedding in urban areas, Pakistan.*

Verplanken, B, &Wood, W. *"Interventions to break and create consumer habits"*, Journal of Public Policy and Marketing, vol 25, 2006, pp.90-103, Lough borough, LEII 3TU, United Kingdom.

Sigiyqanto, L. (2008). *Innovative Learning Model***.** Surakarta: Yuma Pustaka.

Seventh National Development Plan 2017 – 2021. *Accelerating Development Efforts towards Vision 2030Without Leaving no One Behind, Lusaka, Zambia.*

United National Scientific and Cultural Organization [UNESCO] (2014). *Shaping The Future We Want: UN Decade of Education for Sustainable Development*. [PDF] Paris. UNESCO.
Available at http:/unesdo.org/images/0023/002301/230171epdf.

World Bank (2017): http://www.world bank.org/Retrieved on 22 April, 2017.

Zambia Development Agency (ZDA). (2014), *Zambia Energy Sector Profile*. Lusaka: Zambia Development Agency. Retrieved February, 2017 from http//wwwz.da.org.zm/?q=content/energy.

Zambia Electricity Supply Corporation [ZESCO] Limited (2015) General Distribution of the Electricity System, Lusaka, Zambia.

APPENDICES

Appendix 1: Consent letter

Dear participant/Respondent,

My names are Masendeke Sibiziwe, a post graduate student of Environmental Education at the University of Zambia. The study aimed at learning sustainable consumption of hydroelectric power through load shedding among selected residential areas in Chipata District. This topic attracted my thought looking at the prominence of untimely load shedding that has dominated the country, particularly among households in Chipata District. I strongly feel this study was worth undertaking for its findings may be of great benefit to the community and the nation at large. The findings may further provide an opportunity for households to explore RETs which would form a good basis for a cleaner and safer HEP sector in the country. Information that will be given in this study will be treated with confidentiality as this information is also meant for my academic fulfilment.

Participant's signature……

Date……

Appendix 2: A Questionnaire on learning sustainable consumption of HEP through load shedding selected household in Chipata District of Eastern Province

Instructions: *Kindly answer by ticking and filling in the spaces provided.*

Households' Demographic Details.

Date .....

1. Respondents' sex male [ ] female [ ]

2. Age 18 – 25 [ ] 26 – 30 [ ] 31 – 35 [ ] 41 – 45 [ ]
36 – 40 [ ] 46 – 50 [ ] Above 51 [ ]

3. What is your marital status?

Single [ ] Divorced [ ]

Married [ ] Widow/widower [ ]

4. What is your highest level of learning?

a, Primary [ ]
b. Secondary [ ]
c. tertiary
e. Never went to school [ ]

5. What is your occupation? .....

Section A. Household Perceptions on load shedding

1. Do you experience load shedding in your area? Yes [ ] No [ ]

2. How often does load shedding occur in your area?

Never [ ] Rarely [ ] Always [ ] Sometimes [ ]

3. Has load shedding affected you in any way? Yes [ ] No [ ]

4. How has it affected you? Positively [ ] Negatively [ ]

5. How do you view load shedding? Transformative [ ] Detrimental [ ]

6. Give reasons for the answer you have given in question 5

……
……

……
……

7. Are there lessons that you have learned through load shedding Yes [ ] No [ ]

8. If your answer to question 7 is 'yes' give details of the lessons learnt.

……
……
……

9. In your opinion, do you think government is to blame for load shedding? Yes [ ] No [ ]

10. If your response to question 9 is yes, give the reasons for this thought.

……
……
……
……

SECTION B: Transformation of household life styles through load shedding

1. Has load shedding affected your personal life in any way? Yes [ ] No [ ]

   If the answer is yes or no explain how it has/ has not influence your personal life.

   ……
   ……
   ……
   ……

2. Has load shedding affected your expenditure in anyway? Yes [ ] No [ ]

3. If your answer is yes or no to question 2, give details of how it has or has not affected

   you……
   ……
   ……

4. Have you adopted any alternative source of energy during load shedding times Yes [ ] No [ ]

5. If your answer to question 4 is yes, tick the types of alternative gadgets that you adopt during load shedding time? Solar lambs [ ] generators [ ] Stand

by lights [ ] candles [ ] charcoal [ ] Wind mills [ ] gas stoves [ ] torches [ ]
Others [ ] specify……..

6. What were your monthly electricity bills before load shedding?
   a. K100.00 – K150.00 [ ]
   b. K151.00 – K200.00 [ ]
   c. 201.00 – K250.00 [ ]
   d. Above K300.00 [ ]

7. What are the monthly electricity bills in the time of load shedding?
   a. K50.00 – K100.00 [ ]
   b. K101.00 – K150.00 [ ]
   c. K151.00 – K200.00 [ ]
   d. Above K250.00 [ ]

8. What are the reasons for the reduction or increments in your monthly electricity bills?
   ……
   ……
   ……
9. Are you happy about the change in your monthly electricity bills? Yes [ ] No [ ]

10. If your answer to question 9 is yes or no, justify your actions?
    ……
    ……
    ……

11. Has load shedding affected your standard of living in any way? Yes [ ] No [ ]

12. Outline the ways in which it has affected your cost of living
    ……
    ……

SECTION C: Sustainability of alternative sources of energy

1. For how long have you been using the alternative gadgets to adapt to load shedding?
   Short period of time [ ]
   Average period of time [ ]
   Long period of time [ ]

2. Have you had any problems with some of the gadgets you use? Yes [ ] No [ ]

3. What problems have you had with these alternative gadgets.

Lack durability [ ] not easily accessible [ ] expensive to maintain [ ]

Have no problems [ ] environmentally unfriendly [ ]

4. If load shedding was to last forever, would you manage with the energy alternatives you are currently using? Yes [ ] No [ ].

5. Are the energy alternatives adopted users' friendly? Yes [ ] No [ ]

6. If the answer to question 5 is yes or no why?

……
……
……

7. Which of the following alternative energy sources are environmentally friendly?

Solar lambs [ ] generators [ ] Candles [ ] Torches [ ] Candles [ ].

SECTION D: Lessons of sustainable HEP consumptions through load shedding.

8. Do you receive any lessons on electricity usage and consumption? Yes [ ] No [ ].

9. If the answer to question 8 is yes, tick the source of these lessons

Television and Radios [ ] Non – Governmental Organizations [ ]
ZESCO officers [ ] Government Officials [ ]

10. What lessons have you learnt from these organizations?……
……

11. Have these lessons changed the way you view hydroelectricity and its usage? Yes [ ] No [ ]

12. Justify the answer given above by explanation

……
…

Additional comments

What suggestions, opinions and views can you make concerning lessons of sustainable consumption of HEP through load shedding in Chipata District.

Thank you for your participation

THE END.

Appendix 3: A semi-structured interview schedule on learning sustainable consumption of HEP through load shedding

Section A: Households demographic Details

Date .....

1. Respondents' sex……..
2. How old were you at your last birthday? .....
3. What is your marital status? .....
4. What is your highest level of education attainment? .....
5. Do you write and speak English fluently? .....

SECTION B: **Households' perceptions on load shedding**

1. When did you start experiencing load shedding in Chipata district? .....
2. How often does load shedding occur in your area? .....
3. Has load shedding affected you in any way? .....
4. In which ways has load shedding affected you? .....
5. How do you view load shedding and why?
   ……
   ……
   ……
   ……
   ……
6. What lessons have you acquired from load shedding?
   ……
   ……
   ……
   ……
   ……

7. Do you blame anyone for load shedding and why?

…….....

……
……
……
……

SECTION C: Transformation of household life styles through load shedding

1. How has load shedding influenced your personal life?

……
……
……
……
…….

2. Has load shedding affected your expenditure in any way……
3. In what ways has load shedding affected your expenditure.

……
……
……
……
……

4. What alternative sources of energy do you use during load shedding times?

……
……
……
……

5. What were your monthly electricity bills before load shedding?

……
……..

6. What are the monthly electricity bills after load shedding?

……
…….

7. What are the reasons for the reduction or increments in your monthly electricity bills?

……
……
……

8. Are you happy with the change in your monthly electricity bills and why?

……
……
……
……

9. Has load shedding affected your cost of living in any way?

.....
.....

10. In what ways has load shedding affected your cost of living?

……
……
……
……

SECTION D: Sustainability of alternative sources of energy adopted during load shedding.

11. For how long have you been using the alternative electricity gadgets to adapt to load shedding?

.....

12. Have you had problems with the electricity gadgets you use during load shedding?

……
……..

13. What problems have you had with these alternative gadgets……
……
……

……
……

14. If load shedding was to last forever, would you manage with the energy alternatives you are currently using?
    .....
    .....
15. How user friendly are the adopted alternative energy sources?
    ……
    ……
16. How environmental friendly are the alternative energy sources and which ones specifically?.....
    .....
    .....
    .....
    .....

SECTION E: Lessons of sustainable HEP consumptions through load shedding.

17. What lessons do you know about sustainable consumption of HEP?
    ……
    ……
    ……
    ……
    ……
18. How best can households conserve hydroelectricity?
    ……
    ……
    ……
    ……
    ……....
19. Are there organizations that teach you about sustainable consumption of HEP?
    ……..
20. What are the names of the organizations that teach you about sustainable HEP consumption.....
    .....
    .....
    .....

21. What lessons have you learnt from these organizations

    ……
    ……
    ……
    ……
    ……

22. Have these lessons changed the way you view hydroelectricity and its usage and how?

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

23. What activities, actions and techniques should be included in the learning guide on sustainable HEP consumption?.....

    ……
    ……
    ……
    ……

24. How best would these activities and actions help motivate household HEP consumption behaviour towards sustainable consumption?.....

    ……
    ……
    ……
    ……

Additional Comments:

What suggestions, opinions and views do you have concerning lessons of sustainable consumption of energy through load shedding in Chipata District?

……
……
……
……
……
……

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

Thank you for your participation

Appendix 4: An observation guide on learning sustainable consumption of energy through load shedding

s/n	Observation Theme	Material	Results
1.	Households' perception on load shedding	1. Pen 2. pencil 3. Note book	
2,	Transformation of households' lifestyles through load shedding.	1. Tape Recorder 2. Note Book 3. Pen	
3.	Sustainability of energy sources adopted during load shedding	1. Note Book 2. Pen 3. Tape recorder.	
4.	Learning opportunity on sustainable HEP consumption through load shedding.	1. Tape Recorder 2. Note Book 3 Pen	