Exploring the Relationship between Renewable Energy and Gender Relations at Household Level

Cathrine Chinyandura

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DECLARATION

I, Cathrine Chinyandura, declare that this research report is my own unaided work. It is being submitted in partial fulfilment for the Degree of Master of Arts in Development Studies at the University of the Witwatersrand. It has not been submitted before for any degree or examination in any other university.

_____

_____day of _____ March 2016.

DEDICATION

I dedicate this work to my family for their unwavering support and being a pillar of strength.

ACKNOWLEDGEMENTS

First and foremost, I am grateful to my faithful God for giving me strength and wisdom to carry out this work. I greatly appreciate the guidance and patience of my supervisor, Dr Srila Roy. Thank you for your support and confidence in me. My heartfelt gratitude goes to Professor Jacklyn Cock for your advice and guidance. I thank my family and loved ones for their undying support. I highly appreciate you walking with me on every step of this journey. I am greatly thankful to all my friends for morale support. The success of this study would not have been possible with the participants who devoting their time and effort to make this work possible. I'm particularly indebted to all the families who accommodated me during my field work. I highly appreciate your hospitality.

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List of Abbreviations

AIDS	Acquired Immuno Deficiency Syndrome
BaRREM	The Barrier Removal to Renewable Energy Project in Malawi
BEST	Malawi Biomass Energy Strategy
CBO	Community Based Organisation
CPV	Concentrator Photovoltaics
CSO	Civil Society Organisation
CSP	Concentrated Solar Power
DRC	Democratic Republic of Congo
DoEA	Department of Energy Affairs
ESCOM	Electricity Supply Corporation of Malawi
FAO	Food Agriculture Organisation
GAD	Gender and Development
GDP	Gross Domestic Product
GHGs	Greenhouse Gases
GoM	Government of Malawi
HIV	Human Immuno-deficiency Virus
IEA	International Energy Agency
ILO	International Labour Organisation
LPG	Liquefied Petroleum Gas
MDGs	Millennium Development Goals
MAREP	The Malawi Rural Electrification Project
MERA	Malawi Energy Regulatory Authority
MGDS	Malawi Growth and Development Strategy

MNREE	Ministry of Natural Resources, Energy and Environment
MOFFEA	Ministry of Forestry, Fisheries and Environmental Affairs
MREAP	Malawi Renewable Energy Acceleration Programme
MVP	Millennium Village Programme
NAPA	National Adaptation Programme of Action
NGO	Non-Governmental Organisation
NSREP	The National Sustainable and Renewable Energy Programme
PAESP	The Promotion of Alternative Energy Sources
ProBEC	The Programme for Biomass Energy Conservation
RETs	Renewable Energy Technologies
SSA	Sub-Saharan Africa
TCRET	Testing and Training of Renewable Energy Technologies
TV	Television
TPES	Total Power Energy Supply
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
WAD	Women and Development
WHO	World Health Organisation
WLPGA	World Liquefied Petroleum Gas Association

CHAPTER ONE: INTRODUCTION

1.0 Background

Energy poverty remains one of the challenges facing society today and an obstacle to the realisation of social and economic development. As echoed by Ban Ki-moon, the UN Secretary General in 2011, “energy is the golden thread that connects development, social inclusion and environmental sustainability”. Access to modern energy systems has positive impacts on human well-being; ranging from health and safety, labour productivity, educational outcomes and gender equality (IEA, 2002; Cecelski, 2002; Argawal and Bina, 1986). Lack of energy services is linked to multidimensional aspects of poverty: education, health, and employment (Chirau, 2015). Pachauri et al (2004) note that the relationship between energy and poverty should be understood as one which is mutually causative.

Several global initiatives have focused efforts on sustainable use of energy and widening access to modern energy. These efforts are underpinned on the significant role of energy in social and economic development (Chirau, 2015; Pachauri and Rao, 2013). The Earth Summit called for sustainable use of natural resources (Reddy, 2000). The Rio Declaration and Agenda 21 underscored that “energy is essential to economic and social development and improved quality of life”.

Despite energy being an indispensable resource, widening access to modern energy has been very slow, particularly in the developing world (Pachauri and Rao, 2013). In addition, energy is shrouded by inequity in its distribution and use. Ban Ki Moon, the UN Secretary General pointed out that “energy poverty is a threat to the achievement of Millennium Development Goals. It is inequitable and unsustainable”. Growing literature on energy indicate differentials in energy access by geographical

location, income and gender (The World LP Gas Association (WLPGA), 2014; Arora-Johnsson, 2013; Pachauri and Rao, 2013; Brew-Hammond and Kemausuor, 2009; IEA, 2006; Cecelski, 2005; Clancy et al, 2003; Karekezi and Kithyoma, 2002; Reddy, 2000; Dutta, 1997). Energy poverty is dichotomised between the Global South and the Global North, men and women, the rich and the poor, urban and rural areas (Kaygusuz, 2011; Karlsson, 2007; Cecelski, 2005).

An estimated 2.6 billion people around the world rely on biomass for cooking and heating purposes resulting in over 4 million premature deaths worldwide, mainly women and children due to inhalation of hazardous emissions (IEA, 2014; 2013; Sovacool, 2012; Sovacool et al, 2012; Kowsari and Zerriffi, 2011; Reddy, 2000). The burden of energy poverty lies mainly in the Global South, with the most affected being rural households, although there is growing literature showing that the urban poor also lack access to modern energy (Karekezi and Kithyoma, 2002). Africa and South Asia are the regions severely bearing the burden of energy poverty. An estimated 1.3 billion people living in the global South, particularly Asia and Sub-Saharan Africa (SSA) have no access to electricity and 85% of these people live in rural areas (Sovacool, 2012; Karekezi and Kithyoma, 2002). UNDP (2010) adds that an additional 1 billion people worldwide rely on unreliable and intermittent electricity supply.

SSA has the lowest per capita share to modern energy (Sokona et al, 2012). Only about 30% of the region's population has access to electricity, whilst the majority of the population (90%) depends on biomass for cooking and heating (Brew-Hammond and Kemausuor, 2009). Such a status quo renders SSA the least electrified region (WLPGA, 2014; Brew-Hammond and Kemausuor, 2009; Cecelski, 2005; Karekezi

and Kithyoma, 2002; Reddy, 2000). Zambia derives a large share (over 80%) of its total energy supply from biomass, only 20% of the country's population has access to electricity. In Malawi, biomass is the primary energy providing approximately 90% of the country's total energy supply (Taulo, Gondwe and Sebitosi, 2015). In East and Central Africa, biomass provides over 90% of the total energy supply in Uganda. In Mali, less than 12% of the country's population has access to electricity (Karlsson, 2007). In Asia, biomass provides a large share (80%) of the total energy of Nepal and Lao PDR, whilst in India, an estimated 625 million people cook with biomass and approximately 300 million people have no access to electricity (Bhide and Monroy, 2011).

Even though different groups worldwide lack access to energy, overall, energy poverty has a female face (Demetriades and Esplen, 2008; Cecelski, 2005; Reddy, 2000). This gender bias of energy poverty has led to the coining of the phrase 'feminisation of energy poverty'. Considering that the majority of the world's poor are women, it is not surprising that they are also the majority who are energy poor (Demetriades and Esplen, 2008; Reddy and Reddy, 1994). Feminisation of energy poverty or the gender-poverty-energy nexus is apparent in developing countries where despite the pivotal role played by women in energy production and distribution, they continue to depend heavily on biomass. The gendered nature of energy poverty draws attention to the social and economic disparities between men and women. Social analyses of gender explicitly demonstrate that the gendered nature of energy poverty is associated with gender roles, implying that though both men and women are affected by energy poverty, they encounter and experience it differently and their coping strategies and opportunities for escape are different (Khamati-Njena and Clancy, 2002; Clancy, 2001; Dutta, 1997).

Due to the gendered division of labour, the energy needs of men and women are different (Cecelski, 2006; 2004). Women in nearly all countries engage in productive, reproductive, and community tasks, hence the use of the phrase 'triple burden' (Khamati-Njena and Clancy, 2002; WLPGA, 2014; Cecelski, 2006; Reddy, 2000). These triple roles, particularly household tasks take women's considerable time and energy, jeopardising their health and leaving them time poor. Time-use studies conducted in different contexts confirm the significant amount of time and energy which women and girls put in reproductive tasks.

Argawal (1995) found that in India women and girls spent considerable time and effort in fuel, water and fodder collection. An ESMAP study conducted in India in 1996 found that women spent on average 2 hours a day on fuel collection. Barnes and Sen (2004) observed that in rural India women spent about 40 minutes daily collecting fuel, one hour fetching water and about 3 hours cooking and about 6 hours undertaking other housework. In Tanzania, women's daily leisure time is a mere 2 hours whilst men enjoy at least 4.5 hours of leisure per day. In Cameroon, women's weekly average working hours are double (64 hours) than that of men (32 hours) (Bamberger et al, 2001). Even with increasing female labour force participation in the job market, women remain largely responsible for care and housework. In rural areas of SSA, where biomass is the main energy source, women on a daily basis carry an average of 20kgs of fuel wood on an average distance of 5km (Brouwer et al, 1997). In Western Kenya, on a typical day women often spend an average of 2-5 hours collecting fire wood and work 50% more hours in agricultural tasks compared to men (Bamberger et al, 2001). Overall results from large scale time-use surveys conducted in Benin, Madagascar, Mauritius and South Africa indicated that women spend 3-5 times as much time as men on domestic activities. In Benin, women spent

four times as much time as men in collecting fuel wood. Women in all the surveyed countries, dominated men with regards to time spent on cooking. It can be deduced from these findings that energy solutions for cooking and fuel collection would relieve women of time spent on such tasks.

The tasks which women undertake within constrained energy access have drudgery and health impacts (Wamukonya, 2002). Indoor pollution has devastating effects; it is a leading cause of death in poor communities of the world (WHO, 2011). In addition, it causes impaired lung function leading to chronic obstructive pulmonary disease; acute respiratory infections; chronic bronchitis; damage to the eyes leading to impaired vision; increased chances of still-birth in pregnant women and cor pulmonale (enlargement of heart) (WHO, 2011; Shailaja, 2000; Dutt et al., 1996; Mavalankar, 1991). On the other hand, time poverty means women spend considerable amount of time in unpaid work activities leaving them with insufficient time for productive activities, rest and leisure (Cecelski, 2006; 2004; Khamati-Njena and Clancy, 2002; Reddy, 2000).

Growing literature on energy demonstrates that household fuel choice is influenced by intra-household and extra-household factors (Bhide and Monroy, 2011; Howells et al, 2005; Karekezi and Kithyoma, 2002; Reddy, 2000; Dutta, 1997; Reddy and Reddy, 1994). Household income has been found to be a key influencing factor in household fuel choice (Howells et al, 2005). Dutta (1997) found that in India when energy had to be purchased, men entered the decision making process as traditionally they are the household providers. Dutta further observed that gender roles played a critical role in choosing a household cooking energy system. Women were responsible for decisions in their domain such as where to obtain fuel.

Exogenous factors found to influence household fuel choice include cultural norms and values and education level (Bhide and Monroy, 2011; Karekezi and Kithyoma, 2002; Reddy, 2000; Dutta, 1997). Evidence indicates that customs on food taste influence fuel selection as was found by Karekezi and Kithyoma (2002) in Sierra Leone where households were reluctant to switch from firewood to modern energy due to the perceptions that the latter alters food taste. Similarly, in Mexico households' dislike of LPG was based on their belief that it alters the taste of tortillas, the staple food which is typically prepared in wood-fired clay ovens (Masera et al, 2000).

Research indicates that when women have power over household income, expenditures are directed towards fulfilling the household's basic needs (Dutta, 2005). In Cote d'Ivoire, when women's control over the household's cash resources doubled, the total budget allocation on food expenses increased by 2% whilst expenditures on cigarettes and alcohol decreased by 26% and 14% respectively.

Energy access has been found to have an impact on gendered division of labour. Empirical evidence on the effect of energy access on gender division of labour indicates mixed findings. Studies conducted in USA indicated that acquisition of new household appliances led to men reducing the time they spent in housework (Hawthorne, 1996). In contrast, studies in Nepal found that with the introduction of the micro-hydro power, men became more involved in domestic tasks such as carrying grain to the grinding mill and taking care of babies whilst women participated in development projects (Mahat, 2004; Rana-Deuba, 2001).

Despite increasing scholarship on how intra-household relations influence energy access and the impact of modern energy on gender division of labour, the operations

within the household remain elusive due to the complexity of the processes. As such, it is a field where full understanding lacks, highly dynamic and contextual. It is against this background that the study was interested in investigating the relationship between RETs and gender relations at household level in Malawi.

1.1 Purpose of Study

Though vast literature exists on various aspects of biomass in Malawi, literature on the impact of intra-household relations on household fuel choice is scarce. The study fills a contextual gap, as highlighted earlier; the area of intra-household gender relations remains elusive given its dynamism, being context specific and the complexity of intra-household processes.

The study is also relevant to Malawi given its high levels of energy poverty, with women being more vulnerable than men. The precarious energy supply which the country is faced with is adversely impacting its economic and social development. As such, a topic on energy provides vital information and insights on how Malawi can effectively carry out its energy planning and programming. In addition, examining energy access with a gender lens is important in providing knowledge on intra-household relations which impact energy use which need to be integrated in energy planning and programming if Malawi is to achieve its economic and social development goals.

1.2 Goals and Objectives of the Study

Within the discussed context, the study had an overall aim of investigating the relationship between RETs and gender relations at household level. The specific objectives were to:

- explore how intra-household relations influence decision making on use of RETs within the household and;
- investigate how RETs affect the gendered division of labour.

The study was guided by the following research questions:

1.3 Research Questions

Main Research Question

- How do RETs affect gender relations?

Sub-Research Questions

- What are the gender roles for men and women in Malawi?
- How do intra-household gender relations influence the adoption of RETs at household level? Who decides on adoption and installation of the RETs? Who benefits from the adoption of RETs?
- To what extent, if any, do RETs affect the gender division of labour?

1.4 Methodology

The study was underpinned on the fundamentals of qualitative research design. The design was primarily informed by the purpose, objectives and research questions of the study. The qualitative approach was adopted as it was consistent with the gender relations theoretical framework used in this study. Considering that qualitative research design is grounded in the living experiences of people, it was the best approach to use for this study which involved capturing subjective experiences of Malawian women and processes in gender relations.

Through participant observation and narrative in-depth interviews, the study elicited Malawian women's gendered experiences, interpretations and meanings in relation to energy use. The methods allowed the researcher to amass rich insights, social meanings and context-specific descriptions on intra-household gender division of labour, power relations, resource allocations, negotiations and decision making processes that have a bearing on energy access. Participant observation allowed the researcher "inquiry from the inside", providing a degree of immersion important in exploring gendered experiences. It also made it possible to create trusting relationships with participants so as to enable them to share personal experiences which they normally do not discuss. Narrative in-depth interviews were used in the study as they were considered best for exploring issues of social identity and social change (Elliot, 2005). Through this method, the women participants were able to tell their gendered life stories.

Key informant interviews were conducted with government and civil society organisations' representatives in order to collect data on legal and policy frameworks, national programmes and projects related to topics under inquiry.

Purposive and convenience sampling was used to select participants. Three families living in different selected sites and using a specified renewable energy source (biomass, hydro-electricity and solar energy) were sampled for participant observation. Eighteen women were sampled for narrative in-depth interviews, with six women drawn from each site and using the specified renewable energy source (biomass, hydroelectricity and solar energy). A total of six key informant interviews were conducted, three key informant interviews were conducted with government

representatives whilst the remaining three interviews were held with representatives from civil society organisations (CSOs).

Ethical considerations in this study involved adequately informing respondents on the nature and purpose of study, maintaining confidentiality and anonymity (by using pseudo names), seeking voluntary participation and informed consent in the research and not misusing the data and results of the study.

1.5 Structure of the Report

Chapter 2, Literature Review, the chapter commences with the framing of energy poverty by defining, quantifying and conceptualising it. The gender-poverty-energy nexus is then examined, highlighting the implications of energy poverty on women. The focus then turns to intra-household gender relations theoretical framework so as to contextualise and lay the foundation on which the study is based. A discussion of the theoretical frameworks is done so as to demonstrate the influence of intra-household gender relations on energy access. The chapter closes with the topic on renewable energy, providing pertinent global and regional statistics and discussing the benefits of and challenges surrounding renewable energy development and utilisation.

Chapter 3, Study Methodology, a detailed description of the qualitative research design is provided before describing the sampling, data collection methods, data analysis techniques and ethical considerations used in the study. Limitations of the study are provided to close the chapter, considering how they may have impacted the outcomes of the study.

Chapter 4, Findings and Discussion, the chapter presents findings of the study followed by analysis of the findings in groupings of main themes which are related to objectives and research questions of the study.

Chapter 5, Conclusion, the chapter collates all information, discussing core issues in relation to theoretical framework and other literature, followed by implications of the study and directions for further research.

CHAPTER TWO: LITERATURE REVIEW

This chapter provides an overview of related topics relevant to this study. Topical subjects discussed under this chapter are energy poverty, gender-energy-poverty nexus, theoretical framework and renewable energy. A review of existing literature on each of the stated sub-topics is done so as to lay groundwork for the theoretical evaluation of intra-household gender relations and their relationship to adoption of RETs.

The beginning section of the chapter focuses on energy poverty and presents relevant statistics on the subject in an attempt to quantify the situation. The section further discusses the groups most vulnerable to energy poverty and examines the conceptualisation of energy poverty as well as its impacts. The section then turns on contextualising energy poverty in Malawi, using relevant country statistics to show its magnitude and impacts. The section closes with the topic on renewable energy, providing pertinent global and regional statistics and discussing the various forms of renewable energy. The concluding focus on this topic is the benefits of and challenges surrounding renewable energy development and utilisation.

2.1 Introduction

Energy plays an important role in sustainable development (Chirau, 2015; Kowsaki and Zerriffi, 2011; Oparaocha and Dutta, 2011; Cecelski, 2005; Pachauri and Spreng, 2004; Clancy, Skutsch and Batchelor, 2003; Wamukonya, 2002; Shailaja, 2000; Reddy, 2000). It is important in meeting basic welfare needs and is vital in economic development. At the launch of the SE4All Initiative in 2011, the UN Secretary General, Ban Ki-moon, reiterated that “Energy is the golden thread that connects development, social inclusion and environmental sustainability”. Access to

modern energy systems has positive impacts on human well-being; ranging from health and safety, increasing labour productivity, educational outcomes and improving gender equality (IEA, 2002; Cecelski, 2002; Argawal, 1986).

The increased realisation of energy as a cornerstone to development has resulted in the issue of energy access moving from the periphery of the development agenda to the centre stage. Energy access is increasingly shaping policy at international and national level (Sokona et al, 2012). Since the 1992 Earth Summit, various initiatives have been taken at different levels to promote universal energy access. The Earth Summit increased awareness on sustainable development and called for sustainable use of natural resources, with energy development being one of the pillars of sustainable development (Reddy, 2000). Through the Rio Declaration and Agenda 21, over 150 States committed themselves to protect the environment. Agenda 21 underscores that “energy is essential to economic and social development and improved quality of life”. The UN Secretary General’s Advisory Group on Energy and Climate Change (AGECC) called for universal energy access by 2030 (AGECC, 2010). In 2001, the G8 renewable energy task force noted that modern energy services are fundamental for all three pillars of sustainable development: economic, social and environment (Wamukonya, 2007).

The UN General Assembly declared 2012 as the ‘International Year for Sustainable Energy for All’ (Sokona et al, 2012; Sovacool et al, 2012; Pachauli and Spreng, 2011). The initiative aimed at mobilising public and private sectors as well as civil society to work towards the attainment of universal energy access, reduction of global energy intensity by 40% and globally intensifying development and utilisation of renewable energy to 30% of total primary energy supply (Sokona et al, 2012;

Sovacool et al, 2012). The UN General Assembly further declared 2014-2024 as the 'International Decade of Sustainable Energy' for sustainable development (WLGA, 2014; Sovacool et al, 2012). The first two years (2014 -2016) were dedicated to the theme, "Energy for Women and Children's Health and Economic Empowerment". The U.S government launched the U.S Power Africa Initiative with the objective of achieving universal energy access through increasing electrification rates, regional energy trade and enhancing resource management in Africa.

2.2 Energy Poverty

Energy poverty is a form of social inequality which aggravates other inequalities (Cecelski, 2005; Khamati-Njenga and Clancy, 2002). As such, energy poverty is unacceptable in contemporary society and concerted efforts are needed to address it. In 2011 during the launch of SE4All Initiative, Ban Ki-moon, the UN Secretary General declared that "Energy poverty is a threat to the achievement of Millennium Development Goals. It is inequitable and unsustainable". An excerpt titled 'Energy poverty: How to make modern energy access universal', prepared by IEA in collaboration with UNDP and UNIDO was featured at the 2010 MDGs review meeting (IEA, UNDP, 2010).

Though energy poverty is agreed to be a global challenge, its conceptualisation is laden with debates. Before quantifying the problem of energy poverty, it is important to unpack the concept. A starting point in defining and conceptualising energy poverty is understanding the concept of poverty. Understanding these concepts is of significance to this study as addressing gendered poverty energy is not about targeting men and women but about targeting the underlying issues.

As mentioned earlier, the concept of energy poverty is complex (Sovacool, 2012; Sovacool et al, 2012; UNDP, 2010; Pachauri and Spreng, 2004; Reddy, 2000). Lack of a straight forward definition of poverty makes conceptualising energy poverty an intricate task. Poverty has been conceptualised in several ways, from economic to social terms (Clancy, Skutsch and Batchelor, 2003). In economic terms, poverty encompasses the income perspective and under this conception, to be poor is to earn less than US$2 per day when adjusted for the purchasing parity of countries (Sovacool, 2012). Considering this definition, a shocking 40% of the world's population is poor (D'AGostino, 2010). The social conceptualisation acknowledges that poverty is multidimensional and therefore to be poor is characterised by deficiencies in literacy, life expectancy, health, housing, nutrition and access to energy (Sovacool, 2012; UNDP, 2010; Clancy, Skutsch and Batchelor, 2003). It is under the multidimensional conception of poverty that energy indicators are encompassed. Two energy indicators that are incorporated in this conception are electricity (lacking electricity constitutes poverty) and cooking fuels (relying on biomass for cooking purposes constitutes poverty) (Sovacool, 2012). There is growing consensus that poverty is not static and it is a multidimensional concept. These dimensions add to the complexity of poverty as people can move out of, or into poverty (Cecelski, 2005; Clancy, Skutsch and Batchelor, 2003).

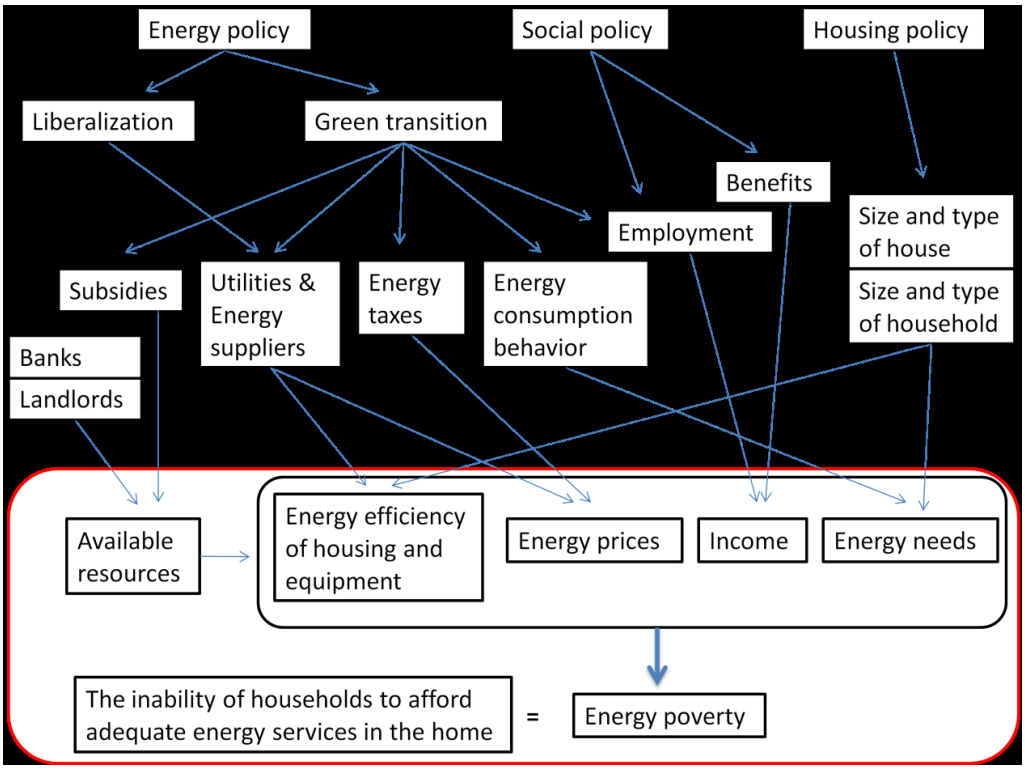
Given the complexity of the concept of energy poverty, several definitions have been formulated. UNDP (2001) defines energy poverty as "the inability to cook with modern cooking fuels and a lack of a bare minimum of electric lighting to read or for household and productive activities at sunset". It has also been defined as the lack of access to modern energy services which are vital for human development (Ismail and Kembo, 2015; Kohler, Rhodes and Vermaak, 2009). The definition has been

broadened by others to encompass fundamental components of energy services. The broader approach defines energy poverty as a lack of access to adequate, affordable, reliable, high quality, safe and environmentally friendly energy services to attain economic and human development (Reddy, 2000; Clancy, Skutsch and Batchelor, 2003; IEA, 2010; Asian Development Bank, 2010). Key defining indicators in this definition are absence of choice in assessing adequate, reliable, affordable, quality and safe energy services (Winkler, 2009).

This definition addresses the importance of modern energy services in supporting human basic needs; cooking, water and sanitation, space heating which are confined to households while at the same time driving productive activities such as agriculture, manufacturing, mining, commerce (Sovacool, 2012; Reddy, 2000). In this context, lack of energy access contributes to poverty and poverty contributes to energy poverty. Energy poverty can thus be seen as both a cause and a consequence of economic poverty. In this regard, Pachauri et al. (2004) advance that the relationship between energy and poverty is one of mutual causation. It is however imperative to note that even though universal access to adequate, affordable, reliable, good quality and safe energy services is crucial for development, it is however an insufficient condition for development (Reddy, 2000).

The diagram below illustrates interrelated driving factors in energy poverty. The diagram demonstrates that energy poverty is an outcome of the interaction between macro and micro level factors. This study's primary focus is exploring the micro-level factors which influence energy access, even though to a lesser extent it will look at macro level factors given the intricate relationship between the two levels.

Figure 2.1: Interaction of policies, actors and drivers related to energy poverty



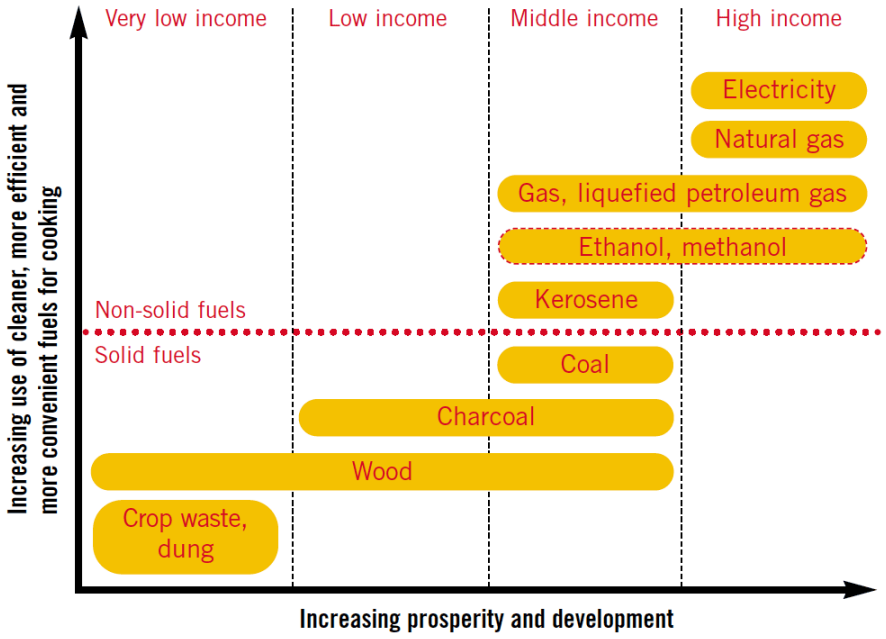
Source: Nierop, u.d

2.2.1 Energy Ladder

Energy poverty is commonly is conceptualised using the 'energy ladder' model, which is a representation of 'the percentage of population among the spectrum running from simple biomass fuels (dung, crop residues, wood, charcoal) and coal (or soft coke) to liquid and gaseous fossil fuels (kerosene, liquefied petroleum gas (LPG) and natural gas) to electricity' (Holdren and Smith, 2000). The 'energy ladder' model plots energy sources hierarchically on a ladder, with the 'simplest' or 'traditional fuels' (wood, animal and plant waste) occupying the bottom part of the ladder, whilst 'advanced' or 'modern fuels' (electricity) being ranked at the top (Sovacool, 2012; Reddy, 2000). The ordering of the fuels on the ladder is in terms of efficiencies, with the less efficient fuels being ranked at the bottom whilst efficient fuels are ranked higher on the ladder. Kerosene is by far an efficient fuel (3-5 times efficient) compared to wood, likewise LPG is super-efficient (5-10 times) than crop

residues and animal dung (Barnes and Floor, 1996). Efficient fuels are also 'cleaner' compared to less efficient fuels. Thus, high ranking fuels emit minimal to none levels of hazardous gases (carbon dioxide, sulphur dioxide) and particulates. Apart from demonstrating the ranking of fuels by efficiency and cleanliness, the model also illustrates the differences between how the rich and poor consume energy. The model postulates that as a household's income increases, it relies on clean, convenient, efficient and costly fuels (UNDP, 2007; IEA, 2006). In other words, the poor use traditional fuels (wood, animal and plant waste) which are dirt and less efficient whilst the rich rely on modern fuels (electricity and LPG) that are clean and have higher efficiencies (Howells et al, 2005; Reddy and Reddy, 1994).

Figure 2.2: The Energy Ladder Model



Source: WHO, 2006

The energy ladder model has received several criticisms due to it being reductionist and its simplistic interpretation of fuel choice and use (Clancy et al, 2003; Reddy, 2000). The model fails to capture the complexity of fuel choice which is influenced by

several interdependent factors; individual, household, geographical, climatic, and socio-cultural in addition to income (Elias and Victor, 2005). For instance, studies in India (Bhide and Monroy, 2011; Dutta, 1997) indicate that education and gender influence household fuel choice. Dutta (1997) underlines that decision making for a household cooking energy system is 'highly segregated along gender lines'.

The model fails to account for the often observed fuel stacking, that is households' use of a mix of fuels (Lloyd, 2014; WLPGA, 2014; Sokona et al, 2012; Sovacool, 2012). Rather than fuel switching, households tend to 'fuel stack', using multiple fuel options. Sokona et al (2012) note that in Africa although rich-poor, urban-rural differences exist in terms of distribution of energy systems, these differences are blurred. Rich and poor households as well as urban and rural households use traditional energy systems alongside modern energy systems. Even though rich households can afford clean, efficient and convenient fuels, they do not totally abandon traditional fuels; they tend to use both traditional and modern fuels.

The multiple use strategy is partly because each fuel serves a different purpose and multiple fuels offer household fuel security, particularly to fuel price volatility (WLPGA, 2014; Elias and Victor, 2005). Such trends have been observed in several countries in developing countries. Studies in South Africa confirm this dual use. A study conducted in an informal settlement in Cape Town revealed that though households predominantly used LPG for cooking and water heating, they used paraffin and candles for lighting (Wolpe and Reddy, 2010). Another study done in the electrified parts of Khayelitsha, Cape Town showed that 24% of the sampled households continued using paraffin whilst 33% used a combination of cooking appliances: traditional and modern energy appliances (Cowan and Mohlakaona,

2005). Lloyd (2014:5) notes that even though there is minimal use of fuel wood in urban areas in South Africa, some urban households “harvest broken pallets from nearby industries”.

The contracted view of the model also ignored the increasing population of the urban poor who due to several reasons continue to rely on traditional biomass fuel for much of their energy needs (Wamukonya, 2002; Shailaja, 2000). The implication of these shortfalls on the ‘energy ladder model’ is that energy policy planning and interventions cannot be solely based on income but have to consider multiple factors. As noted by Mehlwana (1997:15), “any uniform conception or oversimplified explanation of energy use by poor people is bound to backfire”.

2.2.2 The Global and Regional State of Energy Poverty

Although conceptualising ‘energy poverty’ is an arduous process, organisations such as IEA, WHO and other UN agencies have made outstanding efforts to provide statistics on energy poverty worldwide. Contextualising global and regional energy poverty is essential to this study in order to locate Malawi in this global challenge and appreciate the magnitude of energy poverty to which renewable energy is a potent solution.

While energy is considered to be an indispensable resource for human development, there are differentials in its access. Majority of people in developing countries are deprived of modern energy (Wamukonya, 2007; 2002; Cecelski, 2005; 2004; Clancy, Oparaocha and Rohr, 2004; Denton, 2002; Shailaja, 2000) Even though there has been growing spread of modern energy worldwide, certain regions of the world are still lagging behind (Kaygusuz, 2011; Kelkar, 2009). SSA and Asia are two regions with the lowest per capita share to modern energy (Sokona et al, 2012; Munien and

Ahmed, 2012; Kaygusuz, 2011; Wamukonya, 2002). An estimated 1.3 billion people living in developing countries, particularly Asia and SSA have no access to electricity and 85% of these people live in rural areas (IEA, 2013; Sovacool, 2012; Cecelski, 2005). UNDP (2010) adds that an additional 1 billion people rely on unreliable and intermittent electricity supply. In 2008, 70% of the population in 35 countries had no electricity, whilst in 2007, 29 countries had below 10% of their populations accessing modern energy (Sovacool, 2012). Globally, about 2.6 billion people depend on biomass energy for cooking and heating purposes resulting in over 4 million premature deaths worldwide, mainly women and children due to inhalation of hazardous emissions (Sovacool, 2012; Sovacool et al, 2012; Reddy, 2000).

In SSA, only about 30% of the population has access to electricity, whilst the majority of population (90%) depends on biomass for cooking and heating (Brew-Hammond and Kemausuor, 2009). In an address on an event to launch the US Power Africa Initiative in 2014, the USAID Assistant Administrator for Africa, Earl Gast, highlighted that from a total of 20 countries in the world with the lowest electricity consumption, 17 are in Africa. Furthermore, rural electrification rates in this region are less than 5 percent (Wamukonya, 2007; Karekezi and Kithyoma, 2002). Besides relying on biomass for cooking and heating, the region also depends on non-modern energy sources (candles) for lighting. Such a status quo renders SSA the least electrified region (WLPGA, 2014; IEA, 2013; Brew-Hammond and Kemausuor, 2009; Cecelski, 2005; Karekezi and Kithyoma, 2002). It is imperative to note that the billions of people relying on traditional energy sources have a legitimate right to and need for increased energy services which are affordable, healthier, reliable, and sustainable.

2.2.3 Energy Poverty in Malawi

Malawi is characterised by high poverty levels, with approximately 40% of the country's population living below the poverty line and 20% at risk of multiple deprivations (Taulo, Gondwe and Sebitosi, 2015). The high poverty levels result in heavy dependence on biomass (Yaron et al, 2010).

Biomass is the primary energy source providing approximately 90% of the country's total energy supply (Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014; Kaunda, 2013). The total national energy consists of less than 2.3% from electricity, 3.5% from liquid fuels and gas and 1% from coal (Kaunda, 2013). Biomass is the dominant energy source in any sector: households (98%), industry (55%), service (27%) and transport (5%) (Kaunda, 2013). National data indicate that the major source of cooking energy is firewood (88%) and it is predominantly used in rural areas (96%) in comparison to urban areas (42%). The second most used source of cooking energy is charcoal (8%) and lastly electricity (2%). Paraffin is rarely used for cooking purposes in Malawi due to its exorbitant prices but is rather used for lighting.

Table 2.1: Population distribution by source of energy for lighting and cooking

Source of Energy	Cooking *(% of population)*			Lighting *(% of population)*		
	National	Rural	Urban	National	Rural	Urban
Charcoal	8.0	1.7	43.4	0.0	0.0	0.0
Electricity	2.0	0.4	13.6	7.2	1.9	37.5
Firewood	88.0	95.7	41.8	2.6	2.9	0.4
Gas	0.0	0.0	0.1	0.0	0.0	0.0
Paraffin	1.0	1.2	0.7	85.7	92.5	46.5
Others	1.0	1.0	1.0	1.3	1.6	0.3
Candles	0.0	0.0	0.0	3.2	1.1	15.3

Source: Malawi Census Main Report, 2009.

As indicated in the table above, fuel wood is the predominant energy source in rural areas compared to urban areas. On the contrary, charcoal is widely used in urban areas compared to rural areas. Openshaw (2010) observed that charcoal is a fuel choice of urban areas and middle income households.

Hydropower supplies 94% of the country's electricity whilst thermal energy accounts for 6% of the county's electricity. Only 8% of the total country population (mainly urban and peri-urban population) is connected to grid electricity supply (GoM, 2015; Taulo, Gondwe and Sebitosi, 2015; Kaunda, 2013). Approximately 25% of the urban households have access to electricity. Merely 1% of the rural population has access to grid-connected electricity. The level of access to electricity in Malawi is far below the average of developing countries, which stands at 32% (Kiplagat, Wang and Li, 2011). Electricity and LPG are erratically available and costly to majority of the households. Electricity tariffs were increased by 84% in 2013 making it prohibitive to most households (Zalengera et al, 2014).

Currently, the demand for electricity is outstripping supply resulting in a deficiency that is resulting in unreliable supply characterised by frequent load shedding by the electricity utility, Electricity Supply Corporation of Malawi (ESCOM) (Gamula, Hui and Peng, 2013). To meet current demand, it was estimated that the country would need an extra 140 MW by year 2015 (GoM, 2013). Contributing to unreliable power supply is under investment in transmission and distribution infrastructure of ESCOM (ibid). Some of the infrastructure used is susceptible to outages, hence during peak periods, load shedding has to be done to avoid dangerous overload. Most of the low voltage distribution networks are operating beyond limit and regulatory requirements. Transformers are over saturated resulting in technical losses and excessive voltage

drops. Private sector investment in the electricity market is difficult due to government subsidy directed to ESCOM, giving it a competitive advantage over other players (Gamula, Hui and Peng, 2013).

2.3 Gender -Poverty-Energy Nexus

Similar to other sectors, the energy sector wears a female face too. The gender-poverty-energy discourse can be traced to the 1970s when some special attention was paid on women in the energy sector with the aim of eliminating the inequitable burden they experience compared to men. The women-targeted approach was a response to the 1970s energy crisis, particularly biomass energy (Leach and Mearns, 1988) in rural areas. The debate centred on demand of wood fuel outstripping supply (Wamukonya, 2002). It is this debate which saw the rise of the "gap theory" which envisaged critical shortages (Anderson, 1986; O'Keefe and Raskin, 1985). The "gap theory" was challenged for neglecting the social, economic, cultural and historical factors which influence natural resources management (Bradley and Campbell 1998; Katerere, 1992).

The framework was reductionist; it simplified the complex issue of biomass management to time and labour. The limitations of the "gap theory" in the women-energy discourse, gave prominence to insights from ILO work in the 1970s (ILO, 1999; Cecelski 1987, 1984; Agarwal 1986). The work centred on rural household economics, time budget and labour. Using time-use surveys, time poverty and drudgery of reproductive roles became issues of concern (UNDP, 1995; Bryson and Howe, 1993; Horestein, 1989; Tinker, 1987). The debate extended to health impacts of these tasks. The narrowing of the debate to rural areas ignored fuel stacking which is common in urban households (Wamukonya, 2002; Shailaja, 2000). The

contracted view ignored the increase in urban poor classes which still rely on fuel wood for much of their energy needs.

As the energy discourse has evolved over the years so has the perspectives on gender. There is no doubt that access to energy is a gendered issue. Women make up the bulk of the world's energy poor (WLPGA, 2014; World Bank, 2009; Cecelski, 2006; Reddy, 2000). Women's energy poverty is linked to deprivations in many facets of their lives. Considering that women are disproportionately affected by poverty, it is not surprising that they are also the majority of those who are energy poor. Even though energy poverty affects both men and women, its impacts on the two are different. This is because men and women have diverse gender roles which result in different energy needs (Reddy, 2000). Women in nearly all countries engage in productive, reproductive, and community tasks, hence the use of the phrase 'triple burden' (WLPGA, 2014; Cecelski, 2006; Khamati-Njena and Clancy, 2002).

Energy poverty is particularly acute for rural women. In most developing countries, rural households are characterised by poverty making it difficult to acquire modern energy services. In addition, rural communities lack access to grid-based power supply. Climate change is further increasing rural women's workloads due to depletion of resources causing women to travel long distances in search of fuel, water and fodder (Rohr, 2006). Faced with high poverty levels and absence of modern energy services, rural households heavily rely on traditional sources of energy (Cecelski, 2006; Khamati-Njena and Clancy, 2002; Reddy, 2000). Overall, irrespective of geographical location, women expend considerable time and effort in their reproductive tasks as evidenced by time-use surveys conducted in different

settings. In rural areas of SSA, women on a daily basis carry an average of 20kgs of fuel wood on an average distance of 5km (Brouwer et al, 1997). In Western Kenya, on a typical day women often spend an average of 2-5 hours collecting fire wood. Overall results of large scale time-use surveys conducted in Benin, Madagascar, Mauritius and South Africa demonstrate that women spend 3-5 times as much time as men on domestic activities. In Benin, women spent four times as much time as men in collecting fuel wood. Women in all the surveyed countries dominated men with regards to time spent on cooking. Findings of a study conducted by Brouwer et al (1997) in Malawi showed that 95% of fuel collection was done by women and men only participated in exceptional cases. Bandyopadhyay et al (2011) found that women in Malawi spent at least 1 hour 30 minutes collecting fuel. In terms of water collection, Kanyongolo et al (2011) observed that women walk long distances of over 1km to reach a borehole. In rural India, Barnes and Sen (2004) observed that women spent about 40 minutes daily collecting fuel, one hour fetching water and about 3 hours cooking and about 6 hours undertaking other housework. In addition, an ESMAP study conducted in India in 1996 found that women spent on average 2 hours a day on fuel collection.

This gendered nature of tasks results in women bearing a disproportionate burden of energy poverty. Their responsibilities demand considerable amounts of energy, which account for the pivotal role women play in energy production and distribution. To meet their energy needs, most women in developing countries heavily rely on traditional energy sources (WLPGA, 2014; Cecelski, 2006; Clancy, Skutsch and Batchelor, 2003; Reddy, 2000; Dutta, 1997). The time for women to take up productive activities, rest and have leisure is restricted as they spend considerable time on reproductive activities (Demetriades and Esplen, 2008). Considering that

time is a limited commodity, the term ‘time poverty’ has been coined to analyse time allocations on different activities (UNDP, 2012). Several time-use studies have shown that women are time poor due to significant time they allocate to unpaid work activities. Studies in Uganda found that women work on average 12-18 hours per day compared to men who work 8-10 hours. Similarly, women in Kenya work 50% more hours compared to men in agricultural tasks. In Tanzania, women’s daily leisure time is a mere 2 hours whilst men enjoy at least 4.5 hours of leisure per day (Dutta, 2005). In Cameroon, women’s weekly average working hours are double (64 hours) than that of men (32 hours) (Bamberger et al, 2001). Much of the disparity in men and women’s working hours is because the latter have to spend additional hours on reproductive tasks. Even with increasing female labour force participation in the job market, women remain largely responsible for care and housework (Pachauri and Rao, 2013; Bhide and Munroy, 2011; Dankelmann, 2010; Cecelski, 2006; Reddy, 2000; Bouwer et al, 1997; Dutta, 1997). Climate change make women increasingly time poor as due to depletion of resources they are compelled to travel long distances to collect water and firewood (Demetriades and Esplen, 2008).

Time poverty has implications on poverty and women’s contribution in community level decision making (Demetriades and Esplen, 2008). A study conducted in Malawi found poor literacy rates in fuel wood scarce regions and a strong correlation between time children spent collecting fuel wood and school attendance (Gaye, 2007). Inability of women to engage in productive work due to time poverty restricts their bargaining power and decision making in the household (Danielsen, 2012; Dankelman, 2011; Nelson et al, 2002). Furthermore, a preoccupation with unpaid work leaves women with no time to participate in community decision making, with

the result of their needs being neglected and undermining the effectiveness of community interventions (Demetriades and Esplen, 2008).

Due to energy poverty, women experience devastating health impacts (WHO, 2011; Shailaja, 2000). WHO (2011) notes that indoor pollution is a leading cause of death in many poor communities of the world. It has been found to cause impaired lung function leading to chronic obstructive pulmonary disease; acute respiratory infections; chronic bronchitis; damage to the eyes leading to impaired vision; increased chances of still-birth in pregnant women and cor pulmonale (enlargement of heart) in non-smoking women who cook on wood-stoves (Shailaja, 2000; Dutt et al., 1996; Mavalankar, 1991).

2.4 Summary

The discussion above attempted to frame the problem of energy poverty by quantifying it and showing its inequity dimensions. What is apparent in this discussion is that women's energy poverty is embedded in the social, cultural, economic and institutional structures (Batliwala and Reddy, 2003). At macro-level, as represented in Figure 1 in the early sections of this chapter, policy frameworks play a crucial role in energy access (Wamukonya, 2002). Energy policies affect men and women differently (ENERGIA, 2007). There is no doubt that the energy reforms which have been widely taking place in recent years in most SSA impact women and men differently. Though opening markets can enable women to participate in the energy sector, the social, cultural and economic constraints faced by women make such market-based approaches intrinsically exclusive (Figueiredo and Perkins, 2013; Rodenberg, 2009; Rohr, 2009; Wamukonya, 2002; Bell, 2001). By commodifying natural resources, women's workloads are increased as they are forced to walk

longer distances in search of ‘free’ resources to fulfill their gender roles (Bell, 2001). Thus, energy policy if not well developed, it can contribute to women’s energy poverty. At micro-level, the synergies between energy use and intra-household relations have been established (Bhide and Monroy, 2011; Dutta, 1997). As realising the impact of intra-household gender relations on adoption of RETs is the focus of this study, the next section contextualises the study by exploring intra-household gender relations models.

2.5 Theoretical Framework

This study intended to explore the relationship between renewable energy and gender relations at household level. The understanding of how gender relations shape decisions which have far-reaching impacts in life was of significance to this study. As such, the study was based on the Gender Relations perspective. The perspective encapsulates the social realities of women, who were the primary interest group in this study and the complexities of intra-household dynamics. This lens illuminates the role that gender relations have in household decision making. Using the gender relations perspective was of relevance to this study as the understanding of intra-household dynamics is crucial in addressing energy poverty which is prevalent in Malawi and is characterised by a female face. A deepened understanding of gender relations at household level is essential in appreciating their effect on energy access. An understanding of intra-household gender dynamics which culminate in inequalities in energy access is essential in ensuring that the energy sector effectively integrates gender in its planning and interventions. Absence of gender integration in the energy sector has resulted in development of gender-blind policies, programmes and projects which negatively impact on women

(Danielsen 2012; Clancy, 2001; Reddy, 2000; Argawal 1997). The theoretical framework also provided guidance to the development of research question.

This section explores past and current theoretical perspectives on intra-household gender relations with the aim of contextualising the study.

2.5.1 Gender

Enhancing gender equality is enshrined in many international commitments. The gender discourse has for a long time occupied centre stage in human development. Gender is defined as the socio-cultural construction of roles of men and women in society (Demetriades and Esplen, 2008; Cecelski, 2004; Kabeer, 1992). It is deeply rooted in culture and varies within and across cultures and changes overtime (Kabeer, 1994; Oakley, 1985). Gender is a fundamental organising factor in society and has an impact on processes of production, consumption and distribution (FAO, 2011; Ditto, 2011; Esplen and Brody, 2007; Kabeer, 1992). Gender interacts with other social organising facts such class, age, ethnicity, sexuality and nationality to create variability in human characteristics (Hawkesworth; 1997; Beneria and Roldan; 1987). As rightly postulated by Beaujot (2000:50), “gender is a structure and part of an interactive process”.

The concept of gender has evolved over the years. Feminists and other scholars are of the standpoint that any study on gender “cannot start from the viewpoint that the problem is women but rather men and women, and more specifically the socially constructed relations between them” (Whitehead, 1979). The need to understand women in totality rejects the narrow preoccupation with women because it obscures the intricate dynamics which shape women’s lives (Demetriades and Esplen, 2008). The recognition that conceptualising women in isolation is inadequate resulted in a

shift from Women and Development (WAD) to Gender and Development (GAD), with the latter appreciating that women and men have to be characterised in relation to one another and not in isolation (Demetriades and Esplen, 2008; Cecelski, 2004). Women do not live in a vacuum, thus “abstracting women from their social realities conceals the relational nature of gendered power and the interdependency of men and women, and paints a distorted picture of women’s vulnerabilities, choices and possibilities” (Esplen and Brody, 2007:2).

Gender relations are a complex issue which is influenced by several factors and in turn influence several facets of women and men’s lives. Gender relations have an impact on the economic, social and political lives of women and men. They define the social relationships between men and women as well as characteristics, responsibilities and their behaviours. Gender relations dictate the division of resources between men and women which is interconnected to power relations and bargaining processes within social institutions (FAO, 2011; Esplen and Brody, 2007; Gupta, 2000; Agrawal, 1997; Kabeer, 1994; 1992).

2.5.2 Theories on Intra-Household Gender Relations

The discourse on household dynamics can be traced back to mid-1960s when it became of interest to economists which led to its integration in mainstream economics. The household is considered to be a significant economic and decision making unit, hence its importance to various practitioners in different sectors. Households are constantly making decisions regarding different aspects of their lives ranging from food allocation, income use, education, contraception use just to mention a few. Decisions made by households on a daily basis have a profound impact on a macro and micro level; they impact family members, communities and

nations (Angel-Urdinola and Wodon, 2010; Elliot and Gray, 2000). Thus, given the impact of household decision making on different social structures, it is imperative that any development interventions have a deep understanding of intra-household dynamics so as to be designed and implemented correctly.

The household has been a unit of interest to many researchers in their attempt to understand gender issues, resource allocation, decision making and energy use. Over the years, researchers have recognised that intra-household dynamics are complex than what had been earlier theorised. Conceptualising intra-household relations is a complex undertaking to an extent that despite decades of trying to understand these dynamics**,** researchers' knowledge remains limited (Pachauri, 2007; Elias et al, 2005; Heltberg, 2004; Masera et al, 2000; Leach, 1992). Such limitations and realisation of the intricacy of intra-household dynamics have led to paradigm shift in their conceptualisation. There is general consensus that several factors influence household decision making. These factors include marital status, income level, education and age (Angel-Urdinola and Wodon, 2010; Bourguignon et al, 2009; Quisumbing and Maluccio, 2003; Skutsch, 1998; Agrawal, 1997; Reddy and Reddy, 1994; Bourguignon and Chiappori, 1992).

The relative resources contributions theory (Blood and Wolfe, 1960) propounds that power in household decision making is interconnected to a household member's resource ownership. The resources are not necessarily monetary in nature but include other assets such as education and employment. Traditionally as the man was considered to be the household provider, it bestowed him with power, making him a dominant member in household decision making. However, with an increasing number of women entering the job market and pursuing education, there is

transformation in household decision making (Gentry, Commuri and Sunkyu, 2003; Lee and Beatty, 2002; Ruth and Commuri, 1998). The increase in women with better command on resources (income, education and employment) is resulting in higher involvement of women in household decision-making.

Davis's theory (1970; 1971; 1976) on the impact of marital roles' on household decision making remains relevant in the conceptualisation of household decision making. In the triangle of marital roles, Davis (1976) highlights that household decisions are sometimes made jointly, independently and dominated by one member. The decisive factor on whether decisions are dominated by one member or taken jointly is fundamentally anchored on the culturally ascribed roles of each member. To this effect, Davis (1976:250) states, "couple's power and preferences are "built into the roles of husband and wife on the basis of cultural norms". Households with a conservative view on social roles tend to have the man as a dominating figure in decision making whilst households which hold non-traditional ideology tend to make decisions cooperatively (Belchi and Willis, 2002; Palan, 2001).

Men tend to dominant financial decisions and decisions pertaining to technical issues. In contrast, women take a leading role in decisions regarding child care and household products. Davis's postulation is supported by studies conducted in diverse contexts. In India, Dutta (1997) found that decision making regarding household cooking energy system was segregated along gender roles and norms. Women were responsible for decisions in their domain, for instance, where to place the cook stove in the house and where to obtain fuel whilst men entered the decision making process when energy had to be purchased as traditionally they are the household providers. A study conducted in South Africa on household decision making in

various spheres such as where to live, schooling for children and day–to-day expenditure found that joint decision making was the most common approach adopted which indicate cooperative bargaining (Booysen et al, 2013). Similarly, in Malawi a study on couple decision making in the areas of pregnancy, sexual relations, contraception use, money and food found that couples used a combination of decision making approaches: husband dominated, wife dominated and collaborative (Mbweza, Norr and McElmurry, 2008). The approaches adopted in decision making were determined by gender and other cultural scripts. Important aspects that emerge in household decision making are the characteristics of centralisation and specialisation.

The theoretical literature on intra-household decision making centres around competing models: unitary, collective and bargaining models (Mader and Schneebaum, 2013; Bourguignon et al, 2009; Quisumbing and Maluccio, 2003; Agrawal, 1997; Udry, 1996). The unitary models fall within the Neo-Classical approach which is under New Home Economics. These models analyse intra-household relations by assuming that a household is a single unit where all members share the same preferences (Booysen et al, 2013; Cecelski, 2004; Argawal, 1997; Udry, 1996). The unitary models postulate that household members act in unison to maximise a single utility function (Becker, 1981; Samuelson, 1956). The models assume that household resources (income, capital labour and land) are pooled for common good. Samuelson's (1956) consensus model was one of the earliest unitary models to assume that household members had congruent interests and acted in a way that maximised common welfare. The model was advanced by Becker (1981) who perceived the household to be guided by a benevolent household head who

combines the interests of all household members to create a single shared utility function and make every effort to maintain this status quo.

Over the years, the unitary viewpoint has been criticised by several practitioners who question its plausibility. The models are criticised for neglecting the role of power imbalances in resource distribution, heterogeneity in preferences and autonomy in control of resources (Lundberg and Pollak, 2008; Doss, 2001; Agrawal, 1997; Chant, 1997; Kabeer, 1994; Whitehead, 1984). Feminist critics criticise the unitary models for justifying discriminatory power and resource distribution within the household (Katz, 1997; Moore, 1988). They argue that the presumption of the household as a unified unit obscures asymmetries in intra-household relations. The models are further criticised for disregarding the intricacy of household relationships which make household behaviour highly complex than what the models propose (Cherchye et al, 2005; Agrawal, 1997; Kabeer, 1997; Sen, 1990).

Sadly, most developed interventions are still framed according to the unitary model assertions despite vast evidence showing the shortfalls of the view (Cecelski, 2005; Skutsch, 1998). Development programmes have been cited as perpetuating gender inequalities by focusing on men as heads of households and therefore directing information, capacity-building, financial resources, agricultural products to men and excluding women (Quisumbing and Maluccio, 2003; Doss, 2001; Ferguson, 1994).

With increasing evidence on the rejection of the unitary models, alternative models have been proposed so as to address the complex household issues overlooked by the unitary perspective (Chirwa et al, 2011; Quisumbing and Maluccio, 2003; Agrawal, 1997; Haddad et al, 1997; Sen, 1990). The notion of the household as a site of conflict, bargaining and negotiation replaced the concept of the household as

a site of cooperation (Mader and Schneebaum, 2013; Cecelski, 2004; Quisumbing and Maluccio, 2003). Bargaining approaches offered an alternative which suits the social reality of the family and how existing gender inequalities are negotiated and contested. Bargaining approaches are classified into two categories: cooperative and non-cooperative bargaining models.

If household members have conflicting preferences, this would mean different household behaviour than that advanced by unitary models. The behaviour would most likely be guided by who controls household resources (Cecelski, 2004). Several empirical studies from various contexts show that the different ways in which household income is controlled result in diverse expenditure patterns (Dutta, 2005; Skutsch, 1998). Income controlled by men tends to be spent on their own consumption. In contrast, growing evidence indicates that when women have command over household income, the resources are expended on child welfare in terms of human capital investment and general family well-being (Dutta, 2005; Skutsch, 1998; Brownning and Chiappori, 1992). In Côte d'Ivoire, when women's control over the household's cash resources doubled, the proportion of the total budget allocated to food increased and there was a significant decline in expenditures on cigarettes and alcohol (Dutta, 2005). Studies conducted in seven SSA countries revealed that children in female-headed households with comparable resources as those in male-headed households had better enrolment rates than the latter (Dutta, 2005; Lloyd and Blanc, 1996).

These revelations have demonstrated that intra-household decision making involves some form of bargaining, with the member who controls resources having considerable bargaining power. The bargaining models assume that intra-household

decision making is an outcome of a bargaining process among household members (Booysen et al, 2013; Mader and Schneebaum, 2013; Cecelski, 2004; Quisumbing and Maluccio, 2003; Agarwal, 1997). The non-unitary perspective recognises the individuality of household members and possible differences in preferences and utility functions (Mader and Schneebaum, 2013; Cecelski, 2004). Bargaining becomes an essential element when conflict emerges due to incompatible preferences and utility functions. Bargaining models differ in their assumptions regarding the sources of a person's bargaining power but they commonly stress access to economic resources as a critical source of a person's bargaining power (Iversen, 2003).

Cooperative bargaining models are underpinned on the assumption that household members combine their resources and jointly allocate their resources (Booysen et al, 2013; Cecelski, 2004; Quisumbing and Maluccio, 2003). These models view bargaining as a fundamental process in household decision making. When conflicts arise, household members contest and bargain to achieve Pareto efficient outcomes (Mader and Schneebaum, 2013; Quisumbing and Maluccio, 2003). Household members' cooperation in production and reproduction is based on the higher returns they achieve jointly rather than independently (Cecelski, 2004). If cooperation fails, a member can withdraw from the household, an example being through divorce.

Many of the cooperative bargaining models apply the tools of cooperative game theory (Mader and Schneebaum, 2013; Quisumbing and Maluccio, 2003). The Nash bargaining models of marriage view marriage as a cooperative game in which each member has a utility function and negotiate with one another to achieve Pareto efficient outcomes (Mader and Schneebaum, 2013; Himmelweit et al, 2013; McElroy,

1992). Besides having a utility function, each member also has an outside option, also referred to as the threat point (Mader and Schneebaum, 2013; Rode, 2011). Spouses resolve their conflicting interests through the Nash solution or other bargaining options. None of the disagreeing parties are willing to opt for an outcome that leaves them worse off. The Nash model argues that women who have better fall back plans have leverage in the marriage bargaining process (McElroy, 1992).

The divorce threat models advance that a break down in cooperation leads to marriage dissolution (McElroy and Horney, 1981; Manser and Brown, 1980). Marriage dissolution or divorce depends on price and individual income parameters external to the household which include legal and policy frameworks on marriage, sex ratio in the remarriage market, divorce benefits and social and religious norms (Mader and Schneebaum, 2013; Rode, 2011). A woman who expects to gain more assets upon divorce has an influence in the bargaining process than when the divorce will leave the woman worse off. Violence or the threat of violence also corresponds to a threat point (Tauchen et al, 1991). It is used as a bargaining tool but also an outcome of household power distribution. Cooperative models argue that when conflict arises, most couples opt for cooperative solutions rather than divorce or non-cooperative solutions. Proponents of the cooperative models recommend empowering women with economic resources in order to increase their bargaining power within the household. They are of the view that when women have bargaining power, it will lead to fair distribution in family resources.

Despite the cooperative bargaining models being an improvement on the unitary approaches, certain limitations have been identified in their modelling. Feminist critics argue that though the cooperative bargaining models are commendable for

incorporating differences in household members' preferences, they fall short in treating household members with stereotypical gender roles in the bargaining process (Mader and Schneebaum, 2013). The approaches are criticised for failing to explain the role of gender roles and other factors in intra-household decision making (Katz, 1997).

In this regard, Agrawal (1997) argues that cooperative models fall short in revealing "the full complexity" of the bargaining process as they neglect the impact of exogenous factors (social norms, gender ideologies) on the bargaining process. In other words, the cooperative approaches do not account for the interaction "between extra-household and intra-household bargaining power" (Agrawal, 1997:1). Agrawal's arguements are supported by Kabeer (1997:300) who in reaction to Sen's (1990) concept of 'cooperative conflicts' notes that cultural and gender ideologies impinge on economic processes, thus weakening women's bargaining power despite them having economic resources (income) which makes the "operation of within the household elusive". Furthermore, the models fail to clarify how the breakdown positions are formed and changed (Kaspar, 2005).

The limitations of the cooperative bargaining models led to emergence of alternative approaches, namely, non-cooperative bargaining models. Unlike the cooperative models which view disagreeing couples bargaining to reach a Pareto efficient outcome, non-cooperative models give leeway to the possibility of inefficient outcomes (Rode, 2011; Quisumbing, 2003). This perspective assumes that individuals cannot enter into binding and enforceable contracts with each other (Mader and Schneebaum, 2013; Quisumbing, 2003). Instead, their actions are towards pursuing self-enforcing agreements. Each household member's priority is to

maximise on his/her own utility within his/her own budget constraints, and takes liberally the decisions of other household members (Rode, 2011). The presumption of the household as a non-cooperative unit is based on three unique elements of a household: asymmetric information, enforcement challenges and inefficiency (ibid). Due to the household being inherently inefficient, a pooled budget does not exist as postulated by cooperative models (Lundberg et al, 1997). Non-cooperative models postulate that Pareto outcomes may either be achieved or not. Lundberg and Pollak (2008; 1993) in their 'separate spheres model' advanced the notion that when couples disagree, they do not abandon their marriage, they adopt the non-cooperative solutions which involve remaining together without cooperation but each person fulfilling his or her ascribed social roles in household production.

The notions advanced by the non-cooperative approaches have been used in policy planning for transfers (Quisumbing, 2003). Research conducted in UK and SSA demonstrated that a shift of state transfers from fathers to mothers led to positive child well-being outcomes (Himmelweit et al, 2013). Similar results were not however found in Australia where higher transfers were made resulting in the questioning of UK findings by Lundberg et al (1997). Despite non-cooperative bargaining models being agnostic, they have been criticised for still falling short of accounting for the greater complexity of intra-household relations (Argawal, 1997).

Collective models were developed to overcome the shortfalls of both the unitary and bargaining models. Similar to cooperative models, the collective approaches make a presupposition that household bargaining should result in Pareto efficient outcomes (Browning and Chiappori, 1998; Bourguignon, Browning, Chiappori and Lechene, 1993; Chiappori, 1988). Chiappori (1988) refers to this assumption as 'collective

rationality', and exists as it is the motivating factor for living together as a couple. The approaches do not specify any processes of how these outcomes come into being making them empirically undemanding to apply (Himmelweit et al, 2013). The models accommodate multiple decision makers. Although collective models are applauded for being more realistic and accommodating multiple decision makers and assuming that decisions are reached collectively, their main limitation has been the complications with how these decisions are reached (Bateman and Munro, 2005).

2.6 Intra-Household Relations in Malawi

While the focus of this section is on intra-household decision making, it should be recognised that household decision making processes are embedded in exogenous structures; economic and socio-cultural structures. This therefore warranties a discussion of Malawi's economic and socio-economic structures as intra-household dynamics cannot be understood independently of these aspects.

2.6.1 Country Profile

Malawi is a landlocked country bordering Tanzania, Zambia and Mozambique. The country is an elongated stretched strip of land, with the Rift Valley running across the stretch of land. The country is divided into three regions: Northern, Central and Southern regions. The regions are sub-divided into 28 regions, 6 districts are located in the northern region, 9 districts are found in the central regions whilst the remaining 13 districts are situated in the southern region. For administration purposes, the districts are further sub-divided into traditional authorities (TA), under the authority of a chief. Each TA is composed of villages, which are the lowest administrative structure and are under the charge of a village headman. A fifth of the country is

covered by fresh water, Lake Malawi, which is a tourist landmark and a source of livelihood for many families living along its shores.

2.6.2 Country Demographics

UNFPA (2015) estimates the country's population to be 17.2 million; an increase from 15.4 million recorded in 2011 (UNFPA, 2011). Family size continues to be relatively higher than the global average size. The fertility rate is reported to be 5.3 whilst life expectancy stands at 60 years for men and 62 years for women (UNFPA, 2015). Rural families are relatively large in size compared to urban families. Urban areas are characterised by overrepresentation of men whilst women predominantly live in rural areas (GoM, 2008). Considering that Malawi is one of the least urbanised and developed country in the world, the country is predominantly a rural, with 80% of its population living in rural areas where they depend on agriculture (GoM, 2011).

School enrolment has increased since the introduction of free primary education in 1994. However, only half of the children who enrol for primary education are able to complete all grades (Field, 2009). Poor completion rates are also noted at secondary level (ibid). The situation is more depressing at higher and tertiary education level, where boys are twice likely to be enrolled compared to girls. The Malawi Gender Equality Index of 2012 noted that the tertiary enrolment for males was high compared to that of girls. Contributing factors to this low female participation is low completion and poor grades at secondary education level.

Although net primary education enrolment is similar, girls tend to drop out faster than boys and have poorer performance (GoM, 2009). Many learners drop out school before acquiring reading and writing competencies. As such, Malawi's education performance indicators remain comparatively low to those of the African region.

Overall, literacy levels of women are lower compared to those of men. The overall literacy rate for women is 60.5% whilst for men it is 80% (FAO, 2011). Regional disparities in literacy rates do exist, with urban areas having higher literacy rates (approximately 93%) compared to rural areas (approximately 68%). In addition, the northern region has higher literacy rates in comparison to central and southern regions. The region also exhibit lower gender differences in literacy levels. Interventions to retain the girl child in school have focused on demand and supply factors. On the demand side, the focus has been on addressing issues at household level which impact on girls' education (gendered division of labour, poverty, food insecurity, orphanhood and early marriages) whilst the supply side has been to address quantity and quality of services (pupil-teacher ratio, relevance of curricula, teaching and learning materials and physical infrastructure). There are indications that family responsibilities bestowed on girls adversely affect their education outcomes.

Malawi has a generalised HIV epidemic, with a prevalence rate of 10.6% recorded in 2010 in the 15-49 years age group (GoM, 2015). HIV prevalence rates differ by region, with the Southern region having the highest rate of 15%, followed by the Central region (8%) and Northern region with a rate of 7% (GoM, 2012:13; NSO and ICF Macro, 2011). Similar to other countries in SSA, females are more vulnerable to HIV infection. Women aged between 15-24 years have an infection rate 4-6 times higher than that of males in the same age group (GoM, 2015; White, 2007; Kathewera-Banda et al, 2005). Similar to epidemiological patterns and trends in SSA, the drivers of the epidemic in Malawi are biological, social and behavioural (GoM, 2015). Labour migration is one key driving factor of the epidemic (Bryceson et al, 2004). Labour migration is prevalent in the Southern region, a region

characterised by matrilineal social organisation, high levels of poverty and high population density (Verherjein, 2013).

2.6.3 Livelihoods

Malawi is one of the least developed countries in the world. As highlighted earlier, Malawi's economy is driven by agriculture which employs 80% of the labour and contributes about 35% of the GDP (Verherjein, 2013; FAO, 2011; GoM, 2011; 2006; 2005). Malawi's agriculture sector is divided into two: small-holder farmers and estates. Commercial estates occupy over 40% of the country's arable land and mainly produce tobacco, coffee, cotton, tea and sugar cane which are entirely for export (Arrehag et al, 2006; Kerr, 2005; Sahley et al, 2005). The estate sector is the main provider for wage labour in the country. Small-holder farmers who reside in rural areas mainly engage in rain-fed subsistence farming, although they also contribute to export production (FAO, 2011). It is estimated that women provide 50-70% of the agricultural labour (Nangoma, 2007; Kerr, 2005). The small-holder farmers cultivate an average land size of 0.6 hectares which is below the recommended 1.5 hectares needed to feed a family for a full year (Chinsinga, 2008; Kamwendo, 2006). In the absence of droughts, floods and pests, an average household can have yields which can sustain it for last 6-7 months (Chirwa et al, 2008).

Compared to other countries in the region, Malawi's agricultural productivity is low (Verherjein, 2013). Several factors account for this poor productivity. Small plot sizes have been reported to be a constraining factor in producing high yields (FAO, 2011). Although small plot sizes may be a contributing factor, they need to be viewed in relation to the fact that much of the country's agriculture is based on manual labour.

Few small-scale farmers have draught power and/or income required for mechanised power (Verherjein, 2013; Phiri, 1983; Hyden, 1980). Thus, land clearing, sowing, weeding and harvesting are done by human labour. Considering that women predominantly live in rural areas, they provide the manual labour required for agriculture activities. Kerr (2005) notes that women in Malawi have fewer off-farm choices to earn cash income due to structural inequalities such as low levels of education, employer bias and cultural norms which award women a low status and confine them to the domestic sphere. Mono-cropping of maize, the staple crop has led to soil infertility. Furthermore, climate change which is affecting most countries in SSA is an aggravating factor in low produce as in recent years the country has been experiencing frequent droughts, flooding and destructive winds (Nangoma, 2007).

Given these constraining factors faced by small-holders farmers, the end-result is substantially high poverty levels in rural areas compared to urban areas. A clear dichotomy exists in poverty levels between urban and rural areas, with the latter being poorer. However, there is growing population of the urban poor. Poverty levels in the rural areas are compounded by poor literacy rates and marked deprivation of rural areas of infrastructure, educational and health services (Bryceson and Fonseca, 2006).

Faced with high levels of poverty and limited decent work opportunities, labour migration is a common feature among the rural population, particularly men who migrate to estates, urban areas and surrounding countries (Bryceson et al, 2003). FAO (2011) observes that almost entirely all rural households engage in various income diversification strategies. FAO (2011) adds that the degree of diversification is dependent on the wealth of the household and sex of the household head. Female

headed households tend to be less involved in off-farm wage labour and non-agriculture self-employment. As noted earlier, women are more disadvantaged with regards to decent work opportunities. The gender bias in migration explains the predominant presence of women in rural areas (FAO, 2011; Kerr, 2005).

Apart from labour migration, rural households also engage in *ganyu,* which is casual work in exchange of money or food (Verheijen, 2013). The *ganyu* include working for wealthier families, who in most cases are those receiving remittances from spouses, children or relatives working in urban areas or neighbouring countries, particularly South Africa (Verheijen, 2013; Bryceson et al, 2003). The remittances are used to purchase food but are also critical for buying farm inputs such as fertilisers and pesticides. Poor rural households facing difficulties to have sufficient food normally have no surplus to invest in education, agriculture or any other form of development as food is top priority (Verheijen, 2013).

A considerable number of Malawian households, particularly rural households sell fuel wood and charcoal as a source of livelihood (Kaunda, 2013; Bandyopadhyay et al, 2011; Openshaw, 2010; Brouwer et al, 1997). Several studies conducted in Malawi have demonstrated the importance of forests as a source of livelihood (Kamanga et al, 2009; Fisher, 2004; Brouwer et al, 1997). Stacked bags of charcoal and stock piles of wood are a common feature along Malawi's highways. A study conducted in the country's major urban areas revealed that charcoal trade was a lucrative business, with an estimated value of US$41.3 million, representing a share of 0.5% to the country's GDP (Kambewa and Chiwaula, 2010). The increased demand of charcoal in urban areas is a driving force behind the thriving charcoal

business. This has however led to considerable environmental damage through deforestation (GoM, 2005).

Small-scale fishing is important in Malawi for food security and provision of income (Kathewera-Banda et al, 2005; Matiya and Wakabayashi, 2005; Elllis, Kutengule and Nyasulu, 2003). The sector is highly gendered (Kathewera-Banda et al, 2005). The fishing industry is male dominated and reflect gender dynamics of inequality which can be observed through women's economic dependency (ibid). Women trade sex in exchange for a good bargain in the buying of fish.

2.6.4 Social Organisation

Malawi is characterised by heterogeneity in religion and kinships systems which all have an impact on marriage and social organisation in general (Thornton et al, 2014; Reniers, 2003). Malawi's two kinship systems; patrilineal and matrilineal organising structures continue to co-exist along with other ideologies such as Christianity and Islam (Anglewicz and Reniers, 2014; Verheijen, 2013).

Like in many other countries, marriage in Malawi as a legal institution and a social construct continues to evolve (Bond, 2011). Marriage in Malawi is typically early and universal (Anglewicz and Reniers, 2014; Reiners, 2003). The mean age at marriage for females is 17.9 years whilst for males is 22.6 years (NSO and ICF Macro, 2011). Divorce and remarriage are common, with an estimated 45% of first marriages ending in divorce within 20 years and around 90% of women remarrying within 10 years after the dissolution (Anglewicz and Reniers, 2014; Reniers, 2003).

Marriage patterns widely differ across the country's three regions and tend to be aligned to the region's kinship system (Anglewicz and Reniers, 2014; Verheijen,

2013). In the patrilineal kinship system, descent and inheritance is from males and after marriage, residence is virilocal or patrilocal (the wife moves to the husband's residence). On the other hand, in the matrilineal kinship system descent and inheritance devolves from females and residence after marriage is uxorilocal (the husband moves to the wife's residence). The uxorilocal residence implies that the husband severs from his family, the resource base which gives him power and authority (Reiners, 2003).

For matrilineal groups in the central and southern regions, marriage negotiations in are not elaborate and are less formalised compared to the patrilineal groups in the northern region (ibid.). The Southern region which is mainly inhabited by the *Yao, Lomwe* and *Nyanja* ethnic groups has a matrilineal kinship system with the exception of and a minority of the *Sena* people. The Central region is mainly home to *Chichewa* speaking people, (who are matrilineal) however, it is also characterised by a mixture of ethnic groups (Anglewicz and Reniers, 2014; Verheijen, 2013; Palamuleni, 2011). The Northern region is occupied by the *Tumbuka, Tonga, Nkonde* and *Ngoni* ethnic groups who are patrilineal (Palamuleni, 2011). Each of these ethnic groups has its own diverse set of beliefs, values, customs and socio-economic systems which regulate social organisation.

In patrilineal groups, the bride has to pay *lobola* for the marriage to be considered valid (Mwambene, 2007). Patrilineal groups regard a marriage null and void if payment of *lobola* is not done even if the marriage complies with legal requirements (ibid). Critics of the concept of *lobola* argue that the practice parallels to purchasing a woman which leads to women being ill-treated by their husbands and in-laws as they are considered to be property or a commodity which was bought. They further argue

that the ritual infringes the rights of women to respect and protection against all forms of harm and exploitation. Others contend that the practice creates a financial barrier to a bride who might lack the required resources even if he is ready to commit to marriage. Payment of *lobola* is a significant element of marriage among the patrilineal groups and they defend the ritual on the basis that it has a far deeper cultural symbolism than the commercial meanings attached to it by critics. The practice symbolises an alliance formed between two families and their kinships and not only individuals (husband and wife). The bond created through *lobola* sets the foundation for reciprocal rights and duties of the two families (Mwambene, 2007; Ansell, 2001). For instance, mediators can be drawn from each family when a marriage dispute arises. Both parties have duties to stabilise the marriage.

These kinship systems have an impact on marital status in the country. Matrilineal groups are characterised by high levels of divorce compared to patrilineal groups (Anglewicz and Reniers, 2014). The association of kinship system and relationship/partnership stability is however complex. High partnership turnover in matrilineal groups may be linked to women's greater autonomy in the matrilineal system (Reiners, 2003). Polygny is high among the patrilineal groups of the Northern region (Reniers and Tfaily, 2008). Reiners (2003) note that the other pointers for divorce include education level, religion, marriage duration, presence of children, age gap between spouses and ethnic homogamy.

The plural legal system in Malawi recognises four marriage regimes: civil, customary, Christian and Asiatic marriages. Civil marriages are monogamous and are contracted under the Marriages Act which is contracted in terms of the civil

marriages in England (Mwambeme, 2007). The rights and responsibilities of parties who enter this form of marriage are specified in the Marriage Act.

The other category of marriages recognised by the Constitution of Malawi is customary marriages (Mwambene, 2007). The majority of people in Malawi get married under this type of marriage (ibid). The marriages are contracted according to the customary law applicable to the marriage. Bond (2011) adds that customary marriage laws vary within a country as they are determined by ethnic group customs and sometimes even vary by village. This is the case in Malawi as the country is composed of two main kinship systems (patrilineal and matrilineal) and ethnically diverse groups which are characterised by distinct customs. The rights and responsibilities of the parties married under customary law are stipulated within the customary law applicable to the marriage. Customary marriages are potentially polygamous. It is important to reiterate at this point that though persons can marry according to customary law; this law is subject to the Constitution. In cases where customary law is inconsistent with the Constitution or contravenes the statutory standards, statutory law takes precedence (Bond, 2011; Mwambene, 2007). The Constitution prohibits discriminatory practices; hence any gender discrimination which may be perpetrated in the name of customs is condemned. Relevant to this study, it should be underlined that customary law is dynamic; it evolves in accordance with changing social needs and pressures.

In addition to civil and customary marriages, Malawi has two religious marriage regimes: Christian and Asiatic marriages. Christian marriages are contracted according to Christian rites which are embodied in the African Marriages (Christian Rites) Registration Act (Mwambene, 2007). Mwambene notes that Christian

marriages remain customary in every respect but only differ in that the marriage is celebrated in accordance with Christian rites. This type of marriage does not specify the rights and responsibilities for the parties in the marriage. The Asiatic marriages on the other hand are contracted under the Asiatic (Marriage, Divorce and Succession) Act (Mwambene, 2007). The rights and responsibilities of parties who enter this form of marriage are embodied within customs applicable to the marriage.

2.6.5 Gender Relations

Various research conducted in Malawi indicate that there are significant differences in the roles ascribed to men and women (White, 2007; Kerr, 2005; Reiners, 2003; Brouwer et al, 1997). As Malawi is ethnically diverse, these roles may differ by ethnic group as each group has its own distinct beliefs, values, norms and customs which govern social relations. The different roles influence their capacity to engage in productive work or attain education and thus, their intra-household decision making power.

Verheijen (2013) examines the influence that colonialism and imperialism had on Malawi's culture, traditions and customs including the gendered division of labour. Verheijen argues that Malawi's customs and traditions have undergone transformation since colonial invasion. The contemporary customs and traditions should be viewed as a combination of traditional and foreign elements. In other words, to a certain extent, Malawi's current traditions and customs are colonial constructs. Colonial settlers imposed Western household models and stereotypes. Through manipulation of the ethnic groups' way of life, the settlers modified traditional social organisation. This manipulation is blamed by some for the weakening in power of women in matrilineal systems. Introduction of hut tax, new

commodities (such as sugar and matches) meant engaging in wage labour to be able to make payments. Declining agricultural produce due to declining plot sizes and depleting soil fertility added the pressure for men to migrate out of the villages to areas (estates and mines) where there were job opportunities which were exclusively for men. As men migrated for wage labour, women remained in rural areas in charge of farming activities. This further cemented the gendered division of labour, men being in paid work whilst women were confined in the private sphere doing unpaid work.

The privileged access of men to education and wage labour increased men's resource base while that of women diminished. Consequently, it led to women increasingly depending on men who had access to the much needed resources. Due to decreasing plot sizes and soil infertility, food security depended on the ability to buy fertilizers and supplementary food. This increased women's economic dependence on men with a consequent result of increase in men's power and authority (Semu, 2002; Phiri, 1983; Mandala, 1982). These multiple historical precedents to some extent account for the privileged position enjoyed by men in contemporary Malawi. The changes also meant an evolution in women's socio-economic positions. Even though these historical precedents are important in understanding contemporary gender issues, it is inaccurate to assume that the transformation in Malawi's gender relations is entirely due to colonialism and imperialism.

In contemporary Malawi, male dominance is a common feature despite the distinct kinship systems and diverse ethnic groups (Thornton et al, 2014; Verheijen, 2013; Kathewera-Banda et al, 2005; WLSA, 2002). Men and women have clear gender-

specific roles which unsurprisingly are modeled by culture (Thornton et al, 2014; Bandyopadhyay et al, 2011; White, 2007). As elsewhere in Southern Africa, men in Malawi are considered to be heads of household even among matrilineal groups (Thornton et al, 2014; Kerr, 2005; Kaler, 2003; WLSA, 2002). In addition, men's roles include engaging in paid work outside the home so as to provide the needed cash for family sustenance. FAO (2011) notes that analysis of land distribution in the country show that men predominantly own land. The access to economic resources as argued by Verheijen (2013) continues to give men power and authority which leverages their bargaining power in decision making.

Similar to patterns and trends in SSA, men in Malawi dominate in sexual relationships. They decide when, where and how sex is to be done (White, 2007; Kathewera-Banda et al, 2005). The unequal power relations contribute to this male dominance. In contrast, women are culturally expected to be submissive to their male partners even those from matrilineal groups (Watkins, 2004; WLSA, 2002). The use of violence by men and women's economic dependence makes it difficult for women to negotiate terms of sex. Like other countries in SSA, the result has been increased vulnerability of women to HIV infection and gender based violence compared to men (White, 2007; Kathewera-Banda et al, 2005).

Women in Malawi are primarily responsible for household activities (Thornton et al, 2014; Verheijen, 2013; Bandyopadhyay et al, 2011; FAO, 2011; Nangoma, 2007; Kerr, 2005; WLSA, 2002). This entails undertaking tasks such as water and fuel collection, cooking, child care, house cleaning, laundry and other domestic duties for family welfare. Fuel collection is mainly done by rural women considering that only 1% of the country's rural population has access to grid-connected electricity (Taulo,

Sebitosi and Gondwe, 2015; Zalengera et al, 2014; Kaunda, 2013; Bandyopadhyay et al, 2011; Brouwer et al, 1997). A study by Brouwer et al (1997) found that 95% of fuel collection was done by women. Men only participated in exceptional cases such as when a woman was unable to collect firewood due to sickness and/or advanced age. Fuel and water collection constitute some of the tasks which take women's substantial time and effort. Bandyopadhyay et al (2011) found that women in Malawi spent at least 1 hour 30 minutes collecting fuel. In terms of water collection, Kanyongolo et al (2011) observed that women walk long distances of over 1km to reach a borehole.

With a heightened burden of HIV and AIDS in SSA, women in Malawi as part of their reproductive activities provide care to sick family members (White, 2007; Watkins, 2004; WLSA, 2002). White (2007) argues that like other countries in the world, governments have shifted this role to women for free.

It is imperative to note that women's household daily activities vary by season (Verheijen, 2013). Bearing in mind that women in Malawi supply 70-80% of the labour in agriculture and labour migration of men it means they are responsible for the bulk if not all farming activities (FAO, 2011; Nangoma, 2007; Kerr, 2005). Before the rainy season, women have to clear and plough the fields in preparation for sowing during the rainy season. During the rainy season, they sow, weed and apply fertilizers and pesticides. It is important to reiterate that much of small-holder farming is done manually. Summer months are periods for harvesting which yet again is the responsibility of women. Kerr (2005) notes that though women in Malawi contribute equivalent agricultural hours as men, they additionally devote time to household reproductive activities. Despite their active role in agriculture, the women lack access

to land (FAO, 2011). This is common pattern in both patrilineal and matrilineal ethnic groups.

Women's responsibilities in Malawi are not only confined to their homestead but extend to the community. It is common practice in Malawi for ceremonies on initiation and unveiling of the tombstone to be conducted during the harvesting period (Verheijen, 2013). Women's responsibilities at such ceremonies are a replica of the duties they perform in their own households which include cooking, fetching firewood and water, washing dishes and ensuring that every attendee is fed (Verheijen, 2013; Bandyopadhyay et al, 2011; Brouwer et al, 1997). The only difference which is worth mentioning and relevant to this study is that at such community events, women's workloads are normally higher as they have to cater for large groups of people.

An examination of Malawi's poverty data shows that poverty has a gender dimension. Women in Malawi are poorer compared to men (FAO, 2011; Kerr, 2005). Having explored above the gender inequalities in the country, it is easy to understand why this is the case. Lack of economic resources (education, land and income), low social status and time constraints make it challenging for women in Malawi to experience upward mobility (FAO, 2011; Kerr, 2005; Minot, Kherallah and Berry, 2000).

2.7 Intra-Household Decision Making

Social structures have a bearing on intra-household dynamics. In Malawi, the kinship systems influence marital roles and power dynamics within a household. Considering that evidence indicates that the way marriages are constructed has a bearing on intra-household decision making, it would be expected that the decision making outcomes in Malawi's households are to some extent shaped by the discussed social

constructs (Mbweza, Norr and McElmurry, 2008). Malawi's ethnic diversity however makes it difficult to generalise intra-household dynamics. The different kinship systems and subsequent cultural norms have varying implications on women's access to resources and decision making power in the household.

As noted by Reniers (2003), the high partnership turnover in matrilineal groups may signify the autonomy enjoyed by women in these groups. In addition, the matrilocal residence, a characteristic of matrilineal systems may mean weakening of a husband's power and authority as he is detached from the resource base which gives him power and authority (ibid). The patrilineal system is viewed as offering social protection to women and children as a husband perceives it his duty to maintain his family, a perception not held by husbands under the matrilineal system (WLSA, 2002). From the poverty statistics, a clear contrast can be seen between patrilineal and matrilineal societies which seem to support this assertion. The Southern region which is distinctly matrilineal is the poorest region. This poor economic status can therefore adversely affect the bargaining power of women in these regions.

Blood and Wolfe's (1960) resource theory holds that the resource base of a spouse plays a critical role in his/her influence in household decision making. As indicated above, Malawi poverty statistics show a clear dichotomy between men and women. This is the case with other socio-economic indicators, in which literacy levels are higher among men as well as employment opportunities and land access. Kerr (2005) notes that historically and currently, women in Malawi have limited entitlements in waged labour as well as within households. Kerr observed that in the northern part of the country women had fewer entitlements, particularly land which in

turn affected intra-household dynamics. It can therefore be construed that the weak resource base renders Malawian women powerless in marriages or sexual partnerships.

However, considering that household decision making theories postulate that influence in decision making power is not only based on economic resources, possibilities of women drawing power from other bases should not be underestimated. It would be wrong to view gender roles in Malawi as static; there is evidence of changing gender roles with women increasingly achieving higher levels of education and entering the labour market (Verheijen, 2013; Mbweza, Norr and McElmurry, 2008). Mbweza, Norr and McElmurry (2008) substantiate that education is an important enabler as it exposes people to new ideas and other ways of thinking which are critical in the transformation of gender relations.

A study conducted in the country on couple decision making regarding sexual relations, contraception, pregnancy and money further reaffirms the assertion on changing gender roles (Mbweza, Norr and McElmurry, 2008). The study found three main decision making approaches used by couples: husband dominated, wife dominated and shared. Most couples reported using a combination of these approaches depending on the circumstances. Interestingly, wives had a final say in some of the shared decisions irrespective of them being unemployed and with low educational level. This finding contradicts the assertion by the resource theory that greater resources award an individual power or influence in decision making.

Similar to Dutta's (1997) finding in India that household decision making is segregated along gender, evidence from Malawi indicate that household decision making is highly gendered (Mbweza, Norr and McElmurry, 2008). Evidence indicates

that decisions which were regarded to fall under a woman's specialisation or her realm were characterised by the wife dominated approach while the reverse is true (ibid). This supports Carli's (1999) findings that women's power is not necessarily derived from economic resources but also from their gender roles. Another interesting finding was that decision making was to a certain extent determined by a couples beliefs, values and norms. Couples which held traditional beliefs of men being the head of the household largely used the husband dominant approach whilst couples who were not conservative were likely to adopt the shared approach. This further affirms that social organisation has an influence on intra-household dynamics. It should be however highlighted that the linkage between kinship systems and stability and power is complex.

From a legal view, the separation of marriages in these different regimes means women receive different legal protection which also has an influence on intra-household dynamics. The diverse forms of marriages means a woman's enjoyment of rights within marriage is based on the type of marriage she enters into. Civil marriages have a higher degree of state control which is not found in customary and religious marriages (Bond, 2011).

Another relevant aspect in household decision making is age at marriage. Evidence suggest that marriages in Malawi take place at an early age (Anglewicz and Reniers, 2014; Reiners, 2003; Kumchulesi, Palamuleni and Kalule-Sabiti, u.d). Age at marriage is of particular interest in household decision making because it is indicative of achievements in education, employment and participation in society which are important elements in household decision making. Early marriages do not allow women to complete education and acquire competencies which would afford

them decent employment (Anglewicz and Reniers, 2014; Kumchulesi, Palamuleni and Kalule-Sabiti, u.d). Education level and employment have been shown to increase one's influential power in household decision making (Blood and Wolfe, 1960). As early marriages are prevalent in Malawi, it can be construed that the women are more likely to have an inferior position in household decision making as they do not have the assets which award them bargaining power. Verheijen (2013) notes that the Yao have a reputation of not valuing education and marrying off their children at an early age. Absence of or limited economic and social resources implies that these young brides become dependent on male partners which inevitably bestows men power and limits women's negotiating power in household decision making.

2.8 Intra-household Relations and Household Fuel Choice

It is important to understand the energy use patterns of households, so as to appropriately inform the planning and design of policy interventions aimed at meeting households' energy needs (Clancy, Skutsch and Batchelor, 2003). Understanding the decision-making process within households when choosing energy services, is at the crux of this study as it aims at understanding intra-household dynamics which have a bearing on household energy use. Hence an attempt is made in this section to explore household energy consumption patterns and decision making around energy use.

Households consume a significant amount of energy (Adkins et al, 2010). Household energy consumption can be defined as energy that is expended in a home to meet the energy needs of the family (WLPGA, 2014). Insights on energy use at household level have been gained from various studies conducted on energy use at household

level. Themes of such studies included household energy conservation and determinants of energy use. The insights from these are worth exploring as they are relevant to this study.

As highlighted earlier, households use energy for various activities; cooking, space heating, lighting, water heating and income generation. To achieve each of these activities, households use different energy carriers ranging from cow dung, wood, coal, charcoal, kerosene, LPG and electricity (Karlsson, 2007; Cecelski, 2006; Reddy, 2000; Reddy and Reddy, 1994). These carriers occupy different ranks on the 'energy ladder' as discussed in the previous section. Each carrier has unique characteristics which impact household decision making on carrier choice. These features include convenience, accessibility, efficiency, controllability, cleanliness, current cost and future cost (Reddy, 2000). The selection of an energy carrier is not only affected by carrier attributes but by several other factors. Several studies undertaken in different contexts have revealed diverse factors which determine household energy carrier choice.

One determinant of household energy carrier is a household's socio-economic characteristics (Arnold et al, 2006; Reddy, 2000; Reddy and Reddy, 1994; Hosier and Kipondya, 1993; Leach, 1992). In this regard, income is a major factor influencing a household's choice (Howells et al, 2005; Reddy, 2000). Different carriers require suitable devices or gadgets (stoves, tanks) to which there is an attached cost and the aspect of durability. This means fuel or carrier choice has fixed, quasi-fixed and variable components (Reddy, 2000). Quasi-fixed costs are incurred from for example, monthly fixed costs for natural gas or electricity connection, bulk purchases for certain fuels (storage tanks for gas) and security

deposits as a warranty for monthly payments or for the return of equipment (LPG cylinders). The presence of fixed, quasi-fixed and variable components and the expenses attached to them influences household fuel choice (Howells et al, 2005; Pachauri and Spreng, 2004; Reddy, 2000). Howells et al (2005) illustrate that in South Africa some households which had accessed electricity through a government subsidised electrification programme had the power supply disconnected due to defaulting in bills.

The result of these decisions is dependent on the preparedness and willingness of a household to relinquish current consumption for future gains. The degree to which a family discounts future gains is possibly determined by the household's level of wealth and its liquidity. If fuel choice involves diversion of resources from other functions or entail getting into debt in order to meet the up-front expenses, households are likely to apply high discount rates. Discount rates are much higher among the poor compared to the rich (Reddy and Reddy, 1994). The lack of dependable earnings compels the poor to consider first cost only rather than the lifecycle cost (Howells et al, 2005; Karekezi and Kithyoma, 2002; Reddy, 2000). Karekezi and Kithyoma (2002) adds that the predominant and continued use of fire wood despite its inefficiency and health impacts is possibly due to it being a 'free' source of energy. In most cases, it is collected and not purchased. Considering that efficient devices' costs are prohibitive, the poor end up with poorly efficient appliances which use more energy for a given level of service. It is also important to bear in mind that fuel costs are determined by the market or the opportunity cost involved in collecting them.

The discussion above on income level being a determinant in household choice is at the core of the 'energy ladder' model. However, this basic tenet has been debated over the years in light of observed patterns in household energy use and the role of socio-demographics in fuel choice.

While income level has a substantial impact on household fuel choice, it is not the only factor. Attitudes, values, norms and habits have also been found to influence household fuel choice (Bhide and Monroy, 2011; Karekezi and Kithyoma, 2002; Reddy, 2000; Dutta, 1997). Bhide and Monroy (2011) add that demographic factors such as sex and education also influence determination of fuel mix used by a household. They observe that in India women tend to favour fuels which substitute biomass sources as they are the ones most affected by indoor pollution. However, as households in India are mainly headed by males who are also decision makers; the aspect of indoor pollution is often neglected when deciding on a fuel choice.

Bhide and Monroy's observations are substantiated by Dutta (1997) who underlines that decision making for a household cooking energy system is 'highly segregated along gender lines'. Dutta notes that decisions which have a financial aspect are often made by a male, who is head of the household even though women may be consulted. In other words, men enter the decision making process if energy has to be purchased. Dutta (1997) demonstrates that if the construction of a stove is 'free' (no monetary incentive is required), the decision is normally made by a woman, however if the construction requires finances then the decision maker switches to a male. The other areas in which a woman can make a decision include placement of the cook stove and where to obtain fuel wood (be it purchasing or collecting). A

woman makes decisions in this regard because they are considered to fall under her domain in terms of gender roles.

Research also indicates that when energy has to be procured, priority is given to energy for recreational purposes (television, radio) and not for labour saving equipment (Clancy et al, 2003). The table below showing the segregation of decision making activities by gender is derived from Dutta's (1997) study in India.

Table 2.3: Factors affecting decision making for household fuel choice

Component/sub-system	Typical decisions made	Parameters and variables affecting the decision making
Kitchen	Location of kitchen (M) Construction material of kitchen M) Layout of kitchen (W)	Economic status, climate availability of construction material, secondary use of kitchen
Fuel	Which fuel to use (M/W)	Availability in terms of cost and distance, burning characteristics, taste convenience
Device	Which device to use (M/W) What size (W) How many (W)	Economic status, task suitability, fuel type, awareness level, cooking cycle, time availability, culture, inhibitions
Vessel	Material (W) Size (W) Shape (W)	Economic status, tradition food habits
Food	Type (W) Quantity (W)	Habits
Cook	-	-

M: Decision taken by me, W : Decision taken by women

Source: Dutta, 1997

Decision making on fuel choice is also dependent on exogenous factors (Bhide and Monroy, 2011; Reddy, 2000; Dutta, 1997; Hosier and Kipyonda, 1993). Evidence indicates that the fuel type used by a household is to a certain extent based on the tree species found in the proximity. In their work in India, Bhide and Monroy (2011)

found that the geography and resource endowments in an area determined fuel choice. They found that abundance of coal in India's states of Bihar and West Bengal led to heavy reliance on coal as a fuel choice whilst north-eastern states which are endowed with rivers and an excellent terrain relied on hydro-power.

Cultural preferences and attitudes are important issues in household fuel choice as technology is embedded in social structures (Rehman et al, 2010; Pears, 2007; Pachauri and Spreng, 2004; Karekezi and Kithyoma, 2002; Reddy, 2000; Dutta, 1997). The table presented above illustrates how customs on food taste influence fuel selection. Karekezi and Kithyoma (2002) substantiate that sometimes customs on food taste "cause households to shun improvements such as more efficient stoves". They cite that in Sierra Leone, households were reluctant to switch from firewood to efficient stoves due to perceptions that the latter alter food taste as well as the belief that such technology does not fit their culinary methods. Similarly, in Mexico, households were not in favour of LPG because they claimed it altered the taste of tortillas, the staple food which is typically prepared in wood-fired clay ovens (Masera et al, 2000). In South Africa, a commonly held perception by poorer households is that LPG is dangerous (Annecke et al, 2008). In Malawi a widespread perception is that solar energy is sub-standard and complicated to manage (Zalengera et al, 2014).

In other contexts, educational level has been found to have an impact on household fuel choice. In India, Bhide and Monroy (2011) found that a lack of education and knowledge of the advantages and adverse effects of different fuels led to an uninformed fuel selection. As the household's level of education increases, there is a shift towards efficient fuels.

2.9 Household Fuel Choice in Malawi

In Malawi, several factors affect the fuel choice at household level. Patterns of fuel use in the country to a certain extent exhibit the assertions of the 'energy ladder' model that income level plays a critical role in household fuel choice. The high poverty levels and low access to grid-connected electricity result in heavy dependence on biomass (Yaron et al, 2010). The majority of the households (98%) in the country use biomass as a primary energy source (Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014; Kaunda, 2013; GoM, 2013; Yaron et al, 2010).

There are distinct differences in fuel choice between rural and urban areas. Due to poverty and lack of access to grid-connected electricity and other alternative energy sources, rural households predominantly use biomass compared to urban areas (Kaunda 2013; Gamula, Hui and Peng, 2013; Bandyopadhyay et al, 2011; Kambewa and Chiwaula, 2010). In addition, rural households are motivated to rely on fuel wood because it is 'free' (Bandyopadhyay et al, 2011; Chidamoyo, 1997).

Rural households are therefore a 'best fit' to the postulations of the' energy ladder' model. It should however be emphasized that the growing population of the urban poor in the country seem to dispel the belief that energy poverty is a problem restricted to rural population. National data show that peri-urban households share the same fate as rural households of lack of access to grid-connected electricity hence rely on traditional energy sources (Kaunda, 2013). Their selection of these energy sources is also driven by low and sporadic incomes.

Openshaw (2010) observed that urban households use charcoal more than rural households. The 2008 census data indicate that charcoal (43.4%) is the most used biomass for cooking in urban areas, followed by fire wood (41.8%) and lastly

hydroelectricity (13.6%). The preference for charcoal by urban households is based on its convenience, higher value and non-production of smoke and soot (Openshaw, 2010; Hainess and Kammen, 2000; Chidamoyo, 1997). In contrast, rural households shun charcoal due to its high opportunity costs (Chidamoyo, 1997). With regards to electricity, its prohibitive cost is a possible influencing factor in urban households' fuel choice. In 2013, electricity tariffs were increased by 84% making it unaffordable to many urban households as indicated by an increase in high defaulter rates as well as continued increase in multiple fuel use (Zalengera et al, 2014).

For energy policy and interventions to be effective, they need to be nuanced by all these interrelated complex socio-economic factors. Given this understanding of household fuel stacking and fuel choice determinants, it is now important to turn to renewable energy as a potent solution to energy poverty.

2.10 Renewable Energy

This section examines the topic of renewable energy so as to demonstrate how it can address energy poverty, particularly among women, a central theme in this study.

The growing concerns regarding global warming are favouring a shift from fossil fuels to renewable energy technologies. As a result renewable energy now occupies centre stage in sustainable development. It is imperative that the future of energy development lie in renewable energy as doing so has environmental dividends as well as enhancing energy security (Painuly, 2001). The Earth Summit held in 1992 stressed the need to develop environmentally sustainable technologies. This is reiterated in Chapter 9 of Agenda 21, "*The need to control atmospheric emissions of greenhouse and other gases and substances will increasingly need to be based on*

efficiency in energy production, transmission and consumption and on growing reliance on environmentally sound energy systems, particularly renewable sources of energy". The urgent need to reverse the effects of climate change and at the same achieve energy security and several development goals has prompted governments to take bold actions in the development of renewable energy. As such, renewable energy is increasingly shaping policy at national level (Sokona et al, 2012). Several governments are making concerted efforts in developing and reforming legal and policy frameworks to promote investment in renewable energy. Actions taken by governments include; production quotas, tax credits and feed-in tariffs (Painuly, 2001). Such actions are hoped to stimulate innovation, although no empirical study has shown the effectiveness of such measures in stimulating growth (ibid).

Renewable energy is defined as energy which is derived from naturally inexhaustible and replenishable resources which consists of wind power, solar, hydropower, ocean power, geothermal energy, bio-fuels and biomass (IEA, 2011; UNIDO, 2009). Renewable energy sources are acclaimed to have minimal GHGs emissions. Unlike conventional energy sources which are concentrated in few countries, renewable energy resources are found in wide geographical areas, a feature important for boosting energy security. Several RETs have in recent years come into existence, including more efficient biomass, biogas, and solar power. The International Energy Agency (2006) identifies three first generation of RETs which are in maturity stage (hydropower, biomass and geothermal energy); second generation technologies, those which are undergoing rapid development (solar energy, wind power and modern forms of bio-energy) and third generation technologies; technologies currently in developmental stages (concentrating solar power, ocean power, improved geothermal and integrated bio-energy). The energy agency further note

that renewable energy is likely to displace conventional energy sources in four areas: electricity generation, transportation, water/space heating and rural (off-grid) energy services.

Currently, the penetration of renewable energy sources is increasing gradually but remains limited (Painuly, 2001). Without public support, the production costs of renewable energy have remained expensive compared to conventional energy sources (ibid). In many developing countries, particularly SSA, regulatory, grid and financing remain as key challenges in the penetration of renewable energy (Wamukonya, 2002; Painuly, 2001).

2.10.1 Renewable Energy Sources

As indicated above, RETs cover a wide range of naturally replenishable sources; solar, geothermal, wind, hydro, ocean power and bio-energy. These resources are abundant in many countries worldwide, although in varying levels. **Wind energy** is derived from moving air which using different technologies is converted into electricity or mechanical power (Kaunda, 2013; UNIDO, 2009). Wind farms are largely found on sites where winds are stronger and constant; usually these are offshore sites and areas of high altitude. **Solar energy** is the power of radiant light and heat from the sun. This power is harnessed using a wide range of evolving technologies which include solar heating, photovoltaics (PV), concentrated solar power (CSP), concentrator photovoltaics (CPV) and artificial photosynthesis (Nnadi, Odeh and Omeje, 2014; EREC and Greenpeace, 2011; Hunt, 1982). Solar technologies are characterised as either passive or active solar depending on the way they capture, convert and distribute solar energy. Passive technologies involve

orienting building structures to the sun and selecting materials with solar dispersing properties (Adkins et al, 2010; Wamukonya, 2007; Agbo and Oparaku, 2006).

On the other hand, active solar technologies include solar thermal energy and converting sunlight into electricity directly using photovoltaics (PV) or indirectly using concentrated solar power (CSP). PV technology penetration is comparatively higher than CSP in many countries around the world including in Southern Africa. The wide range of solar energy technologies can be used to support a range of solar systems: grid connected, off-grid and hybrid systems (Nnadi, Odeh and Omeje, 2014; EREC and Greenpeace, 2011). Grid connected systems are common in developed countries and involve connection to local electricity networks; the excess power generated is sold to the utility. Off-grid systems are independent of the grid and are connected to a battery which acts as the main power supply (EREC and Greenpeace, 2011; Wamukonya, 2007). A solar system can be combined with another energy system such as geothermal or wind to increase capacity and efficiency (Zalengera et al, 2014; EREC and Greenpeace, 2011). Such systems can be grid connected or independent.

As stated above, **hydropower** is one of the most matured renewable energy source, it has been used for centuries. Hydropower is generated from kinetic energy generated by flowing water (Klunne, 2013; EREC and Greenpeace, 2011; UNIDO, 2009). Flowing water even at slow rates has the capacity of producing significant levels of energy. Hydropower is generated from different forms of water energy. Large-scale hydro-electric power plants involve construction of dams or reservoirs to hold water which is fed into the turbines, which are energy conversion devices (EREC and Greenpeace, 2011; UNIDO, 2009; Sorensen, 1991). Some of the well-

known large-scale dams used to generate hydropower include the Three Gorges Dam in China, Akosombo Dam in Ghana and Carbora-bassa dam in DRC. Such projects are controversial as they are associated with displacement of communities to make way for construction of the dams as well as high possibilities of flooding (EREC and Greenpeace, 2011). Alternatively, hydropower can be generated from river currents by directly placing the turbines in the river. These are commonly referred to as run-of-the-river power stations (EREC and Greenpeace, 2011; UNIDO, 2009). Hydropower systems vary in size, which is dependent on the power output. There are large-scale, medium-scale, small, mini, micro and pico-hydropower schemes (Kaunda, 2013; EREC and Greenpeace, 2011; UNIDO, 2009). Smaller size hydropower stations are often used to generate power for rural and remote areas (Klunne, 2013; Kaunda, 2013; Kotze, 2011).

Wind energy is power derived from wind by converting the force of wind using wind turbines into electricity (UNIDO, 2009; EREC and Greenpeace, 2011). The rotational energy can be used directly into equipment such as grinding mills and water pumps or stored to produce electricity (ibid). Wind turbines can be operated in both coastal and non-coastal areas, although the former is efficient compared to that on land. Similar to solar systems, wind energy systems are divided into grid-connected, off-grid (stand-alone), hybrid and mechanical systems (Herbst and Lalk, 2014; Nnadi, Odeh and Omeje, 2014; UNIDO, 2009). Grid-connected systems are mainly used in developed countries and are connected to grid electricity supplied by a utility (Sanchez, 2006; UNIDO, 2009). In contrast, off-grid systems involve use of a wind generator connected to a storage battery. The battery in turn supplies the electricity and a controller is used to ensure that the battery does not over charge. These systems are appropriate for rural and remote areas. Mechanical systems are also

applicable to rural and remote areas. In this case, the wind turbines use wind's kinetic energy to pump water. The water supply they generate can be used for human consumption and agriculture purposes (livestock and small-scale irrigation). Hybrid systems entail combining wind energy systems with other energy systems such as solar. The major drawbacks of wind energy systems is social resistance from the public and their variable power output, the output is correlated to fluctuation in wind velocities (Kiplagat, Wang and Li, 2011; UNIDO, 2009). **Geothermal energy** is generated from the heat underneath the earth's surface (EREC and Greenpeace, 2011; Fridleifsson, 2003; UNIDO, 2009). The heat under the earth's crust is from its original formation as well as decay of minerals (UNIDO, 2009). This form of energy is site-specific; it is not all areas in the world which have geothermal reservoirs. High temperatures are required to generate electricity whilst with low temperatures, direct space heating and industrial processing is possible. In SSA, the African Rift Valley holds vast reservoirs of geothermal energy and countries situated in this belt are beginning to exploit the resource (Taulo, Gondwe and Sebitosi, 2015). Localised geothermal energy is derived from hot springs which communities sometimes use for laundry and bathing (ibid).

Ocean power is energy obtained from ocean wave and tidal kinetic energy (EREC and Greenpeace, 2011; Winkler, 2005). Tidal energy is harnessed by constructing a dam across an estuary or bay (EREC and Greenpeace, 2011). The gates built in the barrage allow the tides to build up in a basin. The gates close so as to allow the water to be channelled to turbines. In wave power, the barrages interact with incoming waves and convert this energy into electricity through hydraulic, mechanical; or pneumatic power systems (ibid). **Bio-energy** is a broad term covering energy derived from organic matter, which is a wide variety of plant and

animal material (UNIDO, 2009). The sub-groups under this category are *biomass* (plant and animal materials) and *bio-fuels* (liquid fuels from plant material) (UNIDO, u.d, EREC and Greenpeace, 2011). The widely used biomass sources are wood, agricultural crops and residues and animal waste. These sources can produce considerable amounts of energy directly or indirectly though conversion (UNIDO, 2009). Several technologies exist for the conversion and utilisation of biomass energy: thermal systems involve direct combustion of solids, liquids and gas whilst biological systems involve decomposition of solid biomass to liquid or gaseous fuels (UNIDO, 2009; EREC and Greenpeace, 2011). Bio-fuels are liquid fuels mainly used for transportation derived from converting plant material into ethanol and bio-diesel (EREC and Greenpeace, 2011). Various plants and plant derived materials are used in the production of bio-fuels including sugar-cane, soya beans, sunflower seeds and Jatropha plant. Bio-energy can be used for domestic and commercial purposes. One unique feature of bio-energy is that it can be used in different states: solid, liquid and gaseous, a characteristic not found in other RETs.

2.10.2 Global and Regional Status on Renewable Energy

As mentioned earlier, though renewable energy is making inroads, its penetration remains limited (IEA, 2015, Painuly, 2001). The increased investment in renewable energy as indicated by recent global trends published by the International Energy Agency (IEA) indicates a positive outlook. Preliminary estimates indicate that total investment in renewable capacity was around US$250 billion in 2014, the largest share going to solar photovoltaic (PV) and onshore wind. At present, G20 countries account for 80% of renewable energy growth (IEA, 2015).

RETs currently supply growing significant proportions of total world energy demand (IEA, 2015; OECD and IEA, 2015; Painuly, 2001). In 2014, 13.5% of the total power energy supply (TPES) was derived from renewable energy (IEA, 2015). In 2014, renewable electricity generation increased by an estimated 7%, representing over 22% of the overall generation (ibid.). The bulk of global renewable generation was from OECD non-member countries, with their share increasing to 55%. China continued to be the leading market accounting for approximately 23% of the overall renewable electricity generation in 2014. IEA (2015) projects electricity generation from RETs to grow by 45% between 2013 and 2020, reaching 7 310 terawatt hours (TWh).

Currently, the largest renewable energy source is solid bio-fuels, which account for 10.4% of TPES and 73.4% of global renewable energy supply whilst hydro-electricity is the second largest source, representing a share of 2.5% to world TPES and 17.8% of all renewable energy sources (IEA, 2015). Geothermal energy, liquid bio-fuels, biogas, solar, wind and tidal energy, they all each contribute a minimal share (ibid). In comparison to growth rate in world TPES since 1990, renewable energy sources' growth rate have been remarkable. Since 1990, renewable energy sources have recorded an annual growth rate of 2.2%. The growth in renewable energy has been realised mainly from solar photovoltaic and wind power which had significantly high average annual growth rates of about 47% and 25% respectively. OECD countries are championing much of the world's production of solar and wind energy. Biogases trailed behind wind power, with a growth rate of about 14% whilst solar thermal realised an increase of 12% and the growth of liquid fuels was 10% (IEA, 2015).

In 2014, there was an increase in cumulative renewable electricity. Onshore wind additions were over 45 gigawatts (GW), with China remaining a leading global market with installations totaling to about 20GW (IEA, 2015). Other notable additions were realised in USA (5GW), Germany (4.3GW), Brazil (2.7 GW) and India (2.3 GW). Similarly, capacity in solar photovoltaic (PV) grew to an estimated 40GW in 2014. Asia recorded the highest expansions, notably in China (10 GW) and Japan (9 GW). In OECD Europe, the highest growth was in Germany and United Kingdom, with each expanding capacity by approximately 2 GW.

Notable annual growth rates were also attained in geothermal energy in 2014, due to commissioning of large scale projects in Indonesia, Turkey, Kenya and USA. Hydropower additions slightly declined. Europe offshore wind additions decreased slightly due to connection delays whilst in Asia, offshore wind potential remained untapped.

SSA is home to big energy producers such as Nigeria, Angola, South Africa and new players joining these major producers include Mozambique and Tanzania (IEA, 2015). The region's capacity for renewable energy is gradually increasing, although at a slow rate (OECD and IEA, 2014). Despite, SSA being rich in renewable resources, much of this vast potential remains untapped for various reasons. The region is greatly endowed with excellent solar and hydropower across all its countries, geothermal reservoirs mainly in the East African Rift Valley and wind power, particularly in coastal areas. Though many countries are using hydropower, only a negligible proportion of the resource's potential is used. For instance, DRC exploits a mere 2% of its rich hydropower; Angola uses only 4%, Ethiopia makes use of 5%, Congo utilises 12% whilst Mozambique exploits 14% (OECD and IEA, 2014).

Other renewable energy sources remain negligibly used even though there are signs of progress, particularly in the area of solar PV.

As earlier mentioned, hydropower is the main renewable energy source with a significant share in most of SSA's energy mix. At present, hydropower accounts for one-fifth of the region's power supply although its full potential remain untapped. DRC is an example endowed with huge hydropower capacity but with high burden of energy poverty. Only a mere 9% of the country's population has access to electricity despite an enormous potential from hydropower. However, new hydropower capacity in countries such as DRC, Ethiopia, Mozambique and Guinea is contributing to a reduction in the region's average power supply costs and the share of oil-fired power.

SSA's gas production is gradually making a significant contribution to global supply. Gas production increased from an estimated 7bcm in 1990 to 58bcm in 2012 (OECD and IEA, 2014). Nigeria remains SSA's biggest gas producer and consumer, although there is a shift in focus to new discoveries in Mozambique and Tanzania (OECD and IEA, 2014). Mozambique is a significant gas exporter, exporting 3.5bcm annually by pipeline to South Africa. Major countries in SSA which produce gas for domestic use are Cameroon, Congo, Côte d'Ivoire, Nigeria, South Africa and Tanzania (IEA, 2015; OECD and IEA, 2014). Overall, 7% and 6% of the world's oil and gas resources respectively are found in SSA (OECD and IEA, 2014). In recent years, there have been discoveries of large gas reserves in Tanzania, Mozambique, offshore Rovuma Basin and Kwanza Basin in Angola.

In East Africa, geothermal energy derived from rich reservoirs in the East African Rift Valley is a second largest power supply to Kenya and Ethiopia. In Kenya,

geothermal energy contributed a share of 7% of the country's energy mix in 2012. In terms of bio-fuels, SSA produces and consumes high amount of bio-fuels compared to the world average (IEA, 2015). In 2013, the bulk (about 86%) of the world's solid bio-fuels were produced and consumed in OECD non-member countries, mainly countries in South Asia and SSA where non-commercial biomass is used for cooking and heating.

The gradual growth in renewable energy is driven by supportive policies which include production quotas, tax credits and feed-in tariffs. IEA (2015) asserts that if African countries harness their rich renewable resources, 40% of the region's power generation capacity can be derived from renewable energy in 2040. This can range from large-scale dams to mini and off-grid systems to serve remote areas. Renewable energy is a possible solution to addressing energy poverty which is deeply entrenched in SSA, considering that over 620 million people in the region lack access to electricity and about 730 million heavily rely on traditional biomass for cooking and heating.

2.10.3 Benefits of Renewable Energy

Energy is regarded as the life blood of development. The utilisation of renewable energy will address the forecasted rising energy demand in many countries and reduce environmental destruction (Painuly, 2001; Clancy, 2001). The United Nations Secretary General, Ban Ki-moon expressed that renewable energy has the potential to expedite poor countries' achievement of social and economic development goals.

For the overwhelming number of people in developing countries living in poverty, renewable energy has the prospects of enhancing health, employment opportunities and education (Celceski, 2006; 2004, Clancy, Oparaocha and Rohr, 2004; Clancy,

Skutsch and Batchelor, 2003; Khamati-Njenga and Clancy, 2002; Reddy, 2000). The penetration of biogas technology into the Ghanaian economy has brought health, agriculture, economic and environmental benefits (Arthur et al, 2011). By closing the gaps in these multidimensional aspects of poverty, RETs can be powerful tools for addressing prevailing inequalities (Reddy and Painuly, 2004).

For women, although some of the benefits are not always guaranteed, evidence shows that there are several benefits which women derive from the development and utilisation of RETs (Khamati-Njenga and Clancy, 2002; Denton, 2002; Shailaja, 2000; Clancy, 1999; Dutta, 1997). Cecelski (2000) stresses that RETs empower women as they result in labour and time saving, improved health and increased livelihood options. Gender analyses have shown that RETs have a positive impact on women's practical, productive and strategic needs (Clancy, Oparaocha and Rohr, 2004).

Even though renewable energy has the potential to play an important role in economic and social development, particularly in developing countries, several barriers exist to its penetration (Wamukonya, 2002; Painuly, 2001; Shailaja, 2000; Argawal, 1986). Sokona et al (2012) note that the co-existence of traditional and modern energy systems poses challenges to policy makers in Africa where there is a fragmented energy system which does not integrate traditional and modern energy systems. They further highlight that the traditional energy system is usually governed by informal institutions, which exist outside formal policy processes. Other barriers limiting the diffusion of renewable energy include prohibitive costs, technical and market barriers such as inconsistent pricing structures, institutional, political and

regulatory, social and environmental barriers (Jongh, Ghoorah and Makina, 2014; Wamukonya, 2002; Painuly, 2001).

2.10.4 Challenges of Renewable Energy

Though most governments in SSA recognise benefits of renewable energy to their nations, they face several barriers which hamper implementation. Most SSA countries are unable to realize the gains from renewable energy due to financial constraints. Renewable energy requires significant initial investments in infrastructure and later on maintenance. Financing mechanisms are limited due to low predictability and uncertainty of capital return on investment (Jongh, Ghoorah and Makina, 2014; Pegels, 2010; UNIDO, 2009). These prohibitive costs make renewable energy less attractive than conventional energy sources. In the absence of financial support to potential investors, it is difficult to develop medium to large scale renewable energy systems. IEA (2015) however notes that though renewable energy remains expensive in comparison to conventional energy, the gap has narrowed significantly over the last decade. It is worthy pointing out at this juncture that the large scale investments required in the deployment of renewable energy have driven several governments to be receptive of private investment. As will be discussed earlier, privatisation is likely to negatively impact poor groups of society. In Africa, the current reforms in the energy sector drive tariff charges up, excluding the poor.

Another significant barrier common to most if not all SSA countries is the shortage of trained manpower (Taulo, Gondwe and Sebitosi, 2015; Jongh, Ghoorah and Makina, 2014; Wamukonya, 2002; UNIDO, 2009). Most renewable energy technology development requires highly skilled labour force, which unfortunately is absent in the

region. Even though most countries have taken bold actions in job creation, science and technology skills remain scarce. Countries therefore have to address this skills gap or otherwise rely on foreign experts as an interim measure to fill in the gap.

Developing renewable energy technology requires huge investments in infrastructure. These investments increase the costs of providing electricity in formative years. Prospecting and permitting expenses are relatively enormous and require specialized equipment (Jongh, Ghoorah and Makina, 2014) Development of transformers and transmission lines is not only a lengthy process but an expensive undertaking. Prospective wind sites often undergo years of regular monitoring before they can be confirmed to be suitable sites. In addition, the standards and regulations for renewable energy are new, hence are still being developed. (Jongh, Ghoorah and Makina, 2014; Winkler, 2005; UNIDO, 2009).

Institutional and regulatory challenges pose a serious obstacle in the development of renewable energy resources in SSA. Legal and regulatory requirements for medium to large scale electricity generation are often cross-cutting among government agencies. The challenge which results from the involvement of several government agencies is that the process is lengthy. This is compounded by the fact that regulatory requirements of different government agencies are often fragmented and uncoordinated (Fakir and Nicol, 2008). At times, there is duplication of efforts making the process cumbersome and frustrating.

Social barriers cannot be underestimated as one of key barriers to development of renewable energy. Renewable energy projects often require resources which are highly competitive such as land, water (private or communal). Hydropower requires creating barrages which reduce water flow for other uses whilst at the same time

there are possibilities of flooding which in turn displaces communities. This has been the case in India, where mega-dams led to depleted water flow for communities. In some parts of the world, residents have rejected wind farms due to their visual impacts. IEA (2014) notes that the Massachusetts Cape Wind project was delayed as residents blocked construction of the project. In contrast, residents living around the Ardrossan Wind Farm in Scotland believed the farm had improved their area.

In most agrarian communities, land is considered an inheritance, resulting in reluctance by many people to give it up (Amigun et al, 2011). Environmental concerns are likely to be raised by some social groups. It is also quite common to have divergent attitudes concerning renewable energy projects at national and lower levels. Although no scientific evidence to support this view, women have generally been found to be supportive of renewable energy compared to men (Clancy, 2001). Successful implementation of renewable energy projects therefore lies in careful consideration, public consultation and awareness and working closely with affected communities. This is reiterated in a UK government report which underlined that "projects are generally more likely to succeed if they have broad public support and consent of local communities" (Department of Energy and Climate Change, 2011:35). Moreover, in Germany and Denmark renewable energy projects are owned by communities through cooperative structures and contribute a significant share to overall renewable energy consumption (Morris and Pehnt, 2012).

Concerns of limited opportunities to export the large volumes of produced electricity have also surfaced (Jongh, Ghoorah and Makina, 2014). After heavy investment in renewable energy, the expectation is a sizable market to sell to so as to realise capital return on investment. This is unlikely as some of the domestic markets are

small whilst the region is characterised by low levels of integration and interconnectedness.

Other challenges which do not necessarily cut across the region include natural barriers, some of the required resources (water, biomass) are depleting due to climate change and other demographic factors.

2.10.5 Renewable Energy in Malawi

Malawi is endowed with abundant resources for renewable energy (Taulo, Gondwe and Sebitosi, 2015; Gamula, Hui and Peng, 2013). Huge opportunities lie in biomass, solar energy, hydropower, wind and geothermal energy. Currently, the level of exploitation of renewable energy is very low and mainly restricted to pilot projects except for hydropower which is the main source of the country's electricity (Taulo, Gondwe and Sebitosi, 2015). The low levels of exploitation are attributed to several factors which will be discussed later under this section.

Full utilisation of renewable energy has a great potential of transforming lives in many different facets. Given the high levels of energy poverty in Malawi, renewable energy would benefit a huge number of households particularly rural households which face severe energy challenges. Lack of reliable energy power is crippling Malawi's economy and is a constraint to human development, thus RETs can bring relief in this regard. As asserted by Ban Ki Moon, the UN Secretary General at the launch of SE4All initiative in 2011, energy is the "golden thread" needed by Malawi to realise gains in every sector; education, health, business, infrastructure development, tourism. With only 1% of the rural population accessing grid connected electricity, renewable energy would enable this population to access modern energy. RETs can play an important role in both cooking and lighting applications.

Renewable sources can increase the quality and quantity of lighting services which is a vital service in education (Mills, 2005).

Current programmes

Several programmes and projects on renewable energy have been implemented and some are still being implemented with varying degrees of success (Gamula, Hui and Peng, 2013).

Solar Energy

Malawi has an enormous potential to develop solar energy as it has remarkable radiation much of the year (GoM, 2015; Taulo, Gondwe and Sebitosi, 2015; Gamula, Hui and Peng, 2013). Solar energy presents great potential to fill the gap in energy needs of the country. Solar radiation is estimated to be 2138 - 3087 hours and 2133kWh/m²/year (Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014). Considering that solar energy collectors are installed on an inclined surface, the solar radiation may be higher by about 2% compared to a horizontal surface (Zalengera et al, 2014). The global solar emission on a horizontal surface is approximately between 4.3kWh/m²/day minimum and 7kWh/m²/day maximum. The average annual daily average solar radiation is an estimated 5.86kWh/m²/day which is equivalent to 250 million tonnes of oil. Maximum radiation of 6.5 –7.0 kWh/m²/day is received in September and October whilst the minimum radiation of 4.3 – 4.6 kWh/m²/day is received in January and February as well as June and July depending on location. Peak hourly solar radiation exceeds 1000kWh/m² during November to December (Taulo, Gondwe and Sebitosi, 2015). The total available solar energy potential over the total geographical area (94,280 km²), of Malawi is calculated to be 356,284,837MWh/year. Considering that most parts of the country receive solar

radiation of between 8-12 hours per day, Malawi has an enormous potential to develop solar power and the solar energy produced is adequate to produce electricity through solar thermal systems or by photovoltaic systems (Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014; Gamula, Hui and Peng, 2013; Kaunda, 2013).

Optimal utilisation of solar energy has potential of drastically reducing the demand for electricity on the grid power system. Solar thermal applications can be used for water heating and cooking which claim a considerable proportion of the country's electricity (Zalengera et al, 2014). This can enable efficient supply of electricity to industries and households.

Status of Energy Generation from Solar

Currently, solar power is being used for various applications although there is need for up-scaling and broadening these applications. Solar water heaters are being used in health care centres, mission centres and a minimal number of households (Zalengera et al, 2014). Solar water heaters for domestic use are being manufactured locally and it is estimated that a total amount of installed solar water heaters is 4 855 sqm² (Taulo, Gondwe and Sebitosi, 2015). Hybrid systems (solar-wind) have been installed on six sites in the country: Chiradzulu, Mzimba, Nkhotakota, Thyolo, Nkhata Bay and Ntcheu (locally known as solar villages) (Taulo, Gondwe and Sebitosi, 2015; GoM, 2015; Zalengera et al, 2014; Kaunda, 2013).

Each of the hybrid systems provides power to about 150 households. The Barrier Removal to Renewable Energy Project in Malawi (BaRREM) launched in 2002 has aided installation of stand-alone PV systems in rural areas targeting health facilities, schools and households. PV systems are increasingly being utilised in

telecommunications repeater stations, water pumping, refrigeration and lighting (Taulo, Gondwe and Sebitosi, 2015; Gamula, Hui and Peng, 2013). Civil society organisations have been playing an active role in this regard. World Vision, a non-governmental organisation (NGO) uses PV systems to pump water which it then supplies to rural communities (Zalengera et al, 2014). A major achievement is the installation of the 870kW grid-connected PV systems at Lilongwe International Airport in 2013 (Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014). If expanded and up-scaled, PV systems can feed into the grid, thus improving energy security and reducing heavy dependence on hydro power.

Wind Energy

Worldwide, wind energy use is gaining momentum. Wind energy systems convert the power of moving air into electricity or mechanical power (Kaunda, 2013). Although there is a paucity of data in the area of wind energy in Malawi, recent studies indicate that there is potential for the country to generate electricity from wind energy (Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014). National data indicate that overall, the country receives moderate to low wind speeds ranging between 2.0 – 7.0 m/s (Taulo, Gondwe and Sebitosi, 2015; Gamula, Hui and Peng, 2013). Zalengera et al (2014) add that wind speeds averaging 2m/s have been recorded for significant periods in five of the meteorological stations, with wind velocity of above 3m/s being recorded between July and October. Coincidentally, wind speeds peak during periods when the water table and river levels are low; hence wind energy can be used for water pumping to supply households and agricultural irrigation (ibid.). In addition, the same periods are characterised by high atmospheric temperatures making wind energy an opportune energy source for space cooling. The country average wind speeds are feasible to generate electricity

at a small-scale and for mechanical water pumping for areas at a height of more than 10m above the ground as such areas have improved terrain irregularities.

Status of Energy Generation from Wind

At present, wind energy has been restricted to small scale water supply for livestock and agricultural irrigation (Taulo, Gondwe and Sebitosi, 2015). A notable initiative in the area of wind energy is the identification of two sites for potential wind farms in Mzimba and Rumphi districts under the Malawi Renewable Energy Acceleration Programme (MREAP) (Zalengera et al, 2014). As mentioned earlier, wind turbines have been installed as part of the hybrid systems (solar-wind) geared towards rural electrification. Through funding from the Scottish government, the Department of Energy Affairs (DoEA) is collaborating with MREAP in conducting comprehensive wind measurements at five strategic sites as part of a project of compiling the country's wind atlas.

Further analyses and studies into the applicability of wind energy are needed to determine achievable capacity and viability of large and/or small scale wind energy systems.

Geothermal Energy

Several countries worldwide have successfully generated electricity from geothermal reserves. Reservoirs of geothermal energy have been identified in Malawi largely due to its location along the African Great Valley which is endowed with abundant geothermal reserves (Taulo, Gondwe and Sebitosi, 2015; Gamula, Hui and Peng, 2013). Approximately 50 geothermal spots have been identified in Malawi, with nearly 20 having an average surface temperature of beyond 50°C (Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014). Investigation conducted on three of the

spots (Chiweta, Mwankeja and Nkhotakota) showed that the spots have a combined geothermal potential of 200MW (Gondwe et al, 2012). With surface water temperatures of beyond 50°C, the geothermal reserves can be used to extract heat for industrial purposes and/or space temperature regulation (Zalengera et al, 2014).

Status of Energy Generation from Geothermal Energy

In spite of the strategic location of Malawi on the East African Rift Valley which endows it with geothermal reserves, this form of renewable energy has not been comprehensively explored and fully tapped into. Some of the hot springs are used by local communities to provide hot water for domestic use (bathing and laundry) (Zalengera et al, 2014). Previously, a number of studies aimed at designing a prototype geothermal power plant have been carried out. One of these ongoing projects is the 30MW plant in Nkhotakota which is still at exploration stage and depending on exploration results may be upgraded to 100MW (Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014).

Hydropower

Hydro power is the most exploited renewable energy resource in Malawi (Zalengera et al, 2014). Feasibility studies conducted on the country's various rivers indicate that the country has enormous potential of generating hydroelectricity. The country is estimated to have a gross theoretical potential of 1 670MW and an average power generation of 15 000GWh/year (Taulo, Gondwe and Sebitosi, 2015). Forty percent (40%) of the untapped hydro power potential lies on the Shire River (Zalengera et al, 2014). Several potential unexploited small hydro power sites are also found across the country, with each site having an estimated capacity of 10MW. The table below shows the potential hydropower sites across the country. At present, the country's

hydro power is about 17% of what the nation can generate (Taulo, Gondwe and Sebitosi, 2015). The micro-hydro power sites have the potential of generating off-grid or independent mini-grid electrification; however their development is restricted by projected costs.

Table 2.4: Potential hydropower sites in Malawi

Name of River	Site	Planned Year of Site Development	Electricity Generation Potential (GW)
Songwe	Mavolo	2020	0.16
South Rukuru	Lower and high Fufu	2020	0.42
Dwambazi	Chimgonda	2040	0.05
Bua	Chizuma, Chasombo, Malenga, Mbongozi	2040	0.21
Shire	Kholombidzo	2025	0.28
Shire	Mpatamanga	2035	0.3
Ruo	Zoa	2050	0.05
Other		-	0.008
TOTAL			**1.478**

Source: Zalengera et al, 2014

Status of Energy Generation from Hydro Power

Hydropower generates 94% of Malawi's electricity to which only 8% of the country's population benefits from grid-connected electricity (GoM, 2015; Taulo, Gondwe and Sebitosi, 2015; Zalengera et al, 2014; Gamula, Hui and Peng, 2013; Kaunda, 2013). The national grid largely benefits urban and peri-urban households than rural households. Bulk of the country's electricity (98%) is generated from four hydro facilities located on the Shire River (Zalengera et al, 2014; Kaunda, 2013). In

comparison to its neighbours (Mozambique, Tanzania and Zambia), Malawi has an undersized electricity supply system (Gamula, Hui and Peng, 2013).

As of March 2015, the total installed capacity for electricity generation was 430MW to which the bulk (80%) was generated by the public utility, ESCOM (Taulo, Gondwe and Sebitosi, 2015). Approximately 19.6% of the electricity is generated by the private sector (ibid). The capacity of privately owned generators is however difficult to determine, even though a study conducted in 2001 estimated the capacity to be about 51.3MW (Gamula, Hui and Peng, 2013). At present, the total capacity of grid connected hydropower systems stands at 351.8 MW whilst that of small hydropower systems is 4.5MW (GoM, 2015; Taulo, Gondwe and Sebitosi, 2015).

The current system average peak load is approximately 300MW, whilst the available capacity is 255MW representing a shortfall of 14% (Taulo, Gondwe and Sebitosi, 2015). The deficit is one reason for the constant power outages experienced in the country. Electricity outages are reported to cost the country about USD 16 million annually (Gamula, Hui and Peng, 2013). Contributing to unreliable power supply is under investment in transmission and distribution infrastructure of ESCOM (ibid). Some of the infrastructure used is susceptible to outages, hence during peak periods, load shedding has to be done to avoid dangerous overload. Most of the low voltage distribution networks are operating beyond limit and regulatory requirements. Transformers are over saturated resulting in technical losses and excessive voltage drops. Private sector investment in the electricity market is difficult due to government subsidy directed to ESCOM, giving it a competitive advantage over other players (Gamula, Hui and Peng, 2013).

Future plans to boost electricity generation consist of expansion of conventional hydro power systems, construction of thermal power stations as well as a nuclear plant (Taulo, Gondwe and Sebitosi, 2015). This will result in an increase in total generation capacity from 430MW in the base year to approximately 2 764MW (GoM, 2010). In addition, hydro power capacity is projected to increase to an estimated 1 985 MW in 2050. Hydro power will continue to be the main electricity source in the short and medium term. In addition to local resources, there are prospects for Malawi to be connected to the Southern African Power Pool (Gamula, Hui and Peng, 2013).

Biomass

According to Zalengera et al (2014), Malawi produces an estimated 7 million tonnes of crop residues and animal waste annually. Large surpluses of biomass exist in the northern parts of the country; however these are not economically and physically accessible to the majority of the population in the central and southern regions who are in most need of the biomass (Kambewa and Chiwaula, 2010).

Status of Energy Generation from Biomass

As discussed in earlier chapters, biomass is the primary energy source in Malawi. The main contributors of woody biomass in Malawi comprise of forest reserves, agricultural residues, animal dung and energy crops (Taulo, Gondwe and Sebitosi, 2015; Gamula, Hui and Peng, 2013; GoM, 2010; Kambewa and Chiwaula, 2010). Waste is primarily derived from municipal and manufacturing waste.

2.11 Malawi Energy Policy

Malawi like many other countries in SSA is experiencing energy security crisis. The prevailing adverse impacts stemming from the energy crisis has obliged the government to act pro-actively and put instruments in place that will assist in

countering the challenge. The government has demonstrated commitment to developing and transforming the energy sector in order to grow its economy, reduce energy poverty and fulfil its international commitments. In line with this commitment, the government has developed a number of national and sectoral development frameworks including power sector reform, biomass energy, rural electrification and renewable energy.

Malawi is a signatory of various international protocols in the different areas of environmental management, social and human development. Notably, Malawi is a signatory of the Kyoto Protocol which birthed the UNFCCC. The overarching development framework of Malawi is the Vision 2020 which spells out the country's long-term aspirations for sustainable economic growth and development. The fundamentals of sustainable development and healthy ecosystems are entrenched in the Vision. The national development strategy acknowledges the importance "of monitoring greenhouse gasses (GHGs), adoption of ozone friendly technologies" (Nangoma, 2007: 3). The national development framework has been translated into medium term development strategies which commenced with the Malawi Poverty Reduction Strategy which lapsed in 2005 and was replaced with Malawi Growth and Development Strategy (MGDS) (Kaunda, 2013). The first MGDS was implemented from 2005/2006 to 2010/2016. The current strategic plan, MGDS II was launched in 2011 and is expected to lapse in 2016. The MGDS is the overarching policy document that guides government's efforts as well as that of development partners to achieve Vision 2020 and international goals. The strategic plans emphasize the need to achieve energy security and recognise the central role of energy in attaining the country's developmental goals. Elements of energy security underscored in the strategic plans include sustainable energy generation and supply, irrigation and

water development, natural resources and environmental management and integrated rural development (Gamula, Hui and Peng, 2013; Kaunda, 2013).

Energy Policy, Programmes and Projects

A notable development in the energy sector can be traced back to 2003 when the government approved the National Power Sector Reform Strategy as part of reforming the energy sector (Kaunda, 2013).This strategy led to the development of the Malawi Energy Policy (GoM, 2010). The policy authorised participation of the private sector in energy generation, transmission and supply. The Energy Policy was instrumental in the liberalisation of the energy market. In its provisions, the policy gives leeway to the private sector to invest in the energy sector either as a sole entity or in partnership with the government. It is imperative to note that though policy frameworks have enabled participation of the private sector in the energy sector, Malawi's liberalised energy sector is still in its formative stages (Kaunda, 2013). Some have argued that private sector investment in the energy market is challenging due to government subsidy directed to the public utility, ESCOM, which consequently gives it a competitive advantage over other players (Gamula, Hui and Peng, 2013). One of the core objectives of the Malawi Energy Policy is to transform the country's energy economy, from over reliance on biomass to a shift towards modern energy (GoM, 2015; Gamula, Hui and Peng, 2013; Kaunda, 2013). It is in this regard that the government considers the private sector to be an essential stakeholder.

The Energy Policy paved way to several legislation and regulations that further cemented participation of the private sector in the energy sector. The energy laws and regulations which govern the energy sector are presented below.

Malawi Energy Laws and Regulations

- The Energy Regulation Act 2004
- The Electricity Act 2004
- The Rural Electrification Act 2004
- The Liquid Fuels and Gas (Production and Supply) Act 2004
- The Energy Regulation By-Laws, 2008
- The Rural Electrification Regulations, 2008
- The Liquid Fuels and Gas (Production and Supply) Regulations, 2008

The National Energy Policy and the Energy Regulatory Act of 2004 resulted in the formulation of the corporate body, **Malawi Energy Regulatory Authority (MERA)** which has the mandate for sector wide regulation (GoM, 2015; Kaunda, 2013). MERA has an oversight role in generation, transmission and retail of electricity. This involves regulation of tariffs and prices for energy sales and services; enabling the shift towards modern energy as well as increase access to such sources; promoting development and utilisation of renewable energy including certification of RETs and facilitating energy efficiency and saving (ibid.). MERA's challenges in fulfilling its mandate are mobilising resources to implement policy provisions and ensuring that regulations are enforced impartially and professionally so as to create an enabling environment which encourages the growth of the liberalised energy sector which is still immature. In addition, the government acknowledges that some of the body's operations are not yet in full swing which may further compromise growth of the liberalised energy sector (GoM, 2015).

Given the background that bulk of Malawi's energy is derived from biomass, it was necessary for the government to formulate instruments which govern this sub-sector. As such, the energy policy extends to other departments and not only the Department of Energy Affairs (DoEA). In regulating the biomass energy sub-sector, departments in the Ministry of Natural Resources, Energy and Environment (MNREE) and Ministry of Forestry, Fisheries and Environmental Affairs (MOFFEA) play a crucial role. In attempts to transform the country from heavy reliance on biomass, the government instituted several legal and policy frameworks as well as a number of initiatives (GoM, 2015; Kaunda, 2013). In 2009, the government approved the **Malawi Biomass Energy Strategy (BEST)** which aimed at sustainable biomass use, improve end-user efficiencies and promote use of non-biomass options (Kaunda, 2013). Implementation plans for the strategy were formulated at both national and district levels. The main challenge to realisation of this strategy is human and financial constraints.

The Programme for Biomass Energy Conservation (ProBEC) was established in order to promote use of biomass energy efficient technologies such as clay stoves (GoM, 2015; Gamula, Hui and Peng, 2013; Kaunda, 2013). Under this programme, the government has collaborated with several development partners in rolling out various initiatives aimed at increasing use of biomass energy efficient technologies. The programme has been instrumental in promoting the use of efficient technology in curing tobacco. **The Promotion of Alternative Energy Sources (PAESP)** which was introduced in 2006 had the aim of promoting use of other alternatives such as solar, briquettes, biogas and gel fuel in order to reduce environmental degradation caused by unsustainable harvesting of forests (ibid). A study by DoEA into the inhibiting factors for the uptake of renewable energy in the country led to the birthing

of **The National Sustainable and Renewable Energy Programme (NSREP)** in 1999. For the purpose of this study, it is worth noting some of the identified obstacles to extensive utilisation of renewable energy in the country. Identified hindering factors included a limited number of participating organisations in the sector, human resources constraints, paucity of data on RETs, absence of regulatory frameworks and lack of financing mechanisms and incentives to acquire RETs (Gamula, Hui and Peng, 2013). NSREP had therefore a mission to promote the development, use and marketing of RETs in the country (GoM, 2015; Gamula, Hui and Peng, 2013; Kaunda, 2013). Specific objectives of the NSREP were:

- to increase the access to energy sources by the majority of the population in order to raise the level of productivity;
- to raise the living standards of the poor segment of the population;
- to empower women as key players in the society by recognising their special relationship to energy, particularly at the household level;
- to promote and develop sustainable and RETs, which will enhance socio-economic development;
- to enhance institutional and household capacity to access and manage renewable energy in sustainable ways (Gamula, Hui and Peng, 2013).

The Programme brought together all renewable energy projects implemented by the government and development partners. BARREM which evolved out of NSREP and funded under the UNDP-GEP project aimed at addressing the identified obstacles to uptake and extensive utilisation of renewable energy (Gamula, Hui and Peng, 2013; Kaunda, 2013). BARREM mainly focused on solar PV systems (ibid). At a global level, the Project had the objective of reducing GHGs through promotion of solar PV systems whilst at the national level it partly aimed to eliminate market barriers which

hindered the increase in solar energy service delivery. In this regard, the Project assisted in the development of favourable regulatory frameworks for solar PV technologies and demonstrating the viability of investments in solar PV technologies. BARREM resulted in the emergence of an association for renewable energy companies; the Renewable Energy Industry Association (Kaunda, 2013). In addition, Mzuzu University actively participated in the Project and continues to do so through training and testing of RETs at its centre for Testing and Training of Renewable Energy Technologies (TCRET). The centre collaborates with Malawi Bureau of Standards and DoEA in ensuring the certification of RETs, their installation and maintenance. The University runs short term trainings on RETs and has an academic programme, BSc in Renewable Energy Technologies. Emergence of renewable energy industries was an indicator of increasing awareness of renewable energy in the country. Thus, despite some challenges, the Project managed to achieve most of its objectives. It has however been noted that the Project was unable to develop viable financing mechanisms for RETs which was one of its set objectives (Gamula, Hui and Peng, 2013).

Even though solar PV systems are increasingly penetrating the market, challenges still exist and installations are predominantly in institutions (rural health centres, schools and police units). Institutional solar PV installations are commonly affected by non-maintenance whilst use of solar PV systems in income generation is negligible to non-existent due to lack of solar PV systems to provide for thermal and mechanical energy services (Kaunda, 2013). This unfavourable state of affairs is partly due to the perception that solar energy is sub-standard and is complex to manage. To counter this challenge, public awareness has to be on-going and efforts have to be made to scale up other renewable energy sources.

The Malawi Rural Electrification Project (MAREP) was established to provide modern energy to rural communities so as to stimulate economic activities. It was envisaged that provision of modern energy to rural trading centres (rural growth centres) was vital to boosting economic activities in rural areas (Gamula, Hui and Peng, 2013; Kaunda, 2013). In addition, through the Project, households and institutions would access modern energy. Although the initiative was an additional effort to transform the country from use of traditional energy sources to modern energy sources, it has been argued that a household's decision to switch to an alternative energy source is determined by the energy costs and costs associated with purchase and maintenance of the devices (Kaunda, 2013) than environmental costs. Most rural households including those operating businesses at the rural trade centres have low incomes hence may not be able to afford the modern energy even if they aspire to use it given its benefits. Moreover, given that fuel wood is 'free' of charge or cheap, the prospects of shifting to modern energy for cooking and other thermal services are low.

The country has developed the **National Adaptation Programme of Action (NAPA)** to counter climate change and guide actions in sustainable development and environmental management (Oxfam, 2009; Nangoma, 2007). One of NAPA's priority activities is restoring forests. The activities are funded through the UNFCC's Least Developed Country Fund.

Liberalisation of Malawi's Energy Industry

Like many countries in the SSA region, Malawi's energy sector is undergoing reform which intends to liberalise the industry and allow more effective private sector participation. The country's power sector has been in previous years characterised

by monopoly by the vertically integrated power utility. As earlier mentioned, the approval of the National Energy Policy heralded the liberalisation of Malawi's energy sector. The country is currently undertaking major reforms, which aim at encouraging competition in the sector through participation of many players, commercialising the state utility and establishing (semi) independent regulatory agencies (Taulo, Gondwe and Sebitosis, 2015; Gamula, Hui and Peng, 2013). The provisions of the National Energy Policy give leeway for the private sector to invest in the energy sector either as a sole entity or in partnership with the government. Though the policy has enabled participation of the private sector, at present, ESCOM still receives heavy government subsidy which is viewed as giving it an unfair advantage and making it difficult for other players to gain a share in the sector (Gamula, Hui and Peng, 2013).

The private sector was viewed as a crucial stakeholder in government's efforts to transform the country from over reliance on biomass to a shift towards modern energy (Gamula, Hui and Peng, 2013; Kaunda, 2013; GoM, 2015). In addition, the private sector is reckoned to assist in closing the energy deficiency gap created by population increase and economic growth. The country's population is projected to grow to about 19.696 million by 2030, with an average annual growth rate of 2.8% (Taulo, Gondwe and Sebitosi, 2015). Private sector participation is perceived as inevitable as the forecasted economic growth of 6% per annum until 2030 would require considerable energy infrastructure investments (Taulo, Gondwe and Sebitosi, 2015; GoM, 2010). The required total investment in energy infrastructure from 2011 and 2030 is reported to be a staggering amount of US$2.1million (ibid). This is an enormous amount considering that the government's annual budget for total expenditures is below US$10 million (ibid).

Moreover, ESCOM currently faces challenges of revenue inadequacy, vandalism and poor service quality which all necessitate private investment. It is estimated that 50% of the current power plants are beyond their life spans resulting in huge distribution losses and need for frequent systems maintenance to improve efficiency (Taulo, Gondwe and Sebitosi, 2015). The need for heavy capital injection in the formative years of RETs is another motivating factor to turn to the private sector.

The National Energy Policy paved way to several legislation and regulations that further cemented participation of the private sector in the energy sector. BARREM with the assistance of development partners assisted in the development of favourable regulatory frameworks for renewable energy, particularly of solar PV technologies. An enabling environment is crucial in attracting entry of the private sector. Several development partners (JAPAN (JICA), GIZ, UNDP, DANIDA, GEF, Scottish government) are working with the government in the development and utilisation of renewable energy. The efforts of the development partners are augmented by several international and local organisations in this field. Increased participation has the effect of lobbying the government to create a conducive environment for participation.

The pros and cons of market liberalisation in public utilities have been much debated in recent years. Proponents of market liberalisation argue that it increases economic efficiency; however studies in recent years have put the efficiency gain under question.

CHAPTER THREE: STUDY METHODOLOGY

Existing literature on the proposed research area was reviewed with the aim of locating and positioning the study. This section focuses on the methodology used in the study. The chapter provides details of the research design, data collection methods, study site, study population, sampling, data analysis and ethical standards.

3.1 The Qualitative Design

This study was underpinned by fundamentals found in both the phenomenological and social constructionist paradigms. Both these paradigms acknowledge that meanings attached to everyday experiences are highly subjective, social constructs and are mediated in the course of human interaction. Consequently, these two complementary paradigms proved quite influential in situating this study within the interpretive and qualitative research design. Lincoln and Guba (2000:3) point out that qualitative research involve an *interpretive and naturalistic a*pproach. Using this view, the qualitative research design enabled the researcher to collect pertinent data in participants' natural settings and make sense of intra-household dynamics which influence energy use in the way participants understood and experienced them. The researcher concurs with Ulmer and Wilson (2003:523) that qualitative research captures "abstract concepts; emotions, culture, social organisation, social relationships……" which are life experiences and social processes difficult to quantify.

The qualitative research design awarded the researcher flexibility to follow unexpected ideas during the study as well as to be sensitive to contextual factors which influence participants' behaviour, perceptions, practices and knowledge. In addition, such a design allowed the researcher to thoroughly investigate symbolic

dimensions and social meanings attached to issues under discussion (Conger, 1998; Alvesson, 1996; Bryman et al, 1988). The social, economic, cultural and political complexities embedded in intra-household dynamics can only be best understood qualitative methodologies. These intricacies are not best dissected and understood using quantitative methods. It is these inherent attributes of the qualitative methodology which made it best suited to amass rich insights, social meanings and context-specific descriptions of intra-household dynamics.

3.1.1 Participant Observation

Participant observation was used together with narrative in-depth interviews. As identified by Everend and Louis (1981), participant observation allowed the researcher “inquiry from the inside”. Using this form of inquiry allowed the researcher a degree of immersion in terms of experiential involvement, direct contact with participants and physical involvement in the setting. Participant observation was not only used as a data collection technique but to create lasting and trusting relationship with participants so they could be free to express themselves and share personal experiences they do not normally discuss. The researcher using her attending and observational skills was able to capture life experiences and social processes significant to issues under inquiry. The “inquiry from the inside” approach provided the researcher with a holistic picture from historically unique situations to idiosyncrasies with significant meaning. Borrowing from Shank’s metaphor, participant observation gave the researcher a privileged way of ‘seeing’ in the study. The method was the ‘lantern’ which helped “shed light in dark corners” as referred to by Shank (2002: 11).

Participant method was a preferred method because gender relations are about social relations, they are captured in what people do, an aspect which cannot be captured using quantitative methods or interviews. One understands gender relations better when they observe relationships of household members, the gendered division of labour. Observing participants in their 'natural setting' and engaging in household activities gave the researcher an appreciation of household resource allocation and use. The method helped uncover issues and activities which are normally covert and cannot be uncovered by quantitative methods or interviews.

The duration of the study was six weeks. The researcher spent at least two (2) weeks with each selected family. This was deemed a reasonable period to have created rapport with families as well as collect substantial data. To ensure that the researcher did not exert extra burden on the families she lived with, the researcher contributed in-kind towards meeting household needs.

3.1.2 In-depth Narrative Interviews

In-depth narrative interviews were used to complement participant observation. This method offers an intersection of historical, biographical and social contexts. A preference of this method was based on Young's (2007) observation that narratives of first-person experience are valued for their power to counter and debunk totalising collective historical narratives which often subordinate and homogenise individual experiences and perspectives. In a personal narration, the participant identified herself with a particular personal, social, cultural and political identity. Everything narrated by a participant functioned to express, confirm and validate that claimed identity. Similarly, Elliot (2005) contends that the narrative method is especially useful when exploring issues of social identity and social change. In this regard, the

method was the ‘best fit’ to this study which explored gender relations, a facet of social identity. In its interpretive inclination, the narrative approach allowed the researcher to pay attention to what was not spoken. Narratives provided a holistic understanding of the participants’ personal experiences and opinions, thus offering deep, rich, subjective stories. The preference of the method was also underpinned on its ability to allow participants to bring their stories to life. It is on this premise that Connelly and Clandinin (1990:25) comment that, “humans are story-telling organisms who individually and collectively lead storied lives”. Through story-telling, the participants reflected on their personal experiences of energy use and household decision making, constructed meanings around them and presented their comprehension to the researcher.

The interviews were unstructured and consisted of open-ended items in order to document and understand participants’ realities. To accommodate Palmary’s (2005) cautionary note that due to their openness unstructured interviews if not well managed the interview can seem ‘disingenuous’, the researcher took a facilitative role, to tactfully steer back participant from totally irrelevant digressions. Adoption of an unstructured interview format allowed the researcher to follow unexpected ideas which arose during the interview. As stated by Dawson (2002), the in-depth narrative interviews enabled the participant to talk freely what she deemed important, with little directional influence from the researcher. In this way a participant had the liberty to string her story in her own style.

Interview questions were developed around research questions. However, the researcher was flexible in posing questions as in this type of interview the participant takes an active role. Flexibility was essential in the interviews as it permitted the

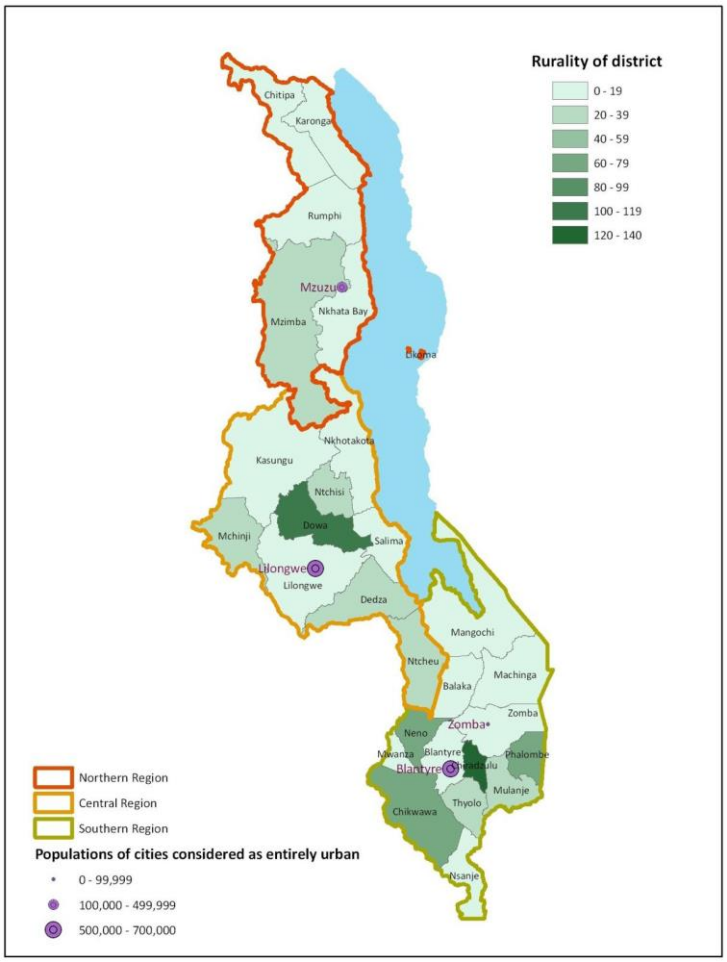
researcher to accommodate other important information which arose. Interviews were conducted at scheduled times which were drawn in consultation with participants. Attempts were made to schedule appointments around participants' daily activities, so as not to disrupt their daily routines. The interviews were conducted in a setting of participant's choice which met confidentiality and privacy requirements.

In-depth interviews were also conducted with keys informants from government agencies; and civil society organisations (CSOs). Key informants' identification was based on their personal and professional expertise and experience in the subjects under enquiry. Due to unavailability of government officials, the researcher was not able to reach the desired target number of interviews. Government agencies were targeted for the purposes of providing information on relevant legal and policy frameworks as well as national programmes and projects. Civil society organizations (CSOs) were selected so as to provide essential information on grassroots interventions and advocacy efforts.

Interviews were recorded to ensure accuracy and a permanent record of reference which was used in the analysis stage.

3.2 Research population and site

This study was conducted in the southern region of Malawi. The Southern region is considered the poorest of the three regions and though home to mainly the Chichewa speaking people, it is home to a mixture of ethnic groups. In addition, the region has a high population density and severe challenges of deforestation.



A total of three sites were conveniently sampled for the study. Two of the study sites (Kachere and Nkolokosa) are in Blantyre whilst one site, Mwandama village, is situated in Zomba district. Kachere is an informal settlement whilst Nkolokosa is a formal high density suburb.

3.2.1 Target Population

The target population of the study was women beneficiaries of Self-Help Development International, an Irish non-governmental organisation (NGO) working in the field of food security and women economic empowerment. The women also had to be living within selected sites (Mwandama, Kachere and Nkolokosa) and their households using the selected RETs. The study population also consisted of all (a)

government agencies and (c) civil society organisations (CSOs) working in the field of gender as well as energy, particularly RETs.

3.3 Sampling

Considering that this study was qualitative in nature, with specific parameters for participants' selection, the study employed non-probability sampling, specifically purposive and convenience sampling techniques. Dawson (2002) asserts that non-probability sampling is usually suitable in descriptive studies rather than studies which seek to generalise findings to a larger population. Purposive sampling entails selection of participants in a non-random manner and based on set criteria or parameters. This sampling technique allows the researcher to engage with participants who have the required or expected knowledge, competencies and experience in the area under inquiry (Teddlie and Yu, 2007). This improves the quality of data collected. The study used purposive sampling to target women whose households were using at least one of the selected RETs. The participants had to be beneficiaries of Self Help Development International, the NGO that the researcher had worked with in previous years.

Initial contacts with the participants were fostered through the NGO. Convenience sampling was used by the organisation in pre-selection of the participants. This involved the project staff informing the beneficiaries of the study and seeking volunteers who wanted to participate in the study. Through this process potential participants were identified. The participants either volunteered to take part in the in-depth narrative interviews or being a household under observation. The outcome was separate lists of potential volunteers for in-depth narrative interviews and households to be under observation. After establishing possible families to be under

observation (the one which would live with the researcher during her fieldwork), purposive sampling was then used to select families which met the set parameters. This process was conducted by the researcher and project staff. It involved having informal private meetings with volunteers to assess if they met the set parameters and their willingness to participant in the study. It was at this stage that the ethical consideration of voluntary participation and informed consent were enforced.

3.3.2 Sample Size

The study included three families which formed the primary target group, each located in the three study sites. The family in Mwandama village used biomass, whilst the one in Kachere informal settlement used solar energy (PV system) and lastly the family in Nkolokosa used hydroelectricity. In addition to families under observation, 6 women living in the same area as each family under observation and using the same renewable energy source were interviewed. The total number of women who participated in the in-depth narrative interviews was therefore 18. These participants were also beneficiaries of Self-Help Development International in one way or another and had gone through the selection process. The 18 women formed the secondary target group of the study as they were targeted to further enrich the study. A small sample size was appropriate for this study as the findings were not intended for generalisations but to gain rich insights.

By virtue of living in the same household and investigating intra-household dynamics, all household members of families under observation were sampled into the study. This was based on the premise that gender relations at household level are best understood by understanding the gendered division of labour among household members, their relationships and interactions.

3.8 Data Analysis

The recorded interviews were transcribed not far apart from the time an interview was conducted. This facilitated accuracy and filling in of ‘gaps’ of information as the researcher could tap back into her memory.

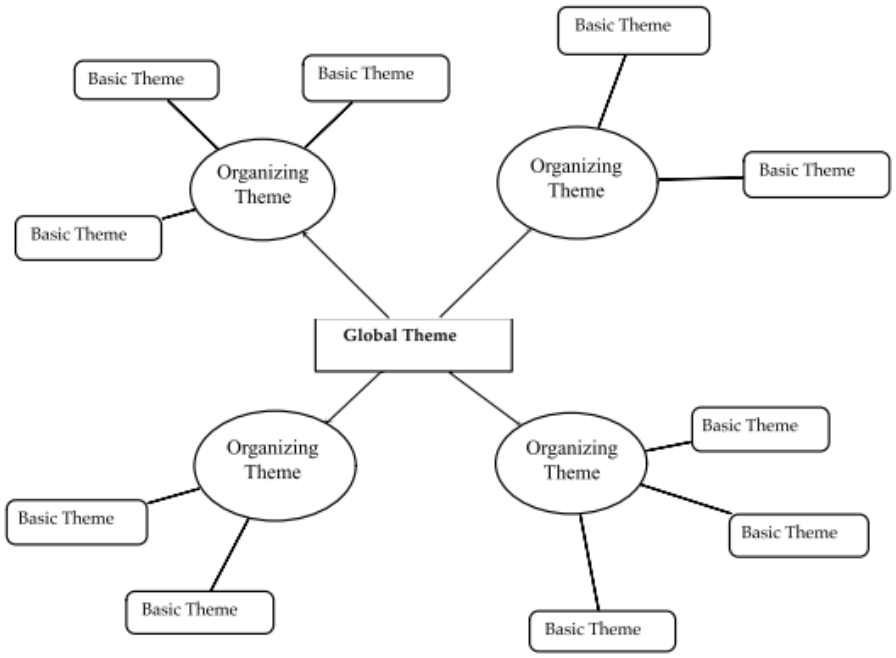
The study used the thematic networks analysis in examining the collected data. Attride-Stirling (2001) notes that thematic networks analysis is relevant when desiring to gain results that are indicative of underlying conceptualisations. For this study, it was important to understand the underlying influential intra-household gender relations on adoption of RETs. The benefits of the thematic networks analysis lie within its strength to provide deep insights into overarching constructions within the data whilst simultaneously encapsulating the underlying themes in those constructs. This form of analysis gives clear indications of prominent themes emerging at different levels of the data.

The inclusion of text or verbatim in data interpretation make thematic networks analysis a credible form of analysis. Excerpts from the study substantiate a researcher’s interpretation which has to be holistic, logical, sensitive and coherent. As the study was interested in intra-household dynamics, it was necessary to incorporate texts as it allowed participants to bring their role to life and enriched the researcher’s interpretation.

To arrive at the themes, the researcher familiarised herself with the data by immersing herself in the data in order to understand it. The next step was to infer emerging themes through extensive coding which enabled categorisation into global, organizing and basic themes (Braun and Clarke, 2006; Attride-Stirling, 2001). Similar themes were grouped in a common category and a map created to gain insight into

emerging linkages. Basic themes consisted of the simplest themes, which together made up the organising themes which summarised the significance of basic themes. The overarching themes were a summation of organising themes. A network of themes was created around each global theme. The networks were vital for providing an insight on emerging inter-linkages, similarities and differences. The mapping exercise is clearly demonstrated using an illustration by Attride-Stirling (2001) given below.

Figure 3.2: Basic Structure of a Thematic Network



Source: Attride-Stirling, 2001:388

With the map in place, the researcher then continued to explore the themes and their linkages in order to attach meanings. At this stage, the researcher had a personal 'dialogue' with the content as well as reflecting on personal beliefs and values so that they did not contaminate the data. Self-evaluation and deep immersion into emerging interconnections provided a fresh view to the data (Durrheim and

Wassenaar, 1999). For this study, this process was crucial as the study focused on issues laden with cultural beliefs and value systems.

3.5 Ethical Standards

Anonymity: the researcher took steps to ensure that what participants say was not traced back to them when the final report was produced. This was achieved through non-capturing of names as well as use of pseudo names and codes on all study material. Pseudo names were also used in the final report. The data was stored in a lockable cabinet in the researcher's residence. All research material was disposed of as per university guidelines.

Confidentiality: all information given to the researcher was kept in confidence; it was not directly or indirectly disclosed to any other parties. The researcher maintained confidentiality through storing the study data under lock and key and using codes and pseudo names on all data and in reporting. During interviews, confidentiality and privacy was maintained through conducting the interviews in a private setting.

Informed Consent: all participants were debriefed on the purpose of the study and thereafter consent to participate was sought. Informed consent was achieved through both written and verbal formats. The informed consent form contained a section with a brief introduction on the study and its purpose. The written consent form was mainly administered to key informants whilst verbal consent was mainly directed to the sampled women who were unable to read and write.

Voluntary participation: the study was based on a participant's willingness to participant. Under no circumstances were participants coerced directly or indirectly to

participate in the study. A statement on voluntary participation was incorporated in the written consent form and verbalised to illiterate participants. Furthermore, participants were informed of their ability to withdraw at any point of the study or an interview.

3.6 Limitations of the Study

While this study contributes to contextual gaps, it is has its own limitations. First, social desirability could have affected participants' responses. Self-reported behaviour may have been under or over-reported. It is difficult to assign with certainty the changes in gender division of labour to RETs considering that gender relations are affected by several economic, political, social and cultural factors. Owing to the purposive sampling strategy, the sampled participants are not statistically representative of the country population. In addition, the study was restricted in geographical scope; which limits the generalisability of the findings.

CHAPTER FOUR: STUDY FINDINGS AND DISCUSSION

This chapter presents findings of the study followed by analysis of the findings in groupings of main themes which are related to objectives and research questions of the study. The first section of the chapter begins with a description of study sites and the three families which were under observation.

4.0 Profile of Study Sites

Study Site 1: Blantyre

The participants in Blantyre were selected on the basis of using either hydro-electricity or solar energy. Participants in Nkolokosa were using hydro-electricity and belonged to a skills development project ran by Self-Help Development International. Women in Kachere used solar energy and belonged to the revolving schemes of Self-Help Development International.

Blantyre is situated in the Southern region. It lies on the eastern edge of the Great Rift Valley. As such, the city is surrounded by topographical features of hills, plateaus and natural drainage systems. Blantyre has 2 distinct seasons; the rainy and dry seasons, with the former stretching from November to April while the dry season runs from May to October. The mean rainfall of the city is 1122mm.

Blantyre is considered to be the commercial city of Malawi, a hub of finance, retail, construction, communication, transport, food and textile manufacturing. The informal sector employs 18% of the city's population and contributes a significant share to the economy. In 2008, the population was estimated to be 661 256, with a growth rate of 2.8%. Over 65% of this population lives in informal settlements which are

characterized by poor living conditions. Poverty in the city is about 24% (UN Habitat, 2011).

UN Habitat notes that Blantyre faces several population related challenges which include rapid population growth, poor waste management, pollution, water and sanitation. Planned areas have adequate social services but informal settlements face inadequate access to services. Demand for water has increased over the years and is attributed to the rapid population growth which is increasing demand. The huge demand of water results in frequent water pipe bursts. Sanitation and refuse collection services are non-existent in informal settlements. The indiscriminate waste dumping is the cause of water pollution. Street lighting is poor as there is irregular maintenance. Electricity is mainly supplied by ESCOM, the public utility. As demand is outstripping supply, the city experiences frequent power outages. Power supply to informal settlements is very poor, with most households not using the grid-connected electricity. The incessant power outages are a driving factor in the widespread use of biomass in the city, particularly in informal settlements. Most families use charcoal and firewood, whilst very few families use solar energy.

Several private and public institutions of higher learning can be found in the city. However, the city has shortage of primary and secondary schools and teaching staff. Blantyre is serviced by 6 hospitals and 18 health clinics. Several private medical institutions also exist. These health services are however inadequate in informal settlements. Malaria is one of the leading causes of death in Blantyre. Frequent outbreaks of water-borne diseases such as cholera are common in the informal settlements.

Informal settlements

Like most countries in Africa, informal settlements are proliferating at an alarming rate due to rapid urban population growth driven by rural-urban migration. Housing standards in these areas are below the required standards of low-income housing. The informal settlements are characterised by indiscriminate waste dumping, poor infrastructure and inadequate social services. The largest informal settlement, Ndirande has an estimated population of 118 000 (UN Habitat, 2011).

Study Site Two: Mwandama Village

Village selection was based on purposive sampling and to a certain extent convenience. The participants were selected on the basis of them using biomass as a source of energy. The women were actively involved in the various food security projects run by Self-Help Development International.

The Mwandama village is situated near Zomba, the former capital city of Malawi. The village has a population of about 35 000 villagers. Rainfall ranges between 900-1200mm, even though the region in which the village is located has been reported to be experiencing the effects of climate change resulting in rising temperatures and reduced rainfall. Small-holder farming is one of the main sources of livelihood. The main crops grown include the staple grain; maize, pigeon peas, cassava, groundnuts and tobacco as a cash crop. The village is in close proximity to tobacco commercial

farms, which provide wage income for the villagers. The dominant forestry products in this area are Miombo woodlands which is native vegetation.

The village's socio-economic indicators are poor. The key health challenges are malaria, HIV and AIDS and malnutrition, particularly for children. Health care facilities are not available within close proximity. Water is unsafe for drinking and much of the water for domestic use is drawn from unprotected springs in the village. School attendance and completion rates are poor, due to due to lack of education infrastructure and children engaging in wage labour in the nearby commercial farms. Poverty levels are high, with 90% of the villagers living below poverty line. There is poor infrastructure in terms of transport networks.

The key highlight and motivating factor in its selection was it being part of the Millennium Village Project (MVP), a United Nations initiative to implement UN Millennium Development Goals in rural community settings with high poverty levels in Africa. The MVP started in Mwandama in 2004. Several community development initiatives are being implemented in the village. These include brick laying, baking, aquaculture, water and sanitation and LED lanterns.

4.1 Profile of Participants

Family 1: Kawala Family

Family Structure

The Kawala family was the first family which accommodated me during the first two weeks of field work. They live in Mwandama village. Mr Jafet Kawala, the head of the household is a tall and slim man. He limps in his left leg, which he says was due to a tractor accident which happened in his youth when he once worked on a tea

plantation. He says he is 58 years old, although his worn out body make one perceive him to be in his mid-60s. He jokes that he married when he was very young, owning only two trousers and 3 shirts. When he talks about his wife, he smiles, one can see his dimpled cheeks. He has spent much of his life living in the village, although when he was young he travelled to different parts of Malawi in search of piece jobs. His wife, Maria Kawala is a petite, dark skinned jovial woman, who delights herself in community work as she once was a home-based caregiver some years back.

Mr and Mrs Kawala have six children, four girls and two boys whose ages range between 7 and 31 years. The first three are girls, two are married and one is a divorcee who is living at the Kawala homestead. The two boys, one is aged 15 and the other 7 years. The Kawalas are proud grandparents of 9 grandchildren, of which 4 are living with them. Their divorced daughter has 2 children (girls) and the other 2 (boy and girl) are each from the other two daughters.

Living Arrangements

The Kawala homestead has four traditional huts, 3 are used as bedrooms, whilst one is regarded as a kitchen which also serves as a bedroom during the night when they receive visitors. A cattle kraal located on the field margins only has four cattle. Adjacent to the hut regarded as the boys' bedroom is a chicken pen from where the chickens crow in the early hours of the morning to signal day break. Mr Kawala has been busy in the past days erecting another kraal for the three goats, one which he got from his uncle and the two they bought from the maize they sold.

Livelihoods

Mr Kawala mends shoes at a nearby rural growth centre and is also a tailor, although he has not been tailoring for a while since the machine developed a fault. His wife sells fresh and dried fish caught from Lake Malawi. The children help in the business. She sells the fish along the highway and at the rural growth centre. The divorced daughter regularly travels to Blantyre to buy a wide variety of merchandise which she resells in the village or sometimes exchanges with gallons or bags of maize. They grow maize as a main crop, together with legumes such as beans and groundnuts. In times when they have a bumper harvest, Mrs Kawala, travels to Blantyre to sell their produce in the city's green market stalls.

Community Organisation

The community is under the leadership of a herdman. The community is characterised by collective way of living and family life is much governed by traditional rules. Defiance of these traditional rules can lead to ostracisation. Marriage is universal in the village and takes place early. Natural resources in the community are a common pool governed by common rules. Violation of the set rules results in the offender (s) being summoned to the traditional court which is presided by community elders who are elected by the community.

Family 2: Faustina

After two weeks of living with the Kawalas in the Mwandama village, I moved to Blantyre, to an informal settlement called Kachere where I was accommodated by Faustina and her family. Faustina is 32 years old married to George aged 37 years. Faustina says she has secondary education and has vocational training on basic book keeping and management to assist in finance management of her enterprise.

George also acquired secondary education but could not complete it due to financial hardships. They have four children ranging from 4 -15 to years; 2 boys and 2 girls. The eldest boy is in secondary school whilst the youngest is a girl who spends most of her days besides Faustina.

Livelihoods

George has a stall for repairing bicycles and radios and during weekends he works for one Indian family as a gardener. Faustina sells fat cakes, cooked *chinangwa* (cassava) and porridge. She mainly sells early in the morning to those who will be going to work. At times, she sells her fat cakes on credit; she usually does this with bus drivers who ply the Blantyre to Kachere or Chiradzulu (a nearby village) routes. When she has a substantial amount of funds she purchases old clothes which she then resells in her stall which is situated along the highway and sometimes takes the clothes to monthly markets which run in different areas of country. She is a member a women's group to which Self-Help Development International administers a revolving fund. The NGO started the schemes to economically empower women. The group is composed of 8 women who set their own operational rules, open a savings bank account in which they save their monthly contributions. The contribution is an agreed amount received from each member per month. At the end of the year, they use the savings to buy agreed upon items which they distribute among the members equally. It is through the scheme that all members acquired solar panels and lanterns.

Living Arrangements

Their shack is made of mud and a roof of corrugated steel, thatch and plastics. It is one big room divided in between with a curtain, one side serving as a bedroom and

the other as a kitchen. The first three children sleep in the kitchen, in which I joined them and slept on the side assigned to the older girl. The kitchen has a small charcoal stove, locally known as *mbaula*, plastic containers for storing water, a small radio and TV. Cardboard boxes are lined on the floor to warm and even the floor surface. Faustina comments that she dislikes winter and rainy seasons, as the shack gets extremely cold and leaks. When the family has visitors, depending on the relationship, they either sleep in the kitchen or they are accommodated by relatives or friends who live nearby.

Community Organisation

Kachere is an informal settlement, where people of different backgrounds live. It is mainly people who cannot afford the high costs of living in the formal settlements of Blantyre. Faustina jokingly describes her community as;

"Kachere is a mixed market, thieves, prostitutes, young and old, you find them all here. We are here to make a living".

Similar to residents of most informal settlements in Africa, the residents of Kachere are frustrated by government's unresponsiveness to their concerns and needs. They claim the government has no interest in providing them with basic facilities and services. They perceive government officials as crooks, corrupt and are in office to plunder what belongs to them. They further allege that all the government officials need from residents of informal settlements is their votes to sustain their looting. This negative perception of government has resulted in strained relationships between the residents and the government.

Many of the families in the settlement survive through informal enterprises and clandestine activities. Kachere is a common ground for criminal activities which include selling of dagga, illegal brew and commercial sex work.

Family 3: Maria

Maria is aged 31 years and lives in Blantyre in a formal high density suburb of Nkolokosa. She holds a Diploma in Information Technology and has been working fulltime for a government department for the past four years. She is a single parent who lives with her five year old daughter and her two younger siblings. Her brother is at a tertiary institution pursuing studies in agriculture whilst the sister is in secondary school. A maid helps take care of her daughter. She lives in a rented apartment which has three bedrooms, one small kitchen and a dining room.

Living arrangements

Her brother occupies one room, whilst the sister occupies the other. When I arrive, I share a room with her sister. There are times when Maria co-habits with her male partner. The house is furnished with modern furniture and appliances. The maid is off duty during weekends, hence much of the house chores are done by every family member.

Livelihoods

Maria has a decent job with a decent salary in a government department. She also owns a hair salon which she remotely manages. She has plans to buy her own house and lease extra rooms. Her entrepreneurial spirit has rubbed off on her siblings. Her brother sometimes repairs electronic gadgets for a small fee whilst the sister engages in short-term work at local supermarkets during school holidays. Maria says she inherited her entrepreneurial skills from her parents who sell eggs

and chickens in the village where they live. She adds that the escalating cost of living in the city force you “to do something”.

Community Organisation

Most probably due to her educational background, Maria is an open minded lady, with a liberal view towards life. She does not hold traditional views although she appreciates some of her cultural norms. Blantyre, as a hub of commerce and industry is cosmopolitan in nature. This multi-ethnicity permeates every part of the city life as evidenced by the various languages spoken, dressing codes and the different food tastes. Although, Malawians are generally hospitable people, the city is characterised by individuality compared to communal living in rural areas. Most of the residents I informally interacted with attribute this to cost of living and the waning of cultural traditions in the city. Unlike the days of Kamuzu Banda (the former president) when women wore full body covering clothes, it is now common site in Blantyre to see young women wearing clothes which expose their bodies.

The formal settlements have adequate basic facilities and services, although residents often complain of frequent power cuts and exorbitant electricity and water charges. Residents are of the perception that the high electricity fees they pay are not in line with the frequent power outages they are subjected to. They claim that services have deteriorated drastically since the time of Kamuzu (the affectionate name of the former president, Kamuzu Banda) and it is worsening by the day.

4.3 Theme 1: Gender roles in Malawi

To determine the gender roles in Malawi, women were asked to make a self-assessment of their roles in terms of what their duties entail and the human energy

expenditure involved in these tasks. Additionally, the women were asked to make an assessment of the work burden of their male counterparts.

Women's Roles and Responsibilities

Consistent with literature, it was clear from the narrations that women's tasks fell in three categories: reproductive, productive and community tasks.

Reproductive Activities

The commonly cited household tasks involved home cleaning, fetching water, cooking, fetching fire wood, washing plates and clothes, farm work (sowing, weeding, harvesting), caring for the sick and child care. As described by Mrs Kawala,

"My day is long, I usually wake up at 05:00a.m to clean the yard and then proceed to fetch water and when I return, I wash plates, open the kraal. The work never ends".

Similarly, in urban areas, Faustina noted that;

"Early mornings are reserved for fetching water at the water point, preparing children for school".

Slight disparities were noticed between rural and urban areas. Farming activities were additional responsibilities mentioned by rural women. This finding is consistent with literature, which indicates that women in Malawi account for the majority of the

labour force in the agriculture sector. In addition, national statistics show that the majority of women in Malawi live in rural areas.

Productive Activities

The women engaged in several productive activities. The commonly cited enterprises were selling of fresh produce, food processing (selling dried fish, boiled cassava, porridge and traditional brew), hair salons and selling of charcoal. Although both rural and urban women engaged to some extent in income generating activities, this was predominant among urban women compared to rural women. One woman from the informal settlement of Kachere noted;

"When I finish house cleaning in the mornings, I prepare my merchandise to sell at the highway. I sell dried fish and vegetables".

This could be attributed to high cost of living in urban areas which pressured women into productive activities as a survival strategy. In addition, urban areas offered a wider market which from my observation was non-existent in rural areas.

Community Activities

In addition to household tasks and income generating projects, women in all sites reported being involved in community activities, although this was to a lesser extent among urban women. Urban women were less active in community activities, except funeral and close associates gatherings. This may be due to the individualistic life which characterises urban life as well as preoccupation with survival. One rural woman expressed;

"When there is a funeral, you have to leave all your activities and attend that funeral. Sometimes you are there for 2-3 consecutive days before returning home. If you

don't attend community funerals, people will not attend any funeral which happens in your family".

Men's Gender Roles

Men's roles were described to include working for an income, hut thatching and logging. It was clear from women's narrations that men's roles were very specific

whilst there were no clear-cut boundaries in women's roles. Women sometimes engaged in what was considered to be men's roles, for instance clearing the land. Women reported that men who participated in women's roles risked being labelled 'womanly'; hence men avoided such 'deprecating' work. It was clear in the narratives that men who engaged in women's tasks felt emasculated as they faced humiliation from fellow men and interestingly from women despite women expressing the need for assistance in their exhausting tasks. Women further stated that boys or girls were often discouraged to do work which did not fall within their ascribed roles. It is imperative to note that the construction of women's roles as emasculating to men is likely to contribute to gender roles in Malawi being static.

Human Energy Demands

Women reported their work to be intensive as it was carried out all day long and throughout the year. Rural women expressed that their work demands shifted with seasons, with the rainy season exerting extra time and physical demands due to

more duties involving clearing the land, ploughing, sowing, weeding, application of fertilizers and pesticides. They added that the work demands were also dependent on the grown crop; tobacco was cited as a labour intensive crop compared to maize and groundnuts, some of the commonly grown crops. The implication of this finding is that women may avoid cash crops such as tobacco which have good returns for poorly paying crops. This has a bearing on women's access to income which in turn affects their bargaining power in decision making.

Women had an overall outlook that their work did not afford them time to rest or take care of themselves. My observations in all the households I stayed, women woke up early before any household member was awake and retired to bed when everyone else had already gone to bed. Women complained of being constantly exhausted and attributed certain ailments to their work. Women constantly reported of suffering from back ache, chest pains, fatigue and coughing. This finding is consistent with study findings from India where due to their gender roles; women were likely to experience respiratory diseases, damage to the eyes, severe fatigue and rheumatic arthritis (Bhide and Monroy, 2011; Shailaja, 2000). In addition, several time-use studies conducted in SSA have demonstrated that women spend considerable time and effort on their ascribed roles (Bamberger et al, 2001). In this regard, one urban woman expressed;

"When I sleep it's as if I'm a dead log, the body feels heavy and numb at times".

In assessing the work of their male counterparts, women were of the opinion that though men's work was at times demanding, it was not done all day which afforded them time to rest and recuperate.

Time poverty

Time poverty experienced by women does not only impact on rest and health, it also has implications on their bargaining power in household decision making. Several scholars have noted that time poverty limits women's bargaining power in household decision making (Danielsen, 2012; Dankelman, 2011; Demetriades and Esplen, 2008; Celceski, 2005; Clancy, 2001; Agrawal, 1997). Many women in Malawi as indicated by participants spend considerable time on unpaid work which leaves them with no time to participate in productive work. Productive work is essential in increasing one's command on resources thereby strengthening one's bargaining power in decision making as postulated by the relative resources contributions theory (Blood and Wolfe, 1960).

Summary

Overall, the findings on this theme point out that men and women in Malawi have distinct gender roles irrespective of ethnic background. The roles are consistent with roles ascribed to men and women in most cultures in SSA. Consistent with literature, women in Malawi engage in household, productive and community activities. Slight differences exist in household tasks based on geographical location; rural women had additional tasks for farming activities. In addition, urban women were more likely than rural women to engage in productive activities.

Theme 2: How do intra-household gender relations influence the adoption of RETs at household level?

Determinants of women's bargaining power in decision making

Participants were asked to describe decision making processes in their households concerning purchasing of household items. It was apparent in the interviews that

there was no uniform decision making process, it varied from one household to another and on the matter a decision is to be taken. One rural woman echoed;

“palibe banja lofanana, banja riri lonse lili ndimalamuro osiyana translated into *each family is different and has its own rules of operation. Moreover, when a decision needs to be made, you look at the matter which needs to be deliberated upon”.*

Social Norms

Participants stated that the decision making process was an interactive process in which communication played an essential part. Through probing, it became clear that communication was embedded in social norms. The social norms dictated how, where and when communication took place. Women expressed that there were styles of communication which a woman was not expected to use when communicating with her husband. As rightly captured by one woman;

“A good woman does not speak to her husband in an impolite manner and knows when to speak to the husband”.

The women expressed that when a woman was respectful to her husband and communicated with him in a rightful manner, the husband was likely to consider her voice in decision making. The women further pointed out that decision making processes in their households depended on whether the matter to be decided upon was considered to belong to a woman or man’s realm. Issues related to food distribution and child care were considered a woman’s sphere, hence a woman was likely to make independent decisions or take a leading role in the decision making process of such cases. Although so much focus has been given on economic resources and how they influence intra-household gender relations, the study

findings reflect that power relations in decision making go beyond economic resources. Complying with specific gender social norms was reported to have an influential role in decision making. These findings reinforce the arguements posed by some scholars that social norms play an indispensable role in intra-household decision making (Argawal 1997; Kabeer 1997). The findings further support Davis's (1976: 250) postulation that "couple's power and preferences are "built into the roles of husband and wife on the basis of cultural norms". Women emphasised that the way they communicated with their husbands mattered when making a decision. Using socially approved ways of communicating with a husband was an essential ingredient in making the husband more receptive of a woman's ideas. Diverting from socially approved ways was reported to lead to a woman's ideas being overlooked or break down of the decision making process. It is has to be underlined that gaining bargaining power through gender roles may lead to rigid gender roles where women continue to undertake their ascribed roles for the bargaining position.

Economic Resources

Participants shared that men in Malawi were considered to be primarily responsible for the overall financial well-being of the family. It appeared to be a tacit agreement in marriage that the man was the provider of material provision and family sustenance. The participants expressed that decision making in the household, particularly on 'major' issues was vested in man as he *"brought income in the household and is the head of household".* It was clear from the interviews that men played an important role in decisions of a financial matter. In this context, one woman remarked that;

“If you have nothing, no job, money, how can you voice anything? It is as if you are biting the hand that feeds you”. Sometimes no matter how much you try to put sense into the man’s head, he has the final ruling as the money is in his pocket”.

The sentiments expressed above demonstrated that the women’s contributions in decision making were often overlooked due to their poor income base. In addition, the women indicated that their contribution in decisions of a financial matter was limited as they were considered ‘wasteful’ and ‘irrational’. The findings support the assertions of the relative resources contributions theory by Blood and Wolfe (1960). In addition, they affirm Kerr’s (2005) findings that historically and currently, women in Malawi have limited entitlements in waged labour as well as within households. The gender stereotypes which were voiced out by participants perpetuate the prejudices which exist in Malawi.

Participants expressed that it was common for couples to have considerable tensions and conflicts regarding decisions on allocation of financial resources. Women who engaged in productive activities were of the opinion that tensions arose when each spouse wanted to control the other spouse’s spending. The participants expressed that when a man did not fulfil his family financial obligations, it was sufficient grounds for a woman to use her earnings individually. Women’s unbending nature to disclose and have their earnings controlled was reported to at times result in domestic violence as men felt their roles as providers and heads of households were challenged. What these findings reveal is the changing landscape in gender roles as women increasingly enter the labour market.

As advanced by Blood and Wolfe (1960), the increasing resource base strengthens women’s bargaining power in decision making. As outlined by bargaining

approaches, the findings show that there are times when couples use the tools of a cooperative game to contest and bargain in order to reach Pareto efficient outcomes. Similar to the non-cooperative perspective, the findings show that spouses find it challenging to enter into binding contracts. The resistance of spouses to disclose their earnings and yield to control of their expenditure by another spouse is a clear indication of spouses pursuing their own self-enforcing agreements as advanced by non-cooperative models.

Who makes the decision (s) on the adoption and installation of RETs?

Women classified adoption of RETs as an issue which would require joint decision making as it impacted on various elements of family life, some which were under a man's domain and others falling in a woman's realm. Although women were of the opinion that joint decision making was the best option in this regard, in reality they reported that much of the decisions on the matter were dominated by men. They further expressed that men did not only make the decisions, they paid and controlled whatever was purchased. Women's limited financial resources restricted them from making decisions on RETs as highlighted by one woman;

"Even if I want an electric cooker today, it's all daydreaming because I have no money for it. When I tell my husband, he has excuses, he keeps on saying we will see next month and one month turns into a year".

Women noted that sometimes their passivity in decision making to purchase and install RETs was due to them not directly enjoying the benefits of the technologies as men bought what satisfied their needs and not necessarily those of women and family welfare. Women described men's self-serving interests as not beneficial to family welfare. One woman stated that;

“I just saw him come with a solar panel, where and how much he bought it I have no clue. The solar panel is mainly used for lighting and to watch soccer on TV”.

It was however apparent in the women’s narratives that when a woman had economic resources, she could influence the decision making as she could sway the decision in her favour due to the financial contribution she made. The women further reported that when they had financial resources, in some cases they took independent decisions whereby they purchased RETs without consulting the men.

Women also attributed their lack of bargaining power on RETs to lack of technical know-how of the technologies. Most of the women alluded to being clueless on the use of the RETs. In contrast, men are expected by society to be technically minded. The women reported that even when a decision was taken jointly; it was the man who informed the woman on the workings of the RETs, their benefits and shortfalls. It was therefore logical that men took a dominant position when deciding on RETs. Interestingly, single women reported that when they had to decide on purchasing RETs, they consulted their male associates as they were more knowledgeable on such matters than themselves. Women expressed that their suggestions to purchase RETs which would assist them in their work or enhance the family’s well-being were viewed with scepticism or they had to be interrogated about it to an extent that they were made to feel as if their idea was absurd. This was not the case when the man decided to purchase RETs.

Women with tertiary education strongly expressed that they would not let a man dominate or control the money they earned. They further added that technology had enabled them to compensate for their lack of technical knowledge on RETs as these

days one could easily acquire pertinent knowledge through the internet. This finding shows the positive impact of education on a woman's well-being and her family welfare. As expected, single women's decisions on adopting RETs had minimal influence from men. This group of women reported that they sometimes consulted their male acquaintances (relatives, sexual partners, workmates) when they wanted to purchase RETs. However, the final decision was their prerogative.

These findings affirm empirical evidence which has indicated that the different ways in which household income is controlled result in diverse expenditure patterns (Dutta, 2005; Skutsch, 1998). Income controlled by men tends to be spent on their own consumption whilst when women have command over household income; they spend it on child welfare in terms of human capital investment and general family well-being (Dutta, 2005; Skutsch, 1998; Brownning and Chiappori, 1992). The findings are similar to findings from Côte d'Ivoire where an increase in women's control of household's cash resources resulted in an upsurge in food budget allocations and a decline in expenditures on cigarettes and alcohol (Dutta, 2005). In addition, the findings confirm the importance of economic resources in the bargaining process as postulated by Blood and Wolfe (1960).

Who benefits from adopted RETs?

It was clear from the discussions that adoption of RETs benefited everyone, although women complained that men monopolised the use of the RETs. The women pointed out that such behaviour by men was not surprising as in the first place, their decision to purchase the RETs was based on their self-serving interests. One woman from a household using hydroelectricity commented that;

“My husband has a habit of forcing us to save electricity, to an extent of switching to charcoal for cooking because he wants to watch a soccer game in the course of the week”.

Women were of the opinion that most men had no appreciation of women’s tasks. Having such an appreciation would make them sensitive to the energy needs of women.

Despite complaints of men sometimes misusing RETs, women expressed that RETs were extremely beneficial, particularly in their income generating activities. The RETs enabled them to carry out these activities in the late hours of the day. The longer they engaged in productive activities, the higher the returns they could expect. They further added that RETs also eased the burden in some of their reproductive activities. One old woman reported that;

“In my youth days we used to pound maize into mealie powder by hand, every day you regretted why you were born a woman. By the time you finished, your hands were painful. These days all you need to do is take your maize to the grinding mill. Even if you have to walk a distance to get to the grinding mill; it’s a better option”.

The findings are in tandem with literature which has shown that men seem to perceive the benefits of RETs in terms of leisure whilst women perceive the benefits in terms of family well-being. In Sri Lanka, men perceived the benefits of electricity from micro-hydro to be leisure, quality of life and education of children whilst women viewed electricity as reducing their workload, enhancing health outcomes and on purchasing RETs, they seem not to consider the drudgery of women’s work (Sen and Barnes, 2004). Empirical evidence indicates that the case is different in female

headed households. Female heads of households have been found to prioritise purchasing domestic appliances which reduce their workload compared to male headed households (Madon, 2003). They however, consulted their male relatives and friends for advice on their decisions to purchase appliances or gadgets.

Theme 3: Impact of RETs on gender division of labour

Household Activities

Women were asked to describe how RETs affected the gender division of labour. Most of the participants shared positive accounts of their use of RETs. The participants were excited with how RETs transformed their lives. They mentioned that RETs had to a great extent eased their work burdens and allowed them to devote time to income generating activities. One woman echoed that;

"Now that I have a solar panel and lantern, I'm able to clean the house during the night as there are times I leave without cleaning due to the nature of my business".

Women who used electricity applauded it for being clean and making their *"lives easy".* In this regard, one commented;

"When *I compare my mother's life in the village and mine, I can see how electricity simplifies my life. I'm able to cook my meals in minimal time, watch TV on what's happening in the world and study in the late hours. My former class mates who are living in the village look way much older than me, most probably due to too much work as the body doesn't rest".*

Rural women who relied on biomass expressed that if they had access to RETs, it would "*solve much of their problems".* In their view, electricity would save them time in their household activities. Jokingly, one woman said;

"If I had access to electricity I would not be old as I'm now. With this kind of work (harvesting, collecting water and firewood) you quickly turn into a granny, there is no rest".

Rural women narrated how simple tasks such as charging a mobile were time consuming as they had to walk long distances to the rural growth centre. In addition, they felt that lack of RETs jeorpadised family welfare. For instance, children who relied on paraffin lamps for studying were in danger of being burnt and/or family possessions. It was clear from the interviews that the women's enthusiasm of RETs was not only because they directly benefited them but they also enhanced their families' wellbeing.

Although all the women continuously reported on how RETs eased their daily household, my observations in all the study settings indicated a contrasting image. I observed from the family I stayed with which relied on hydroelectricity that they mainly used it for lighting and leisure (TV and radio) and to a lesser extent for cooking and food processing. The responses I got for this anomaly was that electricity was expensive, hence households tried to use it sparingly. Participants reported that they were expecting the costs of electricity to increase in the future as there had been numerous tariff increases in a short space of time.

When I enquired on the costs they paid for electricity, I was informed that electricity tariffs were categorised into three: lower, middle and high classes. The lower class

was for lighting only, with a cost of MK5 000 per month. Middle class was charged at MK20 000 per month and high class with the highest cost of MK50 000 per month. Through the participants and my informal interactions with merchandisers at the market place, I got to know the prices of biomass. A 70kg bag of charcoal was sold for MK4 500, with an average family of 5 requiring at least 2 bags per month. For a 50kg bag, one had to pay MK3 500. On the other hand, a bundle of firewood was sold for MK 5000 and lasted 3-5 days depending on family size. Women reported that they tried to use what they had conservatively to reduce costs. Given these costs, women reported that all the energy sources in the country were generally costly. My analysis of the costs in relation to general levels of household income conceded with the women's sentiments of everything being costly.

To reduce costs, the family using hydroelectricity only cooked meals requiring less cooking energy with electricity whilst for meals requiring high amounts of cooking energy such as offals and sugar beans (popular dishes partly due to low cost) and water heating they resorted to fuel wood or charcoal. Ironically, this coping strategy increased water costs as high amounts of water were needed to wash the pots covered in soot. For women in the informal settlement who collected water from a centralised water point, it also meant more trips for collecting water.

Considering that cooking is one activity which takes women's considerable time and effort, it is depressing to see that RETs did not bring much change in this area. These findings indicated that RETs do not always bring the envisaged benefits to women and division of labour. The findings showed that electrification does not necessarily result in 'extensive use' of electricity apart from lighting and entertainment which have been found to be more beneficial to men and children than

women. Although electrification has been justified on the basis that it results in economic progress (Cecelski, 2000; Clancy, 1999), empowers women due to labour and time saving, improved health outcomes and increased livelihood options, findings indicated that its exorbitant costs make it exclusive. Considering the disproportionate levels of poverty among women, they have limited capacity to afford this technology. As noted by several scholars, the prohibitive costs of electricity are often overlooked in its advancement as a vital means to economic and social development. The scholars further argue that the costs are worse for rural women given the uneven topography and dispersed nature of settlements in rural areas which increase infrastructure costs (Wamukonya, 2002; Mehlwana, 1997).

My observations in the family which relied on solar energy mirrored those in the households dependent on hydroelectricity. The solar energy was only used for operating the TV and radio and lighting for the house and the market stall. Faustina due to lack of technical know–how reported that she had been told by her husband that she could not use it for cooking. Clancy, Oparaocha and Rohr (2004) note that due to low output, which make them unsuitable for cooking; solar home systems have been found to suit men's needs for entertainment but not women's needs for cooking. They are however commended for producing good quality illumination, which can enhance education outcomes and enable women to do other housework as well as income generation activities due to extension of the day.

Although no family was using solar cookers, studies conducted in India indicate that solar cookers are incompatible with rural lifestyles particularly the social life and cooking patterns (Shailaja, 2000; Argawal, 1986). The unpopularity of the technology is due to its incompatibility with cooking timings, type of dishes to be cooked and

location of cooking. Solar cooking systems differ from the cooking patterns of many societies in developing countries which view the fire as a social hub which brings families together to socialise; social capital which women most rely on in undertaking this activity. In South Africa, Green (2001) found that by virtue of solar cooking being done outdoors, it robbed women of the opportunity to socialise their children.

With regards to biogas technology, study findings from countries where it is used demonstrate that though it has the potential to replace biomass in cooking and heating (Arthur et al, 2011), it increases women's workload. The technology requires daily additions of dung and water which are head loaded and done by women (Denton, 2002).

Productive Activities

Consistent with findings elsewhere, women delighted in using RETs because they enhanced their businesses as highlighted by one woman from Kachere;

The solar lantern enables me to *prepare the merchandise for my business during the night. I used to rely on candles, which was quite costly as I normally used 2 candles per day. I had to use my profits to buy candles, which was not good for my business given the meagre profit I get. With the solar lantern all I do is recharge with the God given resource which has no cost and the quality of lighting is excellent".*

Women in rural areas who relied on biomass perceived that lack of RETs jeopardised their micro-businesses. If they had access to RETs the quality of their businesses would be enhanced. Rural women were optimistic that RETs would help them devote more time to their income generating activities as they would have been 'freed' from the drudgery of household activities. They added that access to RETs

would give them time to attend community meetings, allowing their voices to be heard in community decision making.

Women perceived the benefits from RETs in terms of quality improvement and efficiency which had the potential of increasing sales with the ultimate outcome of increased income. The women also saw the inter-linkages between their tasks. They highlighted that gains realised in household tasks from the use of RETs led to gains in income generating activities.

Personal observations and interviews with the women revealed that women in the food processing businesses were reluctant to use RETs in their businesses. On probing why this was the case, the women reported that their reluctance was due to prohibitive costs and RETs *"not being suitable for the food types they sold".* The cost for RETs was cited as high as it involved cost of appliances, regular purchases and maintenance or replacement of the appliances. For many, these costs were unbearable considering their meagre earnings. As shown by other studies, the poor have limited capacity to afford efficient appliances, let alone the regular payments (Reddy and Reddy, 1994; Clancy, Skutsch and Batchelor, 2003). Reddy (2000) emphasised that different energy forms require suitable devices to which a cost is attached. Each fuel or carrier choice has fixed, quasi-fixed and variable components. Quasi-fixed costs are incurred from monthly fixed costs, for example, cost for LPG or electricity connection and security deposits as a warranty for monthly payments or for the return of equipment (LPG cylinders). The presence of fixed, quasi-fixed expenses make these energy forms prohibitive to the poor (Reddy, 2000; Howells et al, 2005; A study conducted in South Africa found that poor households which had

electricity used paraffin, coal and biomass when they could not afford to buy electricity (Sustainable Energy Africa, 2014).

Interestingly, the reluctance of the women to use RETs was also based on their belief that they altered the food taste. This meant losing customers which was not an option they were willing to take as the businesses sustained their families. One woman remarked;

"*One rainy season I used a paraffin stove to prepare my fat cakes; my regular customers constantly complained that my fat cakes had an offensive smell of paraffin which made them buy from other merchandisers*".

Even though the women appreciated the cleanliness and convenience of RETs, they were willing to continue with the drudgery in order for their businesses to thrive. This finding is similar to Dutta's (1997) findings in India where fuel selection was found to be determined by customs on food taste. Karekezi and Kithyoma (2002) using findings from Sierra Leone noted that sometimes customs on food taste "cause households to shun improvements such as more efficient stoves". In Sierra Leone, households were reluctant to switch to modern energy as they believed it altered food taste and was not appropriate for several culinary methods. Similarly, in Mexico, households disliked LPG as they claimed it changed the taste of tortillas, the staple food which is typically prepared in wood-fired in clay ovens (Masera et al, 2000).

As highlighted earlier, RETs were appreciated by the women for extending the working day. The good quality lighting offered by solar was reported to allow children to study at night whilst women could undertook some of their household and productive tasks in the late hours. Though this is commendable for productive work,

personal observations showed that women used the extended day to continue with household tasks which made RETs a ‘blessing in disguise’ as it increased women’s hardships. Some of the women mentioned that due to the use of RETs, they were able to do house cleaning and laundry during late hours without disruptions as everyone would have gone to bed. This finding point out that RETs have the potential of increasing women’s workload as they ‘carry their duties into the extended day’.

When asked if RETs had changed men’s responsibilities, overall women were of the opinion that the prevailing gender division of labour had not changed. Men continued to be reluctant to do household tasks. Women voiced that the cultural scripts on the assigned societal roles seemed to be strongly imprinted in men forbidding room for flexibility. One woman from a household using hydroelectricity commented that;

“My husband is extremely lazy, when he comes from work all he does is sit on the sofa and watch TV, of course with expectations that food is ready. He finds it extra difficult to iron his shirt which is an easy task when using an electric iron”.

Women reported that the rigidity or reluctance of men to assist in household tasks despite RETs making the tasks simpler was due to the humiliation which was associated with a man doing ‘womanly’ work. The disgrace was said to be unbearable. Women also added that engaging in the ‘deprecating’ work was as if ‘falling from the throne of grace’. They expressed that men found it difficult to shift between tasks, *“changing one cap for the other”*. As such, RETs made no impact in increasing men’s participation in women’s tasks. Some women however, reported that their husbands had become *“hands-on”* since they started using RETs. One woman who sold sugar beans and groundnuts noted that;

“Ever since we bought the solar lantern, my husband helps at night to pack the beans and groundnuts in the small sachets, something I never saw him do prior to the purchase”.

The women who reported these changes attributed the changes to the convenience and cleanliness of RETs. The women were of the opinion that because RETs made it possible to conduct some of the household tasks behind closed doors; it increased men’s engagement in ‘womanly’ work because their fears of humiliation (when found doing the work in the open) were lessened. The findings are comparable to findings from various countries. Studies conducted in USA indicated that acquisition of new household appliances led to men reducing the time they spent in housework (Hawthorne, 1996). In contrast, studies in Nepal found that with the introduction of the micro-hydro, men became involved in domestic tasks such as carrying grain to the grinding mill and taking care of babies whilst women participated in development projects (Mahat, 2004; Rana-Deuba, 2001). Likewise, in Sri Lanka it is regarded normal for men to do household tasks such as ironing (Masse, 2003).

Overall, the findings indicated that a conclusive picture on the impact of RETs on gender division of labour is not straight forward. There is no doubt that in many ways, RETs are time and labour saving for women. Though, this is the case, there are indications that RETs may increase women’s workloads as has been discussed above. In addition, there is no decisive evidence to indicate that RETs increase men’s participation in tasks ascribed to women.

CHAPTER FIVE: CONCLUSIONS

The study aimed to explore the relationship between renewable energy and gender relations at household level using qualitative methods. The study illustrates that men and women in Malawi have distinct roles which are rooted in culture. The stereotyping of women's roles contributes to inadequate policy and programmes to address women's energy needs. Due to invisibility of women's energy needs, decision makers do not fully comprehend their significance hence they are not prioritised at both macro and micro levels.

With regards to intra-household relations, the study argues that factors which affect a woman's bargaining power vary by context. The study demonstrates that intra-household relations and the related mechanisms of cooperation, conflict and bargaining shape the division of labour and distribution of assets. The study shows that various factors influence women's bargaining power. It identifies economic and social factors as having an influence in the bargaining process. Even though tangible resources play a fundamental in the bargaining process, the study shows that intangible resources' influence on the bargaining process cannot be downplayed. The study argues that social norms though overlooked in decision making processes boost women's bargaining power. Findings indicate that women rely on their gender roles to leverage their bargaining power. The study concludes that the influence of social norms should not be underestimated in decision making processes.

The study shows that power relations and resource allocation embedded in intra-household decision making influence the outcomes on RETs. The study argues that several socio-economic challenges impede women from accessing RETs. Lack of economic resources and limited knowledge are some of the barriers to women

accessing RETs. Due to unequal power relations and asset distribution, men predominately determine the outcomes of any energy intervention; how it is used and whom it benefits in the household. The study further reflects that RETs risk adding extra work burdens to women, not sufficiently catering for their needs and excluding women. Technologies such as biogas systems which require constant collection of water and animal waste risk increasing women's drudgery. In addition, technologies which do not address women's energy needs are of minimal value to them. The low output of solar systems make them unsuitable for cooking, an area which takes women's considerable time and effort. Women's lack of access and control over resources such as land, income and education are obstacles to women realising accessing modern energy. Overall, if not well thought through, RETs can reproduce gender inequalities. For RETs to address women's needs, focus should not be on what technology can technocrats deliver to women as consumers but should be about treating women as active agents who can choose options which best suit their needs.

Implications of Study

Given the fact that findings are not conclusive on the impact of RETs on gender division of labour, this area requires further inquiry. In addition, improved access to energy has been reported to 'free' women from time and energy consuming tasks. Being liberated from the drudgery is said to leave women with more 'free time'. There is need to explore what women do with the 'free time' they gain.

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APPENDIX 1

PARTICIPANT INFORMATION SHEET

School of Social Sciences
Development Studies Programme
Private Bag 3, Wits 2050, Johannesburg, South Africa

Dear Participant,

My name is Cathrine Chinyandura, a Masters student in the Development Studies Programme at the University of the Witwatersrand. I am carrying out a study on: **The Relationship between Renewable Energy and Gender Relations at the Household Level.** I kindly invite you to participate in the study. The research procedure will involve an individual interview for approximately 45 minutes. Your participation is voluntary and non-participation will have no negative consequences. You are not at an advantage or disadvantage in any way if you choose to participate or not to participate in the study. You have the right not to answer any questions you feel uncomfortable to answer. You may withdraw from the study at anytime, should you feel you do not want to continue without any penalty or negative consequences attached to your withdrawal.

All the information collected during the study will be kept private and confidential. The study material (notes and tapes) will not be seen or heard by any other person at any time; only the researcher will process the information and will keep it in a safe place which is locked all the time. All study material (notes and tapes) will be destroyed when the research is finished. No identifying information such as your real names or personal details that could identify you will be used in the study material and research report. There are no direct benefits for participating in the study. There are also no unforeseeable risks for participating in the study.

If you choose to participate in this study, please complete the given informed consent form.

Your voluntary participation in this study will be greatly appreciated.

Thank you

Ms. Cathrine Chinyandura (Student Number: 762527)

Contact persons:

Cathrine Chinyandura (Researcher)	+27 62 3208 152	chinyandura@gmail.com
Dr. Srila Roy (Supervisor)	+27 11 717 79999	Srila.Roy@wits.ac.za

APPENDIX 2

PARTICIPANT INFORMED CONSENT FORM

School of Social Sciences
Development Studies Programme
Private Bag 3, Wits 2050, Johannesburg, South Africa

RESEARCH TOPIC: The Relationship between Renewable Energy and Gender Relations in the Household at the Household Level

1. I hereby confirm that I have been informed by the researcher, Ms. C. Chinyandura about the nature of the study. ☐**Yes** ☐**No**
2. I have also received, read and understood the Information and Consent sheets concerning the study. ☐**Yes** ☐**No**
3. I am aware that the information I give will be processed without mentioning my real name(s). ☐**Yes** ☐**No**
4. In view of the requirements of the study, I agree that the data collected during this study can be processed in a computerized system by the researcher. ☐**Yes** ☐**No**
5. I understand that I can at any stage, without prejudice, withdraw my participation in the study. ☐**Yes** ☐**No**
6. I have had sufficient time to ask questions and of my free will, I will participate in the study. ☐**Yes** ☐**No**

Signature: _____ **Date:** _____

CONSENT FOR AUDIO RECORDING

I give my consent to be audio taped during the interviews. ☐**Yes** ☐**No**

Signature: _____ **Date:** _____