FACTORS INFLUENCING ACCESS TO RENEWABLE ENERGY BY RURAL FAMILIES. A CASE OF SOLAR LANTERNS PROJECT IN ISIOLO COUNTY, KENYA

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A Research Project Report Submitted in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Arts in Project Planning and Management of the University of Nairobi

2018

DECLARATION

I declare that this Research project is my original work and has not been submitted for a degree in any other university or college for examination or academic purposes.

Signature: ……...Date:……...

Nzai Patrick Charo Kitsao

L50/89306/2016

This research project has been submitted for examination with my approval as the University Supervisor.

Signed…… Date ……

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DEDICATION

This work is dedicated to my late father Harrison Kitsao and Kahunda Jefwa and my dear children Purity Dama and Mapenzi Nzai for their encouragement, prayer and love, understanding and unending support. To all of you I say thank you and May God bless you abundantly.

Lastly, I am grateful to God for the far He has brought me. He has always provided and as been there for me at the time of need. May his name be glorified.

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ABBREVIATIONS AND ACRONYMS

CM: Community Management

FiTs: Feed-in tariffs

GDP: Gross Domestic Product

GOK: Government of Kenya

IEA: Institute of Economic Affairs

IPCC: Intergovernmental Panel on Climate Change

KEREA: Kenya Renewable Energy Association

KNBS: Kenya National Bureau of Statistics

MoE: Ministry of Energy

MW: Megawatts

PV: Photovoltaic

RET: Renewable Energy Technologies

SHSs: School of Humanities and Social Sciences

SEDEC: Solar Energy Development Environmental Consideration

SREP: Supervisory Review and Evaluation Process

UNEP: United Nations Environment Programme

US: United States

ABSTRACT

In developing countries, lighting is generally thought to rank among the top three uses of energy. Adaption of renewable energy sources is typically not placed in the context of a specific fuel choice. Solar Technology would provide the solution to the evident energy gap but this tends to be negligible in most developing countries. There has been a lot of criticism, from various quarters, on the way the Isiolo County solar lanterns project are managed. The purpose of the study was to establish the factors influencing access to solar lanterns project by rural families in Isiolo County, Kenya. The study was guided by the following objectives; to establish the influence of community involvement, alternative sources of energy, availability of information and family income level on access to solar lanterns project by rural families in Isiolo County, Kenya. The study was grounded on resource dependence theory and public participation theory. The study adopted a descriptive research design. The target population for this study composed the community leaders, county government officials and the rural residents in Isiolo County. A sample population of 145 was selected from the target population of 234 with a 95% confidence level and an error of 0.05. The study selected the respondents using stratified random sampling technique. Primary data was obtained using self-administered questionnaires. The questionnaire was made up of both open ended and closed ended questions. The drop and pick method was preferred for questionnaire administration so as to give respondents enough time to give well thought out responses. After data cleaning, descriptive statistics such as frequencies, percentages, mean score and standard deviation was estimated for all the quantitative variables and information presented inform of tables. The qualitative data from the open-ended questions was analyzed using conceptual content analysis and presented in prose. Inferential data analysis was done using multiple regression analysis. The study found that community participation had a greater influence on access to solar lanterns project. It was found out that communication satisfaction, involvement in projects management and public dialogue influence access to solar lanterns project in a great extent. The study findings showed that knowledge on solar energy, experience and information sharing influence access to solar lanterns project in a great extent. It was further indicated that leadership style, strategic agility and commitment influence access to solar lanterns project in a moderate extent. It was also found that formal education, accessibility to information, training and capacity building was found to influence access to solar lanterns project greatly. It was also revealed that that proximity grid electricity, affordability and availability of alternative energy sources influence access to solar lanterns project greatly. The study findings found that there is a great influence of family income level on access to solar lanterns project. The results indicated that household expenses influence access to solar lanterns project in a great extent. The study recommended that Government of Kenya and especially the Ministry of Energy should provide training and education to increase the availability of information and awareness on the use of solar energy. The study recommends Government should consider zero rating tax on Solar equipment so as to influence lower pricing thus making it more affordable for purchase and installation of solar system. The study recommends that there should be timely release of funds as a way to ensure completion of projects within the stipulated time. Finally, the study concluded that community participation had the greatest influence on access to solar lanterns project followed by alternative sources of energy in Isiolo County, Kenya, followed by availability of information then family income level had the least influence on access to solar lanterns project.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Energy is not regarded as a basic necessity, but it is a basic ingredient in the successful satisfaction of almost all basic human needs (Yuko, 2004). The level and intensity of energy use is an important indicator of a countryôs economic growth. The main sources of energy are divided into two main categories: conventional and renewable energy sources. Conventional sources such as energy from non-renewable resources have numerous challenges that include pollution and global warming; this has made countries change policies to encourage adoption of greener technologies in renewable energy sources.

Renewable energy can in general terms be defined as energy that can be derived from resources which are naturally replenished on a human continuance, for instance sunlight, biogas, wind, hydropower, tides, waves and geothermal heat. Renewable energy sources can substitute conventional energy sources in four distinguishable areas: electricity generation, hot water/space heating, motor fuels, and rural (off-grid) energy services (World bank, 2014). Fossil fuel which includes coal, oil and natural gas led world economic growth, but these fuels release of carbon dioxide (CO2) into the earth atmosphere, and are the main drivers of global warming and climate change (Stern, 2006). The increased concern over influence related to energy use and global warming hints that there will be more reliance on renewable energy sources in future which includes wind, solar, geothermal, hydro, biogas, wave and tidal.

Additionally, with increasing energy prices, more attention is being shifted to further exploration of renewable energy sources as an alternative to fossil fuels. As a result, academics and industries from various parts of the world have begun to envision renewable energy driven future in the pursuit of a sustainable energy system (IPCC, 2007). Renewable energy comes from natural resources such as sunlight, wind, rain, tides and geothermal heat. About 16% of global energy consumption comes from renewables: 10% is from traditional biomass, which is used mainly for heating and 3.4% from hydroelectricity. New renewables such as small hydro, modern biomass, wind, solar, geothermal, and bio-fuels account for about 2.8%. There has been a rapid growth in new renewables because of increased uptake of the relevant technologies (UNEP, 2011).

Approximately 80 % of all energy consumed in the world is utilized by the first twenty large economies commonly referred as G20 in 2010 (Schmidt and Haifly, 2012). According to this statistic this group of countries is important in shaping renewable trend since this is where most energy demands are happening. Overall about 16% of world energy consumption comes from renewables; with 10% from traditional biogas, used majorly for heating and about 3.4% from hydroelectricity. New renewable energy sources including small hydro, modern biogas, solar, wind, geothermal, and bio-fuels contribute about 2.8% (UNEP, 2011).

The world has witnessed a rapid growth in new renewables due to increased uptake of the relevant technologies. Investments in renewable energy have increased by 32% in 2010, to a record US$211 billion. The increase in investments was as a result of wind farm development in China and small scale solar photovoltaic (PV) installations in Europe (UNEP, 2011). World annual percentage increase for 2008 depicts significant achievements with all forms of grid connected solar PV capacity growing by 70%, wind power grew by 29%, solar hot water gained by 15%, and small hydro increased by 8% (El-Ashry, 2009). Additionally, Renewable energy Global Status Report (2009) gives a ranking of the top five renewable energy investor economies together with rankings of top five states depending on their investment and capacity of renewable energy until 2008. It shows that countries with emerging economies such as Brazil, China, Indonesia, India, Philippines and Turkey are investing significantly in different sources of renewable energy.

Global investments in renewable energy increased by 32% in 2010, to a record US$211 billion mainly because of wind-farm development in China and small-scale solar PV installations in Europe (UNEP, 2011). Africa achieved the largest percentage increase in investment in renewable energy among developing regions excluding the three big economies. In 2008, India accounted for 17.7% of the global population but was the fifth-largest consumer of energy, accounting for 3.8% of global consumption. Indiaôs commercial energy supply is dominated by coal and oil (most of it imported), with renewable energy contributing less than 1% overall and accounting for approximately 10% of installed capacity.

As in many countries that are experiencing high economic growth, its power-generating capacity is insufficient to meet current demand, and in 2009ï2010, India experienced a generation deficit of approximately 10% (84TWh) and a corresponding peak load deficit of 12.7%, i.e. over 15 GW. As a result of frequent electricity shortages, the Indian economy lost about 6% of Gross Domestic Product (GDP) in FY2007ï2008. To meet its current goals of

economic growth, by 2017 India will need to increase its installed generating capacity to over 300 GW. In recent years, control over generating facilities has shifted to federal government and private entities, including those that have set up captive power plants for their industrial facilities. The private sector dominates the generation of renewable energy (Arora et al., 2010).

African continent is gifted with huge renewable and non-renewable energy sources. Some estimates show that the continent has 1,750TWh potential of hydroelectric power and 14,000 MW of geothermal energy potential. It receives enough solar radiation throughout the year, and several studies have confirmed the availability of immerse wind energy resources in several areas of the continent. Nevertheless, these energy endowments are largely underutilized (Daly, 2012). For example, only about 5% of the continentôs hydroelectric power potential has been exploited, whereas the same figure for geothermal is 0.6%. Energy poverty in Africa remains a serious impediment to human and economic development in many parts of the continent.

Africa as a region continues to face critical challenges in its energy sector characterized by inadequate access to modern energy services, low purchasing power, poor infrastructure, low investments and over reliance on traditional biogas to satisfy their basic energy requirements. Comparing Africa with other parts of the globe, the lack of access to energy is most pronounced in the continent. In most Sub-Saharan countries access to the electricity grid is less than 1% (Daly, 2012).

Recent trends show that by 2020 still over 60% of Sub-Saharan Africans will not have access to electricity. In spite of the environmental, social and health challenges associated with its use, traditional biogas still remains the major source of energy for the majority of the poor. Biogas accounts for about 70-90% of primary energy supply in some economies and about 86% of energy consumption. Moreover, adoption of renewable energy is limited due to high initial transition costs (Love, 2012). There are however distinct variations within the continent, with biogas energy accounting for only 5% of energy consumption in Northern Africa and 15% in South Africa.

Africa is endowed with vast renewable and non-renewable sources of energy. It is estimated that the continent has 1,750TWh potential of hydropower and 14,000 MW of geothermal potential. The continent receives abundant solar radiation through the year, and recent studies have confirmed the availability of abundant wind energy resources along some of the coastal

and specific inland areas of Africa. With respect to non-renewable energy, coal resources are available in abundance in Southern Africa. At the end of 2007, the continent had over 117 billion barrels of oil of proven oil reserves and over 14.6 trillion cubic meters of proven gas reserves. However, these energy endowments remain largely underutilized. Africa attained the biggest gain in investment in renewable energy sources among developing countries excluding South Africa. Africa total investment rose from US$750 million to US$3.6 billion, majorly due to strong performance in Egypt.

Kenya as a country is aspiring to become energy secure, with only about 6% of the rural population with access to grid electricity. Decentralized renewable energy systems have enormous potential in meeting immediate energy requirements for isolated institutions, businesses and households in remote areas (Wanjiru & Ochieng, 2013). Prohibitively high connection costs and low incomes among majority of people in developing countries such as Kenyans accelerate low access to energy in spite of the government efforts under the rural electrification programme (Love, 2012). For instance, the cost of rural electrification is estimated to be between US$ 30 to US$ 40 per kWh, compared to an amortized life-cycle cost of solar and battery operated systems of US$ 1 to US$ 2 per kWh (Kiplagat, Wang & Li, 2011).

Even though Kenya has vast renewable energy resources including solar, wind, bio-fuel, biogas, geothermal and hydropower, their application has been limited. The expansion of the renewable energy is being catalyzed by the increasing demand and price of electricity, growing world oil and gas costs and environmental pressure. Biogas energy makes over 70% of total energy consumption in Kenya. Petroleum and electricity, account for approximately 22% and 9% respectively (Mwakubo et al., 2007). The Kenyan energy sector is characterized by the heavy dependence on biogas, low access to modern energy, frequent power outages, over dependence on hydroelectricity and high reliance on imported oil. Renewable energy sources adoption is, hence, significant means to meet the challenges of increasing demand and dealing with the related environmental pressure.

According to Kimuyu, Mutua and Wainaina (2012), installed electric power capacity in Kenya was 1,412.2MW as of December, 2010. This installed capacity could not to meet demand; therefore, the government contracted 60MW of emergency power to bridge the deficit. This was necessary so as to meet the increasing demand and cut down on load-shedding, especially during peak periods. Hydroelectric power is the leading source, accounting for 51.55% of total installed capacity. Thermal (petrol), geothermal, co-generation

and wind contribute 33.2%, 13.38%, 1.84% and 0.36% respectively. Therefore, renewable energy accounts for approximately 67.1%, thus Kenya power generation is now majorly ógreenô. Solar energy technologies harness the energy of direct solar irradiance to create electricity using photovoltaics cells and concentrating solar power to create thermal energy to meet direct lighting requirements as well as to produce fuels that might be used for transport and other purposes which might include heating and cooling (Hemmen, 2011).

Kenya has a high solar energy potential since it receives daily insolation of between 4-6kWh/m2. Solar use in Kenya is majorly for photovoltaic systems, drying and water heating. The Solar photovoltaic systems are used mainly in telecommunication, lighting and water pumping. Currently the country has installed capacity of approximately 4 MW. In addition, the country currently has approximately 140,000 solar water heating systems installed. Currently in Kenya, most renewable energy systems technology is available although market penetration is notably low and existence of these technologies is rarely known by potential users (Mwakubo et al., 2007).

In addition, very few studies have sought to investigate determinants of renewable energy adoption in Kenya. For instance, Lay et al. (2012) found that family income and education influence adoption of solar home systems (SHSs) but the authors did not thoroughly investigate the influence of household characteristics and other economic factors on adoption of SHSs. Although Kenya has vast renewable energy resources such as solar, wind, biomass, bio-fuel, geothermal and hydropower, their use has been limited. Expansion of the sector is being catalysed by the growing demand and cost of electricity, increasing global oil and gas prices and environmental pressure. In Kenya, biomass accounts for over 70% of total consumption. The other sources are petroleum and electricity, which account for about 22% and 9% respectively (Mwakubo et al., 2007).

As evidenced by good government policy and energy planning that aim to ensure a sustainable energy mix, Kenyaôs move towards renewable energy has been broad-based. Investment has grown from virtually zero to more than US$1.3 billion, including funding for wind, geothermal and small hydro capacity of 724MW, and for the production of 22 million litres p.a. of ethanol. Geothermal was the highlight, with the local electricity-generating company, KenGen, securing debt finance for additional units at its Olkaria project (UNEP, 2011). With the new financing arrangement, the company will add 280MW of power to the grid in the next three years. At household level, adoption of solar is still too low.

1.2 Statement of the Problem

In developing countries, lighting is generally thought to rank among the top three uses of energy, with cooking and television, and space heating being of even greater importance (World Bank 2010). In addition, the adaption of renewable energy sources is typically not placed in the context of a specific fuel choice. Yet only in this specific context can renewable adoption of fuel switching be adequately understood. In Kenya, solar household systems seem to be used to a significant extent for lighting (Jacobson, 2006). Less than 44% of the population and 5% of the rural population in Kenya has access to lighting (World Bank, 2010). Adoption of Solar Technology would provide the solution to the evident energy gap but this tends to be negligible in most developing countries. Though the renewable energy sector is not relatively new, its growth in the country is at a low pace as compared to the other developing countries (SREP, 2011).

Most of the Rural Population use Kerosene for lighting and Charcoal or firewood for cooking. These have caused many health problems because of the smoke emitted and also due to burns caused by the open flames. There are some solar lanterns project problems that should be stressed particularly; project risk estimation and risk management, project management ï operation management communication. Be that as it may, notwithstanding the quantifiable advantages management, generally couples of open organizations have consummated the practice (Mateen, 2016).

Several studies have been done in relation to access to renewable energy such as; Gitone (2014) who did a study on determinants of adoption of renewable energy in Kenya. Keriri (2013) assessed factors influencing adoption of solar technology in Lakipia north constituency, Kenya. However, none of the studies reviewed established factors influencing access to solar lanterns project by rural families in Isiolo County, Kenya. This study will therefore bridge this gap by answering the question; what are the factors influencing access to renewable energy focusing solar lanterns project by rural families in Isiolo County, Kenya?

1.3 Purpose of the Study

The study determined the factors influencing access to renewable energy by rural families in Kenya. A case of solar lanterns project in Isiolo County, Kenya.

1.4 Objectives of the Study

The study was guided by the following objectives:

i. To establish how community participation influence access to solar lanterns project by rural families in Isiolo County, Kenya.
ii. To evaluate the influence of alternative sources of energy on access to solar lanterns project by rural families in Isiolo County, Kenya.
iii. To determine the influence of availability of information on access to solar lanterns project by rural families in Isiolo County, Kenya.
iv. To determine the influence of family income level on access to solar lanterns project by rural families in Isiolo County, Kenya.

1.5 Research Questions

The study will seek answers to the following research questions:

i. To what extent does community participation influence access to solar lanterns project by rural families in Isiolo County, Kenya?
ii. How do alternative sources of energy influence access to solar lanterns project by rural families in Isiolo County, Kenya?
iii. To what extent does availability of information influence access to solar lanterns project by rural families in Isiolo County, Kenya?
iv. How does the level of family income influence access to solar lanterns project by rural families in Isiolo County, Kenya?

1.6 Significance of the Study

The project managers in Isiolo County were bound to benefit as the study highlighted key areas of access to renewable energy projects. The findings might further be used as a pilot project by other government corporations hence promoting project ownership and encouraging inclusivity by tapping on indigenous knowledge therefore improving chances and status of project(s) sustainability and peopleôs accessibility.

The findings of this study provided relevant and valuable information on how best to streamline renewable energy sector. The study provided information that could be used to come up with policies that enhance renewable energy development and access thereby contributing to achievement of Kenyaôs Vision 2030.

The findings of this study provided valuable information to companies and dealers of solar lanterns products need to align their business activities and products with the consumersô preferences to be more appealing to the society they serve. However, to increase the uptake

of solar energy in Kenya, it is imperative to understand the factors that affect its accessibility and development. Thus, this study provided insights into the determinants of solar energy adoption and development in Kenya. The study findings were used to further increase engagement of potential consumers into adoption of renewable energy for economic empowerment.

The rural families in Isiolo County will benefit from the finding of the study whereby the county government may use the finding as a pilot project and other corporations hence promoting project ownership and encouraging inclusivity in projects and companies and dealers of solar lanterns products aligned their business activities and products to meet local people preferences and affordability.

Scholars interested in studying the use of renewable energy could use the study findings as entry point in understanding the determinants of adoption of renewable energy. The study provided the most up-to-date data on determinants of access to solar lanterns in Kenya. This study therefore, significantly enriched and broadened existing literature on renewable energy. The research findings layed some foundations for further research on renewable energy.

1.7 Delimitation of the Study

This study was on the factors influencing access to renewable energy by rural families focusing on solar lanterns project by in Isiolo County, Kenya. The study specifically focused on community involvement, and alternative sources of energy, availability of information and family income levels. Isiolo County had been chosen as the study area since it was one of the areas where most government projects are not successfully implemented. The target of the study included; community leaders, county government officials and the rural residents.

1.8 Limitations of the Study

The study anticipated encountering some limitations that would hinder access to information that the study sought. The respondents targeted in this study would be reluctant in giving information fearing that the information being sought would be used to intimidate them or print a negative image about them. The researcher hoped to handle this by carrying an introduction letter from the University to assure them that the information they gave was treated with confidentially and was used purely for academic purposes.

1.9 Basic Assumptions of the Study

The study assumed that there were no serious changes in the composition of the target population that would affect the effectiveness of the study sample. This study also assumed that the respondents were honest, cooperative and objective in the response to the research instruments and were available to respond to the research instruments in time. Finally, the study assumed that the authorities in Isiolo County would grant the required permission to collect data from employees.

1.10 Definition of Significant Terms Used in the Study

The following are the definitions of terms that will be used throughout this study:

Alternative sources of energy: these are diverse sources of energy; both renewable and non-renewable. Some of the most common sources of energy include biomass (wood fuel and charcoal), wind, solar, geothermal, biogas, and coal.

Availability of information: concerns the environment in which the agent operates, the symbol level is system oriented, in that it includes the mechanisms the agent has available to operate. The knowledge level rationalizes the agent's behavior, while the symbol level mechanizes the agent's behavior.

Community involvement: this is people participation in the decision-making and project management process

Family Income level: Refers to sufficiency of an economic or productive factor required accomplishing an activity, or as means to undertake an enterprise and achieve desired outcome.

1.11 Organization of the Study

This study is organized into five chapters. Chapter one contained the introduction to the study. It presented background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the Study, delimitations of the study, limitations of the Study and the definition of significant terms. On the other hand, chapter two reviews the literature based on the objectives of the study. It further looked at the conceptual framework and finally the summary. Chapter three covers the research methodology of the study. The chapter describes the research design, target population, sampling procedure, tools and techniques of data collection, pre-testing, data analysis, ethical

considerations and finally the operational definition of variables. Chapter four presented analysis and findings of the study as set out in the research methodology. The study closed with chapter five which presents the discussion, conclusion, and recommendations for action and further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provided an extensive literature and research related to factors influencing access to renewable energy focusing on solar lanterns project. This literature review summarized a diverse spectrum of views about institutional determinants. The chapter was thus structured into theoretical, conceptual and empirical review. The study also presented the knowledge gap the chapter sought to fulfill.

2.2 Review of Renewable Energy

Solar lanterns use the sunôs energy to produce electricity and therefore result in none of the greenhouse or acid gas emissions associated with electricity generated by the combustion of fossil fuels. The amount of solar energy reaching the earth each year is many times greater than worldwide energy demand, although it varies with location, time of day, and the season. Sunlight is also a widely-dispersed resource, and photovoltaics can capture energy from the sun virtually anywhere on earth. Solar cells convert sunlight directly into electricity using semi-conducting materials similar to those used in computer chips. When sunlight is absorbed by these materials, the solar energy knocks electrons loose from their atoms, allowing the electrons to flow through the materials to produce electricity. This process of converting light (photons) to electricity (voltage) is called the PV effect. Photovoltaic inverter design is now seen as the crucial element in solar power development, despite some of the challenges that can shape PV inverter design. Over the last few years the photovoltaic (PV) market has grown enormously, driven by government feed-in tariffs (FiTs) in response to the need for economies to act smarter in terms of their energy mix (James, 2013).

When placed on existing structured, such as the rooftop of a home or office building, solar energy systems require negligible amount of land space (EPA: Non-hydroelectric Renewable Energy). Utility scale solar farms, on the other hand, do require large amounts of land to produce electricity on a commercial scale (SOLAREIS; Solar Energy Development Environmental Consideration). This fact raises concerns about the potential impact of such projects on natural habitats. The EPA is working to address these concerns by sitting renewable energy projects on contaminated lands and mine sites. Emissions associated with generating electricity from solar technologies are negligible because no fuels are combusted. There are many potential benefits to solar PV installations. Such systems can reduce energy costs, act as a price hedge against rising energy costs, reduce the amount of pollution-rich energy consumed from the grid and also reduce carbon emission. They also capitalise on under-utilised roof or ground space (The Data Centre, 2013).

2.3 Factors influencing access to renewable energy

This study reviewed literature on the factors influencing access to renewable energy as stipulated below.

2.3.1 Community participation and Access to Solar Lanterns

For a long time, community participation and ownership have been considered by most developing countries as important tools to enhance public engagement and ownership over community development projects so as to attain sustainability. Involvement plays a major role in peopleôs management of their own affairs. Ownership and control of resources have a profound impact on involvement in development projects. According to Mathbor (2014), emphasis is made on the following areas as crucial in a participatory service and resource management programs: Community Organization (CO), Community Management (CM), greater economic and social equality, better access to services for all, greater involvement in decision making, and deeper involvement in the organizing process resulting from the empowerment of people. All these are aimed at achieving sustainability in the development projects

Community need to be involved in the decision-making and project management process if they are to remain supportive of the idea or technology being introduced in terms of project undertaking for ownership. In other words, for the purpose of achieving success as a project manager must create an environment of involvement in the running of the project (Ndagi, 2013). Kansas University (2013) defined Stakeholders as those who may be affected by or

have an effect on an effort. They may also include people who have a strong interest in the effort for project, academic, philosophical, or political reasons, even though they and their families, friends, and associates are not directly affected by it. There are three main types of stakeholders: Primary stakeholders - the people or groups that stand to be directly affected, either positively or negatively, by an effort or the actions of an agency, institution, or organization. Secondary stakeholders - are people or groups that are indirectly affected, either positively or negatively, by an effort or the actions of an agency, institution, or organization. The director of an organization might be an obvious key stakeholder, but so might the line staff ï those who work directly with participants ï who carry out the work of the effort. If they donôt believe in what they are doing or donôt do it well, it might as well not have begun.

The need for community participation and ownership has been found to be increasingly important in the successful performance of a project. Indeed, Weisman (2011) found that the degree to which stakeholders are personally involved in the implementation process will cause great variation in their support for that project. According to World Bank (2012), stakeholder involvement is the number one reason for successful projects followed by availability of information and a clear statement of requirements. Further, Jobber (2009) viewed stakeholder consultation as the first stage in a program to implement change. As this factor was derived for the model, stakeholder consultation expresses the necessity of taking into account the needs of stakeholder or users of the project.

Once the project manager is aware of the major community, he is better able to accurately determine if their needs are being met. Urban (1993) established that the most important factor in the success of new product development is to understand the voice of the customer. It was found that stakeholder consultation is more influential in service-oriented projects such as information technology (Ndagi, 2013) and marketing based projects. In addition, to stakeholder consultation at an earlier stage in the project implementation process; it remains of ultimate importance to determine whether the stakeholders for whom the project has been initiated will accept it. Stakeholder acceptance refers to the final stage in the implementation process, at which point the ultimate efficacy of the project is determined. Too often project managers make the mistake of believing that if they handle the other stages of the implementation process well, the stakeholder will accept the resulting project. Stakeholder acceptance is a stage in project implementation that must be managed like any other.

As an implementation strategy, Rossman (2012) discusses the importance of user involvement in the early stages of system development as a way of improving the likelihood of later acceptance. Bean and Radnor (1979) examine the use of intermediaries to act as a liaison between the designer, or implementation team, and the projectôs potential users as a method to aid in stakeholder acceptance. Naidoo (2010) found out that user involvement refers to a psychological state of the individual and is defined as the importance and personal relevance of a system to a user. It is also defined it as the userôs participation in the implementation process. There are two areas for user involvement when the company decides to implement a system: (1) user involvement in the stage of definition of the companyôs system needs, and (2) user participation in the implementation of systems. The function of the system rely on the user to use the system after going live, and recognizes the user as a significant factor in the implementation. In the implementation process, many projects fail due to lack of proper user training.

2.3.2 Alternative Sources of Energy and Access to Renewable Energy

Renewable energy accounts for about 67.1%, which means that power generation in Kenya is now largely ógreenô. Although installed capacity in hydropower has not seen much growth in the last decade, there have been increased initiatives in geothermal exploitation, sustaining the level of clean electricity in the national grid. The solar market in Kenya is among the largest and its usage per capita is the highest among developing countries. Cumulative solar sales in Kenya (since the mid-1980s) are in excess of 200,000 systems, and annual sales growth has regularly topped 15% over the past decade (Jacobson, 2006). Much of this activity is related to the sale of household solar systems, which account for an estimated 75% of solar equipment sales in the country (KEREA, 2009). Compared to countries such as Germany, the existing solar PV market in Kenya remains small. This market is, however, relatively well established compared to other countries in East Africa, such as Tanzania and Uganda. In 2006, the total installed base was about 250,000 units or New installations have averaged about 25,000ï 30,000 units p.a (KEREA, 2009).

Further growth in the solar sub-sector is likely to be held back by market failures and other barriers. Most demand for PV systems is driven by the rural non-electrified private sector, with cash sales being the usual method of transaction. Changes in Kenyaôs power sector since the adoption of the Sessional Paper No. 4, 2004 on a blueprint for the countryôs energy policy have led to new interest in renewable energy. Recent policies have focused on geothermal,

hydropower and co-generation technologies with much less emphasis on PV technology, although the government is currently implementing an electrification scheme for remote schools using solar energy (Ngigi, 2006).

In addition to its energy policy, interest in renewable energy in Kenya has risen due to renewed initiatives in rural electrification and environmental concerns about global warming and air quality. The previous focus on renewable energy responded to two main orientations. Large-scale renewables, such as large hydropower and geothermal projects, were developed in order to improve the security of supply through diversification and reduced exposure to external shocks such as high oil prices. Recently, there has been growing interest in new renewable energy technologies (RET) such as wind, small hydro, and PV energy. These technologies have been developed to expand access to modern energy services, especially in rural and marginalized areas. Although Kenya is well endowed with renewable energy resources, only geothermal, wind and co-generation (generation from bagasse) have been seriously exploited and connected to the national electricity grid (KNBS, 2011).

Solar energy is relatively well developed and has enormous potential due to the countryôs proximity to the equator. Kenya is the third largest market for domestic solar systems after India and China. In fact, Kenya and China are the fastest growing markets, with annual growth rates of 10%ï 12% in recent years, with private dealers providing most solar systems (Arora et al., 2010) although the government has also taken measures to increase uptake of these technologies. The initial markets received donor seed money in the 1980s (Mwakubo et al., 2007), which allowed PV system components to become accepted and available. The government has recently intensified measures to increase the uptake of renewable energy by championing initiatives to adopt these technologies. Some of these initiatives include the fitting of the Ministry of Energy (MoE) offices (Nyayo House), the Office of the President (Harambee House), the Office of the Prime Minister and the Ministry of Finance (Treasury) with solar PV and natural lighting. Funds for this were factored in the National Budget 2011/2012, demonstrating government commitment to these initiatives (Ministry of Finance, 2011).

Kenya has a diverse source of energy; both renewable and non-renewable. Some of the most common sources of energy include biomass (wood fuel and charcoal), wind, solar, geothermal, biogas, and coal. Although all these sources of energy exist, it is worth noting that the exploitation on large-scale of renewable energy in Kenya, apart from geothermal and to some extent, cogeneration of electricity, has largely remained low as most individuals

prefer to use the traditional sources of energy as they are cheap and easily available. In addition to biomass (wood fuel and charcoal), other sources of energy that are commonly used in Kenya, more so in rural areas include solar and wind energy. In most rural households, most alternative that is used have a direct link with the socio-economic status of such households (Mbuthi, 2007). In rural areas, most people can easily afford biomass energy as most homesteads are surrounded by woodlands, farmlands, forests and bush lands; hence, the 45% of dependability on forests for provision of this and 93% dependability on biomass as a source of energy in Kenya. Globally, more than 80% of the rural population in developing countries uses traditional fuels such as wood fuel and kerosene. As a result of these, most people opt to use these sources of energy as these individuals associate electricity with more spending (Ministry of Energy, 2013). On the other hand, Kenya relies heavily on imported petroleum products, which include gas that is used in most homes (GOK, 2002).

In addition to petroleum products including gas, about 83% of the urban residents have access to kerosene and almost 76% use it for cooking and 61% for lighting. As a result of the common nature of kerosene in most households, kerosene is one of the energy sources with a very effective distribution chain that ensures that it reaches the most remote of places. This has been enabled by numerous kerosene retailers who buy kerosene for resale in small quantities, which most rural households can afford. Due to this, it has become a greater challenge to move people from using it to using cleaner sources of energy (Government of Kenya, 2007).

2.3.3 Availability of information and Access to Renewable Energy

The adoption of innovations describes a point in time when the adopter of an innovation decides to use the innovation in question. Rogers (2003) theories that the process of adoption commences with an individual driven by precedent conditions such as a felt need to adopt an innovative product or service. The individual will pass along an innovation decision process at a pace that is influenced by their own level of innovativeness and by the perceived characteristics of the innovation. The decision-making process is aided by communication channels; either mass-media communications or by local channels such as word-of-mouth.

Due to its early development, quite a number of studies have examined adoption in the case of the Kenyan consumer market for SHSs. Track the emergence of the Kenyan SHSs market from the 1980s to the mid1990s. They also report results from a (not representative) survey of approximately 40 SHSs users interviewed near urban centers. This initial analysis of the

Kenyan SHSs market finds that SHSs are purchased by affluent households with above average income that are located near the electricity grid. The authors admit that this counterintuitive finding may be due to a selection bias given that they largely surveyed households in the vicinity of urban centers and hence near the grid.

A more thorough quantitative analysis of the Kenyan SHSs market was carried out by Jacobson (2006), who describes various aspects of the Kenyan SHSs market and presents analyses based on two cross-sectional surveys among rural Kenyan households which were conducted in 2000 and 2001. Jacobson finds that the benefits of solar electrification are captured, primarily by the rural middle class, that solar plays only a modest role in supporting productive activities and education, and that solar electrification is more related to general market forces than to poverty alleviation and sustainable development. Based on the 2000 survey,Jacobson further finds that most SHSs are owned by households in the first three wealth deciles. He characterizes these households as belonging to the rural middle class, with annual household incomes well above USD 2,000 (in current USD). In the paper the further argues that the data suggests a trend towards a deepening of access beyond the middle class, with smaller systems becoming affordable for lower-income households as well.

Komatsu et al. (2011) also assess the determining characteristics for household purchases of SHSS in a case study for three regions in rural Bangladesh that comprises around 600 households. They model a twostep decision, where the household first faces the (binary) decision of whether to purchase a system and then in a second step decides on the size of the panel. The authors find household income, ownership of rechargeable batteries, kerosene consumption, and the number of mobile phones to bekey determinants of SHSS purchases. They especially highlight the level of kerosene consumption as a key determinant. It is worth noting that while the studies on cooking -fuel choice mostly draw on national household surveys, the SHSs adoption literature cited above typically uses smaller surveys, often tailored to one specific research question (e.g. Jacobson 2006; Komatsu et al. 2011).

2.3.4 Family Income Levels and Access to Renewable Energy

One important element of our conceptual framework is the energy -ladder hypothesis. This hypothesis assumes that a householdôs fuel (or energy source) choice depends crucially on the householdôs income level. As income rises, households move first from using traditional fuels, such as wood, to transitional fuels, like kerosene, and then to modern fuels, such as electricity from the grid (Leach 1992). Modern fuels are generally perceived to be superior to

traditional or transitional fuels in efficiency, comfort and ease of use (Farsi et al. 2007). The concept can thus be seen as a stylized extension of the economic theory of the consumer: as income rises, consumers not only demand a larger amount of the good but also change their consumption pattern in favor of higher quality goods (Hosier & Dowd 1987).

The stark differences observed in energy -use patterns between poor and rich countries (Leach 1992) as well as between households with differing income levels within many (developing) countries motivated the energy-ladder hypothesis, which has since served as the basis formany empirical applications in the literature (Gebreegziabher et al. 2011). Indeed, the empirical literature has confirmed that income is one of the main demand-side factors determining household fuel choice. This can be partly explained by the fact that modern fuels often involve a relatively large upfront investment in equipment, which hinders credit - constrained poorer households from using it.

In addition, the adoption of modern fuels may require knowledge and a certain level of education as demand-side factors. On the supply side, there is often a lack of access to markets for modern fuels and the required equipment may not be supplied. All these factors together may explain why so many poor households are prevented from climbing up the energy ladder.

For this household activity the majority of households use firewood, charcoal, kerosene or electricity, with the specific mix varying depending on the setting (Njong,& Johannes 2011). Each household faces a number of mutually exclusive options for cooking fuels and chooses the fuel that maximizes its utility. So-called fuel stacking ï that is, a householdôs combining of different fuels for one purpose (in this case cooking) ï is an aspect that is often discussed in the literature (Acker & Kammen, 1996).

In this case, a single option can be a combination of different fuels. Fuel stacking is therefore addressed in some cases by using typical fuel combinations as choices (Heltberg 2004) and ignored in other cases by considering only the main fuel used by the household (Farsi et al. 2007). The literature on cooking -fuel choice often stem from national house - hold surveys and typically do not include a time dimension. The studies therefore investigate a kind of cross-sectional energy ladder,ò as they do not discuss economic development over time, but rather variations in cross-sectional data ï that is, between rich and poor households. In the following, we review some evidence on the determinants of fuel choices for cooking fuels in developing-country contexts. Heltberg (2004), for example, investigates fuel switching in

urban areas for eight developing countries. He finds a strong link between electrification and the uptake of modern cooking fuels. Other factors that are associated with an increased likelihood of choosing modern fuels are consumption expenditure and education, as well as, in some specifications, the size of the household. In a similar investigation in\ Guatemala, Heltberg(2004) confirms the relevance of income for fuel choice. He also emphasizes the importa nce of non-income factors, such as the cost of fire wood (as firewood is a widely used cooking fuel in Guatemala).

Gebreegziabher et al. (2011) assess the determinants of the adoption of electric mitad cooking appliances for baking bread, among other energy uses, in Northern Ethiopia and the effects of this adoption on urban energy transition The authors' analyze the factors that explain urban householdsô choice of fuel among five options: wood, charcoal, dung, kerosene and electricity. Based on survey data the paper finds that the likelihood of the electric mitad adoption increases with household expenditure, age of household head and family size. Furthermore, fuel choices more generally are found to be determined by the prices of substitutes, household expenditure, age and education of household head, and family size, with the probability of using transitional and modern fuels (such as kerosene and electricity) positively correlated with the price of wood and charcoal, household expenditure, the age and education of the household head.

All of the studies presented above find income or household expenditure to be a key determinant of cooking -fuel choice, in line with the energy-ladder hypothesis. Most authors additionally stress the importance of non -income factors, which vary slightly from case to case but typically include both socioeconomic demand-side factors and supply -side factors, such as fuel prices or electrification rates. While some of these factors are specific to cooking (for example, gender of household head), most are likely to affect lighting -fuel choices as well (for example, education). The above literature on the determinants of cooking -fuel choices is closely linked to empirical studies that analyze SHS adoption. The factors that are of special relevance to SHS up- take should also be included in our lighting-fuel choice analysis, in addition to the more general fuel -choice determinants.

In in the residential sector in most rural settings, affordability is one of the primary factors that determine the ability to pay for a dependable form of energy. As research studies show, most of the individuals living in rural areas are poor and vulnerable; hence most of them mostly depend on traditional sources of energy for sustenance. In a research that was carried in households in Kisumu, IEA (2008) found out that, although most individuals were willing

to be connected with electricity, most lack the required amount of funding to cover the capital and operating costs.

2.4 Theoretical Orientation

This section discusses the theoretical foundation on which the study is anchored. The study will be grounded on resource dependence theory, and public participation theory.

2.4.1 Resource Dependence Theory (RDT)

This theory was developed by Pfeffer and Salancik, (2003). In employing this theory to this study, the researcher looks at factors influencing access to renewable energy. Further, the author argues that the solar lanterns projects under study are dependent on resources, these resources ultimately originate from the environment of such as donors, the environment to a considerable extent contains other organizations, the resources one organization needs are thus often in the hand of other organizations, resources are a basis of power, legally independent organizations can therefore be dependent on each other Jakachira (2013).

In addition by adopting this theory, the researcher also argues that; in as much as organizations are inter-dependent, the theory of Resource Dependence needs a closer examination. Itsô very weakness lies in its very assertions of dependence. According to this theory, organization depends on resources for their survival; therefore, for any organization to achieve sustainability, resources are indispensable. For community based organizations to achieve performance, resources are important. The researcher therefore argues that these resources will not only come in the form of financial resources but for project sustainability, other resources of human for example volunteers and land should be considered. This theory addressed research question two which sought to empty the influence of level of income on access to the solar lanterns projects, the theory will explain the important role that funding plays.

2.4.2 Public Participation Theory

Public participation was institutionalized in the mid-1960s with President Lyndon Johnson's Great Society programs (Cogan & Sharpe, 1986). Erick Erickson is a personality theorist who believes that the most important force driving human behavior and development of personality is the social interaction. He points out that the social environment combined with biological maturation provides each individual with a set of crises that must be resolved. Erick Ericksonôs human development theory comprises of eight psychosocial stages, and the

fourth stage is more relevant to this study. This fourth stage is a period occurring from about six years to twelve years. At this stage the child is expected to learn rudimentary skills via formal education (Baron, Boschee & Jacobson, 2009). The child within the solar lanterns project develops a sense of industry and learns the reward of perseverance and diligence. The child at this stage is ready and willing to learn about how to use tools; machines and methods preparatory for adult work. The child learns to do things well or correctly in comparison to a standard or to others. Society meets these tendencies of the child by creating opportunities for learning and co-operation. Virtues of competence arise during this stage (Sloth-Nielsen, 2014).

The theory underscores the fact that the creation and the ongoing operations of each solar lanterns project are as a result of several actors' activities, who are the stakeholders. The central idea therefore is that a programme/project's success is dependent on how well the organization manages the relationships with key groups such as community in place and others that can affect the realization of the project objectives. This theory gives an understanding of the influence of community participation on access to solar lanterns project

2.5 Conceptual Framework

A conceptual framework is a model that presents and explains the relationship between various variables. In a conceptual framework, there are two types of variables: dependent variable and independent variable (Jabareen, 2009). The conceptual framework of the study can be summarized in the figure 1. It shows the relationship between independent variable and dependent variable. Furthermore, it also shows other factors, moderating and intervening variables that can play in and affect both independent and dependent variables in this study.

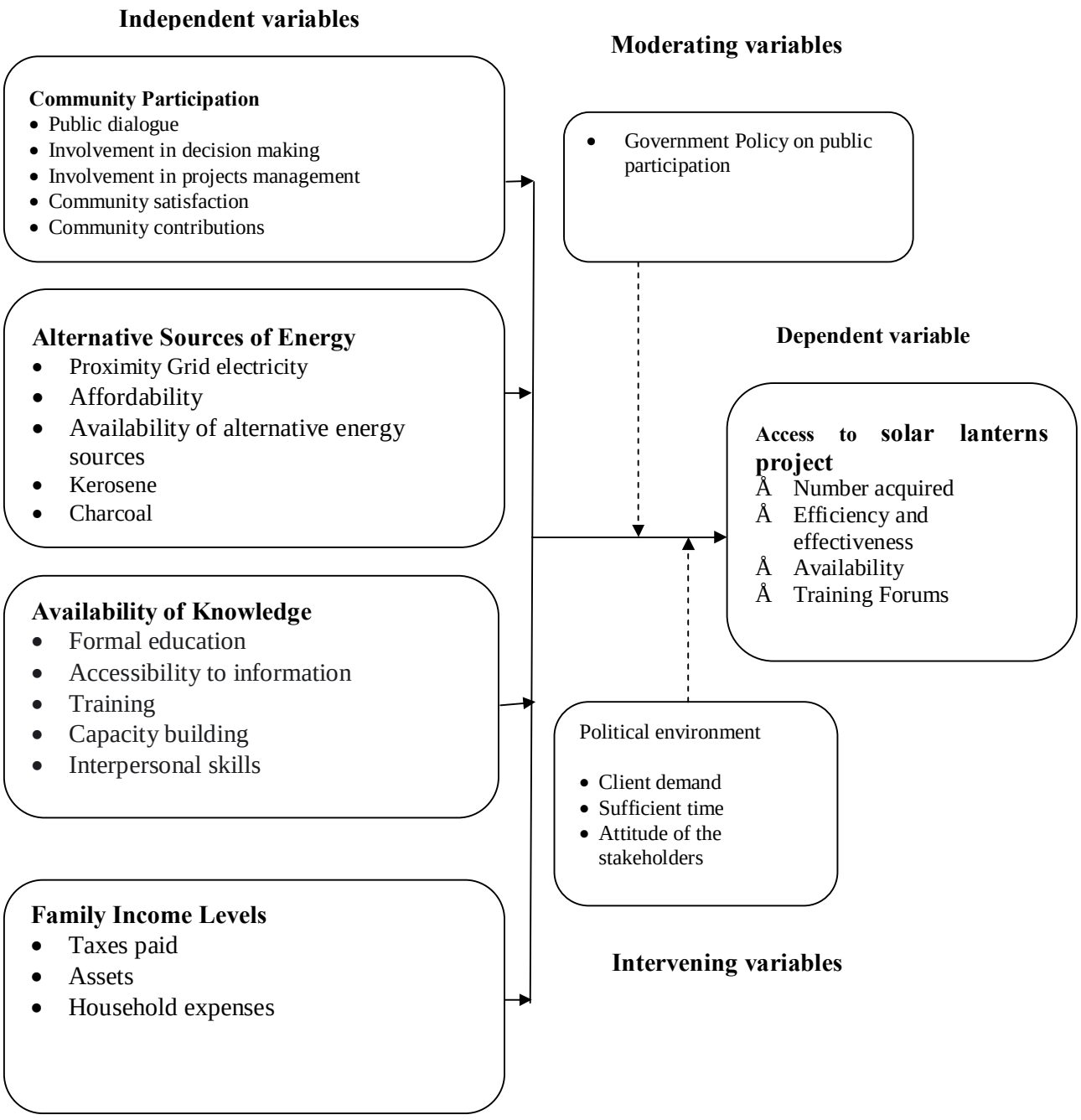

Figure 1: Conceptual framework

2.6 Summary and Research Gaps

This study was grounded on resource dependence theory, stakeholder theory, theory of change and public participation theory. Most of the reviewed studies in this chapter had been conducted in developed countries whose approach to access to renewable energy. The

literature concerning the access to solar lanterns project is limited and typically paints a pessimistic picture of the potential for solar power systems. In summary, the determinants for access to solar lanterns project technologies are typically examined without putting them into the context of a particular fuel choice and often based on non-representative samples and case studies. As lighting fuel choices and the role of lighting in energy use in developing countries have not been investigated as thoroughly as cooking fuel choices, we focus our analysis on the fraction of household energy consumption that goes to lighting.

Locally, Gitone (2014) did a study on determinants of adoption of renewable energy in Kenya. Keriri (2013) assessed factors influencing adoption of solar technology in Lakipia north constituency, Kenya. However, none of the studies reviewed established factors influencing access to solar lanterns project by rural families in Isiolo County, Kenya. This study therefore seeks to fill all these literature gaps by exploring the factors influencing access to renewable energy focusing on solar lanterns project by rural families in Isiolo County, Kenya.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the procedures and techniques that were used in the collection, processing and analysis of data. Specifically, the following subsections were included; research design, target population and sampling, data collection instruments, data collection procedures and finally data analysis.

3.2 Research Design

The study adopted a descriptive research design. A descriptive design was concerned with determining the frequency with which something occurs or the relationship between variables (Bryman & Bell, 2011). Thus, this approach was suitable for the study, since the study intended to collect comprehensive information through descriptions which were helpful for identifying variables. Bryman and Bell (2011) asserts that a descriptive design sought to get information that described existing phenomena by asking questions relating to individual perceptions and attitudes.

3.3 Target population

According to Sekaran and Bougie (2010), a population is the total collection of elements about which we wish to make inferences. The target population for this study composed the community leaders, county government officials and the rural residentôs representatives in Isiolo County as shown in Table 3.1.

Table 3.1: Target Population

	Population	Percentage
Community leaders	56	23.93
County government officials	24	10.26
Rural residentôs representatives	154	65.81
Total	**234**	**100.00**

3.4 Sample size and Sampling Procedures

Sampling is a deliberate choice of a number of people who were to provide the data from which the study drew conclusions about some larger group whom these people represent. The section focused on the sampling size and sampling procedures.

3.4.1 Sampling Size

The sample size is a subset of the population that is taken to be representatives of the entire population (Kumar, 2011). A sample population of 145 was arrived at by calculating the target population of 234 with a 95% confidence level and an error of 0.05 using the formula taken from Kothari (2004).

$$n = \frac{z^2.N.\partial_p^2}{(N-1)e^2 + z^2\partial_p^2}$$

Where; n = Size of the sample,

N = Size of the population and given as 234,

e = Acceptable error and given as 0.05,

∂p = The standard deviation of the population and given as 0.5 where not known,

Z = Standard variate at a confidence level given as 1.96 at 95% confidence level.

The sample size fits within the minimum of 30 proposed by Saunders, Lewis and Thornhill (2012).

Table 3.2: Sampling Frame

	Population	Ratio	Sample
Community leaders	56	0.62	35
County government officials	24	0.62	15
Rural residentôs representatives	154	0.62	96
Total	**234**		**145**

3.4.2 Sampling Procedures

The study selected the respondents using stratified proportionate random sampling technique. Stratified random sampling is unbiased sampling method of grouping heterogeneous population into homogenous subsets then making a selection within the individual subset to ensure representativeness. The goal of stratified random sampling is to achieve the desired

representation from various sub-groups in the population. In stratified random sampling subjects are selected in such a way that the existing sub-groups in the population are more or less represented in the sample (Kothari, 2004). The study used simple random sampling to pick the respondents in each stratum.

3.5 Research Instruments

Primary data was obtained using self-administered questionnaires. The questionnaire was made up of both open ended and closed ended questions. The open-ended questions were used so as to encourage the respondent to give an in-depth and felt response without feeling held back in illuminating of any information and the closed ended questions allow respondent to respond from limited options that had been stated. According to Saunders (2011), the open ended or unstructured questions allow profound response from the respondents while the closed or structured questions are generally easier to evaluate. The questionnaires were used in an effort to conserve time and money as well as to facilitate an easier analysis as they are in immediate usable form.

3.6 Pilot Testing

Pilot testing refers to putting of the research questions into test to a different study population but with similar characteristics as the study population to be studied (Kumar, 2005). Pilot testing of the research instruments was conducted using staff working in Isiolo County since it has a similar setting. 14 questionnaires were administered to the pilot survey respondents who were chosen at random. After one day the same participants were requested to respond to the same questionnaires but without prior notification in order to ascertain any variation in responses of the first and the second test. This was very important in the research process because it assisted in identification and correction of vague questions and unclear instructions. It was also a great opportunity to capture the important comments and suggestions from the participants. This helped to improve on the efficiency of the instrument. This process was repeated until the researcher was satisfied that the instrument did not have variations or vagueness.

3.7 Validity of Research Instruments

According to Golafshani (2012), validity is the accuracy and meaningfulness of inferences, based on the research results. One of the main reasons for conducting the pilot study is to ascertain the validity of the questionnaire. The study used content validity which draws an

inference from test scores to a large domain of items similar to those on the test. Content validity is concerned with sample-population representativeness. Gillham (2011) stated that the knowledge and skills covered by the test items should be representative to the larger domain of knowledge and skills. Expert opinion was requested to comment on the representativeness and suitability of questions and give suggestions of corrections to be made to the structure of the research tools. This helped to improve the content validity of the data that was collected. Content validity was obtained by asking for the opinion of the supervisor, lecturers and other professionals on whether the questionnaire was adequate.

3.8 Reliability of Research Instruments

Instrument reliability on the other hand is the extent to which a research instrument produces similar results on different occasions under similar conditions. It's the degree of consistency with which it measures whatever it is meant to measure (Bell, 2010). Reliability is concerned with the question of whether the results of a study are repeatable. The questionnaire was administered to a pilot group of 14 randomly selected respondents from the target population and their responses used to check the reliability of the tool. This comprise 10% of the sample size. A construct composite reliability co-efficient (Cronbach alpha) of 0.7 or above, for all the constructs, is considered to be adequate for this study (Rousson, Gasser and Seifer, 2012). Reliability coefficient of the research instrument was assessed using Cronbachôs alpha (Ŭ) which is computed as follows:

ȷ =k/k-1× [1-× (S^2)/× S^2sum]

Where:

Ŭ= Cronbachôs alpha

k = Number of responses

× (S^2) = Variance of individual items summed up

× S^2sum = Variance of summed up scores

3.9 Data Collection Procedures

The researcher obtained an introduction letter from the university which was presented to each stakeholder so as to be allowed to collect the necessary data from the respondents. The drop and pick method were preferred for questionnaire administration so as to give respondents enough time to give well thought out responses. The researcher booked

appointment with respondent organizations at least two days before visiting to administer questionnaires. The researcher personally administered the research instruments to the respondents. This enabled the researcher to establish rapport, explain the purpose of the study and the meaning of items that may not be clear as observed by Best and Khan (2003).

3.10 Data Analysis Techniques

Data was analyzed using Statistical Package for Social Sciences (SPSS Version 25.0). All the questionnaires received were referenced and items in the questionnaire were coded to facilitate data entry. After data cleaning which entails checking for errors in entry, descriptive statistics such as frequencies, percentages, mean score and standard deviation were estimated for all the quantitative variables and information presented inform of tables. The qualitative data from the open-ended questions was analyzed using conceptual content analysis and presented in prose

Inferential data analysis was done using multiple regression analysis. Multiple regression analysis was used to establish the relations between the independent and dependent variables. Multiple regressions were used because it is the procedure that uses two or more independent variables to predict a dependent variable. The multiple regression model generally assumed the following equation;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: -

Y= Access to solar lanterns project

β_0=constant

$\beta_1, \beta_2, \beta_3$ and β_4 = regression coefficients

X_1= community involvement

X_2= alternative sources of energy

X_3= availability of information

X_4= income level

ύ=Error Term

In testing the significance of the model, the coefficient of determination (R^2) was used to measure the extent to which the variation in access to solar lanterns project was explained by

the variations of the factors. F-statistic were also computed at 95% confidence level to test whether there was any significant relationship between access to solar lanterns project and the determinants affecting it. All necessary diagnostic tests was performed.

3.11 Ethical Considerations

The researcher observed the following standards of behaviour in relation to the rights of those who became subject of the study or were affected by it: First, in dealing with the participants, they were informed of the objective of the study and the confidentiality of obtained information, through a letter to enable them give informed consent. Once consent was granted, the participants maintained their right, which entailed but was not limited to withdraw or decline to take part in some aspect of the research including rights not to answer any question or set of questions and/or not to provide any data requested; and possibly to withdraw data they have provided. Caution was observed to ensure that no participant was coerced into taking part in the study and, the researcher sought to use minimum time and resources in acquiring the information required. Secondly, the study adopted quantitative research methods for reliability, objectivity and independence of the researcher. While conducting the study, the researcher ensured that research ethics were observed. Participation in the study was voluntary. Privacy and confidentiality was also observed. The objectives of the study were explained to the respondents with an assurance that the data provided was used for academic purpose only.

3.12 Operationalization of Variables

The operationalization of variables is shown in Table 3.3.

Table 3.1: Operationalization of Variables

Objectives	Type of Variable	Indicator	Measurement scale	Tools of analysis	Type of analysis
To establish the influence of community participation on access to solar lanterns project by rural families in Isiolo County, Kenya.	community participation t	Public dialogue Involvement in decision making Involvement in projects management Community satisfaction Community contributions	Ratio Nominal Nominal Nominal Interval	Percentages Mean score	Descriptive statistics Regression analysis
To evaluate the influence of alternative sources of energy on access to solar lanterns project by rural families in Isiolo County, Kenya.	alternative sources	Proximity Grid electricity Affordability Availability of alternative energy sources	Interval Nominal Nominal	Percentages Mean score	Descriptive statistics Regression analysis
To determine the influence of availability of information on access to solar lanterns project by rural families in Isiolo County,	availability of information	Formal education Accessibility to information Training Capacity building Interpersonal skills	Nominal Nominal Interval Interval Nominal	Percentages Mean score	Descriptive statistics Regression analysis

Kenya.					
To determine the influence of family income level on access to solar lanterns project by rural families in Isiolo County, Kenya.	income level	Taxes paid Assets Household expenses	Interval Interval Interval	Percentages Mean score	Descriptive statistics Regression analysis
	Access to solar lanterns project	Number acquired Efficiency and effectiveness Availability Training Forums	Nominal Interval Nominal	Mean score	Descriptive statistics Regression analysis

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter discusses the findings obtained from the primary instrument used in the study. It discusses the characteristics of the respondents, their opinions on the influence of access to renewable energy by rural families in Kenya. A case of solar lanterns project by rural families in Isiolo County, Kenya. The chapter is organized to present the findings by first looking at the response rate, the demographic variables and objectives. In order to simplify the discussions, the researcher provided tables that summarize the collective reactions of the respondents.

4.2 Response rate

The respondents sampled of the study were 145.The questionnaires were administered to all of them but only 112 were returned. This gave a response rate of 77.24 % which is within what Kumar (2008) prescribed as a significant response rate for statistical analysis and hence it was accepted for the study according to Mugenda and Mugenda (2003) recommendation that a response rate of above 70% was appropriate for the study.

Table 4.1: Response Rate

	Number of respondents	**Percent**
Response	112	77.24
Non- Response	33	22.76
Total	**145**	**100**

4.3 Demographic Information

The sought to know general information of the respondents by examining their gender, level of education and their age bracket. This was of great importance for it gave the researcher a hint of who is filling the questionnaires and be able to know if the respondents are the targeted ones and whether the information given is the correct one theyôre seeking.

4.3.1 Gender of the Respondents

The respondents were asked to indicate their gender where the data obtained was presented in Table 4.2.

Table 4.2:Gender of the Respondents

	Frequency	Percent
Male	74	66.1
Female	38	33.9
Total	**112**	**100**

The results in Table 4.2 indicated that most of the respondents were male who were 66.1% while the rest were female as shown by 33.9%. This shows that the study obtained more information from male respondents since most of the rural residentôs representatives are men.

4.3.2 Level of Education of the Respondents

The respondents of this study were asked to indicate their level of education. Their responses were as shown in Table 4.3.

Table 4. 3: Level of Education of the Respondents

	Frequency	Percent
Certificate	45	40.2
Diploma	34	30.4
Degree	28	25
Masters	5	4.5
Total	**112**	**100**

From the findings ,40.2% of the respondents showed that their highest level of education was Certificate, 30.4% showed that their highest level of education was diploma and 25% showed that their highest level of education was degree. The least were 4.5% of the respondents who indicated that their highest level of education was Masters. This implies that most of the respondents were learnt enough to give reliable information on the subject under study.

4.3.3 Age Bracket of the Respondents

The respondents were required to indicate their age bracket. Their responses are as shown in Table 4.4.

Table 4.4: Age Bracket of the Respondents

	Frequency	Percent
20-30 years	20	17.9
31-40 years	18	16.1
41-50 years	58	51.8
51-60 years	16	14.3
Total	**112**	**100**

From the findings most of the respondents were aged at 41-50 years as shown by 51.8%, 17.9% were aged at 20-30 years,16.1% were aged at 31-40 years and the least were 14.3% of the respondents who indicated that they were aged 51-60 years. The results show that most of the respondents were aged above 41-50 years. This meant that they were old enough to have noticed various factors that influence access to renewable energy by rural families and hence the information they gave could be relied upon.

4.4 Factors Influencing Access to Solar Lanterns Project

Descriptive statistics under this section presents findings that were drawn in relation to the research questions as well as the study objectives. The study explored community participation, alternative sources of energy, availability of information and income level.

4.4.1 Community Participation

The respondents gave their opinions on the extent to which communication participation influence access to solar lanterns project by rural families in Isiolo County, Kenya. Their responses are as shown in Table 4.5.

Table 4.5 : Influence of Communication Participation on access to solar lanterns

	Frequency	Percent
Little extent	9	8
Moderate extent	30	26.8
Great extent	48	42.9
Very great extent	25	22.3
Total	**112**	**100**

The results show that communication participation greatly influence access to solar lanterns project as indicated by 42.9%, moderately as shown by 26.8%, in a very great extent as shown by 22.3% and in a little extent as shown by 8%. This implies that community participation has a greater influence on access to solar lanterns project.

The respondents were required to determine the extent of community participation aspects influence on access to solar lanterns project. Table 4.6 presents their opinions.

Table 4.6: Influence of Community Participation on access to solar lanterns

	Mean	Std. Dev.
Public dialogue	3.929	0.654
Involvement in decision making	2.518	1.245
Involvement in projects management	3.991	0.811
Community satisfaction	4.339	0.679
Community contributions	3.241	1.050

The respondents indicated that communication satisfaction as shown by a mean of 4.339, involvement in projects management as shown by a mean of 3.991 and public dialogue as shown by a mean of 3.929 influence access to solar lanterns project in a great extent. The results further revealed that community contributions as expressed by an average of 3.241 and involvement in decision making as shown by a mean of 2.518 influence access to solar lanterns project in a moderate extent.

4.4.3 Alternative Sources of Energy

The researcher asked the respondents to indicate their opinions on which extent does alternative sources of energy influence access to solar lanterns project. Their results are as shown in Table 4.7.

Table 4.7: Influence of Alternative Sources of Energy on access to solar lanterns

	Frequency	Percent
Little extent	21	18.8
Moderate extent	27	24.1
Great extent	43	38.4
Very great extent	21	18.8
Total	**112**	**100**

From the study findings, the respondents indicated that with a great extent alternative sources of energy influence access to solar lanterns project as shown by 38.4%, with a moderate extent as shown by 24.1% and with both little extent and very great extent influence access to solar lanterns project as shown by 18.8%. As per the findings it is revealed that alternative sources of energy influence access to solar lanterns project greatly.

The respondents gave their opinions on the influence of alternative sources of energy aspects on access to solar lanterns project. The opinions are presented in Table 4.8

Table 4.8: Influence of Alternative Sources of Energy on access to solar lanterns

	Mean	Std. Dev.
Proximity Grid electricity	4.366	0.771
Affordability	4.339	0.679
Availability of alternative energy sources	3.545	1.030
Kerosene	2.732	1.074
Charcoal	1.938	0.913

The respondents indicated that proximity grid electricity as illustrated by a mean of 4.366 and affordability as shown by a mean of 4.339 and availability of alternative energy sources as illustrated by a mean of 3.545 influence access to solar lanterns project in a great extent. The respondents also indicated that Kerosene as illustrated by a mean of 2.732 influence access to

solar lanterns project in a moderate extent. However, the respondents indicated that Charcoal as illustrated by a mean of 1.938 influence access to solar lanterns project in a low extent.

4.4.4 Availability of information and access to solar lanterns

The respondents gave their opinions on what extent does availability of information influence access to solar lanterns project. Their responses were as shown in Table 4.9.

Table 4.7: Influence of availability of information on access to solar lanterns

	Frequency	Percent
Little extent	10	8.9
Moderate extent	35	31.3
Great extent	53	47.3
Very great extent	14	12.5
Total	**112**	**100**

Results presented in Table 4.9 showed that the respondents indicated that availability of information influence access to solar lanterns project with a great extent as shown by 47.5%, with a moderate extent as shown by 31.3%, and with a very great extent as shown by 12.5%. However, the results also indicated that the respondents influence access to solar lanterns project with a little extent as shown by 8.9%. This implies that there is a greater influence of availability of information on access to solar lanterns project.

The respondents were asked to indicate their opinions on how availability of information aspects influence access to solar lanterns project. Their replies were as shown in Table 4.10.

Table 4.10: Influence of availability of information on access to solar lanterns

	Mean	Std. Dev.
Formal education	4.339	0.679
Accessibility to information	4.366	0.771
Training	3.634	1.004
Capacity building	3.563	0.966
Interpersonal skills	2.142	0.758

Respondents indicated that formal education as shown by a mean of 4.339, accessibility to information as illustrated by a mean of 4.366, training as illustrated by a mean of 3.634 and capacity building as shown by a mean of 3.563 was found to influence access to solar lanterns project in a great extent. However, the respondents also indicated that interpersonal skills as shown by a mean of 2.142 influence access to solar lanterns project lightly.

4.4.5 Income Level and access to solar lanterns

The respondents were asked to indicate their opinions on what extent income level influence access to solar lanterns project. Their responses were as shown in Table 4.11.

Table 4.8: Influence of family Income Level on access to solar lanterns

	Frequency	Percent
Not at all	4	3.6
Little extent	13	11.6
Moderate extent	13	11.6
Great extent	35	31.3
Very great extent	47	42
Total	112	100

From Table 4.11, the respondents indicated that family income level influence access to solar lanterns project with a very great extent as shown by 42%, with a great extent as shown by 31.3% and with a moderate extent and little extent as shown by 11.6%. The respondents also indicated that income level did not influence access to solar lanterns project as shown by 3.6%. The study findings imply that there is a great influence of income level on access to solar lanterns project.

The respondents were asked to give their opinions concerning influence of income level aspects on access to solar lanterns project. Their responses were as presented in Table 4.12.

Table 4.9: Influence of family Income Level on access to solar lanterns

	Mean	Std.Dev
Taxes paid	3.027	0.716
Assets	3.446	1.003
Household expenses	4.339	0.679

Table 4.12 indicates that household expenses as shown by a mean of 4.339 influences access to solar lanterns project in a great extent. In addition, the respondents indicated that assets as shown by a mean of 3.446 and taxes paid as shown by a mean of 3.027 influences access to solar lanterns project in a moderate extent.

4.4.6 Access to Solar Lanterns Project

The respondents were asked to give their opinions concerning aspects of access to solar lanterns project aspects for the last five years. Their responses were as shown in Table 4.13.

Table 4.10: Trend of aspects of Access to Solar Lanterns Project

	Mean	Std. Dev.
Number acquired	3.830	1.012
Efficiency and effectiveness	3.420	1.213

Availability	3.580	1.152
Training Forums	3.027	0.716

The respondents indicated that number acquired as illustrated by a mean of 3.830 while availability as illustrated by a mean of 3.580 had improved for the last five years. However, efficiency and effectiveness as illustrated by a mean of 3.420 and training forums as shown by a mean of 3.027 had remained constant for the last five years.

4.5 Multiple Regression Analysis

Multiple regression analysis was conducted as to determine the relationship between community participation, alternative sources of energy, availability of information and income level against the dependent variable access to solar lanterns project. After running the selected data through SPSS, a statistical model was generated.

Table 4.11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.889	0.791	0.783	1.402

From the findings, Table 4.16 is a model fit which establish how fit the model equation fits the data. The adjusted R^2 was used to establish the predictive power of the study model and it was found to be 0.783 implying that 78.3% of the variations in access to solar lanterns project are explained by changes in community participation, alternative sources of energy, availability of information and income level.

Table 4.12: Analysis of Variance (ANOVA)

Model		Sum of Squares	Df	Mean Square	F	Significance.
1	Regression	818.483	4	204.621	101.327	.000
	Residual	216.076	107	2.019		
	Total	**1034.559**	**111**			

The probability value of 0.000 indicates that the regression relationship was highly significant in predicting how the community participation, alternative sources of energy, availability of information and income level affected access to solar lanterns project in Isiolo County, Kenya. The F calculated at 5 per cent level of significance was 101.327. Since F calculated is greater than the F-critical (value = 2.871), this shows that the overall model was significant.

Table 4.13: Regression Coefficients

	Un standardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	2.534	0.155		16.348	.000
Community participation	0.889	0.293	0.931	3.034	.004
Alternative sources of energy	0.831	0.344	0.872	2.416	.020
availability of information	0.811	0.239	0.886	3.393	.015
Income level	0.809	0.278	0.861	2.910	.005

The regression equation obtained from this outcome was: -

$$\mathbf{Y = 2.534 + 0.889\ X_1 + 0.831\ X_2 + 0.811\ X_3 + 0.809\ X_4.}$$

From the findings the study found that if all independent variables were held constant at zero, then the access to solar lanterns project will be 2.534. From the findings the coefficient for community participation is 0.889 which is significant since p=0.004 is less than 0.05, meaning that a unit change in community participation leads to a 0.889-unit change in access to solar lanterns project. The study also found that a unit change in alternative sources of energy changes would lead to 0.831 units change in access to solar lanterns project. The variable was significant since p-value=0.020<0.05.

The study further found that a unit change in availability of information would lead to 0.811 units change in access to solar lanterns project. The variable was significant since p-value=0.015<0.05. Finally, the study revealed that income level would lead to 0.809 units change in access to solar lanterns project if all other variables are held constant and the variable was significant since p-value=0.005<0.05.

Finally, community participation had the greatest influence on access to solar lanterns project followed by alternative sources of energy in Isiolo County, Kenya, followed by availability of information then income level had the least influence on access to solar lanterns project. All variables were significant since their p-values were less than 0.05.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives summary of the data findings, discussion of the data findings, conclusion drawn from the findings highlighted and recommendation made. The conclusions and recommendations drawn are focused on addressing the objective of the study.

5.2 Summary of the Findings

This section focused on the key variables discussed in chapter four and give a summary of those findings.

5.2.1 Community Participation and access to solar lanterns

The study sought to establish how community participation influence access to solar lanterns project by rural families in Isiolo County, Kenya. The study found that community participation has a greater influence on access to solar lanterns project. It was found out that communication satisfaction, involvement in projects management and public dialogue influence access to solar lanterns project in a great extent. The results further revealed that community contributions and involvement in decision making influence access to solar lanterns project in a moderate extent.

5.2.2 Alternative Sources of Energy and access to solar lanterns

The study sought to determine the influence of availability of information on access to solar lanterns project by rural families in Isiolo County, Kenya. As per the findings it is revealed that alternative sources of energy influence access to solar lanterns project greatly. Further it was indicated that proximity grid electricity, affordability and availability of alternative energy sources influence access to solar lanterns project greatly. It was also indicated that Kerosene influence access to solar lanterns project in a moderately. However, it was also indicated that Charcoal influence access to solar lanterns project lowly.

5.2.3 Availability of information and access to solar lanterns

The sought to assess the influence of availability of information on access to solar lanterns project by rural families in Isiolo County, Kenya. It was found that there is a greater influence of availability of information on access to solar lanterns project. From the results it was

indicated that formal education, accessibility to information, training and capacity building was found to influence access to solar lanterns project greatly. However, it was also indicated that interpersonal skills influence access to solar lanterns project lightly.

5.2.4 family Income Level and access to solar lanterns

The study sought to determine the influence of family income level on access to solar lanterns project by rural families in Isiolo County, Kenya. The study findings found that there is a great influence of income level on access to solar lanterns project. The results indicated that household expenses influence access to solar lanterns project in a great extent. In addition, it was also indicated that assets and taxes paid influences access to solar lanterns project moderately.

5.3 Discussion of the Findings

This section links the findings of the study with literature in chapter two.

5.3.1 Community Participation and access to solar lanterns

The study found that community participation has a greater influence on access to solar lanterns project. This was in line with Weisman (2011) who stated that the need for community participation and ownership has been found to be increasingly important in the successful performance of a project. The degree to which stakeholders are personally involved in the implementation process will cause great variation in their support for that project. According to World Bank (2012), stakeholder involvement is the number one reason for successful projects followed by executive availability of information and a clear statement of requirements.

It was found out that communication satisfaction, involvement in projects management and public dialogue influence access to solar lanterns project in a great extent. This was in line with Urban (1993) who established that the most important factor in the success of new product development is to understand the voice of the customer. It was found that stakeholder consultation is more influential in service-oriented projects such as information technology and marketing-based projects.

The results further revealed that community contributions and involvement in decision making influence access to solar lanterns project in a moderate extent. This concurred with Ndagi (2013) who stated that community need to be involved in the decision-making and project management process if they are to remain supportive of the idea or technology being

introduced in terms of project undertaking for ownership. In other words, for the purpose of achieving success as a project manager must create an environment of involvement in the running of the project.

5.3.2 Alternative Sources of Energy and access to solar lanterns

As per the findings it is revealed that alternative sources of energy influence access to solar lanterns project greatly. This was in line with findings of KNBS (2011) who stated although Kenya is well endowed with renewable energy resources, only geothermal, wind and co-generation (generation from bagasse) have been seriously exploited and connected to the national electricity grid.

Further it was indicated that proximity grid electricity, affordability and availability of alternative energy sources influence access to solar lanterns project greatly. It was also indicated that Kerosene influence access to solar lanterns project in a moderately. These findings were same as of Government of Kenya (2007) who asserted that as a result of the common nature of kerosene in most households, kerosene is one of the energy sources with a very effective distribution chain that ensures that it reaches the most remote of places. This has been enabled by numerous kerosene retailers who buy kerosene for resale in small quantities, which most rural households can afford. Due to this, it has become a greater challenge to move people from using it to using cleaner sources of energy.

However, it was also indicated that Charcoal influence access to solar lanterns project lowly. These findings concur with Mbuthi (2007) who stated that in addition to biomass (wood fuel and charcoal), other sources of energy that are commonly used in Kenya, more so in rural areas include solar and wind energy. In most rural households, most alternative that is used have a direct link with the socio-economic status of such households.

5.3.3 Availability of information and access to solar lanterns

It was found that there is a greater influence of availability of information on access to solar lanterns project. This concur with Rogers (2003) who stated that the adoption of innovations describes a point in time when the adopter of an innovation decides to use the innovation in question. The process of adoption commences with an individual driven by precedent conditions such as a felt need to adopt an innovative product or service.

From the results it was indicated that formal education, accessibility to information, training and capacity building was found to influence access to solar lanterns project greatly.

However, it was also indicated that interpersonal skills influence access to solar lanterns project lightly. These findings were similar with those of Jacobson (2006) who found that the benefits of solar electrification are captured, primarily by the rural middle class, that solar plays only a modest role in supporting productive activities and education, and that solar electrification is more related to general market forces than to poverty alleviation and sustainable development.

5.3.4 Family Income Level and access to solar lanterns

The study findings found that there is a great influence of income level on access to solar lanterns project. These findings concur with Leach (1992) who stated that as income rises, households move first from using traditional fuels, such as wood, to transitional fuels, like kerosene, and then to modern fuels, such as electricity from the grid.

The results indicated that household expenses influence access to solar lanterns project in a great extent. In addition, it was also indicated that assets and taxes paid influences access to solar lanterns project moderately. This was the same as Heltberg (2004) who stated that for example, investigates fuel switching in urban areas for eight developing countries. He finds a strong link between electrification and the uptake of modern cooking fuels. Other factors that are associated with an increased likelihood of choosing modern fuels are consumption expenditure and education, as well as, in some specifications, the size of the household.

5.4 Conclusion

The study concluded that community participation has a greater influence on access to solar lanterns project. It was deduced that communication satisfaction, involvement in projects management and public dialogue influence access to solar lanterns project in a great extent. The results further revealed that community contributions and involvement in decision making influence access to solar lanterns project in a moderate extent.

As per the findings it is was concluded that alternative sources of energy influence access to solar lanterns project greatly. Further it was deduced that proximity grid electricity, affordability and availability of alternative energy sources influence access to solar lanterns project greatly. It was also deduced that Kerosene influence access to solar lanterns project in a moderately. However, it was also concluded that Charcoal influence access to solar lanterns project lowly

It was concluded that there is a greater influence of availability of information on access to solar lanterns project. From the results, it was deduced that formal education, accessibility to information, training and capacity building was found to influence access to solar lanterns project greatly. However, it was also inferred that interpersonal skills influence access to solar lanterns project lightly.

It was finally concluded that there is a great influence of family income level on access to solar lanterns project. The results inferred that household expenses influence access to solar lanterns project in a great extent. In addition, it was also deduced that assets and taxes paid influences access to solar lanterns project moderately.

5.5 Recommendations

This finding suggests the need for government and other stakeholders to create awareness and sensitize the learned people regarding the benefits of adopting solar energy. This would ultimately increase adoption of solar energy among the educated people.

The study recommends that Government of Kenya and especially the Ministry of Energy should provide training and education to increase the availability of information and awareness on the use of solar energy. This can be done through seminars, workshops and public barazas where members are invited for training and demonstration on the use and benefits of solar energy.

The study further found that there is high cost of the solar equipment and the fact that most of the people did not have regular income and therefore had very low chances of accessing loans meant that they were unable to afford solar equipment. The study thus recommends Government should consider zero rating tax on Solar equipment so as to influence lower pricing thus making it more affordable for purchase and installation of solar system. This would be of assistance especially for the people living in the rural areas. Alternatively, the government could arrange for a plan that allows households to pay an agreeable small amount of money per month in a bid to increase the use of solar energy

The Community used other sources of Energy, which were mostly wood based. The county Councils need to get involved as energy solution providers regardless of the availability of alternative/substitute of other sources of energy. Solar power will eventually help the councils achieve better forest cover as communities turn to solar and use less wood-based fuel. The community should be encouraged to harness solar technology since it is cheaper

and easily accessible compared to other sources of energy given that the community comes from a remote area where the sun is abundant.

The Grid Electricity in most of Isiolo is far from the community settlements and the likelihood of majority of the people living here getting grid electricity in the near future is slim. This means that Kenya Power needs to identify the opportunity provided by the gap in Isiolo and indeed in Kenya and import, sell and install solar systems that provide more than just lighting as the opportunity is there to assist other Kenyans who are not served by the Grid Electricity to access better energy solutions.

The study recommends that there should be timely release of funds as a way to ensure completion of projects within the stipulated time. In order to create a sense of ownership and ensure sustainability of the solar lanterns projects, project implementers need to build in community participation in their project designs, implementation and other decision-making processes.

To be able to implement effective and sustainable projects that are evidence based, solar lanterns project implementers also need to ensure that monitoring is an integral part of their projects and that lessons learnt are properly documented and used to inform future projects.

The government also needs to support and provide incentives for investments in alternative power sources. This need to be seen as complementing solar lanterns project efforts to improve and increase accessibility while at the same time promoting the use of renewable energy as opposed to fossil generated electricity

5.6 Suggestions for Further Studies

Since this study was limited to Isiolo County, the study recommends the same study should be done based on other counties in Kenya to determine the influence of access to solar lanterns project.

Further research is necessary as the findings were based on a relatively small sample that may have influenced the nature of results that were obtained. There is need to expand on the sample size and carry out similar research in other locations.

More research on the individual variable that is community participation, alternative sources of energy, availability of information and income level to enhance deep and through understanding of influences of each variable on access to solar lanterns project.

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APPENDICES

Appendix I: Letter of Transmittal of Research Instruments

P.O Box 66-60300

Isiolo.

Dear Sir/ Madam,

RE: ACADEMIC RESEARCH PROJECT

I am a Master of Arts in Project Planning and Management student at University of Nairobi. I wish to conduct a research entitled Factors Influencing Access to Renewable Energy in Kenya.A Case of Solar Lanterns Project by Rural Families in Isiolo County, Kenya. A questionnaire has been designed and will be used to gather relevant information to address the research objective of the study. The purpose of writing to you is to kindly request you to grant me permission to collect information on this important subject from your organization.

Please note that the study will be conducted as an academic research ant the information provided will be treated in strict confidence. Strict ethical principles will be observed to ensure confidentiality and the study outcomes and reports will not include reference to any individuals.

Your acceptance will be highly appreciated.

Yours faithfully,

Patrick Nzai Kitsao

L50/89306/2016

Appendix II: Research Questionnaire

This questionnaire is to collect data for purely academic purposes. The study seeks to investigate the *factors influencing access to renewable energy in Kenya. A case of solar lanterns project by rural families in Isiolo County, Kenya*. All information will be treated with strict confidence. Do not put any name or identification on this questionnaire.

Answer all questions as indicated by either filling in the blank or ticking the option that applies.

SECTION A: DEMOGRAPHIC INFORMATION

SECTION A: Background Information (Please tick (ã) appropriate answer)

1) Please indicate your gender: Female [ ] Male [ ]
2) State your highest level of education

Certificate [ ] Diploma [ ] Degree [ ] Masters [ ] PhD [ ]

Others (Specify) ----------

3) Please Indicate your age bracket 20-30 yrs [ ] 31-40 yrs [ ]

41-50 yrs [ ] 51 ï 60 [ ]

Community Participation

4) To what extent does community participation affect access to solar lanterns project by rural families in Isiolo County, Kenya?

Not at all	[ ]	Low extent	[ ]
Moderate extent	[ ]	Great extent	[ ]
Very great extent	[ ]		

5) To what extent do the following affect access to solar lanterns project by rural families in Isiolo County, Kenya?

	Very great extent	Great extent	Moderate extent	Low extent	Not at all
Public dialogue					
Involvement in decision making					
Involvement in projects					

management					
Community satisfaction					
Community contributions					
Public dialogue					

6) In your view how do the above aspects of community participation influence access to solar lanterns project by rural families in Isiolo County, Kenya?
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é é
é é é é é é é é é é

7) To what extent do the following affect access to solar lanterns project by rural families in Isiolo County, Kenya?

	Very great extent	Great extent	Moderate extent	Low extent	Not at all
Knowledge on solar energy					
Experience					
Strategic agility					
Leadership Style					
Commitment					
Information sharing					

Alternative sources of energy

8) To what extent do alternative sources of energy affect access to solar lanterns project by rural families in Isiolo County, Kenya?

Not at all [ ] Low extent [ ]
Moderate extent [ ] Great extent [ ] Very great extent [ ]

9) To what extent do the following affect access to solar lanterns project by rural families in Isiolo County, Kenya?

	Very great extent	Great extent	Moderate extent	Low extent	Not at all
Proximity Grid electricity					
Affordability					
Availability of alternative energy					

sources					
Kerosene					
Charcoal					

10) In what way do alternative sources of energy affect access to solar lanterns project by rural families in Isiolo County, Kenya?

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11) **Availability of information**

To what extent does availability of information affect access to solar lanterns project by rural families in Isiolo County, Kenya?

Not at all [ ]

Low extent [ ]

Moderate extent [ ]

Great extent [ ]

Very great extent [ ]

12) To what extent do the following affect access to solar lanterns project by rural families in Isiolo County, Kenya?

	Very great extent	Great extent	Moderate extent	Low extent	Not at all
Formal education					
Accessibility to information					
Training					
Capacity building					
Interpersonal skills					

13) In your view how does availability of information affect access to solar lanterns project by rural families in Isiolo County, Kenya?

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Income Level

14) To what extent does income level affect access to solar lanterns project by rural families in Isiolo County, Kenya?

Not at all [ ]

Low extent [ ]

Moderate extent [ ]

Great extent [ ]

Very great extent [ ]

15) To what extent do the following affect access to solar lanterns project by rural families in Isiolo County, Kenya?

	Very great extent	Great extent	Moderate extent	Low extent	Not at all
Taxes paid					
Assets					
Household expenses					

16) In your view how does income level affect access to solar lanterns project by rural families in Isiolo County, Kenya?

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é é

Access to Solar Lanterns Project

17) What is the trend of the following aspects of access to solar lanterns project for the last 5 years? Where, 5 = greatly improved, 4= improved, 3= constant, 2= decreased, 1 = greatly decreased

	1	**2**	**3**	**4**	**5**
Number acquired					
Efficiency and effectiveness					
Availability					
Training Forums					

Thank you for participating