FACTORS AFFECTING ADOPTION OF SOLAR POWER ENERGY PROJECTS AMONG HOUSEHOLDS IN BARINGO COUNTY, KENYA

Snowy Jepkoech.
Master Student, Mount Kenya University, Kenya.
Dr. Ruth Winnie Munene.
Lecturer, Faculty of Business and Management Sciences, Mount Kenya University, Kenya.

International Academic Journal of Human Resource and Business Administration (IAJHRBA) | ISSN 2518-2374

Received: 19th June 2024

Published: 23rd June 2024

Full Length Research

Available Online at: https://iajournals.org/articles/iajhrba_v4_i4_218_249.pdf

Citation: Jepkoech, S., Munene, R. W. (2024). Factors affecting adoption of solar power energy projects among households in Baringo County, Kenya. *International Academic Journal of Human Resource and Business Administration, 4*(4), 218-249.

ABSTRACT

Kenya being on the equator experiences enough solar energy of between 4-6 KWh/M2 which provides excellent opportunity for solar energy development. Kenya envisions transforming itself into a newly-industrializing, middle-income country by 2030, with a globally competitive and prosperous economy and high quality of life in a clean and secure environment. To achieve this vision, energy is identified as one of the foundations and enablers of the socio-economic transformation envisaged in the country. Nonetheless, only 49% of Kenyans have access to Grid Electricity meaning Solar energy provides Kenyan government with the opportunity to address energy challenges without the need for expensive power generation projects, transmission and distribution networks despite the huge potential the country possesses. There has been a lot of criticism, from various quarters, on the way the county government of Baringo, Kenya solar projects are managed. The purpose of the study was to establish the factors affecting adaptation of solar energy projects among households in Baringo County, Kenya. The study was guided by the following objectives: To establish the influence of alternative sources of energy and level of household income on adaptation of solar energy projects in Baringo County, Kenya. The study was based on resource dependence theory and public participation theory. The study adopted descriptive research design. The population for this study were 364 respondents comprising of solar project managers, community leaders, and community representatives. A sample size of 225 was selected from the target population using stratified random sampling technique. After data collection, it was analyzed. Descriptive statistics was computed and presented in form of frequencies, percentages, mean and standard deviation. Inferential data analysis was e presented using multiple correlation and regression analysis to show the relationship between the variables. Based on the findings the study concluded that there was a moderate positive and statistically significant correlation between alternative sources of energy and adoption of solar power energy. ($r = 0.463$; $p < 0.05$). There was a moderate positive and statistically significant correlation between income of households and adoption of solar power energy ($r = 0.476$; $p < 0.05$). Based on the findings of the study, the researcher recommended alternative sources of energy that are ecofriendly should be encouraged in this case solar power energy in Baringo county, Kenya.

INTRODUCTION

Background

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, 2016). 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, 2016). 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, 2017). 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, 2017).

Global perspective on solar energy

Global investments in renewable energy increased by 32% in 2018, to a record US$211 billion mainly because of wind-farm development in China and small-scale solar PV installations in Europe (UNEP, 2017). 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. India's 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 2019–2020, 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 FY2017–2018. 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., 2019).

Regional perspective on solar energy

African continent is gifted with huge renewable and non-renewable energy sources. Some estimates show that the continent has 3,570TWh potential of hydroelectric power and 19,000 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, 2015). For example, only about 5% of the continent's hydroelectric power potential has been exploited, whereas the same figure for geothermal is0.6%. 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, 2016).

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, 2016). 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. 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 2017, 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$780 million to US$3.9 billion, majorly due to strong performance in Egypt.

In Egypt, which is Kenya's main competitor within the COMESA region, investment in renewable energy rose by US$9800 million to just over US$1.65 billion as a result of just two deals, a 100MW solar thermal project in Kom Ombo, and a 220MW onshore wind farm in the Gulf of El Zeit. The country's next move in renewable energy is likely to be a tender for several hundred MW of wind projects in the Gulf of Suez region (UNEP, 2019). 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 catalyzed by the growing demand and cost of electricity, increasing global oil and gas prices and environmental pressure.

Local perspective on solar energy

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., 2017).

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, 2018). Prohibitively high connection costs and low incomes among majority of people in developing countries such as Kenyans accelerate low access to energy despite the government efforts under the rural electrification program (Love, 2016). 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, 2017).

Even though Kenya has vast renewable energy resources including solar, wind, biofuel, 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., 2017). 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.

Currently, the Kenyan energy sector is characterized by the heavy reliance on unsustainable biomass use, frequent power outages, low access to modern energy, over reliance on hydroelectricity and high dependence on oil imports. Renewable energy is, therefore, an important and timely means to meet the challenges of growing demand and addressing the related environmental concerns. Kenya's Least Cost Power Plan (LCPP) aims to identify new generation sources to enable the national electricity supply to respond to demand, taking into account the 15% margin required to ensure its security.

In the light of frequent droughts and the increase in oil prices, there has been emphasis on developing alternative energy resources especially geothermal, solar, wind and coal. Since power projects take time to construct, there will be measures to fast-track implementation of the power projects in the master plan, to ensure adequate energy supply to meet the demand over the MTP period (Ministry of Finance, 2016). As evidenced by good government policy and energy planning that aim to ensure a sustainable energy mix,

Kenya's 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).

According to Kimuyu, Mutua and Wainaina (2018), installed electric power capacity in Kenya was 1,412.2MW as of December 2019. This installed capacity could not to meet demand; therefore, the government contracted 60MW of emergency power to bridge the deficit. This was necessary 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 'green'. Solar energy technologies harness the energy of direct solar irradiance to create electricity using photovoltaic 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, 2019).

In addition, very few studies have sought to investigate determinants of renewable energy adoption in Kenya. For instance, Lay et al. (2018) 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 catalyzed 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., 2017).

As evidenced by good government policy and energy planning that aim to ensure a sustainable energy mix, Kenya's 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 to produce 22 million liters 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, 2017). 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.

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 2019). 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 due to burns caused by the open flames. 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, 2016). Less than 44% of the population and 5% of the rural population in Kenya has access to lighting (World Bank, 2019). 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, 2017).

Given the importance of the energy sector, procedures have evolved to help keep watch so that such projects are well managed to facilitate their performance success. Solar energy projects are among the most deliberated upon energy issues in Kenya. It has been at the center of national and regional energy policy agenda and different actors both state and non- state have taken steps to resolve the energy deficiency.
Although project failure in mainstream project management has received a lot more attention than project performance, there are quite some significant studies on factors that impact project performance. Many researchers including (Naomi, 2016) has investigated indicators of project success and impact on policy process in Kenya project performance and as a result, have provided several factors believed to affect project performance. Accordingly, proper project design, realistic budget estimates, realistic timeframes, effective communication, secure funding, institutional strengths, prudent risk management among others abound in project management literature as some determinants of how a project performs.

However, literature on how project performance for solar energy projects is impacted by the four variables (economic factors, government involvement, stakeholder participation, and project management) especially in Kenya though available is still not fully developed (Sansom, 2017). An attempt to establish critical success factors that affect performance of energy sector projects specifically solar energy projects based on a project done at Remba - Homabay county leads to the primary purpose of this study. There has been no evident comprehensive research on the factors that influence performance of solar energy projects that can explain the minimal performance of solar energy projects in Kenya. This study therefore sought to fill this gap by investigating out the factors affecting adoption of solar energy projects among households in Baringo County, Kenya.

Purpose of the Study

The purpose of this study was to establish factors affecting adoption of solar power energy projects among households in Baringo County, Kenya.

Objectives of the Study

i. To evaluate how alternative sources of energy affect adoption of solar power energy projects among households in Baringo county, Kenya
ii. To determine the how the level of family income affect adoption of solar power energy projects in Baringo county, Kenya.

Research Questions

i. How does alternative sources of energy affect adoption of solar power projects among households in Baringo County, Kenya?
ii. How does the level of family income affect adoption of solar power projects among households in Baringo County, Kenya?

LITERATURE REVIEW

Alternative Sources of Energy on adoption of solar energy project

Renewable energy accounts for about 67.1%, which means that power generation in Kenya is now largely 'green'. 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 marketing 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 more than 200,000 systems, and annual sales growth has regularly topped 15% over the past decade (Jacobson, 2016). 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,2019). 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 25,000–30,000 units p.a (KEREA, 2019).

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 Kenya's power sector since the adoption of the Sessional Paper No. 4, 2004 on a blueprint for the country's 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, 2016).

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 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, 2016).

Solar energy is relatively well developed and has enormous potential due to the country's 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%–12% in recent years, with private dealers providing most solar systems (Arora et al., 2019) 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., 2017), 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, 2017).

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, 2017).

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, 2018). On the other hand, Kenya relies heavily on imported petroleum products, which include gas that is used in most homes (GOK, 2017).

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, 2017).

Family Income Levels on adoption of solar power energy project

One important element of our conceptual framework is the energy -ladder hypothesis. This hypothesis assumes that a household's fuel (or energy source) choice depends crucially on the household's 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 2015). Modern fuels are generally perceived to be superior to traditional or transitional fuels in efficiency, comfort and ease of use (Farsi et al. 2017). 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 2017).

The stark differences observed in energy -use patterns between poor and rich countries (Leach 2019) 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 for many empirical applications in the literature (Gebreegziabher et al. 2017). 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 most households use firewood, charcoal, kerosene or electricity, with the specific mix varying depending on the setting (Njong, & Johannes 2011). Each household faces several mutually exclusive options for cooking fuels and chooses the fuel that maximizes its utility. So-called fuel stacking – that is, a household's combining of different fuels for one purpose (in this case cooking) – is an aspect that is often discussed in the literature (Acker & Kammen, 206). 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 2014) and ignored in other cases by considering only the main fuel used by the household (Farsi et al. 2017). 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," as they do not discuss economic development over time, but rather variations in cross-sectional data – 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 (2016), 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 (2015) confirms the relevance of income for fuel choice. He also emphasizes the importance of non-income factors, such as the cost of firewood (as firewood is a widely used cooking fuel in Guatemala).

Gebreegziabher et al. (2017) assess the determinants of the adoption of electric mated 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 households' 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 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 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 uptake 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 research that was carried in households in Kisumu, IEA (2018) found out that, although most individuals were willing to relate to electricity, most lack the required amount of funding to cover the capital and operating costs.

Theoretical framework

Resource Dependence Theory (RDT)

This theory was developed by Pfeffer and Salancik, (2015). 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 (2018).

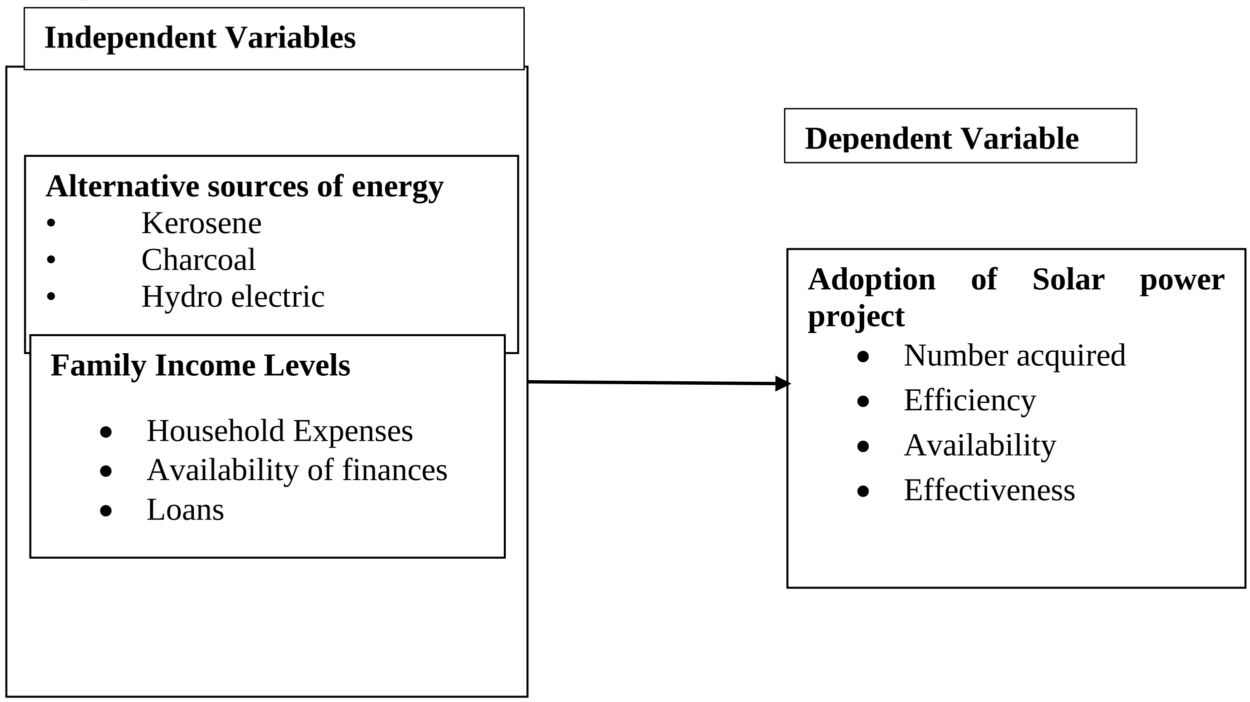
In addition, by adopting this theory, the researcher also argues that; in as much as organizations are inter-dependent, the theory of Resource Dependence needs a closer examination. Its' very weakness lies in its very assertions of dependence. According to this theory, organization depends on resources 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.

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 everyone with a set of crises that must be resolved. Erick Erickson's 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, 2019). 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, 2017).

The theory underscores the fact that the creation and the ongoing operations of each solar lanterns project are because of several actors' activities, who are the stakeholders. The central idea therefore is that a 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

Conceptual Framework



RESEARCH METHODOLOGY

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, 2017). Thus, this approach was suitable for the study, since the study intended to collect information through descriptions which helped in identifying variables. Bryman and Bell (2017) argue that a descriptive design will seek to get information that describes existing phenomena by asking questions relating to individual perceptions and attitudes.

Target population

According to Sekaran and Bougie (2019), a population is the total collection of elements about which the researcher wishes to make inferences. The target population for this studycomprised of the community leaders, community representatives of the households andthe project managers in Baringo County.

Table 1: Target Population

	Population	Percentage
Community leaders	66	18.13
Project managers	34	9.34
Community representatives	264	72.52
Total	**364**	**100.00**

Sampling Size

The sample size is a subset of the population that is taken to be representatives of the entire population (Kumar, 2017). A sample population of 227 was arrived at by calculating the target population of 364 with a 95% confidence level and an error of
0.05 using the formula taken from Kothari (2018).

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

Where; n = Size of the sample,
N = Size of the population and given as 364,

e = Acceptable error and given as 0.05,

∂p = The standard deviation of the population and given as 0.5 where notknown, 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 andThornhill (2016).

Table .2: Sampling Frame

	Population	Ratio	Sample
Community leaders	66	0.62	41
Project managers	34	0.62	21
Community representatives	264	0.62	165
Total	**364**		**227**

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 selecting within the individual subset to ensure representativeness. The goal of stratified random sampling was to achieve the desired representation from various sub-groups in the population. In stratified random sampling subjects were selected in such a way that the existing sub-groups in the population are more or less represented in the sample (Kothari, 2018). The study uses d simple random sampling to pick the respondents in each stratum.

Data Collection Procedures

The researcher obtained an introduction letter from Mount Kenya university postgraduateschool which was presented to each respondent to be allowed to collect the necessary data from the respondents. The drop and pick method after two weeks were preferred for questionnaire administration to give the researcher and respondents enough time to give well thought out responses and any clarification was made. The researcher prior made an appointment one-week prior with the respondents which ensured time saving and gave a briefing on the study. 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 were clear as observed by Best and Khan (2018).

Data Analysis

Data collected 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 computed for all the quantitative variables and results presented inform oftables. The qualitative data from the open-ended questions were analyzed using conceptual content analysis and presented in prose. Inferential data analysis was done using multiple regression analysis. Multiple regressionanalysis was used to establish the relations between the independent and dependent variables. Multiple regressions were used because it used two or more independent variables to predict a dependent variable. The multiple regression model equation was as follows.

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \varepsilon$$

Where: -

Y= Adoption of solar power project

β0=constant

β1, β2, β3 and β4 = regressioncoefficients

X1= Level of awarenessX2= Cost of installation

X3= alternative sources of energyX4= income level

ε=Error Term

RESEARCH FINDINGS AND DISCUSSION

Response Rate

Response rate equals the number of people with whom structured questionnaires were properly completed divided by the total number of people in the entire sample (Fowler, 2014). The study administered 227 questionnaires for data collection. However, 198 questionnaires were properly filled and returned. This represented 87 % overall successful response rates. Respondents were also assured of confidentiality of the information provided. Trex (2012) suggested that a response rate of 50% is adequate 60% is good and 70% and above very good for analysis. This implies that 87 percent response rate was very appropriate for data analysis.

Table 4: Response Rate

Sampled No. of respondents	No. of Questionnaires Returned	Response Rate (%)
227	198	87

(Source field data,2024)

Demographic Information

Gender of the Respondents

The researcher sought to find out the gender of the respondents involved in the study. The findings are as indicated in table 5

Table 5: Gender of the Respondents

Gender	Frequency	Percentage (%)
Male	94	47
Female	104	53
Total	**198**	**100**

According to the findings, 94(47%) of the respondents were male whereas 104 (53%) were female. This imply that majority of respondents were females. This revealed that majority of the respondents were females who are most of the households in Baringo county, Kenya.

Highest level of education

The researcher sought to find out the highest level of education involved in the study. The findings are as indicated in table 6.

Table 6.: Highest level of education

Level of education	Frequency	Percentage (%)
Certificate	84	43
Diploma	52	26
Bachelor’s degree	46	23
Masters	14	7
PhD	2	1
Total	**198**	**100.0**

From most of the respondents were certificate holders at n=84(47%). This was followed by those who had diploma qualification with n=52(26%). Those who had bachelor's degree comprised of n=46 (23%) while those who master's degree was n=14(7%) and the minority were PhD holders with n=2(1%). This implies that majority of the respondents who participated in the study were certificate holders implying that all the respondents were able to read and understand the questionnaires therefore filled the questions independently.

Age of the respondents

The researcher sought to find out the age of the respondents. The findings are as indicated in table 7.

Table 7.: Age of the respondents

Age	Frequency	Percentage (%)
20-30 Years	57	29
31-40 Years	54	27
41-50 Years	56	28
51-60 Years	31	16
Total	**198**	**100.0**

The results on age of respondents showed that majority of the respondents n=57(29%) is aged between 20-30 years. Those aged between 31-40 years were n= 54(27%) while those aged between 41-50 years were n=56(28%). The minority were aged between 51-60 years were n=31(16%). These results implied that majority of the respondents were aged between 20-50 years. These revealed that this age is involved in solar powered projects.

Descriptive Statistics for the study variables

Extent of alternative sources of energy on adoption of solar power project in Baringo, county, Kenya

The study sought to establish the extent alternative sources of energy affect adoption of solar power energy project in Baringo County, Kenya. The results are as indicated in table 8.

Table 8: Extent alternative sources of energy affect adoption of solar power energy

Extent	Frequency	Percentage (%)
Very great extent	36	18
Great extent	59	30
Moderately extent	39	20
Less extent	38	19
No extent	26	13
Total	**198**	**100.0**

(Source field data,2024)

The research findings on the extent alternative sources of energy affect adoption of solar power energy project in Baringo County, Kenya. The results revealed that majority of the respondents agreed a great extent n=59(30%). This was followed by those who agreed at moderate extent with n=39(20%). Those who agreed at a less extent were n =38 (19%). Those who agreed at a very great extent were n= 36(18%) while the minority comprising of n=26(13%) agreed at no extent. These results implied that alternative sources of energy affect adoption of solar power energy project in Baringo County, Kenya.

Alternatives source on adoption of solar power energy projects among households in Baringo county, Kenya

The study objective sought to establish alternative sources of energy affect adoption of solar power energy projects among households in Baringo county, Kenya. The statement concerning were rated as follows (1=No extent, 2=Less extent, 3=Moderately Extent, 4= Great Extent and 5= Very Great Extent). The findings are as indicated in table 9.

Table 9 : Alternative sources on adoption of solar power energy projects among households in Baringo county, Kenya

Alternative sources of energy	5 (%)	4 (%)	3 (%)	2 (%)	1 (%)	Mean	Std. Dev
Proximity Grid electricity	40.1	41.4	13.4	2.4	1.8	4.23	.70
Wind power	40.7	31.7	19.7	14.4	2.5	4.18	.87
Kerosene	34.4	45.1	18.9	4.1	1.5	4.51	.88
Charcoal	43.8	32.1	14.8	5.9	1.4	4.60	.81
Candles	40.3	25.6	24.2	13.0	1.2	4.23	.67
Biomass	27.5	28.6	26.6	15.6	1.7	4.51	.83
Animal dung	33.2	41.4	31.4	12.8	1.3	4.32	.74
Biogas	21.7	23.0	26.7	20.7	6.9	4.08	.86
Crop residues	34.4	33.1	11.9	14.2	6.4	4.38	.81
Branches	35.8	33.6	26.6	12.6	1.4	4.26	.72

The study findings showed that proximity Grid electricity had effect on solar adoption in Baringo county where majority agreed to a very great extent at 41.4 % and those who agreed to a great extent were 40.1 %. Those who agreed at a moderate extent at 13.4 %, 2.4 % agreed to a less extent while the minority agreed at no extent at 1.8 %. The mean was 4.23 with a standard deviation of 0.70. These results revealed that proximity Grid electricity affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that wind power had effect on solar adoption in Baringo county where majority agreed largely at 40.7 % and those who agreed to a very great extent were 31.7 %. Those who agreed at a moderate extent at 19.7 %, 14.4 % agreed to a less extent while the minority agreed at no extent at 2.5 %. The mean was 4.18 with a standard deviation of 0.87. These results revealed that wind power affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that kerosene had effect on solar adoption in Baringo county where majority agreed largely at 45.1 % and those who agreed to a very great extent were 34.4 %. Those who agreed at a moderate extent at 18.9 %, 4.1 % agreed to a less extent while the minority agreed at no extent at 1.5 %. The mean was 4.51 with a standard deviation of 0.88. These results revealed that kerosene affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that charcoal had effect on solar adoption in Baringo county where majority agreed to a very great extent at 43.8 % and those who largely agreed were 32.1 %. Those who agreed at a moderate extent at 14.8 %, 5.9 % agreed to a less extent while the minority agreed at no extent at 1.4 %. The mean was 4.60 with a standard deviation of 0.81. These results revealed that charcoal affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that candles had effect on solar adoption in Baringo county where majority agreed to a very great extent at 40.3 % and those who agreed to a great extent were 25.6 %. Those who agreed at a moderate extent at 24.2 %, 13.0 % agreed to a less extent while the minority agreed at no extent at 1.2%. The mean was 4.23 with a standard deviation of 0.67. These results revealed that candles affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that biomass had effect on solar adoption in Baringo county where majority agreed largely at 27.5 % and those who agreed to a great extent were 28.6 %. Those who agreed at a moderate extent at 26.6 %, 15.6 % agreed to a less extent while the minority agreed at no extent at 1.7%. The mean was 4.51 with a standard deviation of 0.83. These results revealed that biomass affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that animal dung had effect on solar adoption in Baringo county where majority agreed largely at 41.4 % and those who agreed to a very great extent were 33.2 %. Those who agreed at a moderate extent at 31.4 %, 12.8 % agreed to a less extent while the minority agreed at no extent at 1.3%. The mean was 4.32 with a standard deviation of 0.74. These results revealed that animal dung affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that biogas had effect on solar adoption in Baringo county where majority agreed to a moderate extent at 26.7 % and those who largely agreed were 23.0 %. Those who agreed at a very great extent at 21.7 %, 20.7 % agreed to a less extent while the minority agreed at no extent at 4.08%. The mean was 4.08 with a standard deviation of 0.86. These results revealed that biogas affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that crop residues had effect on solar adoption in Baringo county where majority agreed to a very great extent at 34.4 % and those who agreed to a great extent were 33.1 %. Those who agreed at a moderate extent at 11.9 %, 14.2 % agreed to a less extent while the minority agreed at no extent at 6.4 %. The mean was 4.38 with a standard deviation of 0.81. These results revealed that crop residues affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that branches had effect on solar adoption in Baringo county where majority agreed to a very great extent at 35.8 % and those who largely agreed were 33.6 %. Those who agreed at a moderate extent at 27.6 %, 12.6 % agreed to a less extent while the minority agreed at no extent at 1.4 %. The mean was 4.26 with a standard deviation of 0.72. These results revealed that branches affect adoption of solar power projects among households in Baringo county, Kenya. These results implied that alternative sources of energy affect adoption of solar power energy project in Baringo County, Kenya.

Income level of households on adoption of solar power energy project among households in Baringo County , Kenya

The study sought to establish whether income level of households influenced adoption of solar power among households in Baringo county, Kenya. The findings are as indicated in table 10.

Table 10: Income level of households on adoption of solar power

Income level of households	Frequency	Percentage (%)
Yes	181	92
No	17	8
Total	**198**	**100**

The research findings revealed that majority of the respondents at n= 181(92%) reported that income level of households influenced solar power adoption. Minority of the respondents. at n= 17 (8%) reported that income of households did not influence solar adoption. This implied that majority of respondents income level of households had an effect of solar installation in Baringo county, Kenya. Kenya.

Extent of income levels of households on adoption of solar power project in Baringo, county, Kenya

The study sought to establish the extent income levels of households affect adoption of solar power energy project in Baringo County, Kenya. The results are as indicated in table 14.

Table 11: Extent income of households affect adoption of solar power energy

Extent	Frequency	Percentage (%)
Very great extent	56	28
Great extent	49	25
Moderately extent	38	19
Less extent	35	18
No extent	20	10
Total	**198**	**100.0**

(Source field data,2024)

The research findings on the extent income levels of households affect adoption of solar power energy project in Baringo County, Kenya. The results revealed that most of the respondents agreed a very great extent n=56(28%). This was followed by those who agreed at great extent with n=49(25%). Those who agreed to a moderate extent were n =38 (19%). Those who agreed at a less extent were n= 35(18%) while the minority comprising of n=20(10%) agreed at no extent. These results implied that income levels of households affect adoption of solar power energy project in Baringo County, Kenya.

Income of households on adoption of solar power energy projects among households in Baringo county, Kenya

The first study objective sought to establish the extent income levels affect adoption of solar power energy projects among households in Baringo county, Kenya. The statement concerning were rated as follows (1=No extent, 2=Less extent, 3=Moderately Extent, 4= Great Extent and 5= Very Great Extent). The findings are as indicated in table 12.

Table 12: Income levels on adoption of solar energy

Income levels	N	5 %	4 %	3 %	2 %	1 %	Mean	Std
Household expenses	198	45	30	13	7	5	4.17	.75
Availability of the finances	198	40	36	16	10	3	4.68	.92
There is limited policy support for solar energy projects as shown by minimum budget allotment to renewable which has affected adoption of solar energy projects	198	35	38	14	9	4	4.45	.67
Solar energy projects are not affordable to most of the Baringo population as most do not have a source of income	198	43	29	20	5	3	4.56	.89
There is increasingly high level ofpeople on regular income who install solar systems	198	37	40	16	4	3	3.70	1.12
There are favorable means to financial facilities such as bank loans to solar contractors	198	28	34	12	9	7	4.94	1.13
There is considerable financial support such as bank loans to clients who install solar systems	198	35	38	15	5	2	4.52	.66

The study findings showed that household expenses had effect on solar adoption in Baringo county where majority agreed to a very great extent at 45 % and those who agreed to a great extent were 30 %. Those who agreed at a moderate extent at 13 %, 7 % agreed to a less extent while the minority agreed at no extent at 5 %. The mean was 4.17 with a standard deviation of 0.75. These results revealed that that household expenses affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that availability of the finances had effect on solar adoption in Baringo county where majority agreed to a very great extent at 40 % and those who largely agreed were 36 %. Those who agreed at a moderate extent at 16 %, 10 % agreed to a less extent while the minority agreed at no extent at 3 %. The mean was 4.68 with a standard deviation of 0.92. These results revealed that that availability of the finances affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that there is limited policy support for solarenergy projects as shown by minimum budget allotment to renewable energy which affected adoption of solar energy projects in Baringo county. Majority agreed to a great extent at 35 % and those who agreed to a very great extent were 35 %. Those who agreed at a moderate extent at 14 %, 9 % agreed to a less extent while the minority agreed at no extent at 4 %.

The mean was 4.45 with a standard deviation of 0.67. These results revealed that that limited policy support for solarenergy projects as shown by minimum budget allotment to renewable energy affect adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that solar energy projects are not affordableto most of the Baringo population as most did not have a source of income influenced solar adoption in Baringo county. Majority agreed to a very great extent at 43 % and those who agreed to a great extent were 29 %. Those who agreed at a moderate extent at 20 %, 5 % agreed to a less extent while the minority agreed at no extent at 3 %. The mean was 4.56 with a standard deviation of 0.89. These results revealed that solar energy projects are not affordable tomost of the Baringo population as most did not have a source of income affecting adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that there is increasingly high level ofpeople on regular income who install solar systems which influenced solar adoption in Baringo county. Majority agreed largely at 40 % and those who agreed to a very great extent were 37 %. Those who agreed at a moderate extent at 16 %, 4 % agreed to a less extent while the minority agreed at no extent at 3 %. The mean was 3.70 with a standard deviation of 1.12.

These results revealed that there is increasingly high level ofpeople on regular income who install solar systems affecting adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that there are favorable means to financialfacilities such as bank loans to solar contractors effecting solar adoption in Baringo county. Majority agreed to a great extent at 34 % and those who agreed to a very great extent were 28 %. Those who agreed at a moderate extent at 12 %, 9 % agreed to a less extent while the minority agreed at no extent at 7 %. The mean was 4.94 with a standard deviation of 1.13. These results revealed that favorable means to financialfacilities such as bank loans to solar contractors influences adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that there is considerable financial support such as bank loans to clients who install solar systems effecting solar adoption in Baringo county. Majority agreed to a very great extent at 38 % and those who largely agreed were 35 %. Those who agreed at a moderate extent at 15 %, 5 % agreed to a less extent while the minority agreed at no extent at 2 %. The mean was 4.52 with a standard deviation of 0.66.

These results revealed that considerable financial support such as bank loans to clients who installsolar systems has an effect on adoption of solar power projects among households in Baringo county, Kenya.

Diagnostic Test

Autocorrelation Assumption Test

Autocorrelation refers to the correlation of a variable with itself over time. The results of the test of autocorrelation assumption are presented in Table 13

Table 13: Autocorrelation Assumption Test Results

Variable	Durbin-Watson
Alternative sources of energy	2.418
level of family income	2.309
Adoption of solarpower energy	2.681

The indicated that the Durbin-Watson statistic value for alternative sources of energy was 2.418 and level of family income was 2.309. This implies that the study variables had the independence of errors because it meets the threshold of Durbin-Watson between 0-4. The Durbin-Watson test reports a test statistic, with a value from 0 to 4, where: 0-2.5 denotes no autocorrelation. In conclusion, the data collection instruments were found to be valid and reliable and therefore can be used for data collection in the main study.

Normality Assumptions Test

The study conducted a normality test to determine whether the data is normally distributed**.** The result of the normality test is indicated in Table 14

Table 14: Normality Assumption Test Results

Variable	Kolmogorov- Smirnov	Sig
Alternative sources of energy	.294	.554
level of family income	.321	.760
Adoption of solarpower energy	.374	.701

Normality assumption test results in Table 18 established that the data was normally distributed since the significance values for Kolmogorov-Smirnov were greater than 0.05. Alternative sources of energy had a Kolmogorov-Smirnov significance value of p=.554>0.05. Level of family income had a Kolmogorov-Smirnov significance value of p=.760>0.05. Since the p-values were greater than the significance level (0.05), this implies that the data were normally distributed.

Multicollinearity Test

Multicollinearity occurs when two or more independent variables are highly correlated with each other. When multicollinearity is present in a regression model, it can be difficult to determine the unique contribution of each independent variable to the outcomes. The study result is presented in Table 15

Table 15: Multicollinearity Assumption Test Results

Variables	Tolerance	VIF

Alternative sources of energy	.508	1.295
level of family income	.617	1.202
Adoption of solarpower energy	.647	1.237

From the finding the tolerance and variance inflation factor value for alternative sources of energy; (tolerance=0.617 and VIF=1.2020) for level of family income and for adoption of solar power energy (tolerance=0.647 and VIF=1.237). The study results imply that all tolerance values for the five variables under study were all above 0.10 and VIF values all less than 10, this implies that the data used had no Multicollinearity.

Homoscedasticity test results

Homoscedasticity describes the homogeneity of disturbance between independent and dependent variables across the values of the independent variables. It expresses constant residual terms across observations. Conversely, unequal errors lead to heteroscedastic problem. Heteroscedasticities contribute to inefficient parameter estimates and incorrect confidence intervals. When the value of the dependent variable changes, the error term ought not to vary much. For homoscedastic data, p-value is greater than 0.05. Homoscedasticity test results are shown in Table 16.

Table 16: Homoscedasticity Test Results

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	.057	.254		.161	.739
Alternative sources of energy	.077	.090	.046	.268	.713
level of family income	.089	.041	.061	-.345	.745

a. Dependent Variable: Adoption of solarpower

The results in Table 20 shows that, alternative sources of energy and level of family income had p-values 0.713 and 0.745 respectively. All these values are greater than 0.05, implying that the data was homoscedastic and there was no heteroscedasticity problem. The results helped the researcher to validate the appropriateness of the linear regression analysis.

Linearity test results

Linearity tests were undertaken to establish the linear that level of awareness, cost of installation, alternative sources of energy and level of family income. Results are presented in Tables 17 and 18.

Table 17: Linearity between alternative sources of energy and adoption of solar power energy

			Sum of Squares	df	Mean Square	F	Sig.
Adoption of solar power energy * Alternative sources of energy	Between Groups	(Combined)	2.539	118	.478	3.201	.019
		Linearity	1.132	12	2.118	19.712	.001
		Deviation from Linearity	1.623	107	.151	1.612	.165
	Within Groups		1.547	118	.105		
	Total		4.332	198			

Results show that the p-value for the deviation from linearity was 0.165. For linear relationship to exist, the deviation from linearity should be greater than 0.05. 0.156>0.05 implies that between alternative sources of energy and adoption of solar power energy are linearly related. This linear relationship will support inferential statistical analysis particularly in determining the causal relationship between alternative sources of energy and adoption of solar power energy in Baringo county Kenya.

Table 18: Linearity between level of household income and adoption of solar power energy

			Sum of Squares	df	Mean Square	F	Sig.
Adoption of solar power energy * Income of households	Between Groups	(Combined)	2.539	118	.438	3.501	.016
		Linearity	2.102	12	2.318	19.512	.001
		Deviation from Linearity	2.625	107	.194	1.714	.191
	Within Groups		1.547	118	.102		
	Total		6.305	198			

Results show that the p-value for the deviation from linearity was 0.191. For linear relationship to exist, the deviation from linearity should be greater than 0.05. 0.191>0.05 implies that between income of households and adoption of solar power energy are linearly related. This linear relationship will support inferential statistical analysis particularly in determining the causal relationship between income of households and adoption of solar power energy in Baringo county Kenya.

Inferential Statistics

Correlation Analysis

Alternative sources of energy and adoption of solar power energy

The study sought to establish the correlation between alternative sources of energy and adoption of solar power energy in Baringo county Kenya. The findings of the study are as shown in Table 19.

Table 19: Alternative sources of energy and adoption of solar power energy

		Adoption of solar power energy
Alternative sources of energy	Pearson Correlation	.463**
	Sig. (2-tailed)	.000
	N	198

**. Correlation is significant at the 0.05 level (2-tailed).

As indicated in Table 27, the study indicates that there was a moderate positive and statistically significant correlation between alternative sources of energy and adoption of solar power energy in Baringo county Kenya. ($r = 0.463$; $p < 0.05$). This implies alternative sources of energy enhance adoption of solar power energy in Baringo county Kenya.

Income of households and adoption of solar power energy

The study sought to establish the correlation between income of households and adoption of solar power energy in Baringo county Kenya. The findings of the study are as shown in Table 20.

Table 20: Alternative sources of energy and adoption of solar power energy

		Adoption of solar power energy
Income of households	Pearson Correlation	.476**
	Sig. (2-tailed)	.000
	N	198

**. Correlation is significant at the 0.05 level (2-tailed).

As indicated in Table 28, the study indicates that there was a moderate positive and statistically significant correlation between income of households and adoption of solar power energy in Baringo county Kenya. ($r = 0.476$; $p < 0.05$). This implies income of households enhance adoption of solar power energy in Baringo county Kenya.

Regression Analysis

The study carried out a regression analysis to evaluate the combined influence of level of awareness, cost of installation, alternative sources of energy, income of households on adoption of solar power energy in Baringo county Kenya was established. The model summary was shown in table 21

Table 21: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. F Change
1	.891[a]	.793	.795	.3051	.000

The R-Squared is the proportion of variance in the dependent variable which can be explained by the independent variables. The R-squared in this study was 0.793, which shows that the two independent variables level of alternative sources of energy, income of households can explain 79.3 % on adoption of solar power energy in Baringo county Kenya, while other factors explain 20.7%.

Table 22: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.072	.157		.206	.747
	Alternative sources of energy	.225	.195	.176	2.326	.073
	level of family income	.398	.144	.215	3.304	.006
	Adoption of solarpower energy					

Table 31 shows the overall significant test results for the hypothesized research model. The interpretations of the findings indicated follow the following regression model.

$Y= \beta_3 X_3 + \beta_4 X_4$

Therefore,

$Y= 0.225 X_3 + 0.398 X_4$

According to the intercept (β_0), when the two independent variables are held constant, the adoption of solar power energy in Baringo county, Kenya was 0.072. A unit increase alternative sources of energy would lead to a 0.225 improvement in the adoption of solar power energy in Baringo county, Kenya. Finally holding all the other variables constant, a unit increase in income of households would lead to a 0.398 improvement in the adoption of solar power energy in Baringo county, Kenya. From these findings it can be inferred that income of households had the most influence on the adoption of solar power energy in Baringo county, Kenya followed by cost of installation, level of awareness and alternative sources of energy in that order.

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Summary of Major Findings

Alternative sources of energy and adoption of solar power energy among households in Baringo county, Kenya

These results revealed that proximity Grid electricity affect adoption of solar power projects among households in Baringo county, Kenya. The results revealed that wind power affect adoption of solar power projects among households in Baringo county, Kenya. Kerosene and charcoal affect adoption of solar power projects among households in Baringo county, Kenya.

The results revealed that candles and biomass affect adoption of solar power projects among households in Baringo county, Kenya. The results revealed that animal dung and biogas affect adoption of solar power projects among households in Baringo county, Kenya. These results also revealed that crop residues and branches affect adoption of solar power projects among households in Baringo county, Kenya. The overall results implied that alternative sources of energy affect adoption of solar power energy project in Baringo County, Kenya.

Income of households and adoption of solar power energy among households in Baringo county, Kenya

The study findings showed that household expenses had effect on solar adoption in Baringo county, Kenya. The study findings also showed that availability of the finances had effect on solar adoption in Baringo county, Kenya. The study findings revealed that that limited policy support for solarenergy projects as shown by minimum budget allotment to renewable energy affect adoption of solar power projects among households in Baringo county, Kenya. These results revealed that solar energy projects are not affordable tomost of the Baringo population as most did not have a source of income affecting adoption of solar power projects among households in Baringo county, Kenya. The study findings showed that that there is increasingly high level ofpeople on regular income who install solar systems affecting adoption of solar power projects among households in Baringo county, Kenya. The study findings revealed that favorable means to financialfacilities such as bank loans to solar contractors influences adoption of solar power projects among households in Baringo county, Kenya.

The study findings showed that considerable financial support such as bank loans to clients who installsolar systems influences adoption of solar power projects among households in Baringo county, Kenya.

Conclusions

The study indicates that there was a moderate positive and statistically significant correlation between alternative sources of energy and adoption of solar power energy in Baringo county Kenya. ($r = 0.463$; $p < 0.05$). This implies alternative sources of energy enhance adoption of solar power energy in Baringo county Kenya. There was a moderate positive and statistically significant correlation between income of households and adoption of solar power energy in Baringo county Kenya. ($r = 0.476$; $p < 0.05$). This implies income of households enhance adoption of solar power energy in Baringo county Kenya.

Recommendations

Based on the findings of the study, the researcher recommended more awareness on solar power projects in Baringo county , Kenya should be enhanced through community leaders. The study also recommends that solar power energy installation costs should be more cost effectiveness to encourage more households to adopt the solar energy acquisition in Baringo Kenya. The study also recommends that alternative sources of energy that are ecofriendly should be encouraged in this case solar power energy and finally this study recommends that solar energy should be made available and reliable to minimize alternative sources of energy. Training workforce should be set up to t trainshouseholds on solar energy installation and its benefits to the society to encourage those with low income among house holdings in Baringo county, Kenya.

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