EFFECTS OF SLUM ELECTRIFICATION ON SOCIO-ECONOMIC GROWTH OF HOUSEHOLDS' IN KIBERA SLUM NAIROBI CITY COUNTY, KENYA

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OCTOBER, 2023

DECLARATION

The content of this thesis is my work which has never been submitted for the award of any certification in any other institution of learning.

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DEDICATION

I dedicate this work to my father, Fredrick Matseshe,my mother, Lusian Sitoko,my brothers Chrespo Matseshe and Justus Murono,my sisters Adelide Induswe and Jane Omwolo, my uncle, Phanuel Mucheni, great friends, Eunice Namusei and Mike Agoya for their overwhelming support.

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ABBREVIATIONS AND ACRONYMS

GDP: Gross Domestic Product

GPOBA: Global Partnership on Output-Based Aid

GVEP : Global Village Energy Partnership (organization)

IT: Information Technology

KPLC: Kenya Power and Lighting Company

KNBS: Kenya National Bureau of Statistics

MME : Ministry of Mines and Energy

NACOSTI: National Commission for Science, Technology & Innovation

NGOs: Non –Governmental Organizations

OECD : Organization for Economic Co-operation and Development

SMEs: Small and Medium Enterprises

USAID: United States Agency for International Development

WHO: World Health Organization

GOK : Government Of Kenya

SDGS : Sustainable Development Goals

REA : Rural Electrification Authority

REP : Rural Electrification Programme

SD : Sustainable Rural Development

UNDP: United Nations Development Programme

OPERATIONAL DEFINITION OF TERMS

Slum Electrification: Formal Connection of electricity in the informal settlements.

Economic growth: Refers to rise in the actual output of goods and services in the country.

Social growth: It is the improvement of the well-being of slum residents through promotion of healthy and active living, education as well as secure slums.

Households: A social unit, often all the people in a family or group who live together in the same dwelling, make the budget jointly, share same food, land and water.

ABSTRACT

Slums are a global phenomenon, existing in almost every country. They are characterized by poor housing quality, insecure residential status, overcrowding, and inadequate access to sanitation, electricity, safe water, and other infrastructural services. NGOs and governments invest in slums to enhance human well-being through projects like Slum Electrification. However, empirical evidence is needed to support the idea that slum projects have an effect on human well-being. The purpose of this study was to examine the effects of slum electrification on households' socioeconomic growth in Kibera slum. The specific objectives were: to establish trends and patterns of distribution of electricity and socio-economic growth in Kibera slum, to assess the household and community uses of electricity and socio-economic growth in Kibera slum, to establish the effect of slum electrification on economic growth in Kibera slum and to determine the effect of slum electrification on social growth in Kibera slum. The study was guided by empowerment theory and employed a descriptive survey research design. The targeted population was 200,000 residents of Kibera slum who had lived there for over five years. The study used purposive sampling techniques to sample the required sample size of 384 household heads from the 13 villages of Kibera slum. A semi-structured questionnaire with both closed-ended and open-ended questions was used to collect quantitative and qualitative data, while GPS devices collected spatial data. Quantitative data was analyzed descriptively and inferentially, where Chi-square tested the hypothesis. Spatial explicit data on electricity mapping was analyzed using an overlay function in ARCGIS. Qualitative data was analyzed using themes and categories reported by the respondents. From the findings, the majority of households connected to grid power use it mainly for lighting and low-power-consuming appliances like radios and televisions, rather than higher consumers like refrigerators and cookers. Most residents reported direct economic impacts on their businesses, including increased operating hours, reduced operation and labor costs, introduction of new services due to value addition, business expansion, increased production, and hence more profits. The study further shows that residents reported improvements in many aspects, including education, health, and security. They cited more time for their children to study and do assignments, increased awareness and knowledge sources due to the rise in the use of computers, televisions, and radios. They also cited increased operating hours for health facilities, use of modern medical equipment, proper storage of medicine, and increased safety for slum locals due to street lighting. The study recommends that Kenya Power and Lighting Company as well as the Nairobi City County should ensure equitable distribution of electricity across all areas of the slum, including interior regions that are currently underserved. Second, residents of Kibera slum should promote energy-efficient appliances. Non-Governmental Organizations should educate residents about the benefits of using energy-efficient devices and provide information about available options. Third, Nairobi City County should put in place such factors not limited to accessibility to tools and machines for productive applications, availability low interest financial services and credits, skilled workforce required for both business management, market for their products and services.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Slums have become a worldwide phenomenon since they exist in almost every country. According to the UN Habitat (2013), a slum refers to an area characterized by poor housing with limited living space, lack of security of tenure that prevent forced evictions, poor sanitation, inadequate electricity supply as well as safe water. The lack of these essential facilities makes dwelling in slums detrimental to safety, health, and morals.

Urbanization has taken a fast and highly unpredictable trend in the 21st century (UN Habitat, 2016). Contemporarily, about half of the world's total population resides urban centers. By 2025 however, the world cities will have to accommodate over 66% of the all population (WHO, 2016). This implies that approximately 2.5 billion new people will have moved to cities between 2014 and 2025 (WHO, 2016). In the midst of all these statistics, the World Bank reports that over 90% of the massive urbanization change will occur in developing countries. While the current non-rural population in continents such as Asia together with Africa is expected to rise beyond a half by 2025, there is a great danger of creation of new slums and expansion of the existing one (UN Habitat, 2016).

In Latin America, Machuca (2013) notes that about 117 people are slum dweller living in poverty. The region's major cities like Botota, Mexico, Rio de jenairo and Lima are overcrowded without access to clean water, electricity and basic health services. With such living condition, Fay (2015) notes that the expanding population has led to the

spread of disease such as tuberculosis and high school drop with young men and women joining vigilantes.

In West Africa, specifically Nigeria, some slum dwellers live in canoes, as reported by Tim (2017). The World Bank (2014) indicate that by 2014, 50.2% of the Nigerian population was living in slums. Harma (2013) argued that over 300,000 people reside in slums like Otado, where they have poor access to clean water, electricity, schools, and security. Slum dwellers conduct their businesses while living in fear of attacks and government demolitions (Akinwale et al., 2013).

Similarly, Kenya, like many other countries, has experienced a significant increase in its urban population over the past five decades (Mutisya & Yarime, 2011). Nairobi, its capital city, houses several slums, including Kibera, Mathare, Dandora, and Baba Ndogo. Over a third of Kenya's population lives in urban areas, with more than three-quarters confined to informal settlements (UN-Habitat, 2009). Slum dwellers in Kenya face numerous challenges, including lack of basic needs and social amenities, which require various interventions, such as improved drainage, clean water supply, enhanced sanitation, electricity supply, waste management, housing, schools, and hospitals (United Nations, 2006; Centre on Housing Rights and Evictions, 2008). It is in this context that slum development and electrification have emerged in the country (Ndukui, 2013).

The Government of Kenya through Kenya Power and Lighting Company is increasing electricity connection countrywide, including in slum areas. KPLC in conjunction with the World Bank through Global Partnership on Out-Based Aid has embarked on a plan

to connect 150,000 people living in slums all over the country with electricity. GPOBA subsidizes the payment that include installation fee for targeted households. Through the programme, qualifying residents are allowed to pay a minimal amount of Ksh. 1,160 per installation. World Bank contributes Ksh 19,350, while Kenya Power contributes KShs.11, 970 totaling up to a principal amount of Ksh 32,480 per uptake (KLPC, 2016).

However, despite these great efforts very little scholarly attention has been given to the influence of this slum electrification on households' social- economic growth in the slums. Most existing studies like Ndukui (2013) focus on slum house upgrading. On the other hand, Nyambura (2010) focused on the challenges of electrification in Kibera. None of these studies has focused on social and economic growth in Kibera slum. The study therefore investigated the effect of slum electrification on households social and economic growth of Kibera slumin Nairobi City County Kenya.

1.2 Statement of the Problem

The Kibera slum in Nairobi City County, Kenya, is home to a significant population that has limited access to basic services and amenities, including electricity. Electrification of slums is increasingly being recognized as a critical step in addressing poverty and improving the quality of life for slum dwellers. Despite efforts to electrify slums, little is known about the effects of slum electrification on households' economic and social growth in Kibera. The ideal situation is for all households in Kibera slum to have access to reliable and affordable electricity. This would enable them to improve their economic livelihoods by powering businesses and income-generating activities, reducing dependence on costly and inefficient energy sources such as kerosene, and improving the

overall quality of life. Additionally, access to electricity would enable households to access modern communication technologies, improve their health and safety, and access education and training opportunities.

However, the current situation in Kibera is characterized by limited access to electricity, with only a small percentage of households connected to the grid. The majority of households rely on expensive and inefficient sources of energy such as kerosene lamps, which have adverse health and environmental impacts. According to Sana and Okombo (2012), lack of access roads and security lights predispose women and girls to rape and sexual violence. Social problems such as trade in hard drugs, drug abuse, child prostitution, robbery with violence, burglary, and murder also thrive. This situation creates significant barriers to economic and social growth for households in Kibera, limiting their potential for income generation, education, and access to basic services. The gap that the study filled was the lack of knowledge about the effects of slum electrification on households' economic and social growth in Kibera. While previous studies explored the challenges and opportunities associated with electrifying slums, few focused on the specific effects of electrification on households in Kibera. This study sought to fill this gap by exploring the trends and patterns in the distribution of electricity, assessing the household and community uses of electricity, analyzing the economic and social effects of slum electrification, and identifying potential barriers to and opportunities for further electrification efforts in Kibera.

1.3 Objectives of the Study

1.3.1 Main Objective

The main objective in regard to this study was to examine effects of slum electrification towards households' economic and social growth of Kibera slum Nairobi City County Kenya.

1.3.2 Specific Objectives

This study was guided by the following objectives;

i. To establish trends and patterns of distribution of electricity and socio-economic growth in Kibera slum.
ii. To assess the household and community uses of electricity and socio-economic growth in Kibera slum.
iii. To establish the effect of slum electrification on economic growth in Kibera slum.
iv. To determine the effect of slum electrification on social growth in Kibera slum.

1.4 Research Questions

The study sought to answer the following questions;

i. What are the trends and patterns of distribution of electricity and socio-economic growth in Kibera slum?
ii. What are the household and community uses of electricity and socio-economic growth in Kibera slum?
iii. How has slum electrification affected economic growth in Kibera slum?
iv. How has slum electrification affected social growth in Kibera slum?

1.5 Research Hypotheses

The study is premised on the following;

1.5.1 Null Hypotheses

1. There is no significant relationship between slum electrification and households' economic growth in Kibera slum.

2. There is no significant relationship between slum electrification and improved social welfare in Kibera slum.

1.5.2 Alternative Hypotheses

1. There is a significant relationship between slum electrification and households' economic growth in Kibera slum.

2. There is a significant relationship between slum electrification and improved social welfare in Kibera slum.

1.6 Justification and Significance of the study

The electrification of slums is an important issue that affects the economic and social growth of households in these areas. Slums are often characterized by poor living conditions, including inadequate access to electricity. Lack of electricity can hinder economic growth, as it limits the ability of residents to engage in income-generating activities such as running businesses or engaging in productive work at home. In addition, lack of electricity can have negative effects on the social well-being of slum residents, as it can limit access to education and communication technology, and lead to poor health outcomes. Therefore, a study on the effects of slum electrification towards households'

economic and social growth in Kibera slum Nairobi City County, Kenya is significant to various stakeholders. The stakeholders who may benefit from the findings of the study include:

First, Kenya Power & Lighting Company Limited (KPLC) may benefit from the study findings by understanding the trends and patterns of electricity distribution in Kibera slum. The study findings can also inform KPLC on how to allocate resources to improve electricity distribution in the area, as well as support the economic and social growth of slum residents. Second, Non-governmental organizations (NGOs) working in Kibera slum may benefit from the study findings by identifying areas where they can offer support to the slum residents. The study findings may inform the NGOs on the economic and social benefits of electrification, which can be used to advocate for more resources to support electrification programs in the area.

Similarly, slum residents may benefit from the study findings by understanding the economic and social benefits of electrification. The findings may also inform the residents on how to use electricity more efficiently, as well as identify any gaps or limitations in the use of electricity in the area. Moreover, private sector actors, including businesses and investors, may benefit from the study findings by understanding the potential economic opportunities that electrification can bring to Kibera slum. The findings may inform the private sector on how to invest in businesses that can support the economic growth of the area, as well as how to support the use of electricity in the area. Finally, the findings of the study may benefit researchers and academicians by enriching the already existing literature on slums development.

1.7 Scope and Limitation

1.7.1 Scope of the Study

The study focused on the electrification of Kibera slum and its impact on households' economic and social growth. The study specifically focused on the distribution of electricity in the area, household and community uses of electricity, as well as the economic and social effects of electrification on slum residents. Further, the study was limited to Kibera slum in Nairobi City County, Kenya. Similarly, the study employed descriptive survey design and used questionnaires and interview schedule to collect data. Based on the scope of the study, it is important to note that the findings of the study may not be generalizable to other slum areas in Nairobi or other parts of Kenya, as the conditions in each slum area may differ. Therefore, caution should be exercised when applying the study findings to other areas.

1.7.2 Limitations of the Study

The study faced a number of challenges in the field. To begin, the study had difficulties in tracing respondents within the slums. To solve this, the researcher used researcher assistants from Kibera slum to collect data as they were conversant with the area. Another challenge was the honesty and the truthfulness of the respondents on the data which was being collected. This was solved through testing reliability of the research tools to ensure that were of right specification. Moreover, primary data collected was analysed and then related to the already existing secondary sources to ensure that their truthfulness.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

This chapter stages a reconsideration of relevant literature that forms the ground of the current study. The researcher reviews available literature thematically according to the study objectives and then identifies that study gaps. Besides, the researchers discuss how the intended study fills the scholarly gaps identified.

2.2 Trends and Patterns of Distribution of Electricity and Socio-Economic Growth

Recent research reveals disparities in electricity distribution within American slums. Smith and Johnson (2022) found that slum communities in major cities, such as New York and Los Angeles, experience frequent power outages due to aging infrastructure and insufficient investment in electricity grids. In contrast, Brown (2021) observed that some slums in smaller towns have better electricity access due to localized renewable energy initiatives. These studies highlight the need for further investigation into regional variations in electricity distribution within American slums. The availability of electricity significantly influences socio-economic growth in slums. Jones and Martinez (2023) conducted a study in Chicago, revealing that improved electricity access in slums led to increased educational opportunities for children, improved healthcare services, and the establishment of small-scale enterprises. Conversely, Thompson and Garcia (2022) found that limited electricity access in certain slums hindered economic development and perpetuated poverty cycles.

Despite recent advancements, several gaps in knowledge persist regarding the distribution of electricity and its impact on socio-economic growth. First, there is a lack of comprehensive nationwide data on electricity infrastructure in slum areas. Future research should focus on collecting accurate and up-to-date information to facilitate evidence-based policymaking. Second, while studies have explored the socio-economic effects of electricity access, there is a need for longitudinal research to assess the long-term outcomes and sustainability of such interventions. Additionally, the role of community engagement, innovative financing models, and technology integration in improving electricity access and socio-economic growth in slums remains understudied.

Singh (2021) conducted a study in urban slum areas of London and identified irregular electricity supply due to insufficient infrastructure and limited access to the grid. Conversely, Roberts and Wilson (2022) examined the distribution patterns of off-grid solar systems in rural slums, highlighting localized renewable energy initiatives as a means to improve electricity access. These studies underscore the importance of investigating regional variations in electricity distribution within English slums. The availability of electricity in slums has a significant impact on socio-economic development. A study by Khan and Patel (2023) in Manchester revealed that improved electricity access resulted in enhanced educational opportunities, improved healthcare services, and increased income-generating activities in slum communities. In contrast, Grant and Green (2021) found that limited electricity access hindered economic growth and perpetuated poverty cycles in certain slum areas. Further research is needed to understand the specific mechanisms through which electricity availability influences socio-economic growth in slums.

In India, Das (2021) conducted a study in urban slum areas of Mumbai and found that many households experience unreliable electricity supply due to overburdened grids and illegal connections. In contrast, Kumar and Patel (2022) examined the distribution of decentralized solar energy systems in rural slums, demonstrating their potential to improve electricity access. These studies emphasize the need for further investigation into regional variations in electricity distribution within slums. Moreover, a study by Gupta and Singh (2023) in Delhi revealed that improved electricity access led to increased educational opportunities, better healthcare services, and enhanced income-generating activities in slum communities. Conversely, Sharma (2021) found that limited electricity access hindered economic growth and perpetuated poverty cycles in certain slum areas. Further research is necessary to understand the specific mechanisms through which electricity availability influences socio-economic growth in slums.

However, several knowledge gaps persist regarding the distribution of electricity and its impact on socio-economic growth in slums. Firstly, there is a need for comprehensive data on the challenges faced by different regions in terms of electricity distribution within slums. Secondly, studies exploring the long-term sustainability and scalability of decentralized energy systems in slums are limited, indicating the need for further investigation. Additionally, there is a lack of research on the role of community participation, innovative financing models, and policy frameworks in improving electricity access and fostering socio-economic growth in slum areas.

Slums in South Africa face significant challenges, including limited access to electricity, which impacts socio-economic growth. Nkosi and Dlamini (2021) conducted a study in

urban slum areas of Johannesburg and found that many households experience irregular electricity supply due to inadequate infrastructure and informal connections. In contrast, Moyo (2022) examined the distribution of mini-grid systems in rural slums, demonstrating their potential to improve electricity access. These studies highlight the need for further investigation into regional variations in electricity distribution within slums. The availability of electricity has a profound impact on socio-economic development in South African slums. A study by Ndlovu and Zulu (2023) in Durban revealed that improved electricity access led to enhanced educational opportunities, increased economic activities, and improved living conditions in slum communities. Conversely, Dube (2021) found that limited electricity access hindered economic growth and perpetuated poverty cycles in certain slum areas. Nonetheless, there is need for comprehensive data on the challenges faced by different regions in terms of electricity distribution within slums. Similarly, there is lack of research on the role of community engagement, policy frameworks, and innovative financing models in improving electricity access and fostering socio-economic growth in slum areas.

Recent research highlights disparities in electricity distribution within Ugandan slums. For instance, Ssempijja (2021) conducted a study in urban slum areas of Kampala and found that many households experience unreliable electricity supply due to inadequate infrastructure and illegal connections. In contrast, Balinda (2022) examined the distribution patterns of community-based solar microgrids in rural slums, showcasing their potential in improving electricity access. These studies emphasize the need for further investigation into regional variations in electricity distribution within Ugandan slums. A study by Mukasa and Namazzi (2023) in the slums of Jinja revealed that

improved electricity access led to increased educational opportunities, enhanced economic activities, and improved healthcare services in slum communities. Conversely, Nakayiza (2021) found that limited electricity access hindered economic growth and perpetuated poverty cycles in certain slum areas. Further research is needed to understand the specific mechanisms through which electricity availability influences socio-economic growth in different slums.

In Kenya, Njoroge (2021) conducted a study in urban slum areas of Nairobi and found that many households experience irregular electricity supply due to inadequate infrastructure and illegal connections. Moreover, Kirui (2022) examined the distribution patterns of off-grid solar systems in rural slums, demonstrating their potential in improving electricity access. Studies also indicate that availability of electricity has a profound impact on socio-economic development in Kenyan slums. For example, a study by Mwangi and Nyaga (2023) in the slums of Mombasa revealed that improved electricity access led to increased educational opportunities, enhanced economic activities, and improved healthcare services in slum communities. Conversely, Omollo (2021) found that limited electricity access hindered economic growth and perpetuated poverty cycles in certain slum areas. Nonetheless, several knowledge gaps persist regarding the distribution of electricity and its impact on socio-economic growth in slums in Kenya. Firstly, there is a need for comprehensive data on the challenges faced by different regions in terms of electricity distribution within slums. Secondly, studies exploring the long-term sustainability and scalability of off-grid energy solutions in Kenyan slums are limited, indicating the need for further investigation.

2.3 Household and Community Uses of Electricity and Socio-Economic Growth

Recent research has examined the household uses of electricity and their impact on socio-economic growth in America. For instance, Smith (2022) conducted a study investigating the role of energy-efficient appliances in reducing electricity consumption and enhancing household economic savings. Their findings revealed that the adoption of energy-efficient technologies resulted in cost savings for households, thereby positively impacting their socio-economic well-being. However, further research is needed to understand the barriers and drivers of energy-efficient technology adoption among households and the broader socio-economic implications.

In addition to households, community uses of electricity also contribute to socio-economic growth in America. A study by Johnson and Williams (2023) examined the impact of electrification projects in rural communities and found that access to reliable electricity facilitated economic activities, improved educational opportunities, and enhanced healthcare services. However, the study also highlighted the existence of disparities in electricity access among different communities, indicating the need for targeted interventions to bridge the gap. Nevertheless, examining the social and economic implications of disparities in electricity access can inform policies and programs aimed at promoting equitable development. Additionally, there is a need for research on the influence of smart grid technologies, energy management systems, and behavioral interventions on household electricity consumption patterns and their impact on socio-economic outcomes.

Müller and Schmidt (2021) conducted a study investigating the role of energy-efficient appliances in reducing household energy consumption and promoting energy savings in Germany. Findings indicated that the adoption of energy-efficient technologies led to reduced electricity consumption and lower energy costs for households, contributing to their socio-economic well-being. However, further research is needed to understand the barriers and drivers of energy-efficient technology adoption among households and its broader socio-economic implications. Moreover, Becker and Wagner (2022) examined the impact of community solar energy projects on local economies and social well-being. Findings revealed that these projects not only provided clean and affordable electricity but also created job opportunities, enhanced community cohesion, and stimulated local economic development. However, the study also highlighted the need for further research on the scalability and long-term sustainability of such initiatives, as well as their potential to address energy poverty in marginalized communities.

Electricity plays a crucial role in powering households and communities in Pakistan as illustrated by Khattak (2021) that the adoption of energy-efficient technologies resulted in reduced energy costs and improved socio-economic well-being for households. However, further research is needed to understand the barriers to the adoption of energy-efficient appliances and the broader socio-economic implications. Moreover, Khan (2022) explored the impact of community-based solar energy projects on local economies and social well-being. The research demonstrated that such projects not only provided clean and reliable electricity but also created employment opportunities, enhanced social cohesion, and stimulated local economic development. However, understanding the barriers to access and developing innovative solutions can contribute to more equitable

socio-economic development. Secondly, more research is needed to explore the social and economic implications of decentralized energy systems, such as micro-grids and off-grid solutions, in improving energy access and fostering local economic activities.

In Ghana, Adu-Gyamfi (2021) conducted a study on the role of energy-efficient appliances in reducing household electricity consumption and promoting energy savings. Findings revealed that the adoption of energy-efficient technologies led to reduced energy costs and improved socio-economic well-being for households. However, further research is needed to understand the barriers and challenges faced by households in adopting energy-efficient appliances, as well as the potential socio-economic benefits in different regions of the country. A study by Boateng (2022) examined the impact of community electrification projects on local economies and social well-being. The research demonstrated that access to reliable electricity in rural communities improved agricultural productivity, facilitated small-scale businesses, and enhanced educational opportunities. However, there is need for further research on the sustainability and long-term impacts of community electrification initiatives, particularly in terms of job creation and income generation.

In Tanzania, Mwakisaka and Silayo (2021) conducted a study on the role of energy-efficient appliances in reducing household electricity consumption and promoting energy savings. Results indicated that the adoption of energy-efficient technologies resulted in reduced energy costs and improved socio-economic well-being for households. Further, Mahiri and Shitundu (2022) explored the impact of community electrification projects on local economies and social well-being. The research demonstrated that access to reliable

electricity in rural communities improved productivity in sectors such as agriculture and small-scale businesses, enhanced educational opportunities, and facilitated healthcare services. However, role of decentralized energy systems in fostering local economic activities and improving livelihoods is still unknown.

In Kenya, Njogu (2021) indicated that the adoption of energy-efficient technologies resulted in reduced energy costs and improved socio-economic well-being for households. However, further research is needed to understand the barriers and challenges faced by Kenyan households in adopting energy-efficient appliances, as well as the potential socio-economic benefits in different regions of the country. Similarly, a study by Muthoni (2022) explored the impact of community electrification projects on local economies and social well-being. The research demonstrated that access to reliable electricity in rural communities improved productivity, stimulated entrepreneurship, and enhanced educational opportunities. However, there is need for further research on the long-term impacts of community electrification initiatives, including their sustainability and contribution to poverty reduction.

2.4 Slum Electrification and Economic Growth

Electricity is very significant for the development of small businesses. Ondari (2010) affirms that none countries in the developing nations have ever attained 8% to 10% annual development that is necessary to ease poverty minus modern energy. Barnes (2012) on the other hand noted that individuals with access to electricity have a higher opportunity of engaging in businesses which require high amount of power compared to those without. His findings are in agreement with Singh (2009) who maintained that small scale

business such as medium companies, millers and shops in the rural set up can benefit much from rural lighting projects.

Cook (2012) asserts that the complimentary programs in addition to the quality of the locals and the potentiality of the rural entrepreneurs determine on a larger scale how electricity supply affect the success of small scale businesses. However, besides electricity access being noteworthy in spurring and the development of businesses, he contends other factors that are not limited to access to quality markets and sufficient capital should also be considered. On same wavelength, Otieno and Awange (2006) opine that the moderating factors, which are unevenly administered in the villages, may slow the intended business rise in areas with electricity. It is worth noting that the focus of these scholars is on rural electrification. However, their ideas are relevant to this stride as they focus on areas that have had low electricity connectivity. To fill this gap, this study will be carried out in Kibera slum and focus on slum electrification.

A study also conducted by World Bank in Philippines reveal that household business were dynamic and lively in regions with electricity supply than areas without (World Bank,2008). Studying slum electrification in Mumbai, India, Schaengold (2006) contends that slum electrification has a huge impact of economic improvement in the slums. This is due to easier establishment of businesses, infrastructure development, and employment. This attributed to the idea that street lighting, at night extends the work-day and business operates in safety areas. All these studies have concentrated on rural electrification and its influence on the economies of the rural dwellers they have not considered the effect

slum electrification on small businesses within the slums as this study proposes to in Kibera slum.

A study conducted in South Africa by Taryn Dinkelman figured out that employment in the rural areas is positively affected with electrification by a bigger percent. This is because it enabled the beneficiaries to establish microenterprises (Dinkleman, 2011). Studies show that access to electricity improves baseline living conditions for the beneficiaries, which in turn leads to economic empowerment. According to Gunnar *et al* (2011), access to electricity provides interior and exterior lighting thus improving security which enables greater mobility to engage in economic activities.

Ouma (2013) found that owners of the SMEs that are connected to the electricity were highly motivated and hence expansion of their business coupled with value addition services within the town. Additionally, it was noted that the electrification leads to increase in the profitability of small business as it expands the operation time and makes some works easier. However, whereas the author mentions of the Mbita town much of his study is concentrated in the rural areas of Mbita and this focus is on the informal sector. The author has not examined the role of electrification in business in slum within Mbita town. This is the gap that this study intends to fill with special reference to slum electrification in Kibera slum.

2.5 Slum Electrification and Social Growth

The World Health Organization (2015) reports that, rural electrification leads to attraction of health personnel, better services, healthy productive enterprise, and good communication. Reporting on electricity in Hospitals, USAID (2012) reveals that

inefficient energy structure might affect the value of service: for instance, decrease in working hours resulting to an increase of unattended locals, reduction in the lab tests in the health facilities, night-time security concerns and drop in works enthusiasm. The health benefits from rural electrification include better health that constitute of cleaner air from households they reduce use of polluting fuels for cooking, lighting, and heating (Hutton *et al,* 2006). Moreover, better nutrition enhanced by the advancement in the health information awareness via improved availability of television and storage facilities (Bernard, 2010). However, while this is the case, the author has not focused on the health facilities within the rural areas thus creating a scholarly gap that need an address.

Most of the gains in health tend to either arise by way of adjustment in the operation hours or through acquiring and utilization of modern medical machines requires electricity (IEG, 2008). In Columbia provision of PV systems for four rural communities 'was rooted in the running of vaccine coolants, telecommunications, medical devices and proper lighting' (GVEP, 2013). Services provision improved with wide vaccine availability, increased malaria treatment and improved lighting for night appointments (GVEP, 2013). Moreover, in Honduras installation of electricity triggered a scaling down in education output (Squires, 2015). The slimming in the education performance was as a result of the widen child labor market which staged ballooned school dropout. That notwithstanding growth in the employment created a need for students to miss school so as to make up for their working parents (Squires, 2015).

A study conducted in Brazil by MME (2013) measures the social impacts of electrification programs. In the study, 309,000 Brazilian women were enrolled in schools

and that electrification has positive impact on social empowerments in that it led to efficiency in public welfare and services such as education. Majid (2013) notes that electric power supply position in the rural realm has a worthwhile influence on children health operations such as prenatal and postnatal care as well as immunization. The health improvement is associated with the reduction in other cost of health such as smoke from kerosene and burns from the use of kerosene lamps. Studies indicate that rural electrification does not necessarily increase security and reduce street crimes. For instance, the rate of killings grew coincidentally in Brazil with its Rural Electrification program and generally crime went up regardless of electrification programs in the rural and urban areas (Geoff, 2014). Additionally, crime and riots on the public in India has raised each by lager percentages since 1953 (Hesterman, 2013). While the figures do not distinguish clearly the urban and rural ratios, it does not give a good picture for the country as a whole (Hesterman, 2013). There are no data regarding whether crime rates are higher in urban versus rural areas. Other studies point out to the idea that provision of electricity and solar lamps in slums did not have any effects in the educational outcomes.

Gunnar *et al* (2011) conteds that electricity enhances good health as it stems pure indoor air ,food safety and improved nuttrion due to quality storage enhanced by refrigeration. This is also attributed to the boost in the availability of health education via easy access to the avenues rich with the health information as well as enough and extra study time. In the same study, it was found that electricity is beneficial to productive girls education (Gunnar *et al,* 2011). Accessibility to electric energy can improve social and economic circumstances in developing nations through its impacts on the key pointers of poverty that include environment, health and education (Kanagawa & Wakata, 2008).

Schaengold (2006) explored the significance of electrification in Indian slums in India. The author notes that lighting increases time for studying thus improving the educational outcome for the children within the slums. Many students' grounds of not completing their school assignment are lack of kerosene (Khandker, *et al*, 2012). Additionally, lighting boosts the output and effectiveness of other works, so more time is available for learning and studying (Christina *et al*, 2017). Electricity facilitates the working of IT devices which are also essential in enhancing learning. In addition, Khandker *et al* (2012) opines that lighting make better educational outcomes indirectly through improving health and well-being. They further maintained that solar lamps may enhance good air quality within the houses and hence good health for the children that enable them to study and attend school.

In India, Aklin *et al* (2017) notes that connection to solar energy had no positive effect on the studying time. They equally contend that electricity access resulted to decrease in the amount spent on kerosene but no educational gaining's were noted. Samad *et al* (2013) indicate that in Bangladesh electrification enhanced student home studies by more minutes than before and that electricity supply in the rural areas of Vietnam played a key role in scaling up the education yield. Khandker *et al* (2013) contends that lighting up countryside has aided in backing up school attendance for the students. Moreover, grid access boosted household incomes thus parents able to pay their children school fee hence reducing the dropout rates in school as it increased the retention and transition rates. Additionally, in Peru, children from connected houses to the grid had greater education levels than in those households without (Aguirre, 2017).

A recent study of 11 considerable Sub-Saharan African countries found that most of the health amenities had not been connected to electric power, and only few had been connected to reliable electric power supply (Adair-Rohani *et al*, 2013). Electrification plays key role in the operation of hospital and health facility machines. Studying electrification of health facilities in Sub Saharan Africa, Jeroen van't Pad and Elizabeth (2017) opine that absence of reliable electricity supply in clinics and other medical facilities denies patients who arrive at night a chance to be treated since they have to wait till the next day, equally blood vaccines and other supplied medicines may go bad hence wastage .This leads to many death rates. Echoing the same ideas, Michaela (2017) note that that electrification leads to prolonged opening hours in hospitals, provision of extensive services and better functionality of medical equipment's. Moreover, the authors point out to overall improvement in general hygiene, safety and security of the workers and patients at large.

In Rwanda, electricity availability changed the off school children study time from day to night but there was no rise in the total study hour's for students in the rural areas (Grimm *et al*, 2016). Similarly, in Uganda, the relationship between solar lamps and better learning outcomes was negative besides children having more time for studying and doing their homework (Furukawa, 2014). The findings of these studies are in line with World Health Organization (2017) reports that unreliable electricity availability results to wastage of vaccines, interferences in the regular operations of the health amenities and diagnostic apparatus, absence of information transmitters and lights during emergency procedures and childbirth.

Wix, Samuel and Aelvarsdóttir (2017) investigated prospective relationships of electrification and educational outcomes in Tanzania. The study indicated that improving electricity availability enhances education performance but it should be integrated with other initiatives that can better learning environs. The studies have shown how solar energy connected to households has impacted on education with less attention to report from the school point of view. Additionally, these studies are very general thus may have omitted some important aspect as far as lighting is concerned. There is therefore a need to carry out a more localized study to investigate this link between educational outcomes and slum electrification as proposed by this study with close reference to Kibera slum, Nairobi County Kenya.

While the above studies have focused on electrification and its role in the promotion of health, none of them focuses on slum electrification as proposed currently as far as slum electrification and health is concerned. Additionally, most of the studies focus on the rural electrification. This study intends to address this gap by considering slums electrification and it impacts on efficiency of health facilities in Kibera slum. It is thus apparent that there is little information concerning slum electrification and slum security. Much of the literature focuses on rural electrification and security in the rural areas. This study intends to address the above by examining the role of slum electrification on slum security with reference to Kibera slum, Nairobi City County Kenya.

2.6 Theoretical Framework

The study was anchored on two theories, namely, the empowerment theory and the theory of sustainable development.

2.6.1 Empowerment Theory

The advocates of empowerment theory are Rappaport (1984) and Zimmerman (1995). The theory holds that activities, actions, formations and systems may be warranting and that the aftermath of the empowerment process leads to a level of being capacitated. Rappaport (1984) and Zimmerman (1995) noted that the empowerment process and outcome are different in their external design since there is no ordinary measure that can fully seize its meaning for all people in all settings. Empowerment is population and context specific. This is because what empowerment means to one person may be different from what it means to another person in a different context and situation.

Empowering process are those which attempts to get to govern, manage, acquire essential resources and deeply understand individual's social environment is crucial. A process is empowering when it aids a population to gain abilities that enable them to be self-reliant, thinkers, decision makers, and problem solvers. For an individual, an empowering process may include involvement in community or organization. At organizational levels, empowering processes may include shared decision making and leadership. On the other hand, at the society domain, empowering actions may involve accessible media, government, and other society resources.

Empowered outcomes are empowerment or operationalization to enable studying of the consequences of people's endeavors to get the largest command of their areas, and the impact of the innerving actions that are intended to strengthen and create more opportunities to the participants. Just like the process, empowerment outcome differentiates its self at various levels. At an individual level, the outcome may include

events considered to direct proactive behaviour or know-how. At the organizational level, the outcome may entail efficient resource acquisition, organizational networks as well as policy leverage. Finally, at a community level, empowerment process may entail evidence of pluralism, accessible community resources, and the existence of organizational coalitions (Zimmerman, 2000). The empowerment theory is appropriate for this study as it helps in understanding the empowerment process and empowerment outcome. The slum electrification is one of empowerment process while the indicators of economic and social growth are the empowerment outcome.

2.6.2 Theory of Sustainable Development

The researcher also premised the study on the Theory of Sustainable Development. The Theory of Sustainable Development was developed by the World Commission on Environment and Development (WCED) and presented in their landmark report titled "Our Common Future" (also known as the Brundtland Report) (WCED, 1987). The report introduced the concept of sustainable development and provided a comprehensive framework for understanding the interconnections between economic development, social equity, and environmental protection (WCED, 1987). The theory recognizes the interdependence of social, economic, and environmental factors in achieving long-term well-being (UNDP, 1992). This theory provides a holistic framework for understanding and analyzing the complex dynamics of slum electrification and its impact on socio-economic growth in Kibera slum.

The key principles of the Theory of Sustainable Development relevant to this study include: Environmental Sustainability: This principle emphasizes the importance of

minimizing negative environmental impacts and promoting sustainable practices in slum electrification projects (UNDP, 1992). It encourages the use of renewable energy sources and energy-efficient technologies to reduce environmental degradation and ensure long-term viability. The second principle is social equity which highlights the significance of promoting social equity and inclusivity in slum electrification initiatives (UNDP, 1992). It calls for ensuring that all households, regardless of their socio-economic status, have equal access to electricity services and benefit from the associated socio-economic opportunities. The third principle is economic viability which underscores the need for slum electrification projects to contribute to economic growth and improve the livelihoods of households (UNDP, 1992). It recognizes that access to electricity can stimulate income generation, enhance productivity, and create employment opportunities, thereby fostering socio-economic growth.

The fourth principle of community participation advocates for active engagement and participation of community members in the planning, implementation, and decision-making processes of slum electrification projects (UNDP, 1992). It recognizes that involving local communities in the design and management of electrification initiatives increases the likelihood of successful outcomes and sustainability. By utilizing the Theory of Sustainable Development, the study comprehensively assessed the effects of slum electrification on socio-economic growth in Kibera. The theory was suitable for the study because it allowed for a holistic analysis of the interrelationships between environmental, social, and economic dimensions, and thus ensured a comprehensive understanding of the long-term effects of electrification efforts.

2.7 Conceptual Framework

INDEPENDENT VARIABLES **MODERATING VARIABLE** **DEPENDENT VARIABLES**

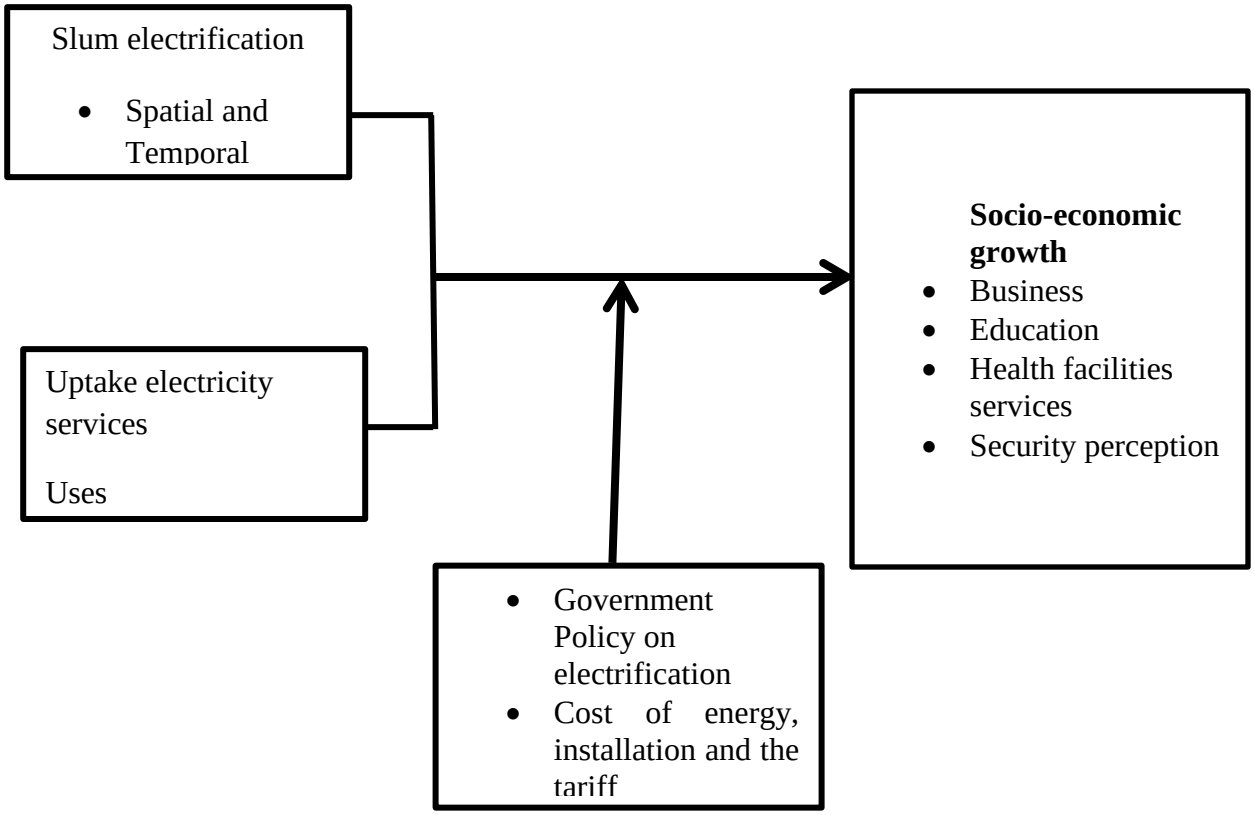

Figure 2. 1: Conceptual framework
Source: Synthesis of literature review.

From the model above, slum electrification impacts on business, security, health and educational outcomes in the Kibera slum. Therefore, it forms the independent variable of this study while later forms the dependent variables. The sub variables that were examined under slum electrification include the Quality of electricity, homes accessing electricity and Streets lit. However, government policy on electrification impacts on slum electrification and the facilities, and areas that needs to be lit within these slums. Accordingly, it forms the moderating variable of this study.

2.8 Summary of Reviewed Literature

The researcher reviewed literature based on the themes derived from the study objectives, namely; trends and patterns of distribution of electricity and socio-economic growth, household and community uses of electricity and socio-economic growth, slum electrification and economic growth as well as social growth. The reviewed literature comprised studies conducted globally, regionally and locally. In addition, the findings of the reviewed studies had both convergent and divergent results on slum electrification and socio-economic growth. The researcher identified several gaps in the reviewed studies including contextual gaps, methodological gaps, scope of studies as well as content gaps.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter constitutes; research design, the study area, target population, the sample techniques and sample size, data collection instruments and where to carry out the pre-testing of the research instruments.

3.1 Research Design

The study employed descriptive survey design. It is a technique of information collection by interviewing or use of questionnaires to a selected population (Orodho, 2003). It can be employed when gathering information on respondent's attitudes, views, traditions or either diverse issue on economic and social welfare (Orodho & Kombo, 2002). This study aimed at collecting information on respondent's data in relation to economic and social effects of slum electrification program in Kibera slum. The design employed household survey which was significant in collecting data on businesses, schools and health facilities in the slums, where are they are located, when did they get electrified, what is variation in their profits before and after electrification, educational outcomes and efficiency in operations. The study utilized a combination of qualitative and quantitative data. The primary quantitative data was acquired through the use of questionnaires while secondary data was found from school archives, internet, journals and books. Spatial explicit data was collected by the use of GPS devices. Qualitative data was found on the interviews with key informants from sampled departments.

3.2 The Study Area

The study was conducted in Kibera slum, which is located in Nairobi City County, Kenya. Kibera is one of the largest slums in Africa, with an estimated population of over 200,000 of the 2.5 million slum dwellers in the city (Desgroppes & Taupin, 2011; Kihato, 2017). The area is characterized by poor housing conditions, limited access to basic services such as water and sanitation, and high levels of poverty (UN-Habitat, 2016). The distribution of electricity in Kibera slum is limited, with some areas having no access to electricity at all (Kihato, 2017). This presents a significant challenge to slum residents who rely on electricity for their daily activities, including lighting, cooking, and running small businesses. Therefore, understanding the trends and patterns in the distribution of electricity in Kibera slum is crucial in identifying the gaps and limitations in the electrification of the area.

Assessing the household and community uses of electricity in Kibera slum provides insights into the specific ways in which slum residents use electricity in their daily lives. This information is crucial in designing interventions that can support the efficient and effective use of electricity in the area. In addition, analyzing the economic effects of slum electrification in Kibera slum provides insights into the potential economic benefits of electrification. This includes increased access to job opportunities, improved income, and reduced reliance on expensive and unsafe energy sources such as kerosene and charcoal (Eberhard & Gratwick, 2011). Moreover, determining the social effects of slum electrification in Kibera slum provides insights into the potential social benefits of electrification. This includes improved health outcomes, enhanced access to education, and increased social interactions (World Bank, 2014).

Kibera slum in Nairobi City County, Kenya was a suitable study area for the study on effects of slum electrification towards households' economic and social growth for several reasons. Firstly, Kibera slum is one of the largest slums in Africa, and therefore presents a significant challenge to the provision of basic services such as electricity. Secondly, the area has limited access to electricity, which makes it an ideal case study to understand the impact of electrification on the economic and social growth of slum residents. Finally, Kibera slum is a unique area in terms of its demographic characteristics, and therefore provides a valuable opportunity to study the impact of electrification on a diverse population.

Kibera slum is a division of Nairobi Area, Kenya, and neighborhood of the city of Nairobi, 6.6 kilometers from the city Centre. It stretches from Langata road to the East and extends to Ngong road to the west. There is a shortage of clean water and education and rape and assault cases are common. Figure 3.1 shows the map of Kibera slum.

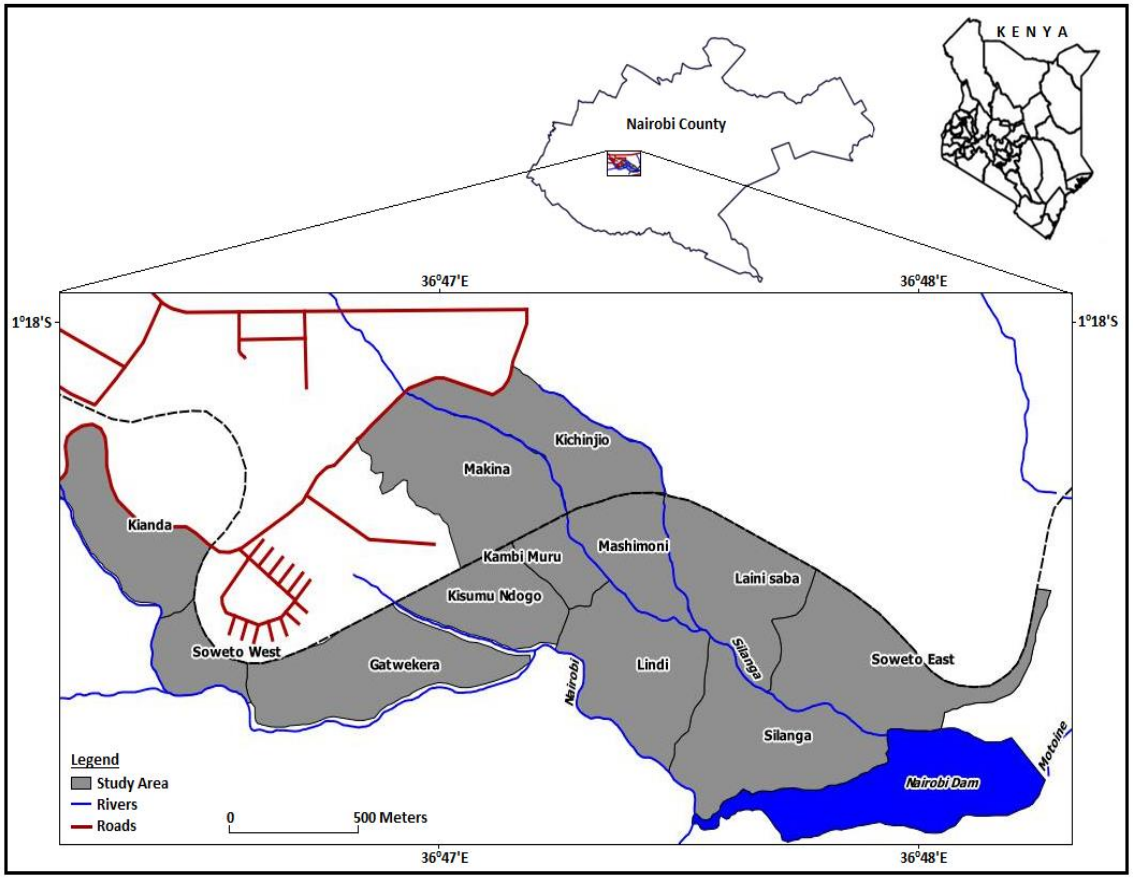

Figure 3. 1: Map of the Study Area Showing the Location of Kibera slum in Nairobi County.
Source: http://kenyapage.net/pictures/kibera.html, February 2019.

3.3 Target Population

The targeted population of this study included: Households heads, business owners, School heads and health officials of Kibera slum who had stayed in the slum for over 5 years. According to Desgroppes & Taupin (2011) Kibera slum has estimated population of 200,000 of the 2.5 million slum inhabitants in the city. The choice of five and above years stay in the slums was to help find facts about the situation of Kibera slum before and after the electrification thus arrive at solid conclusion about the role of electrification in the slum. It is worth noting that the Slum electrification project in Kibera slum begun

in May 2011. This group was targeted since they have vital data as far business, education, security issues and health provision is concerned in the slum. Additionally, they have vital data concerning electrification of their houses within the slum and whether this has been a benefit or a curse.

The study also targeted workers in the sales department from the Ministry of Energy, Kenya Power and Lighting Company. They are targeted because the researcher deem them to have vital data about the number and which streets have been lit in Kibera slum and the challenges they are facing in lighting the slum.

The Nairobi City County Government administrators such the ward administrators, Chief Officers in the respective departments and those in charge of planning and management were also targeted. This is because Kibera slum falls under their jurisdiction thus they pose viral data about the slums social and economic growth and challenges.

3.4 Sampling Techniques and Sample size

3.4.1 Sampling Techniques

A multistage random sampling was used in this survey as sampling units was households and the villages. In every village that was surveyed a minimum of 15 to a maximum of 30 household's heads were purposely selected as most of them had business, connected to electricity and have stayed for over 5 years in Kibera slum. Purposive sampling was also employed to sample key informants; that is, Ministry of Energy, KPLC officials, Nairobi City County government officials, health facilities and schools within Kibera slum who were interviewed. As it was challenging to identify the whole population with

accuracy, purposive sampling was appropriate in sampling the business owners and the household heads.

3.4.2 Sample Size

The desired sample size will be determined using the formula Fisher *et al* (1991):

$$n = \frac{Z^2 pq}{d^2}$$

Where-:

n-The desired sample size (assuming the population is greater than 10,000)

z -The standard normal deviation, set at 1.96, which corresponds to 95% confidence level

p-The proportion in the target population estimated to have a particular characteristic. If there is no reasonable estimate, then use 50 percent (the study will use 0.50).

q = 1.0 –p

d = the degree of accuracy desired, here set at 0.05 corresponding to the 1.96.

In substitution, $n = \frac{1.96^2 x\ 0.5\ x\ (1-0.5)}{0.05^2} = 384$

3.5 Data Collection Instruments

Primary quantitative data was collected by means of questionnaires served to households, business owners to collect information on profits, benefits and uses of electricity.

Secondary data was obtained from schools' performance records at the school heads offices.

Spatially explicit data was collected using participating mapping which involved a community walkabout with key informants to record the coordinates of electricity transformers using a hand-held GPS device.

Qualitative data involved interviews with key informants to collect information from hospitals, schools, Ministry of energy, Kenya Power, Nairobi City County Government to collect information on operation time of business and health facilities, new business, performance of schools and efficiency of health facilities.

3.6 Pilot Study

The researcher conducted a pilot study in Mathare slums. The choice of Mathare slums as a pilot study area for the effects of slum electrification on socio-economic growth of households is justified by several factors. Firstly, Mathare is another large and diverse slum community in Nairobi City County with similar challenges to Kibera slum (World Bank, 2019; The Kenya National Bureau of Statistics, 2019). Secondly, a pilot study in Mathare slums can provide a comparative analysis of the effects of slum electrification on socio-economic growth of households in different slum communities (Okaka & Olukotun, 2021). The findings of the pilot study were used to review questions in the questionnaires and interview schedule to make them clearer and to removing unclear questions to aid collection of reliable and adequate results. Additionally, it equally helped in modifying the questionnaires; the pilot study equally helped the researcher know the challenges that are likely to be faced in the field thus prepare how to handle them.

3.6.1 Reliability

It refers to extent to which the tools are constant in evaluating and giving the similar outcomes. It is vital as it builds a concrete base in validity of the results of the study. The study used the results of pilot study to clear the uncertainty in all the questions of the questionnaires. A indepth understanding of the study variables was used to establish the standard validity of the slum electrification data against the social economic effects.A split half test was used on the respondents. Acorrelation coefficient to show the link between the two set of scores.To find the correlation, the K-R20 formula was used. A correlation coefficient KR_{20} of 0.75 was employed which showed that the two set of the results were greatly related. These provided a projection of variables as an estamate of the actual variables.

3.6.2 Validity

The validity of the content of the research tools was also done. Validity constitutes the level to which the yields resulting from analysis of the data gives the true picture of the actual study. It deals majorly on how accurate the collected data represents the variables of the study. It is important for the test to be effective so as the outcome can correctly be interpreted and used. The validity of the data was evaluated for reliability and checking of the relationship. Further tests taken to ensure validity was appropriate sampling hence raising the assurance level in the sample size, confirming openness of the questions and other measures such as quality mechanism in data screening, validating and privacy. The process of data collection was above board as research assistants supporting in the data collection were appropriately taught and guided by the lead researchers.

3.7 Data Analysis

The collected data was analyzed using both quantitative and qualitative data analysis technique. Specifically, the raw data was pre-processed first and only completed question forms was evaluated. All forms that were not fully answered were handled as no response.

Quantitative data was analyzed descriptively as well as inferentially. Descriptive-frequencies analyzed the uses and benefits of electricity. Inferential statistics-Chi square was employed to test the links of slum electrification on profits and on education outcomes and the variation on profits and performance between business and schools that have electricity and those that are without.

Overlay function in ARCGIS-where you load the GPS coordinate into an administrative map showing spatial distribution of electricity in Kibera slum. Also, information on schools, hospitals, street's location in relation to electrification is shown on the map.

Qualitative data was analyzed using themes and categorized as reported.

3.8 Ethical Considerations

The study managed to acquire necessery research license from the National Council for Science, Technology, and Innovation (NACOSTI) and other requisite authorization from the Nairobi City County to carry this study in Kibera slum. The sampled residents were informed about the confidentiality of the information they provide and that it would not be made available to any individual who was not involved in the study but for the purpose it was intended for. The researcher also informed the paticipants about the procedure involved in the research and they gave their full consent to participate.

CHAPTER FOUR

DATA ANALYSIS

4.1 Introduction

The main objective of the study was to examine effects of slum electrification towards household economic and social growth of Kibera slum. The study focused on households located in all the villages of Kibera slum that are connected to electricity. This chapter present data collected from the respondents. The chapter is organized in thematic beginning with the demographic features, variables and finally the interpretation of the results.

4.2 Response rate

The study had sampled 384 households' heads to participate in this study; however, it managed a 96.9% response degree with only 3.1% of the anticipated sampled respondents not participating. The response level was relatively high as recommended by statistical scholars like Kothari (2004) that recommends a minimum response rate of 51% in a study. Ouma (2011) managed to get a response rate of 76%, Kembo (2013) had 83.3% while Ondari (2010) achieved a response ratio of 67%. All the three scholars did studies on electrification in various areas. The findings are presented in Table 4.1.

Table 4.1: Village/residential zone

	Village	Frequency	Percent
1.	**Kambimuru**	23	6.2
2.	**Katwekera**	22	5.9
3.	**Kianda**	28	7.5
4.	**Kichinjio**	25	6.7
5.	**Kisumu ndogo**	26	7.0
6.	**Laini Saba**	23	6.2
7.	**Lindi**	32	8.6
8.	**Makina**	53	14.2
9.	**Mashimoni**	25	6.7
10.	**Raila**	25	6.7
11.	**Silanga**	28	7.5
12.	**Soweto West**	47	12.6
13.	**Soweto East**	15	4.0
	Total	372	100.0

Source: Author, 2021

4.3 Respondent's Demographics

The study focused on household heads in 13villages in Kibera slum. The evaluated features of the respondents are presented in tables 4.2, 4.3, 4.4, 4.5, and 4.6. They include age, duration of stay, level of education, gender, employment status as well as monthly incomes as recommended by a number of statistics scholars that include Kothari (2004).

Table 4.2 Respondents Gender by Age

		Gender					
		Male		**Female**		**Total**	
Age	**18-24**	5	2.8%	10	5.1%	15	4.0%
	25-30	19	10.7%	37	19.0%	56	15.1%
	31-45	76	42.9%	105	53.8%	181	48.7%
	46-60	66	37.3%	39	20.0%	105	28.2%
	61-70	7	4.0%	3	1.5%	10	2.7%
	Over 70	4	2.3%	1	.5%	5	1.3%
Total		177	100.0%	195	100.0%	372	100.0%

Source: Author, 2021

According to the outcomes in Table 4.2, minority of the sampled respondents at 47.58% were male while the majority at 52.42 %was female. In terms of ages most of the respondents at 48.7% were from age bracket 31-45 followed by 28.2% from age range 46-60 then 15.1% who aged between 25-30, 4% from age group 18-24 then 2.7% from group 61-70 and lastly minority 1.3 % of the sampled residents were in the set of over 70 years. The researcher sought to establish the gender and age of the respondents because gender and age are important factors in determining the impacts of slum electrification on socio-economic growth of households (Odongo & Oluoch, 2018; Okaka & Olukotun, 2021).

Further, the study pursued the period of stay in years. The researcher sought to establish the duration of stay because the length of time that people have lived in the slum can impact their experiences with electrification (Odongo & Oluoch, 2018). The findings are presented in Table 4.3.

Table 4.3: Duration of Stay by Gender in Years

Gender	Mean	N	Range	Minimum	Maximum
Male	19	177	60	2	62
Female	16	195	56	4	60
Total	18	372	60	2	62

Source: Author, 2021

Findings in Table 4.3 show that the duration of stay by gender ranged at 60 with a mean of 18. The findings imply that most respondents in the study had stayed in Kibera slum for a relatively longer period of time.

In addition, the researcher sought to determine the level of education of the respondents. This is because the level of education of households can affect their ability to understand and benefit from electrification (Makena & Kimani-Murage, 2020). The findings are contained in Table 4.4.

Table 4.4 Level of Education

Level	Frequency	Percent
No schooling	5	1.3
Some years of primary	21	5.6
Completed primary school	78	21.0
Some years of secondary school	66	17.7
Completed secondary school	145	39.0
Some years of college/university	29	7.8
Completed college/university	28	7.5
Total	372	100.0

Source: Author, 2021

From the responses in table 4.4, it is clear that 39% of the interviewers had accomplished their secondary level training trailed by 21% primary level leavers on the other hand, 17.7 % of the respondents spent some years in secondary school as well as5.6% that spent few years in primary school but never completed. The post-school levels had 7.5% of the

respondents that completed as 7.8% spent some years but never completed and only 1.3% of the respondents had never been to school. Cumulatively a greater majority of 93% had attained the primary education as 54.3% attained secondary education which is coherent with the findings of other scholars like Kembo (2013) that had 96.8% and Ouma (2011) who had 99% of their respondents attaining the primary education. Ouma (2011) further indicates that such a percentage is a great achievement as it goes hand in hand with Kenya's development strategy vision 2030.

The study also sought to establish the employment of the respondents. This is because the electrification affects employment and thus is an important area of study (Alem, Hassen & Lemma, 2018). The findings are presented in Table 4.5.

Table 4.5 Employment Status by Age

Age	Employment status											
	Unemployed		**Self-employed**		**Employed - public sector**		**Private sector employee**		**Retired**		**Total**	
18-24	6	40.0%	3	20.0%	0	0.0%	6	40.0%	0	0.0%	15	100.0%
25-30	7	12.5%	42	75.0%	2	3.6%	5	8.9%	0	0.0%	56	100.0%
31-45	15	8.3%	147	81.2%	8	4.4%	11	6.1%	0	0.0%	181	100.0%
46-60	8	7.6%	75	71.4%	9	8.6%	9	8.6%	4	3.8%	105	100.0%
61-70	0	0.0%	2	20.0%	1	10.0%	0	0.0%	7	70.0%	10	100.0%
Over 70	1	20.0%	0	0.0%	0	0.0%	0	0.0%	4	80.0%	5	100.0%
Total	37	9.9%	269	72.3%	20	5.4%	31	8.3%	15	4.0%	372	100.0%

Source: Author, 2021

Results of employment status as evident in table 4.5 validates 72.3% of the selected population were self-employed,8.3% were employed in the private sector, 5.4% employed in public sectors and a total of up to 9.9% were unemployed while 4% had retired. In totality 86% of the respondents were employed in various sectors and most of them were from age group 31-45 and 46-60 respectively.

The researcher also sought to establish the monthly income of the respondents. This is because income levels can be an important determinant of the economic impacts of electrification on households, as noted by Alem et al. (2018). The findings are contained in Table 4.6.

Table 4.6: Respondents Monthly Income

	Male		**Female**		**Total**	
Age	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
18-24	4100	5	8100	10	6767	15
25-30	12474	19	7214	37	8998	56
31-45	14511	76	9631	105	11680	181
46-60	19038	66	13872	39	17119	105
61-70	14829	7	33333	3	20380	10
Over 70	17750	4	500	1	14300	5
Total	15772	177	10260	195	12882	372

Source: Author, 2021

A lager percent of the local population earns a mean monthly income of Ksh. 11680 followed by Ksh.17119 from age group 31-45 and 46-60 respectively as minority earn a mean income of ksh.14300 from age group of above 70years. It is equally evident that male have a high monthly income of Ksh.15772 than the female who earn a total mean of Ksh.10260 as show in table 4.6 above.

4.4 Trends and Patterns of Distribution of Electricity and Socio-Economic Growth

The first objective of the study sought to establish trends and patterns of distribution of electricity and socio-economic growth in Kibera slum. These constitute trends and patterns in supply of energy in the slum at the households within the villages. The study also viewed the structuring and positioning of the units in the villages connected. The features observed were grids, GPS location and distance of the houses and other facilities from grids, railway line and roads, the time when they were connected, the connection fee as well as what they spent on electricity monthly. The findings are contained in Table 4.7.

Table 4.7: Household connected to electricity

		Electricity in the household					
		Yes		No		Total	
Village	Kambimuru	23	100.0%	0	0.0%	23	100.0%
	Katwekera	22	100.0%	0	0.0%	22	100.0%
	Kianda	28	100.0%	0	0.0%	28	100.0%
	Kichinjio	25	100.0%	0	0.0%	25	100.0%
	Kisumu ndogo	26	100.0%	0	0.0%	26	100.0%
	Laini Saba	23	100.0%	0	0.0%	23	100.0%
	Lindi	32	100.0%	0	0.0%	32	100.0%
	Makina	53	100.0%	0	0.0%	53	100.0%
	Mashimoni	23	92.0%	2	8.0%	25	100.0%
	Raila	25	100.0%	0	0.0%	25	100.0%
	Silanga	28	100.0%	0	0.0%	28	100.0%
	Soweto west	46	97.9%	1	2.1%	47	100.0%
	Soweto East	15	100.0%	0	0.0%	15	100.0%
Total		369	99.2%	3	.8%	372	100.0%

Source: Author, 2021

According to the outcome in the table 4.7above, 99.2% of the total sampled residents are connected to electricity while minority of 0.8% of them does not use electricity.

Table 4.8 Source of power before getting connected to electricity

		Source of power for lighting before getting connected to electricity									
		Paraffin		Solar		Generator		Battery		Candle	
Village	Kambimuru	21	91.3%	1	4.3%	0	0.0%	0	0%	3	1%
	Katwekera	22	100.0%	0	0.0%	0	0.0%	0	0%	0	0%
	Kianda	27	96.4%	0	0.0%	0	0.0%	1	0%	0	0%
	Kichinjio	21	84.0%	2	8.0%	2	8.0%	0	0%	0	0%
	Kisumu ndogo	26	100.0%	0	0.0%	0	0.0%	0	0%	0	0%
	Laini Saba	23	100.0%	0	0.0%	1	4.3%	0	0%	0	0%
	Lindi	31	96.9%	1	3.1%	0	0.0%	0	0%	0	0%
	Makina	53	100.0%	0	0.0%	0	0.0%	0	0%	0	0%
	Mashimoni	23	100.0%	0	0.0%	0	0.0%	0	0%	0	0%
	Raila	25	100.0%	0	0.0%	0	0.0%	0	0%	0	0%
	Silanga	27	96.4%	0	0.0%	2	7.1%	0	0%	0	0%
	Soweto West	41	89.1%	1	2.2%	5	10.9%	1	0%	0	0%
	Soweto East	15	100.0%	0	0.0%	2	13.3%	0	0%	0	0%
Total		355	96.2%	5	1.4%	12	3.3%	2	1%	3	1%

Source: Author, 2021

The study also sought to find types of power respondents were using before they got connected to electricity and the result as presented in table 4.8 indicate that a total of 355 at 96.2% used paraffin followed by 3.3% that used generator 1.4% used solar and lastly at 1% used battery and candle.

Table 4.9 Expenditure on power before and after getting connected

Village	Statistics	Monthly expenditure on the source(s) of power before getting electricity	Monthly electricity bills
Kambimuru (N = 23)	Mean	761	430
Katwekera (N = 22)	Mean	1593	600
Kianda (N = 28)	Mean	1561	479
Kichinjio (N = 25)	Mean	4140	1160
Kisumu ndogo (N = 26)	Mean	1085	488
Laini Saba (N = 23)	Mean	1635	609
Lindi (N = 32)	Mean	959	2088
Makina (N = 53)	Mean	1721	355
Mashimoni (N = 23)	Mean	1196	639
Raila (N = 25)	Mean	1048	424
Silanga (N = 28)	Mean	2114	600
Soweto West (N = 46)	Mean	1007	498
Soweto East (N = 15)	Mean	1267	520
Total (N = 369)	Mean	1533	679

Source: Author, 2021

Table 4.10: Paired Samples Test

		T	Df	Sig. (2-tailed)
Pair	Monthly expenditure on other source(s) of power Vs. Monthly household electricity bills	6.951	368	.000

Source: Author, 2021

In addition, the study conducted a t-test between the previous expenditure on power and the current monthly electricity bill for the households and the results in table 4.9 is that t = 6.951 at 368 degrees of freedom was significant; p > 0.000. Given that the p value is less than 0.05 (significance level) the study rejects the null assumption and thus there is a major difference stuck between monthly expenditure on other source(s) of power and monthly household electricity bills. This confirms that the household's expenditure on power had gone down upon getting connected to electricity. The response corresponds with those of Aklin *et al* (2017) and Okembo (2013) who contends that electricity access resulted to decrease in the amount spent on kerosene and other alternative sources of power.

Table 4.11 Year of connection

Years	Frequency	Percent
No response	9	2.4%
2005	1	0.3%
2010	8	2.2%
2011	172	46.2%
2012	57	15.3%
2013	51	13.7%
2014	32	8.6%
2015	31	8.3%
2016	6	1.6%
2017	3	0.8%
2018	2	0.5%
Total	372	100%

Source: Author, 2021

For the households that had electricity, the study established when they got connected to electricity and it ranged from the year 2005 to 2018. Majority 172 at 46.2% got connected in 2011 followed by15.3% in 2012 and a minority of 0.3 percent being in 2005 as evident in table 4.11. The results also pointed out that all households paid Kshs 15,000.00 to get connected to the slum electrification program, though many observed that the initial connection payments was so high and also the period before connection after application was long hence limitation and low rate in the new uptake. The results were hand in hand with those of World Bank (2008) who fined in their surveys that peri-urban people find the general cost of grid connection to be high hence they recommended subsidies and weavers to encourage the more uptakes.

Table 4.12 Distances from the Grid

	Village	**Mean Distance (In Metres)**	**N**
1.	**Kambimuru**	6	22
2.	**Katwekera**	21	22
3.	**Kianda**	5	28
4.	**Kichinjio**	45	25
5.	**Kisumu ndogo**	7	26
6.	**Laini Saba**	7	23
7.	**Lindi**	10	32
8.	**Makina**	14	53
9.	**Mashimoni**	14	25
10.	**Raila**	18	25
11.	**Silanga**	78	28
12.	**Soweto West**	152	47
13.	**Soweto East**	5	15
	Total	36	371

Source: Author, 2021

From the table above it is clear that the mean distance of connection from the grid was 36 meters for the respondents with the highest being 152 and the smallest being at 5 Meters in Soweto East.

Table 4.13 Monthly bills across the villages after connection

	Less than 500	**500-1000**	**1000-2000**	**over 2000**	**Total**
Laini Saba	13	5	0	1	19
Mashimoni	7	16	4	0	27
Soweto West	5	13	4	0	22
Kambi Muru	11	8	5	0	24
Lindi	5	10	4	1	20
Makina	6	12	6	0	24
Silanga	7	10	4	0	21
Kichinjio	7	12	4	0	23
Gatwekera	2	19	3	0	24
Kisumu Ndogo	3	15	2	0	20
Raila	4	12	5	0	21
Kianda	8	9	4	0	21
Karanja	9	9	1	0	19
Total	87 (30.5%)	150 (52.6%)	46 (16.1%)	2 (0.7%)	285 (100.0%)

Source: Author, 2021

Majority of the respondents 150 at 52.6% of the total population spent Ksh. 500-1000 for electricity bills monthly followed by 30.5% who spent less than Ksh.500 with the minority at 0.7% who were spending over Ksh2000

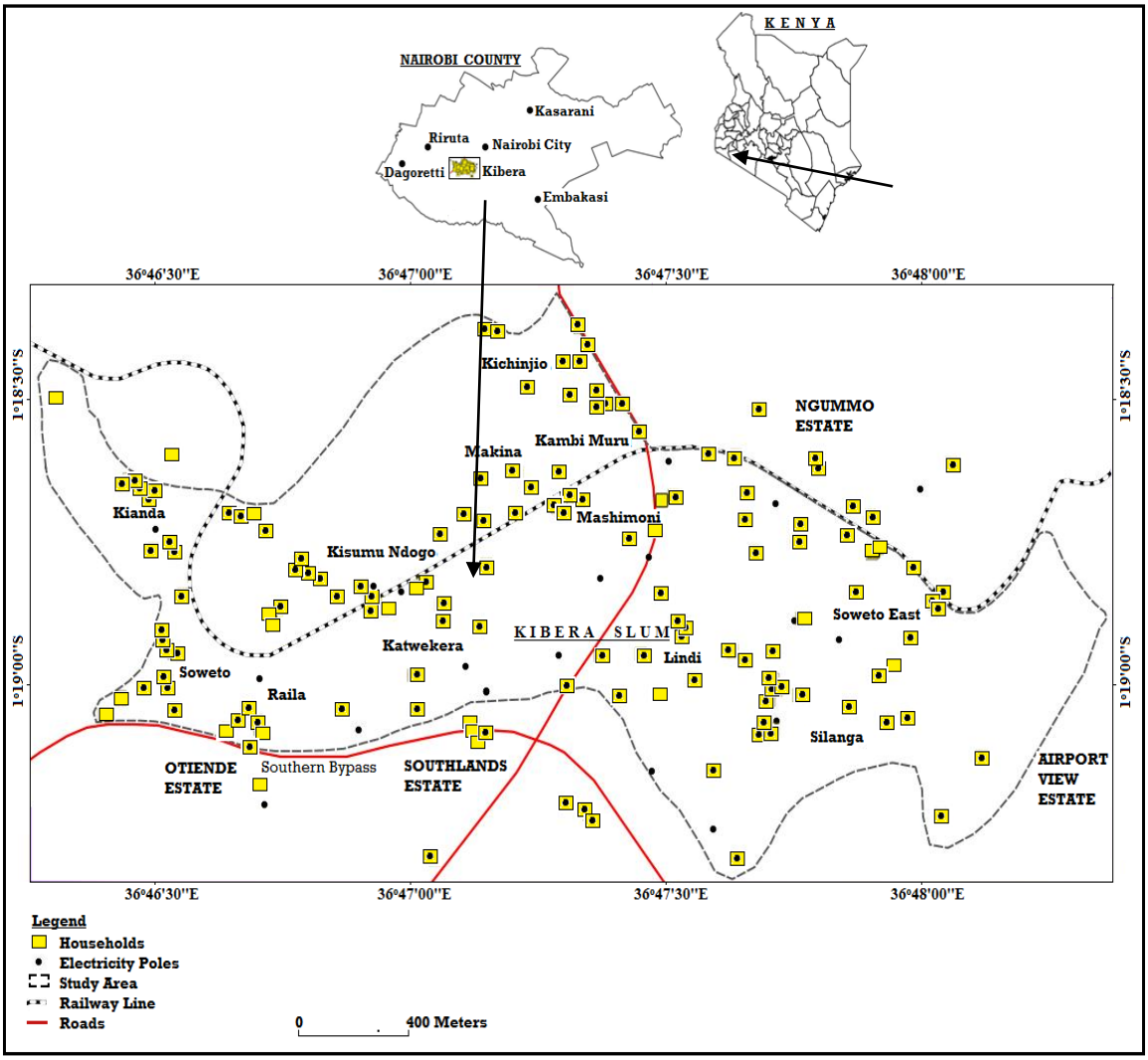

Figure 4.1: Map of the Kibera Slum in Nairobi City County Showing the Position of Households in relation to Electricity Poles
Source: Google Satellite Image (February, 2021)

Results in Fig.4.1 show the location of the sampled households by this study in the villages of Kibera slum in relationship to the nearest electricity pole they are linked to. It is clearly shown that most of the structures connected to the grid are positioned along the railway line and the roads and few of them that are far. Additionally, it was also observed that the household that and villages that were near the tarmacked roads and the railway

line were easily connected and served than those that were far located as shown above and below.

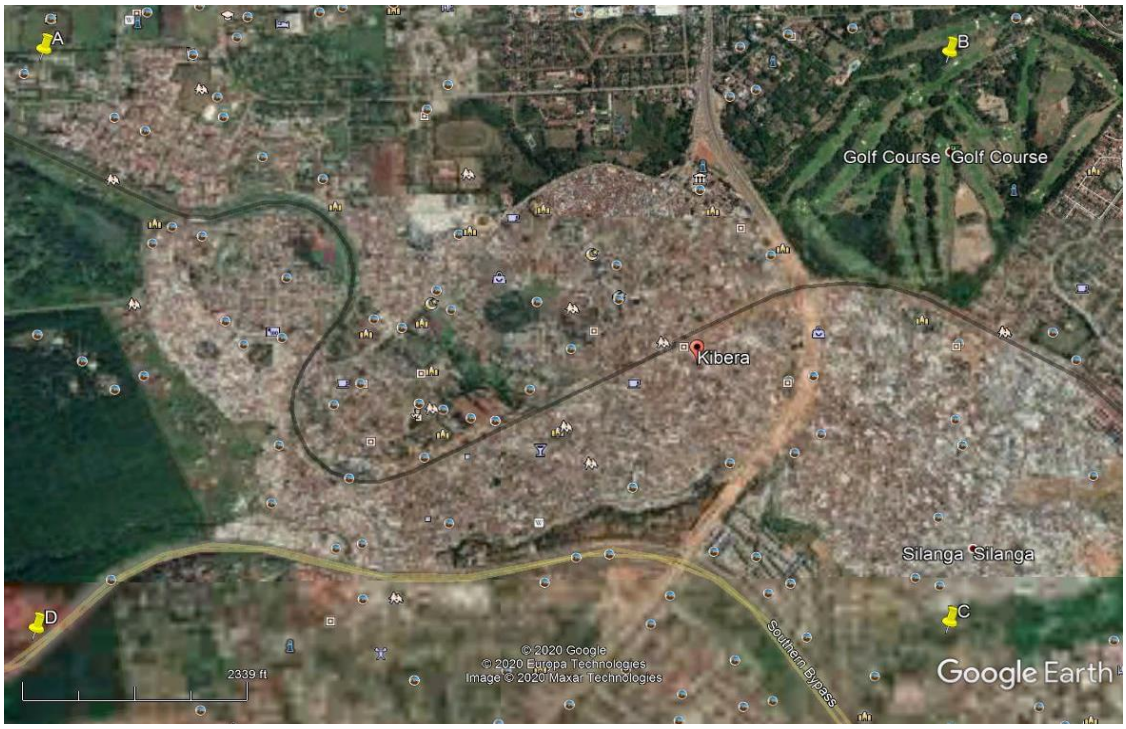

Figure 4:2: Google Earth Satellite Image, February 2021.

The figure above shows the spatial distribution of electricity to the households and other facilities in the villages of Kibera slum. According to the figure most of the structures about 70% are linearly clustered along the roads and railway line as 20% of them are sparsely distributed in the villages and far distanced from the roads but within the maximum grid distance of 500meters.

4.5 Household and community uses of electricity and socio-economic growth

The second objective sought to assess the household and community uses of electricity and socio-economic growth in Kibera slum. The study focused in finding out how power

was utilized and consumed in the sampled households and the local society. At the selected households, the consumption of electricity measure was narrowed to household devices and machines that needed power to operate. The survey required the identified locals to only pick the appliances they used. The results are shown in Table 4.14.

Table 4.14: Appliances in your household and community that use electricity

	After getting connected		**Had before getting connected**	
Appliances	**N**	**%**	**N**	**%**
Cell-phone	365	98.1	311	83.6
Television	334	89.8	10	2.7
Radio	267	71.8	60	16.1
Iron box	206	55.4	4	1.1
Lighting (bulbs)	354	95.2	28	7.5
Hot showers	15	4.0	14	3.8
Water pump	7	1.9	6	1.6
Refrigerator	41	11.0	1	.3
Electricity cooker	39	10.5	1	.3
Microwave	65	17.5	2	.5
Water heater/electric kettle	237	63.7	5	1.3

Source: Author, 2021

As shown in the table above, the use of the devices, tools, and machines at surveyed homes vary between before connection to and after connection. It is evident that with the connection of electricity there was increase in the use of appliance than before connection such as cell-phone usage rose from 83.6% to 98.1%, 2.7 % of the respondent used television before connection but the percentage increased to 89.9% after connection, 16.1% used radio before but after connection the raised to 71.8% now using, 95.2% were also using lighting (bulbs) after connection unlike 7.5% before connection. That notwithstanding the use of water heaters rose to 63.7%, iron boxes 55.4%, microwave to

17.5% followed by refrigerators at 11%, electric cookers10.5%, hot showers 4% then water pumps at 1.9%. The results also shows that, the most used appliances after connection are low power consumption led by cellphone followed by lighting(bulbs), television, radio and water heaters compared to high power consuming appliances which include iron boxes, microwaves, refrigerator, electric cookers, hot showers and water pump.

4.6 Slum Electrification and Economic Growth

The study purposed to establish the economic changes by evaluating sampled household businesses through a questionnaire that had key questions on various dependent variables. The result findings were analyzed using Chi-square, frequency and means as it is presented in Tables 4.15 to 4.25.

Table 4.15 Household business

Village	Household business				
	Yes		No		Total
Kambimuru	17	73.9%	6	26.1%	23
Katwekera	21	95.5%	1	4.5%	22
Kianda	28	100.0%	0	0.0%	28
Kichinjio	21	84.0%	4	16.0%	25
Kisumu ndogo	25	96.2%	1	3.8%	26
Laini Saba	23	100.0%	0	0.0%	23
Lindi	8	25.0%	24	75.0%	32
Makina	22	41.5%	31	58.5%	53
Mashimoni	6	24.0%	19	76.0%	25
Raila	25	100.0%	0	0.0%	25
Silanga	27	96.4%	1	3.6%	28
Soweto West	34	72.3%	13	27.7%	47
Soweto East	14	93.3%	1	6.7%	15
Total	271	72.8%	101	27.2%	372

Source: Author, 2021

Out of the total household surveyed, 271 households at 72.8% had businesses while 101 at 27.2% had no business as presented in Table 4.15.

Table 4.16: Had a business before getting connected to electricity

Village	Yes		No		Total
Kambimuru	16	94.1%	1	5.9%	17
Katwekera	10	47.6%	11	52.4%	21
Kianda	25	89.3%	3	10.7%	28
Kichinjio	18	85.7%	3	14.3%	21
Kisumundogo	13	52.0%	12	48.0%	25
Laini Saba	18	78.3%	5	21.7%	23
Lindi	5	62.5%	3	37.5%	8
Makina	13	59.1%	9	40.9%	22
Mashimoni	4	66.7%	2	33.3%	6
Raila	23	92.0%	2	8.0%	25
Silanga	26	96.3%	1	3.7%	27
Soweto West	33	97.1%	1	2.9%	34
Soweto East	11	78.6%	3	21.4%	14
Total	215	79.3%	56	20.7%	271

Source: Author, 2021

The study further established whether they had started the business before getting connected. The results are as depicted in table 4.16 above; indicate that 215 of the households at 79.3% had business started before being connected with only 56 at 20.7% of them starting after connection.

Table 4.17: When did you start your business?

N	Range	Minimum	Maximum
269	30	1990	2020

Source: Author, 2021

Study findings also indicated that, of the household with businesses they started within the range of 30 years that is between 1990 and 2020 as presented above in Table 4.17

Table 4.18: Does it use electricity

	Frequency	**Percent**
Yes	262	96.7%
No	9	3.3%
Total	271	100.0%

Source: Author, 2021

It was also clear that of the businesses in the households sampled, most of them at 96.7% used electricity as compared to the least 9 households at 3.3% whose business did not use.

Table 4.19: Business daily operation hours

Time in Hours	**Frequency**	**Percent**
5	1	0.4%
6	2	0.7%
7	5	1.8%
8	25	9.2%
9	14	5.2%
10	36	13.3%
11	3	1.1%
12	106	39.1%
13	26	9.6%
14	25	9.2%
15	22	8.1%
16	3	1.1%
23	1	0.4%
24	2	0.7%
Total	271	100.0%

Source: Author, 2021

According to the findings in Table 4.19, 39.1% of the businesses operate for 12 hours daily followed by 13.3 % that operate for 10 hours with 0.4% of the business operating for 5hours.

Table 4.20: Changes in operation hours since getting connected

	Frequency	**Percent**
Increased	268	98.9%
Remained the same	3	1.1%
Total	271	100.0%

Source: Author, 2021

Majority 98.9% of the business owners in the surveyed households were of the opinion that they had more operation hours since getting connected to electricity than before while a smaller percentage of 1.1 stated that it remains the same.

Table 4.21: Average Profit margins before and after getting connected

Village	**N**	**Monthly profit (Kshs) before getting connected**	**Monthly profit (Kshs) after getting connected**
Kambimuru	16	850	1425
Katwekera	21	15619	21857
Kianda	28	6254	22982
Kichinjio	20	6085	11925
Kisumu ndogo	25	14480	20920
Laini Saba	22	6568	15682
Lindi	5	9200	14200
Makina	22	4000	6886
Mashimoni	6	3500	12167
Raila	25	10480	32600
Silanga	26	3331	6073
Soweto West	32	6259	9978
Soweto East	14	5143	13000
Total	262	7331	15273

Source: Author, 2021

Table 4.22: Cross-tabulation between businesses connected to electricity being advantageous to businesses not connected.

		Are businesses connected to electricity advantageous					
		Yes		No		Total	
Business uses electricity	Yes	258	97.0%	4	80.0%	262	96.7%
	No	8	3.0%	1	20.0%	9	3.3%
Total		266	100.0%	5	100.0%	271	100.0%

Source: Author, 2021

Majority of the respondents (96.7%) felt businesses connected to electricity are more advantages. Both those who are connected and those not connected indicated that businesses connected to electricity are more advantageous.

Table 4.23 Chi-square

	Value	**Df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	4.414[a]	1	0.036

Source: Author, 2021

A Chi-square test was conducted to establish if there was a relationship between the views of those connected to electricity and those not connected about businesses connected being more advantageous. The results of χ^2 = 4.414 at 1 degrees of freedom with P= 0.036. Given that the p value is less than 0.05 (significance level) the study rejects the null hypothesis and thus there is a significant difference in the advantage a business connected to electricity has over that which is not connected. This was evident with most locals citing that the connected business had more operation hours, lower operating costs, low labor costs, increased security among others as discussed belowe.

Table 4.24: The advantages of businesses connected to electricity

	Advantages	Frequency	Percent
1	**Low operation costs**	90	30.1%
2	**More efficiency in service provision**	51	17.1%
3	**More operation hours**	151	50.5%
4	**Economically cheap**	30	10.0%
5	**Low labour costs**	6	2.0%
6	**Higher productivity and profits**	22	7.4%
7	**Increased security**	8	2.7%
8	**Usage of machinery is possible and cost cutting**	19	6.4%

Source: Author, 2021

When the respondents were asked why they thought business connected to electricity were advantages they cited varied advantages as displayed in table 4.24 above. Most of the respondents (50.5%) felt that electricity enables businesses to have more operation hours; others at 30.1% were of the same opinion that electricity is advantageous to their businesses as it lower operation costs. 17.1% of them indicated that connection of electricity had enhanced efficiency in service provision followed by others at 10% who stated that it was now economically cheaper running their business connected to electricity than before.7.4% cited that they had higher production and more profits, 6.4% thought that with electricity it was now easier to use machines in their businesses, 2.7 indicated that electricity had increased the security of the businesses and lastly 2% of them stated clearly that it lowers labour costs of the businesses. The findings are in support with Ouma (2013) who established in his study that owners of the SMEs that are connected to the electricity were highly motivated and hence expansion of their business coupled with value addition services. Additionally, he noted that the electrification leads to increase in the profitability of small business as it expands the operation time and

makes some works easier. The results were also in collaboration with Gunnar *et al* (2011), who indicated that access to electricity provides interior and exterior lighting thus improving security which enables greater mobility to engage in economic activities

Table 4.25 Extent to slum electrification have affected business profitability

	Very small extent		Small extent		Moderate extent		Large extent		Very large extent		No response		Total		Chi-Square	Df	Sig.
	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
Access to electricity has enhanced business opportunities	3	.8	2	.5	43	11.6	223	59.9	96	25.8	5	1.3	372	100.0	461.433	4	0.000
Slum electrification has increased business operation hours	0	0	5	1.3	33	8.9	237	63.7	96	25.8	1	.3	372	100.0	345.970	3	0.000
Slum electrification has facilitated expansion of the existing businesses in Kibera slum	1	.3	4	1.1	67	18.0	250	67.2	50	13.4	0	0	372	100.0	562.220	4	0.000
Slum electrification has helped in lowering of	2	.5	15	4.0	63	16.9	219	58.9	73	19.6	0	0.0	372	100.0	400.688	4	0.000

operation cost of the business.																
Slum electrification has increased profitability of my business	0	.0	2	.5	50	13.4	215	57.8	102	27.4	3	.8	372	100.0	272.008	3	0.000
Slum electrification has resulted to increase in employment opportunities.	8	2.2	17	4.6	132	35.5	151	40.6	62	16.7	2	.5	372	100.0	230.297	4	0.000
Electricity supply has led to product value addition in businesses in Kibera slum.	1	.3	2	.5	99	26.6	214	57.5	55	14.8	1	.3	372	100.0	419.121	4	0.000
Slum electrification has enhanced the rise of businesses and multiplication.	0	.0	3	.8	82	22.0	218	58.6	68	18.3	1	.3	372	100.0	263.836	3	0.000

Source: Author, 2021

Finally in ascertaining the effects of slum electrification on household economically, the survey had a set of questions of which sampled residents were expected to rate the outcome of slum electrification in business on a Likert scale from very small to very large extend. The findings were analyzed using chi-square test. The outcome in the table 4.25 points out that all the factors that include: Access to the electricity has enhanced business opportunities, increased businesses operation hours, facilitated expansion of the existing businesses, helped in the lowering of operation costs, increased profitability of the businesses, resulted in the increase of the employment opportunities and lastly led to the increase of product value addition. Tested at degrees of freedom ranging from 3-4 with P=0.00 and given that the P value is less than 0.05 (Significance level) the study rejects the null hypothesis that there is no significant relationship between slum electrification and household economic growth and accepts most of the respondents view that slum electrification has greatly enhanced the various aspect of their businesses thus stemming them up leading to their wellbeing economically. The results were in collaboration with those of other scholars that have researched on electrification like Schaengold (2006) who contends that slum electrification has a huge impact of economic improvement in the slums. This is due to easier establishment of businesses, infrastructure development, and employment as there is street lighting, at night that facilitates extension of the work-day and business operates in safety areas.

4.7 Slum electrification and Social Growth

The last objective sought to determine the effect of slum electrification on social growth in Kibera slum. The researcher therefore requested respondents to respond to questions that covered social aspects including education, health and security. The study analyzed

data using frequencies, means, t-test, and Chi-square. The findings are presented in Table 4.26 to table 4.40.

Table 4.26 slum electrification effects on educational outcomes

		Children use electricity to do their homework and private studies					
		Yes		**No**		**Total**	
Does your household have electricity?	**Yes**	336	91.1%	33	8.9%	369	100.0%
	No	1	33.3%	2	66.7%	3	100.0%
	Total	337	90.6%	35	9.4%	372	100.0%

Source: Author, 2021

The study did a comparison to establish if there was a difference in the personal study time for children in the households before and after getting connected to electricity. The mean hours before getting connected was 1.04 hours while after getting connected was 3.41 hours (Table 4.27). This was an indicator of a difference in the hours of private studies. The above case concurs that of Samad *et al* (2013) who echoed that in Bangladesh electrification enhanced student home studies by more minutes than before and that electricity supply in the peri-urban areas of played a key role in scaling up the education yield.

Table 4.27: Means

	Mean	N	Std. Deviation	Std. Error Mean
Before you got connected to electricity	1.04	329	.776	.043
After you got connected to electricity	3.41	329	1.023	.056

Source: Author, 2021

Because of the suggested difference in the means a paired t-test results of p = 42.239 at 328 degrees of freedom was significant (p > 0.001). Therefore, there was a significant difference in the personal study time for children in the households after getting connected than before (Table 4.28).

Table 4.28: Paired Samples Test for Personal Study Time Before and after being connected

	T	df	Sig. (2-tailed)
After you got connected to electricity vs Before you got connected to electricity	42.239	328	.000

Source: Author, 2021

Table 4.29: The impact of getting connected on your children academic performance

	Frequency	Percent
Improved	332	90.0%
Same	2	0.5%
Dropped	1	0.3%
No Response	34	9.2%
Total	369	100.0%

Source: Author, 2021

From the results in the table above most of the parents in the surveyed household were of the view that being connected to electricity has really impacted on the academic performance of their children as 90.0% accepted that their children's performance improved while a smaller number of them at 0.5 % stating that the performance remain the same and only 0.3% indicated that the performance dropped while 9.2% had no response.

Aguirre (2017) also shares the same observation that children from connected houses to the grid had greater education levels than in those households without.

Table 4.30 Ratings of slum electrification effects on education outcomes.

	Very small extent		Small extent		Moderate extent		Large extent		Very large extent		Total		Chi-Square	Df	Sig.
Access to electricity in the slums has improved performance in schools	3	.8	11	3.0	94	25.3	171	46.0	93	25.0	372	100.0	257.785	4	.000
Access to electricity has increased school retention rate	6	1.6	34	9.1	178	47.8	123	33.1	31	8.3	372	100.0	286.145	4	.000
Access to electricity has led to increase in study hours and time for doing homework	1	.3	2	.5	71	19.1	209	56.2	89	23.9	372	100.0	389.398	4	.000
Slum electrification has led to increased enrolment rate in schools	26	7.0	58	15.6	131	35.2	122	32.8	35	9.4	372	100.0	129.478	4	.000
Slum electrification has led to lighting in all schools in Kibera slum	0	.0	21	5.6	118	31.7	159	42.7	74	19.9	372	100.0	113.183	3	.000
Access to electricity in the slums have led to increase to drop out rates in schools in Kibera slum	90	24.2	196	52.7	56	15.1	26	7.0	4	1.1	372	100.0	304.667	4	.000

Source: Author, 2021

Further analysis on the effects of slum access to power on the different aspects of education that include: Access to electricity in the kibera slum has improvement in the schools' performances, increased school retention capacity, increased study hours and time for doing homework, increased enrolment rate in schools, led to lighting in most schools and lastly led to the decrease in dropout rate. Chi-square results in the table above indicate that residents were of the view that connection to the grid has improved education outcomes of as all the tested variables had a degree freedom of 4 and only one at 3 with all having P=0.00 which was less than 0.05(significance level). The views above were in harmony with the results of other scholars among them Kanagawa & Wakata (2008) who indicates that connection to the grid can boost the economic situations and the wellbeing of the citizens in developing nations through its effects on basic indicators of poverty that include and not limited illiteracy level and environment. Equally Schaengold (2006) noted in his studies that lighting increases time for studying thus improving the educational outcome for the children within the slums. Christina *et al*, (2017) deduced the same views in their study, that improving electricity availability enhances education performance but it should be integrated with other initiatives that can better learning environs. They further echoed that lighting boosts the output and effectiveness of other works, so more time is available for studying and that electricity facilitates the working of IT devices which are also essential in enhancing learning. In addition, Khandker *et al* (2012) opines that lighting make better educational outcomes indirectly through improving health and well-being. They also contended that lighting up countryside has aided in backing up school attendance for the students. Moreover, grid access boosted household incomes thus parents able to pay their children school fee hence reducing the

dropout rates in school as it increased the retention and transition rates. Lastly in coherent with the study findings MME (2013) concludes in a study in Brazil that electrification has positive impact on social empowerments in that it leads to efficiency in public welfare and services such as education.

Table 4.31 Slum electrification's impact on efficiency of health facilities in Kibera slum

	Frequency	**Percent**
Yes	297	99.3%
No	2	0.7%
Total	299	100.0%

Source: Author, 2021

It was also established that most of the household heads at 99.3% were of the idea that slum electrification had impacted on the efficiency of the health facilities in the 13 villages of Kibera slum while 0.7% were of the different opinion as indicated in table 4.13 above.

The distance ranged from 1 meter to 5 kilometers. On average the nearest health facility was 395m away.

The study also checked whether there was a significant difference in the distances to the nearest health facilities using t-test. The t-test results for each village reveal that there was significant difference because 12 villages had a $p > 0.05$. It was only Raila village that had $p = 0.249$ which implies that there was no significance difference in the distances to the nearest medical facility.

Table 4.32: Distance to the nearest Health Facility in Metres

Village/residential zone	N	Min	Max	Mean	Std. Dev		T	Df	Sig. (2-tailed)
Kambimuru	23	6	59	21.17	17.007		5.971	22	.000
Katwekera	22	100	800	468.18	196.120		11.197	21	.000
Kianda	28	1	3000	300.82	563.267		2.826	27	.009
Kichinjio	25	60	150	97.60	18.150		26.887	24	.000
Kisumu Ndogo	26	300	900	584.62	168.979		17.641	25	.000
Laini Saba	23	1	900	360.26	285.064		6.061	22	.000
Lindi	28	10	130	66.39	37.309		9.416	27	.000
Makina	53	1	2000	219.21	452.278		3.528	52	.001
Mashimoni	25	10	300	214.40	55.308		19.382	24	.000
Raila	25	1	2000	93.84	397.441		1.181	24	.249
Silanga	28	1	5000	1010.00	1580.507		3.381	27	.002
Soweto West	47	1	5000	935.83	1349.187		4.755	46	.000
Soweto East	15	1	1500	454.53	491.431		3.582	14	.003

Source: Author, 2021

Table 4.33: Health facility connected to electricity

Village	Yes		No	
Kambimuru	22	100.0%	0	0.0%
Katwekera	21	95.5%	1	4.5%
Kianda	27	100.0%	0	0.0%
Kichinjio	25	100.0%	0	0.0%
Kisumu ndogo	26	100.0%	0	0.0%
Laini Saba	23	100.0%	0	0.0%
Lindi	32	100.0%	0	0.0%
Makina	49	100.0%	0	0.0%
Mashimoni	25	100.0%	0	0.0%
Raila	24	100.0%	0	0.0%
Silanga	28	100.0%	0	0.0%
Soweto West	47	100.0%	0	0.0%
Soweto East	15	100.0%	0	0.0%
Total	364	99.7%	1	.3%

Source: Author, 2021

Most of the health facilities at 99.7% in the 13 villages were connected to electricity with only 0.3 percent not being connected as indicated above in table 4.33.

Table 4.34: Mean operation hours

Village/residential zone	Min	Max	Mean	N	Std. Dev
Kambimuru	12	24	17	23	4.610
Katwekera	12	24	16	22	5.908
Kianda	12	24	22	27	4.344
Kichinjio	8	9	8	25	.332
Kisumu ndogo	12	24	21	25	5.231
Laini Saba	8	24	23	21	3.491
Lindi	7	19	12	32	2.552
Makina	8	24	23	52	3.172
Mashimoni	24	24	24	25	0.000
Raila	8	24	11	25	4.840
Silanga	8	24	12	28	4.316
Soweto West	24	24	24	46	0.000
Soweto East	10	24	21	15	5.713
Total	7	24	19	366	6.556

Source: Author, 2021

It was also determined that health facilities operated within a total mean of 19 hours with some operating at maximum hours of 24 hours while others at minimum hours of 7 as presented in table 4.34.

Table 4.35: Duration of Obtaining Prescribed Drugs from the Facility

Villages	Duration						
	Often		Sometimes		Hardly	Total	
Kambimuru	5	21.7%	18	78.3%	0	0.0%	23
Katwekera	14	63.6%	8	36.4%	0	0.0%	22
Kianda	25	89.3%	3	10.7%	0	0.0%	28
Kichinjio	25	100.0%	0	0.0%	0	0.0%	25
Kisumu ndogo	4	15.4%	22	84.6%	0	0.0%	26
Laini Saba	3	13.0%	20	87.0%	0	0.0%	23
Lindi	8	25.0%	23	71.9%	1	3.1%	32
Makina	51	96.2%	2	3.8%	0	0.0%	53
Mashimoni	2	8.0%	19	76.0%	4	16.0%	25
Raila	25	100.0%	0	0.0%	0	0.0%	25
Silanga	28	100.0%	0	0.0%	0	0.0%	28
Soweto West	46	97.9%	1	2.1%	0	0.0%	47
Soweto East	2	13.3%	13	86.7%	0	0.0%	15
Total	238	64.0%	129	34.7%	5	1.3%	372

Source: Author, 2021

The study further sought to establish how often the respondents received medicine from the medical centers and as indicated in table 4.35, a larger number of them at 64% clearly indicated that they got them on time after most of the health facilities got connected to the grid power than before connection.34.7% indicated that sometimes they will get the drugs while 1.3% cited that they hardly get the prescribed drugs from the facilities they visit for treatment.

Table 4.36 Impact of slum electrification on health facilities

Villages	Slum electrification has had impact on efficiency of health facilities in Kibera slum				
	Yes		No		Total
Kambimuru	22	95.7%	1	4.3%	23
Katwekera	22	100.0%	0	0.0%	22
Kianda	28	100.0%	0	0.0%	28
Kichinjio	25	100.0%	0	0.0%	25
Kisumundogo	25	100.0%	0	0.0%	25
Laini Saba	23	100.0%	0	0.0%	23
Lindi	24	75.0%	8	25.0%	32
Makina	53	100.0%	0	0.0%	53
Mashimoni	25	100.0%	0	0.0%	25
Raila	24	100.0%	0	0.0%	24
Silanga	27	96.4%	1	3.6%	28
Soweto West	45	95.7%	2	4.3%	47
Soweto East	15	100.0%	0	0.0%	15
Total	**358**	**96.8%**	**12**	**3.2%**	**370**

Source: Author, 2021

Health being one of the key variables in the social aspect of this study, it sought to determine whether there was and any impact of slum electrification on efficiency of health facilities functioning and majority 96.8% indicated that yes there was some impacts but minority 3.2% felt no.

Table 4.37 Impacts of slum electrification on efficiency of health facilities

		Frequency	Percent
1.	More operation hours	154	51.5%
2.	Good storage of medicine	102	34.1%
3.	Use of modern machines has enhanced efficiency in service delivery	88	29.4%
4.	Safety of patients and hospital personnel has improved	61	20.4%
5.	Cheaper operation cost than when using other energy sources	24	8.0%

Source: Author, 2021

Household heads cited the many ways in which slum electrification had impacted on the efficiency of the health facilities and health aspect as indicated above in table 4.37. Most of them 51.5% felt that it had it had increased operation hours followed by 34.1 % who felt that it had led to good storage of medicine.29.4% thought with connection there is us of modern machine hence more efficiency while 20.4% were of the opinion that security of the patients had improved and lastly 8% of them felt that with electricity, operation cost was low thus cheaper running the facilities than using other sources of energy. The respondents' views and observation above were in direct support of other scholars like Majid (2013) noted that electric power supply has a worthwhile influence on children health operations such as prenatal and postnatal care as well as immunization and that health improvement is associated with the reduction in other costs of health problems such as smoke from kerosene and burns from the use of kerosene lamps. Hutton *et al* (2006) additionally indicate that health benefits attained from electrification include better health that constitute of unpolluted air from units, reduced use of contaminated fuels for food preparation, warming, and lighting. Moreover, better nutrition enhanced by the advancement in the health information awareness via improved availability of

television and storage facilities (Bernard, 2010).Additionally Jeroen van't Pad, & Elizabeth (2017) share the same views as they state in study that absence of reliable electricity supply in clinics and other medical facilities denies patients who arrive at night a chance to be treated since they have to wait till the next day, equally blood vaccines and other supplied medicines may go bad hence wastage .This leads to many death rates. Echoing the same ideas, Michaela (2017) note that that electrification leads to prolonged opening hours in hospitals, provision of extensive services and efficient operations of medical machines. Moreover, the authors point out to general improvement in general hygiene, safety and security of works and patients. Finally in support of the on impacts of electrification connection result above WHO (2015) reports that, electrification in an area leads to attraction of medical professionals, improving the quality of service, healthy productive enterprise, and communication. Most of the health gains may either be through increase in the operation hours or having advanced medical equipment (IEG, 2008).

Table 4.38 Extent to which slum electrification has affected on efficiency of health facilities

	Very small		Small extent		Moderate extent		Large extent		Very large extent		No response		Total	Chi-Square	Df	Sig.
Slum electrification has led to increase in operation hours of the health facilities	1	.3	0	0	16	4.3	226	60.8	121	32.5	8	2.2	372	360.989	3	.000
Slum electrification has enhanced security and safety of hospital and patients in the slums	0	.0	2	.5	26	7.0	271	72.8	70	18.8	3	.8	372	487.596	3	.000
Access to electricity has improved medical services; delivery, storage and communication in	0	0	0	0.0	54	14.5	239	64.2	78	21.0	1	.3	372	163.671	2	.000

Kibera slum																
Access to electricity has led to decrease in the mortality cases	14	3.38	90	24.2	137	36.8	112	30.1	16	4.3	3	.8	372	171.176	4	.000

Source: Author, 2021

Additionally, the study rated the views of the respondents about the extent to which connection to the grid has impacted on the efficiency running of the health facilities on a likert scale with rating levels from very small extend to very large extend. Results on the table 4.38 above indicate that the chi-square test of the rated variables on the health facilities in relationship to grid connection that include: slum electrification has led to increase in operation hours of the health facilities, enhanced safety of both the health facilities and the patients improved the medical services that include storage, delivery and communication and lastly has led to decrease in mortality. The study validates that slum electrification has enhanced the smooth running of the slum health facilities hence improved health care services thus good health as most of the variables had degree of freedom between 2 -4 and P=0.00 which was less than the significance level (0.05). The findings are in line with those of WHO (2017) which reports that unpredictable electricity availability results to wastage of vaccines, interferences in the regular operations of the health facilities and diagnostic apparatus, absence of information transmitters and lights during emergency procedures and childbirth. Gunnar *et al* (2011) equally conteds that electricity enhances good health as it reduces air pollution and stems up pure indoor air

,food safety and improved nuttrion due to quality storage enhanced by refrigeration. This is also attributed to the boost in the availability of health education via easy access to the avenues rich with the health information as well as enough and extra study time. Correlated with the same, USAID (2012) reveals that inefficient energy structure might affect the value of service: for instance, decrease in working hours resulting to an increase of unattended locals, reduction in the lab tests in the health facilities, night-time security concerns and drop in works enthusiasm.

Table 4.39 Impact of slum electrification has on security

	Slum electrification has impacted on security				
	Yes		No		Total
Kambimuru	23	100.0%	0	0.0%	23
Katwekera	22	100.0%	0	0.0%	22
Kianda	28	100.0%	0	0.0%	28
Kichinjio	25	100.0%	0	0.0%	25
Kisumu ndogo	26	100.0%	0	0.0%	26
Laini Saba	23	100.0%	0	0.0%	23
Lindi	21	70.0%	9	30.0%	30
Makina	53	100.0%	0	0.0%	53
Mashimoni	25	100.0%	0	0.0%	25
Raila	24	100.0%	0	0.0%	24
Silanga	28	100.0%	0	0.0%	28
Soweto West	42	91.3%	4	8.7%	46
Soweto East	15	100.0%	0	0.0%	15
	355	96.5%	13	3.5%	368

Source: Author, 2021

According to the results in the table 4.39 most of the sampled respondents at 96.5% cited that slum electrification has impacted on security while 3.5% said no.

Table 4.40 Extent to which Slum Electrification has Affected Security

	Very small		Small extent		Moderate extent		Large extent		Very large extent		No response		Total	Chi-Square	Df	Sig.
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Slum electrification has increased safety on the streets of Kibera slum	2	.5	6	1.6	36	9.7	226	60.8	100	26.9	2	.5	372	274.756	3	.000
Access to electricity has led to decrease in the cases of insecurity	0	0.0	6	1.6	29	7.8	204	54.8	122	32.8	11	3.0	372	473.405	4	.000

Source: Author, 2021

On finding the extend of the impact on security, majority at 60.8% and 54.8% of the sampled residents to a larger extent felt that slum electrification had increased safety on the streets of the slum and decrease of insecurity cases respectively as evident in table 4.40. The a bove study outcome was in agreement with the findings of Gunnar *et al* (2011) and USAID (2012) that noted that access to electricity provides interior and exterior lighting thus improving security which enables unlimited movement to engage in different productive activities.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECCOMENDATIONS

5.1 Introduction.

This chapter gives summary of the findings, conclusions, recommendations and suggestions for further research based on the findings of the study

5.2 Summary of Findings

The first objective of the study sought to establish trends and patterns of distribution of electricity and socio-economic growth in Kibera slum. Accordingly, the study established that the supply of electricity in the Kibera slum tracks a defined configuration. Further, the study established that most households in Kibera slum were connected to electricity between 2005 and 2018. Moreover, results revealed that majority of the connected households to the grid were within a mean of 36 meters. On the monthly bills, most household heads paid bills between ksh. 500-1000 which was less compared to what they paid before connection when they were using other sources of power like kerosene. Moreover, the study established that households and facilities near the roads, railway lines and those next to the grid were mostly served and connected faster than those that were interior and far from the grid.

The second objective of the study sought to assess household and community uses of electricity and socio-economic growth in Kibera slum. The study revealed that utilization and power consumption was determined by checking the differences in percentages of electronic appliances usage before and after connection. The findings indicated that there was an increment in the use of all the appliances after connection than before with the

majority using lower consuming electronics that included cell-phone, lighting, televisions, and radio than higher consumers like Water heater/electric kettle, iron box, micro-wave, refrigerator, electric cookers, hot showers and water pumps. The findings also indicated that the bills were lower compared to when they were using the other sources of power.

The third objective sought to establish the effect of slum electrification on economic growth in Kibera slum. Results established that majority of household heads were doing much better in their business as compared to when they had not been connected. In addition, the findings revealed that connection of electricity had enhanced efficiency in service provision followed by others who stated that it was now economically cheaper running their business connected to electricity than before. Moreover, connection to electricity led to higher production and more profits as well as the ease of using machines in their businesses and that electricity had increased the security of the businesses and lastly, they stated clearly that it lowers labour costs in their businesses.

The last objective sought to determine the effect of slum electrification on social growth in Kibera slum. The study determined that slum electrification had engineered a constructive enhancement in the daily lives of people in the slums starting with education, health and security. Most of them cited that connection to the grid has improved the education of their children as their have more studying time and of doing assignments. The study also established that many dwellers had improved health services as facilities had increased their operation hours, there was now good storage of the medicine due to proper machines like refrigerators, others stated that with the using modern machines

efficiency improved and safety of the patients at all time as well as reduced cost on energy. Lastly, the study indicated that electricity had impacted on security and most of the respondents reported that slum electrification had increased safety on the streets of the slums and decreased insecurity cases.

5.3 Conclusion of the Study

Based on the findings of the study, the researcher made the following conclusions: As regards the trends and patterns of electricity distribution and socio-economic growth in Kibera slum, the researcher concluded that the distribution of electricity in the slum followed a specific configuration. Additionally, a significant number of households in Kibera were connected to the electricity grid between 2005 and 2018. Furthermore, the study concluded that most of connected households were located within an average distance of 36 meters from the grid. The study also concluded that households and facilities situated near roads, railway lines, and the grid itself were more likely to be served and connected to electricity faster than those located further away or in more interior areas of the slum.

The second objective of the study aimed to evaluate the utilization of electricity at the household and community levels, and its effect on socio-economic growth in Kibera slum. The researcher concluded that a significant increase in the use of electronic appliances after households was connected to the electricity grid. Notably, the majority of households predominantly utilized lower-consumption electronics, indicating a focus on essential needs rather than high-energy-consuming devices. Moreover, the study concluded that comparing the usage patterns before and after electricity connection, it

was observed that appliances such as water heaters/electric kettles, iron boxes, microwave ovens, refrigerators, electric cookers, hot showers, and water pumps had relatively lower usage rates. Lastly, the researcher concluded that bills associated with electricity usage were lower compared to the expenses incurred when relying on alternative power sources.

As regards the third objective, the study concluded that slum electrification has a positive impact on economic growth in Kibera slum. Improved business performance, increased productivity, cost savings, enhanced security, and reduced labor costs were reported as benefits of electricity connection.

As regards the fourth objective, the researcher concluded that slum electrification has had a positive and transformative effect on social growth in Kibera slum. Access to electricity has improved education, with children benefiting from increased study time and improved learning opportunities. The availability of electricity has also enhanced health services, allowing for extended operation hours, better storage of medicines, increased efficiency, and reduced costs. Additionally, slum electrification has positively impacted security, leading to a safer living environment for residents. These findings highlight the significant social benefits that accompany the provision of electricity in slum communities like Kibera slum.

5.4 Recommendations

Based on the findings related to the trends and patterns of electricity distribution and socio-economic growth in Kibera slum, the researcher recommended that Kenya Power and Lighting Company as well as the Nairobi City County should ensure equitable

distribution of electricity across all areas of the slum, including interior regions that are currently underserved.

Based on the findings related to the utilization of electricity at the household and community levels and its impact on socio-economic growth in Kibera slum, the researcher recommended that the residents of Kibera slum should promote energy-efficient appliances. Non-Governmental Organizations should educate residents about the benefits of using energy-efficient devices and provide information about available options.

As regards the third objective, the researcher recommends that the county government of Nairobi City County should put in place such factors not limited to accessibility to tools and machines for productive applications, availability low interest financial services and credits, skilled workforce required for both business management, market for their products and services.

Finally, the researcher study recommends that the government should hasten the slum electricity programs. This will make the local population to develop more, since they have sense that they are more empowered with electricity connection, even if the lives do not necessarily change, the quality of education, health services in addition to security have improved.

5.5 Areas of Further Research.

While the study on the effects of slum electrification on socio-economic growth in Kibera slum provides valuable insights, there are several areas for further research to deepen the understanding of the topic. Here are some potential areas for future research:

i. Explore the adoption and impact of sustainable energy practices in Kibera slum.

ii. Assess the role of policies, regulations, and governance structures in facilitating slum electrification and its socio-economic impact in Kibera slum.

iii. Conduct comparative studies across different slum communities in Kenya.

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APPENDICES

Appendix I: Introductory Letter

Mwanza Juvenalis

P.O Box 636 – 50102

Mumias-Kenya

Dear Sir/ Madam,

RE: REQUEST FOR PARTICIPATION IN THE RESEARCH STUDY

Dear Respondent,

My name is Mr. Juvenalis Mwanza, a Kenyatta University Masters student from the Department of Geography studying Urban and Regional Planning. I am undertaking a study with an aim of understanding "**Effects of Slum Electrification on Households' Economic and Social Growth in Kibera Slum Nairobi City County, Kenya**." I request for your support in giving information for the realization of this study. I assure you that all information provided, will be used for sole academic/research purposes only and will be treated with extreme utmost confidentiality.

Thanks you for your cooperation, your information is invaluable.

Yours faithfully,

Mwanza Juvenalis.

Appendix II : Questionnaire

SECTION A: DEMOGRAPHIC DETAILS AND GENERAL INFORMATION

Kindly tick the applicable box to complete this section

1. Indicate your Gender

   Male 1. [ ]

   Female 2. [ ]

2. How old are you _____

3. For how long have you been living in Kibera slum_____

4. What is your highest education level?

   No Schooling 0. [ ]

   Some years of primary 1. [ ]

   Completed primary school 2. [ ]

   Some years of ssecondary school 3. [ ]

   Completed secondary 4. [ ]

   Some years of college/university 5. [ ]

   Completed college/university 6. [ ]

5. What is your employment status?

   Unemployed 1. [ ]

   Self-employed 2. [ ]

   Employed- public sector 3. [ ]

   Private sector employee 4. [ ]

   Civil Servant 5. [ ]

6. What is your monthly income in Kshs. _____

7. What is your village/residential zone? _____

SECTION B: USES OF ELECTRICITY

8. a) Does your household have electricity?

Yes 1. [ ]

No 2. [ ]

b) If yes in 8(a) what was your source of power before getting connected? (Tick all that apply)

Source of power	**Tick**
Paraffin	
Solar	
Generator	
Others (specify)……..	

c) What was your monthly expenditure on the source(s) of power in 8 (b)? Kshs _____

9. Which year did your household get connected to electricity?

_____

10. Which electrification program did you benefit from?

_____

11. How far (in m or km) is your household from the grid?

_____

12. How much did you pay to get connected to electricity? Kshs

_____

13. How much do you pay for your household electricity bills monthly? Kshs _____

14. Tick all the appliances and facilities in your household that use electricity and did you buy them before or after getting connected to electricity

No	Appliance	Tick for available	Tick for bought before	Tick for bought after
1.	Cellphone			
2.	Television			
3.	Radio			
4.	Iron box			
5.	Lighting			
6.	Hot showers			
7.	Water pump			
8.	Refrigeration			
9.	Electricity cooker			
10.	Microwave			
11.	Water heater/electric kettle			

SECTION C: THE EFFECT OF SLUM ELECTRIFICATION ON HOUSEHOLDS ECONOMIC GROWTH.

Kindly tick the applicable box to complete this section

15. (a) As a household do you have a business? 1. [ ] Yes 2. [ ] No

(b) Did you have a business before getting connected? 1. [ ] Yes 2. [ ] No

16. If yes in 15 (a):

(a) What type of business? _____

(d)When did you start it? _____

(c) Does it use electricity? 1. [ ] Yes 2. [ ] No

(d) What time do you open the business_____ and what time do you close _____

(e) How has your business operation hours changed since getting connected?

1. [ ] Increased 2. [ ] Decreased 3 [ ] Remained the same

(f) What was your monthly profit before getting connected? Kshs _____

(g)What is your average monthly profit after getting connected? Kshs _____

17. Do you consider businesses that are connected to electricity to be advantageous than the ones without?

Yes	1. [ ]
No	2. [ ]

If yes in what ways?.....

……

Kindly rate the extent to slum electrification have affected prpofitability of business using a scale of 1 to 5 where 1 is very small extent 2 is small extent; 3 is moderate extent 4 is large extent and 5 is to a very large extent.

S/No	Statement	1	2	3	4	5
18.	Access to electricity has enhanced business opportunities					
19.	Slum electrification has increased business operation hours					
20.	Slum electrification has facilitated expansion of the existing businesses in Kibera slum					
21.	Slum electrification has helped in lowering of operation cost of the business.					
22.	Slum electrification has increased profitability of my business					
23.	Slum electrification has resulted to increase in employment opportunities.					
24.	Electricity supply has led to product value addition in businesses in Kibera slum.					
25.	Slum electrification has enhanced the rise of x1z1z businesses and multiplication.					

SECTION D: SLUM ELECTRIFICATION EFFECTS ON EDUCATIONAL OUTCOMES

26. (a) Do your children use electricity to do their homework and private studies

1. [ ] Yes 2. [ ] No

27. Has getting connected to electricity increased study/revision time for members of your household?

1. [ ] Yes 2. [ ] No 3. [ ] Don't Know

(b) During a normal school day, on average, how much evening studying hours did members of you household have?

i. Before you got connected to electricity, _____

ii. After you got connected to electricity,

_____

c) What is the impact of getting connected on your children academic performance?

1. [ ] Improved 2. [ ] Same 3. [ ] Dropped 4. [ ] Dropped Don't Know

Kindly rate the extent to slum electrification have affected educational outcomes using a scale of 1 to 5 where 1 is very small extent 2 is small extent; 3 is moderate extent 4 is large extent and 5 is to a very large extent.

S/No	**Statement**	**1**	**2**	**3**	**4**	**5**
28.	Access to electricity in the slums has improved performance in schools					
29.	Access to electricity has increased school retention rate					
30.	Access to electricity has led to increase in study hours and time for doing homework					
31.	Slum electrification has led to increased enrollment rate in schools					
32.	Slum electrification has led to lighting in all schools in Kibera slum					
33.	Access to electricity in the slums have led to increase to drop out rates in schools in Kibera slum					

SECTION E: THE EFFECT OF SLUM ELECTRIFICATION ON EFFICIENCY OF HEALTH FACILITIES

34. a) How far is the nearest health facility (in M or KM) that you can easily access _____

    b) Is the health facility connected to electricity?

        1. [ ] Yes

        2. [ ] No

    c) What are its operation hour's _____

    d) How often do get the drugs prescribed at this facility?

        1. [ ] Often 2. [ ] Sometimes 3. [ ] Hardly

35. In your opinion, do you think slum electrification has any impact on efficiency of health facilities in Kibera slum?

    1. [ ] Yes

    2. [ ] No

36. If yes in question 35 above, please explain how?

    .....……

    ……..……

    ……..……

    ……..……

Kindly rate the extent to slum electrification have affected efficiency of helath facilities using a scale of 1 to 5 where 1 is very small extent 2 is small extent; 3 is moderate extent 4 is large extent and 5 is to a very large extent.

S/No	Statement	1	2	3	4	5
37.	Slum electrification has led to increase in operation hours of the health facilities					
38.	Slum electrification has enhanced security and safety of hospital and patients in the slums					
39.	Access to electricity has improved medical services; delivery, storage and communication in Kibera slum					
40.	Access to electricity has led to decrease in the mortality cases					

SECTION F: THE EFFECT OF SLUM ELECTRIFICATION ON STREET SECURITY

41. In your opinion, do you think slum electrification have any impact on security?

Yes [ ]

No [ ]

42. If yes in question 41 above please explain how?.....

……

…..……

……..……

Kindly rate the extent to slum electrification has affected security using a scale of 1 to 5 where 1 is very small extent 2 is small extent; 3 is moderate extent 4 is large extent and 5 is to a very large extent.

S/No	**Statement**	**1**	**2**	**3**	**4**	**5**
43.	Slum electrification has increased safety on the streets of Kibera slum					
44.	Access to electricity has led to decrease in the cases of insecurity					

45. a) GPS coordinate for household

b) GPS coordinate at the nearest electricity poll to the household

Appendix III : Interview guide for Public Officials

1. To what extent has slum electrification have been achieved in Kibera slum?

   ……

   ……

   ……

2. To what extent has access to electricity has led to improvement in small business either directly or

   indirectly?…….....

   ……

   ……

3. Do you think slums electrification improved educational outcomes in Kibera slum?

   .....……

   ……

   ……

4. Do you think access to electricity has any impact on the operations of health facilities in Kibera

   slum?.....……

   ……

5. To what extent has slum electrification influenced School performance within Kibera

   slum?……..……

   ……

6. What is your take on the slum security in relation to slum electrification in Kibera slum?

   ……

   ……

7. What do you think are the challenges of slum electrification in Kibera slum?

   ……

Appendix IV: Research Proposal Approval From Graduate School Kenyatta University

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School **DATE:** 21st November, 2019

TO: Mr. Mwanza Juvenalis
C/o Department of Geography

REF: C50/29802/2014

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

We acknowledge receipt of your Research Proposal after fulfilling recommendations raised by the Graduate School Board of 6th November, 2019.

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

Thank you,

21 NOV 2019

HARRIET ISABOKE
FOR: DEAN, GRADUATE SCHOOL

CC. Chairman, Department of Geography

Supervisors:

1. Dr. Thomas Kibutu
   C/o Department of Geography
   Kenyatta University
2. Dr. Joseph Mahiri
   C/o Department of Geography
   Kenyatta University

HI/eww

Appendix 5: Research Authorization from Graduate School Kenyatta University

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: C50/29802/2014

DATE: 21st November, 2019

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MR. MWANZA JUVENALIS – REG. NO. C50/29802/2014

I write to introduce Mr. Mwanza Juvenalis who is a Postgraduate Student of this University. He is registered for M.A. degree programme in the **Department of Geography.**

Mr. Mwanza intends to conduct research for a M.A. thesis Proposal entitled, **"Effects of Slum Electrification on Households' Economic and Social Growth in Kibera Slums Nairobi City County Kenya."**

Any assistance given will be highly appreciated.

Yours faithfully,

KENYATTA UNIVERSITY OFFICE OF DEAN GRADUATE SCHOOL P.O. BOX 43844 - 00100 NAIROBI
21 NOV 2019

PROF. ELISHIBA KIMANI
DEAN, GRADUATE SCHOOL

Appendix 6: Research Authorization Permit From Nacosti

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **787731**

Date of Issue: **18/December/2019**

RESEARCH LICENSE

This is to Certify that Mr.. JUVENALIS MWANZA of Kenyatta University, has been licensed to conduct research in Nairobi on the topic: EFFECTS OF SLUM ELECTRIFICATION ON HOUSEHOLDS\' ECONOMIC AND SOCIAL GROWTH IN KIBERA SLUMS, NAIROBI CITY COUNTY KENYA for the period ending : 18/December/2020.

License No: **NACOSTI/P/19/3115**

787731

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

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