

**THE STATUS AND CHALLENGES OF UNIVERSAL ELECTRICITY
CONNECTIVITY IN URBAN INFORMAL SETTLEMENTS,
A CASE OF SILANGA IN KIBERA INFORMAL SETTLEMENT, NAIROBI-
KENYA**

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the Award of the Degree of Master of Arts in Planning, University of Nairobi**

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DECLARATION

I declare that this Research Project is my original work and has not been presented to any other university.

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16TH NOVEMBER 2020

DEDICATION

This research project is dedicated to my dear wife, Lucy and my children, Michael, Lilian & Linet for their love, patience, encouragement and prayers.

ACKNOWLEDGEMENT

I would like to express my heart-felt gratitude to my supervisor Dr. Romanus Opiyo for his consistent advice and valuable comments during the course of this study. I also acknowledge the entire academic staff members, who, I interacted with in the course of my Masters programme.

I would like to honour posthumously my late dad, Michael Njihia Kabiru, who unfortunately passed on before I cleared this research project. He keenly followed, my progress, on the entire Masters programme. He would have felt proud, to see me, graduate.

Special thanks to all my classmates of MA (Planning) for the solidarity in sharing notes and group discussions and work colleagues at Kenya Power for holding fort when I was away, attending class.

ABSTRACT

Access to electricity and connectivity has been a challenge facing informal settlements despite being receptors of new migrants to urban areas and cities. The electricity grid in Kibera is poorly connected, leaving many households and SMEs without formal power connectivity. The study sought to assess the status, connectivity challenges, planning interventions that could be applied towards universal connectivity in Kibera and the resultant implications of such connectivity in urban informal settlements in general. The study used open and closed ended questionnaires to interview 161 households and 150 business premises. The sample size formula was derived from Miller and Brewer (2003). Key informants were interviewed by use of key informant schedules. One Focus Group Discussion (FGD) was conducted for the vulnerable group that included 10 youths and 10 women. The quantitative data collected was analyzed by SPSS and Excel software. The study found that 84.9% of the households had electricity compared to 79.3% of the business premises. However, the study found out that, there were two types connectivity practiced in Kibera; informal (illegal) and the formal (official). Informal connectivity was higher among the households at 6.1% compared to businesses that stood at 4.2%. The study found out that the major challenges inhibiting electricity provision in the slum include high connectivity fees and the monthly bills that many of the slum dwellers could not afford. Due to the haphazard layout of the structures there is little space left for putting up the powerline's infrastructure. This coupled with lack of titles to land and the unresponsive neighbors has made it extremely difficult in obtaining wayleaves consents. The study recommends the government implements a subsidized slum electrification policy, mooted earlier, but abandoned due to lack of funding, to ensure universal connectivity in Kibera and other slums. Connection fees should be lowered and postpaid in installments. The government should take the opportunity of the goodwill that the locals expressed on stakeholders' engagement in order to plan infrastructure in the slum. Demolished encroachments, as inducement, to be compensated to create powerline wayleaves trace. Stringent application rules like submission of title deeds should be done away with. It should also come up with a policy on green energy and give incentives to investors and those willing to install solar panels.

TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT.....	v
TABLE OF CONTENTS.....	vi
LIST OF FIGURES	x
LIST OF PLATES	xi
LIST OF MAPS	xii
LIST OF TABLES	xiii
ABBREVIATIONS AND ACCRONYMS	xiv
CHAPTER ONE	1
INTRODUCTION	1
1.0 Background of Study	1
1.1 Problem Statement	3
1.2 Purpose of the Study	5
1.3 Research Questions	6
1.4 Research Objectives	6
1.5 Justification of the Study	6
1.6 Scope of the study	7
1.7 Study limitations	7
1.8 Definition of Terminologies	8
1.8.1 Informal Settlements/Slums.....	8
1.8.2 Land Tenure	8
1.8.3 Way leave.....	8
CHAPTER TWO	9
LITERATURE REVIEW	9
2.0 Introduction.....	9
2.1 Global Electricity Connectivity in Informal Settlements.....	9
2.1.1 Electrification Experiences of the Informal Urban Settlements in Africa.....	9
2.1.2 Urban, Peri-Urban, Slum Electrification Kenyan Experience	11
2.1.3 Efforts Towards Slum Electrification in Kenya.....	11
2.2 Challenges Facing Slum Electrification.....	14
2.2.1 Poverty	14
2.2.2 Land Tenure	14
2.2.3 High Population Growth-Rate	14
2.3 Opportunities for Slum Electrification.....	15

2.3.1 Increasing Energy Demand.....	16
2.3.2 Donor Interest	16
2.4 Policy Framework.....	16
2.4.1 Sustainable Development Goals (SDGs).....	16
2.4.2 Africa Agenda 2063	17
2.4.3 Kenya Vision 2030	17
2.4.4 Kenya Affordable Housing Program Development Guidelines	17
2.4.5 Nairobi City County Integrated Development Plan (CIDP) 2018-2022.....	18
2.4.6 Nairobi Integrated Urban Development Master plan (NIUPLAN)	18
2.4.7 National Housing Policy for Kenya Sessional Paper No. 3 of 2016	19
2.5 Legal Framework	20
2.5.1 The 2010 Constitution of Kenya.....	20
2.5.2 The Energy Act 2019	20
2.5.3 County Government Act, 2012.....	21
2.5.4 The Land Act	21
2.5.5 The Wayleaves Act Cap 292.....	21
2.5.6 The Landlord and Tenant Bill, 2007.....	22
2.6 Institutional Framework.....	22
2.6.1 Physical Planning Department.....	22
2.6.2 The Electrical Energy Subsectors	23
2.6.3 The World Bank Group (WBG)	23
2.6.4 International Monetary Fund (IMF).....	24
2.6.5 The French Development Agency	24
2.6.6 The Kenya Private Sector Alliance (KEPSA)	24
2.6.7 The Kenya Land Alliance (KLA)	25
2.6.8 Consumer Federation of Kenya (COFEK)	25
2.7 Conceptual Framework.....	26
CHAPTER THREE	28
RESEARCH METHODOLOGY.....	28
3.0 Overview	28
3.1 Research Design.....	29
3.2 Target Population and Sampling Design	30
3.2.1 Target Population.....	30
3.2.2 Sampling Design.....	30

3.3 Data Collection	36
3.4 Data Analysis and Presentation	37
3.5 Ethical Considerations	38
3.6 Data Collection Challenges and Solutions.....	38
CHAPTER FOUR.....	40
BACKGROUND ON THE AREA OF STUDY	40
4.0 Introduction.....	40
4.1 Location Context of the Study Area	40
4.1.1 National Context of Project Area.....	41
4.1.2 Local Context of the Project Area	41
4.2 Climate.....	43
4.3 Historical Background	44
4.4 Population and Demographic Characteristics	46
4.5 Socio-economic Characteristics	46
4.5.1 Housing	46
4.5.2 Education	47
4.5.3 Security	48
4.6 Infrastructure.....	49
4.6.1 Health.....	49
4.6.2 Transport System	49
4.6.3 Water.....	50
CHAPTER FIVE	51
STUDY FINDINGS.....	51
5.0 Introduction.....	51
5.1 Social-Economic Backgrounds of the Respondents	53
5.1.1 Social-Economic Background of the Households	53
5.1.2 Social-Economic Background of Business Owners	55
5.2 Existing Electricity Connectivity.....	56
5.3 Challenges Facing Electricity Connectivity.....	59
5.4 Proposed Slum Electrification Planning interventions	63
CHAPTER SIX.....	69
CONCLUSION AND RECOMMENDATIONS	69
6.1 Introduction.....	69
6.2 Study Conclusions	69
6.2.1 Current Electricity Connectivity Situation in Kibera.....	69
6.2.2 Challenges Facing Slum Electrification.....	70

6.2.3 Planning Interventions towards Improvement of Slum Electrification	71
6.3 Recommendations.....	71
6.3.1 Electricity Accessibility	71
6.3.2 Slum Electrification Challenges	72
6.3.3 Planning Interventions Towards Improvement of Slum Electrification.....	72
6.5 Suggestion for Future Research	74
REFERENCES	75
APPENDICES	84
APPENDIX I: HOUSEHOLD QUESTIONNAIRE.....	84
APPENDIX II: BUSINESS QUESTIONNAIRE.....	87
APPENDIX III: INTERVIEW SCHEDULE (KEY INFORMANTS).....	90
APPENDIX IV: FOCUS GROUP DISCUSSIONS	91

LIST OF FIGURES

Figure 1: Conceptual Framework	26
Figure 2: Average age of the residents	53
Figure 3: Education levels of the residents	54
Figure 4: Household and Business Electricity Connection Status.....	58
Figure 5: Household and Business Barriers to Electricity Connectivity	61
Figure 6: Remedies for Household and Business Electricity Connectivity	62

LIST OF PLATES

Plate 1: Research Team.....	29
Plate 2: Researcher & assistants in the field	30
Plate 3: Administration of household questionnaires	36
Plate 4: Silanga Village Current Power Connection Status	45
Plate 5: Ayany & Kibera Primary Schools	47
Plate 6: PCEA Silanga High School	48
Plate 7: Olympic Primary School & John Paul II Mixed Secondary School.....	48
Plate 8: Water Meters Chamber	50
Plate 9: Substandard wiring in the slums	56
Plate 10: Electricity Network Along the Main Road	57
Plate 11: Aftermath of fire outbreak in Kibera	57
Plate 12: Kibera Narrow Streets	59

LIST OF MAPS

Map 1: Location of Kibera Slum	2
Map 2: Silanga sub villages	34
Map 3: Kibera at National Context.....	41
Map 4: Study Area at Local Context	42
Map 5: Silanga Village	42
Map 6: Part of Nairobi Topographical Sheet No. 148/4.....	43
Map 7: Silanga Electricity Network	45
Map 8: Medical Facilities in Kibera	49
Map 9: Silanga Interior Settlement with limited connectivity.....	58

LIST OF TABLES

Table 1: Rural Electrification Authority Connectivity Report	4
Table 2: Business Premises Samples Distribution.....	32
Table 3: Sample Frame for Households.....	36
Table 4: Household/Business incomes versus Connectivity Analysis	55
Table 5: Synthesis of Findings.....	64

ABBREVIATIONS AND ACCRONYMS

AFD	French Development Agency
CIDP	County Integrated Development Plan
ERC	Energy Regulatory Commission
FGD	Focus Group Discussion
GDC	Geothermal Development Company
GIS	Geographical Information System
GOK	Government of Kenya
GPOBA	Global Partnership on Output-Based Aid
KCYP	Kibera Community program
KENSUP	Kenya Slum Upgrading Programme
KETRACO	Kenya Electricity Transmission Company
KISIP	Kenya Informal Settlement Improvement Programme
KENGEN	Kenya Electricity Generating Company
KNBS	Kenya National Bureau of Statistics
KP	Kenya Power
MDGs	Millennium Development Goals
NEMA	National Environment Management Agency
NIUPLAN	Nairobi Integrated Urban Plan
NLC	National land Commission
PVC	polyvinyl Chloride
REA	Rural Electrification Authority
REREC	Rural Electrification & Renewable Energy Corporation
SDGs	Sustainable Development Goals
SMEs	Small and Micro Small Enterprises
SPSS	Statistical Package for Social Sciences
UN	United Nations
UNDP	United Nations Development Programme
UN-HABITAT	United Nations Development Programme
USAID	United States Agency for International Development

CHAPTER ONE

INTRODUCTION

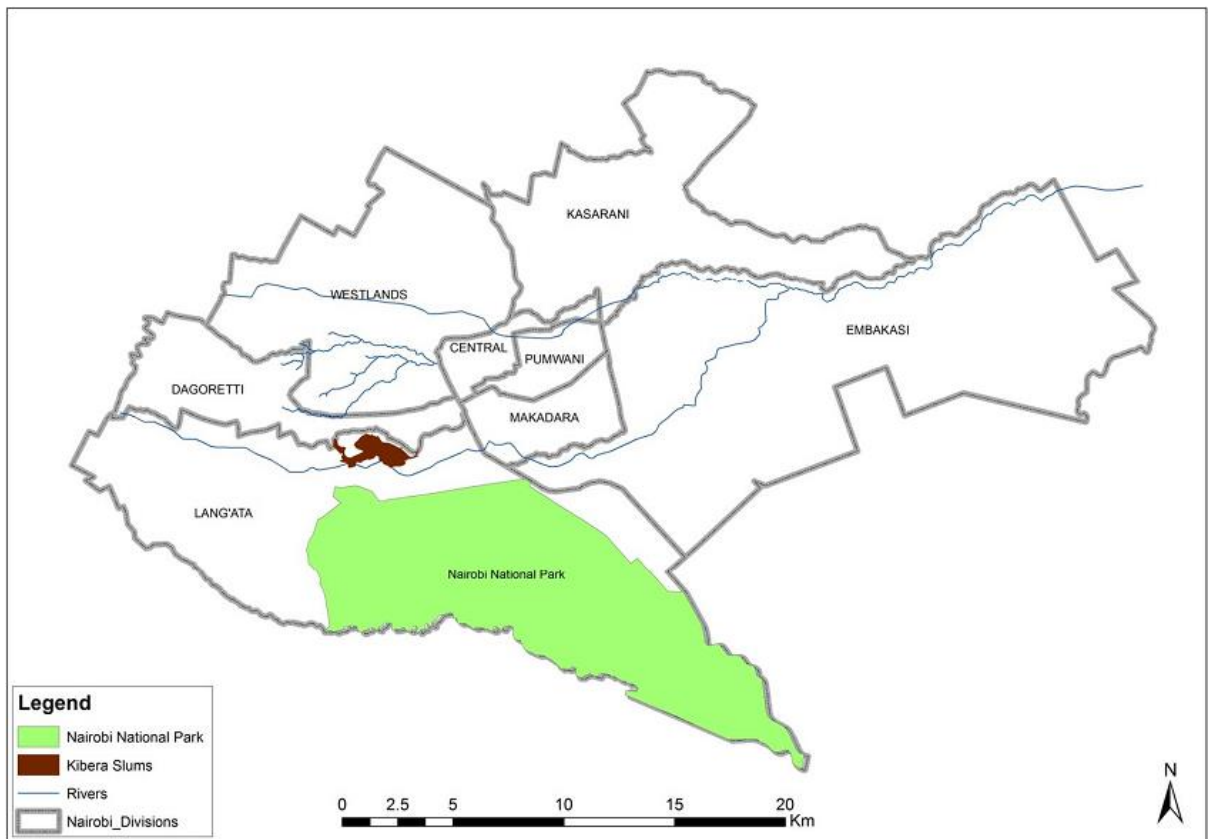
1.0 Background of Study

The world population stood at 6.7 billion in the year 2007 and was expected to skyrocket to 9.2 billion by the year 2050 (United Nations, 2008), a prediction that would result in people living in the urban areas surpassing the rural population of the world (UN-HABITAT, 2007). This is as a result of rapid urbanization in the last decades especially in the less developed regions. It has therefore brought in formation of informal settlements, otherwise referred to as slums. About 50% of the people living in towns live in the informal settlements, thereby, demanding the provision of basic services such as electricity. These settlements are unplanned and lack basic services such as water, electricity, sewer system etc. (UN 2002). Energy provision eradicates poverty and improves society's welfare.

On Friday, 30th January 2015 the Kenya Power MD and CEO, while speaking during a subsidized electricity installation exercise for a Nubian community in Kisii town said that the company would collect more revenue by replacing illegal connections with formal connectivity (Kenya Power Corporate Communication Department, 2015). He noted that, in the recent past, many electrocutions and fire outbreaks in the slums were caused by faulty wiring, done by unskilled criminals.

According to a study, done by African Population and Health Research Center in 2014 only one fifth of Kibera residents had electricity. The rampant poverty and unemployment make it difficult for the residents to cater for the costs of connectivity and the monthly electricity bills. According to Kenya power corporate communication department, the procedure involved in connecting electricity supply to an applicant includes; the customer filling the enquiry form after power utility representative visits the premises to assess the costs. At this point, the applicant must also attach copies of his identity card, PIN, title, allotment or search certificate and a sketch map to the premises. Thereafter the customer is provided with a quotation that he must pay within the ninety days from the date of the quotation. Wayleaves consents must now be obtained from the landowners who will be affected by the project (The Wayleaves Act Cap 292 of 2010).

The slum dwellers are mostly squatters living on government land. Lack of these land ownership documents is one of the major obstacles hindering electricity connectivity in the slums. The prospective power applicant cannot, therefore, qualify for supply, as he cannot produce any ownership documents, which is a mandatory requirement. Furthermore, wayleaves consents cannot be complete without attaching the copy of the title to the premises. Thus, even if the neighbors might be willing to give consents for the power lines to pass over their plots, acquisitions process would still stand incomplete. The other thorny issue is the upfront charges that one has to pay to be connected. This adds misery to the slum dweller who, would have preferred to boost his small business with this money and later clear the connection charges by postpaid installments from the business profits.



Map 1: Location of Kibera Slum

Source: Kenya GIS data, 2009

The roads encroachments are also an obstacle to putting up the network. Other challenges include insecurity on the part of utility staff, tools, equipment, and the compensation matters (USAID, 2014). Lack of access is one of the most common

problems caused by and experienced by residents in the informal settlements (Mohammed H. A & Muhammad S.S, 2006). This makes it hard for the power infrastructure layout to be implemented.

1.1 Problem Statement

Electricity is a key component of household and business activities. Energy is a key part of increased safety and crime reductions, it powers a country's economy, provides a reliable platform for businesses to thrive and it is critical for the health of human beings. World Bank in 2018 observes the milestones achieved in Kenya electricity connectivity as lessons for other African countries. In its report, the bank observes that power connectivity stood at 75 percent as of 2018. This provided impetus for the country's ranking 94th globally at a human capital index score of 0.52. Further, electricity connectivity powers the manufacturing, housing, food production and essentially all sectors of the economy hence being a key factor in a country's GDP growth, its business competitiveness and attraction to investors.

With this understanding, electricity connectivity is key to any economy, household and business premise whether in the rural areas or urban areas, whether in the industrial zone or in the residential zone, whether in informal or formal settlements, in all localities. Electricity needs for the households in urban informal settlements, in third world countries has not been addressed with much focus directed to rural electrification. In Kenya, for instance, the economic survey (2018), reported that, 1,269,510 customers were connected through the rural electrification program during the 2016/2017 financial year compared to 205,287 customers connected by June 2009. This is an average 25.8% increase in connectivity per year. It is significant to note here that, the survey completely ignored the status of connectivity for the slums.

ECONOMIC SURVEY YEAR	FINANCIAL YEAR	CUMMULATIVE CONNECTIVITY	PERCENTAGE OF CONNECTIVITY INCREASE
2019	2017/2018	1,332,100	4.9
2018	2016/2017	1,269,510	30.6
2017	2015/2016	972,018	38.2
2016	2014/2015	703,190	33.0
2015	2013/2014	528,552	16.5
2014	2012/2013	453,544	18.5
2013	2011/2012	382,631	23.7
2012	2010/2011	309,287	23.2
2011	2009/2010	251,056	22.3
	2008/2009	205,287	

Table 1: Rural Electrification Authority Connectivity Report

Source: Kenya National Bureau of Statistics

The African Population and Health Research Center (2014) reported that just a fifth of Kibera residents were connected to electricity as of 2014. Despite the 2006 Energy Bill creating a rural electrification agency known as Rural Electrification Authority, little was included in the bill as regards urban residents let alone slum settlements in the urban areas. The Energy Bill 2006 further entailed connecting public utilities such as schools, health and the market centers. Domestic users according to the bill were to be connected to the grid by sourcing electricity from transformers erected at these public facilities so long as they are within a given radius. This was to be achieved through a “customer creation” exercise as encompassed in the bill.

The bill assumed that all urban residents were well endowed with electricity connections. This, however, was not the case especially in the informal settlements indicating an unimaginable oversight on the part of the bill drafters. The advance payments required during the application for electricity connectivity, prior wiring requirements, space contestations within the informal settlements, low incomes and

high poverty levels of slum residents are some of impediments to uptake of electricity connectivity in the slum settlements of Kenya's urban areas.

The UN – Habitat (2003) observes that land tenure, cost/affordability, costs of internal wiring and government policy on unplanned developments were key factors that influenced electricity connectivity in urban areas especially the slum settlements.

Further, the process of electricity connection in informal settlement areas is compounded by lack of land ownership documents that can guarantee access to credit for power connectivity and it compounds consent acquisition for power wayleaves. With high costs of electricity connectivity and low income of residents earned from wages and small businesses, electricity connection for households and business premises becomes a nightmare in the informal settlements. Further, informal settlements are rampant with illegal electricity connections. If left unchecked the situation could get more aggravated. This understanding prompted efforts to enhance the living conditions in the slum areas. Governments have over the years worked towards achieving 100 percent electricity connectivity including to the urban poor. The adoption of Sustainable Development Goals in 2015 and specifically goal number seven on universal access to affordable, reliable, sustainable and modern (clean) energy for all confirmed the intention of governments towards connecting their populations to reliable electricity sources.

While these challenges are present in literature and cutting across informal settlements globally, limited information is available on the status of electricity connectivity and challenges facing the same within Silanga Area of Kibera slums. This study endeavored to identify the specific challenges to electricity connectivity to households and business premises in Silanga village, Kibera informal settlements. Obtaining reliable information from the study findings was key to recommending planning interventions that would remedy the situation and hence pave way for reliable power connection within the study area.

1.2 Purpose of the Study

The purpose of this study was to establish the status and challenges in achieving universal electricity connectivity in urban informal settlements using Kibera informal settlement in Nairobi, Kenya as a case study.

1.3 Research Questions

1. What is the current electricity connectivity situation in Silanga village?
2. What are challenges facing slum electrification in Silanga village?
3. What planning interventions can be applied to improve slum electrification in Silanga village?

1.4 Research Objectives

1. To find out the existing electricity connectivity situation in Silanga village.
2. To find out the challenges facing electrification in Silanga village.
3. To explore planning interventions towards improvement of slum electrification in Silanga village.

1.5 Justification of the Study

The way forward to making the slums habitable and economically productive is to invest in infrastructure (UN habitat, 2007). This has not been the case for the urban slums in Kenya. Since independence, successful government regimes have not been able to address the issue of slum electrification comprehensively. Despite recent research papers and policy formulations, implementation of informal settlement electrification and access to essential services in these settlements has not been done (Mitullah, 2003). About 70% of electricity consumption occurs in the towns with the slum dwellers demanding, but not getting this service. It is against this backdrop that Silanga has been chosen as one of the urban slum village in Kibera to be researched on.

Moreover, Kibera, with such a big population of 170,170 (GoK, 2009) and its unique location in Nairobi, the capital city of Kenya, makes it an appropriate typical urban slum worth of this study.

Despite the various intervention strategies to electrify Kibera by Kenya Power in conjunction with donor organizations, there has been lack of goodwill within the local community. Part of the reason can be attributed to lack of public participation. Kenya Power has failed to sustain the program, with the connected customers

defaulting on payment. Illegal connections are still taking place. This call for new thinking to ensure the community embraces clean energy.

There is need to meet the universal access requirements for informal settlements. The Sustainable Development Goal no. 7 observes that well lit, well-heated and well cooled households are essential for creating comfortable learning spaces for children and reduce dependency on natural variations in daylight. Access to energy would expand the number and range of opportunities for women. For example, it would enable women to work from home and therefore generate an independent source of income (UN, 2015). For the ecosystem to be complete, informal settlements have to be treated as a part of the global ecosystem.

1.6 Scope of the study

This research is limited to Silanga Village in Kibera informal settlement, Nairobi County. Due to its high population density, Kibera was chosen because its characteristics represent a typical world urban informal settlement. Majorities of the dwellers, who cannot afford decent housing, live in houses walled with mud, are low-income earners and some job seekers. They are also squatters; they do not have titles to land. The land belongs to the Government.

1.7 Study limitations

- Due to insecurity, the research was not able to venture deep into interior areas. Some dark alleys were unfriendly and prone to theft and mugging.
- The other limitation was lack of resources and the fact that this was an academic study, no funding had been set aside for the research.
- Many respondents were hesitant to state whether they were connected formally or informally. Those illegally supplied feared they could be disconnected or prosecuted.
- While the population of the entire Silanga village has been well documented, there was a challenge in determining the number of residents in the sub villages. This is because the government in the latest census exercise did not recognize them.

1.8 Definition of Terminologies

1.8.1 Informal Settlements/Slums

The Physical planning handbook defines informal settlements/slums as unplanned settlements growing/developing on private/ or public land. In the context of this study, these two words will be used interchangeably.

1.8.2 Land Tenure

Land Tenure is the right to own and use of the land.

1.8.3 Way leave

A right of use over the property of another

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This is a review of published literature on global electricity connectivity in the slums with the purpose of understanding the existing situation for slum electrification, examining the challenges facing slum electrification and literature highlights on opportunities for slum electrification. The chapter further provides deep analysis of policy measures such as vision 2030 that has slum electrification pegged to it and has an objective of transforming Kenya into a middle-income economy through the improvement of energy access as an infrastructure. Finally, there is a theoretical and a conceptual framework before a closing summary of the chapter.

2.1 Global Electricity Connectivity in Informal Settlements

The global access to electricity stands at 60%. The rest of the population, use firewood and charcoal for especially food preparing (UN SDGs, 2015) due to lack of green energy. The Sustainable Development Goal No. 7 is not only aimed at affordable energy but also clean energy that is pollution free for the benefit of all communities. Among the targets set to be met by 2030 in the energy sector are reliability, affordability and energy efficiency, international cooperation in research and technology and expansion of energy provision infrastructure. In the electricity subsector, this would involve government investing more in hydroelectricity generation dams, power stations and distribution and transmission lines. More people in the third world are continually moving from the countryside to live in the cities (UN Habitat, 2011)

In Kenya, Kenya Power is the sole provider of electricity. Its mandate includes power transmission, distribution and supply to customers (ministry of energy, 2018). The challenges facing electricity in the slum areas include affordability, land tenure, lack of power wayleaves among others (Muhammad, 2009). In Kibera, illegal connectivity is rampant with the residents being supplied unsafe and illegal power by cartels who are quick to make money (The World Bank, 2015).

2.1.1 Electrification Experiences of the Informal Urban Settlements in Africa

In many African countries, the power generation capacity is lower than the peak demand. Household connectivity in Sub-Saharan Africa is lower than other

developing nations in other parts of the world (World Bank, 2010). This leads to power rationing and installation of generators to avert the crisis. Electricity connectivity charges and the monthly bills are also very high (World Bank, 2010). The rate of connectivity is higher within the endowed households than the poor households.

A case in point is Uganda's slums that are mostly located next to wetlands and closer to railway lines where land is available. Domestic tariff is Ush 426 per KWhr (equivalent to US\$ cents 22). This is quite expensive for the slum dwellers (Muregenzi, 2009).

Uganda's plan for enhanced electrification of informal urban settlements includes use of Output Based Aid (OBA). This is a partnership between the Uganda government and Germany, the European Union and the World Bank. This project provides connectivity fees subsidies for the households in the informal settlements and the rural poor. Micro finance institutions are also to offer loans to facilitate this Program (Muregenzi, 2009).

Immediately after the Democratic elections in South Africa in the early 90s, there was enhanced rural urban migration and immigrants stormed in from Zimbabwe and Namibia. This created pressure on the cities capacity to accommodate the increased population (Maphaka, 2009) leading to creation of slums.

From this South African example, it can be noted that one of most important ways of enhancing electricity connectivity in urban informal settlements would be to first upgrade the slums to formalize them then the provision of infrastructure like roads will be made a lot easier.

To fully address the slum electrification, one must first meet all the stakeholders who are many and they include leaders who are the major stakeholders, security agencies, government ministries, entertainment industry, private sectors, financial institutions and donors.

The goodwill from the government to upgrade and formalize these settlements is necessary if more opportunities that enhance slum electrification are to be promoted. In Kenya, KENSUP and KISP Programs objectives of slum upgrading will go hand in hand with the electrification of these informal settlements.

2.1.2 Urban, Peri-Urban, Slum Electrification Kenyan Experience

According to Mohammad (2009), there is grid intensification by the Kenya Power, and this is set to culminate into slum electrification in Kenya. In this Program, unique technical distribution model is to be used to provide power in various slum areas all over the country and the costs are set to be highly subsidized to the customers. Some of the measures that are either already proposed by Kenya Power or are in operation to promote affordability of electricity include Stima Loan managed by Equity Bank, maximization subsidy of power connectivity, group scheme, Rural Electrification Deferred Payment Plan as well as AFD Load managed by KPLC. These are some measures that are to promote affordability of electricity and subsequently lead to electrification of urban informal settlements.

Despite all these attempts by Kenya Power to promote electricity connectivity in slums, they face a myriad of notable challenges including lack of affordability of customers for connection fee, irregular layouts and narrow walkways and extortionist cartels who are also illegal power suppliers.

2.1.3 Efforts Towards Slum Electrification in Kenya

It is common knowledge that Kenya has perhaps the largest urban poor population in the universe who are accommodated in urban slum settlements. Kibera is known to be the largest and most populous urban slum settlement in Africa (World Bank, 2015). The slum dwelling is characterized by urban poor populations that are largely uneducated, unemployed and highly rely on wages that are as well unreliable. The living conditions in the slum settlement are characterized by poor housing conditions and for the longest time poor access to energy. The World Bank (2018) observes that Kenya leads her east Africa neighbors in electricity connection at 75 percent total access to grid and off grid electricity. Nevertheless, the bank notes that a huge proportion of the population remained unconnected to power. The highly affected on this population was the rural and urban poor in slum settlements like Kibera, Mathare, Mukuru kwa Njenga, Kawangware, Soweto among others.

Kenya's urban slum settlements have for the longest time been characterized by poor quality, unreliable and unsafe electricity connections. However, with efforts by the country's utility company, Kenya Power, and with support from donor agencies including the World Bank and the Global Partnership on Output-Based Aid

(GPOBA), and in collaboration with Kenya Informal Settlement Improvement Project (KISIP) progress has been made in connecting Kenya's slums to safe and secure electricity. The adoption of community – centric approach by Kenya power witnessed a 30-fold increase in safe and secure electricity connections within a year in Kenya's slum settlements (World Bank, 2015). Kibera was the epicenter of these efforts. The community centric approach was adopted in 2014 and has since played a vital role in upgrading electricity connections in Kenya's slum settlements not to mention the eradication of illegal settlements.

The community-centric approach included Kenya Power engaging community members and leaders and marketing the benefits of legal electricity connections as safe, reliable and affordable while at the same time not taking down the illegal connections. Indeed, the utility service provider that is Kenya power confirms that illegal electricity service providers turned to the company to be legalized in provision of basic utility services such as power tokens since there was no more chance owing to the affordability of the program. Connection costs were highly subsidized and those who could not afford the connection fees it was converted for payment in installments.

Despite these efforts in electricity connections, some regions of the slum settlements remained unreached and still efforts are ongoing to ensure total connections to safe, secure and reliable electricity is achieved within all slum areas. The regularization of electricity connections in the slum settlements are still ongoing (De Bercegol, 2018). Nevertheless, it is perhaps right to intimate that in excess of 90% legal electricity connections have been achieved in most of parts of slum settlements in Kenya, Kibera on the lead.

The Kenya Slum Upgrading Program (KENSUP) established under the partnership of the Kenya government and UN-Habitat in 2003 marked yet another effort in the improvement of settlement conditions of urban poor in the slums. The project aimed at improving the livelihoods of slum dwellers in urban areas within Kenya (De Bercegol, 2018). Candiracci, S., & Syrjanen, R. (2007) observe that the aim of KENSUP was “to improve the livelihoods of people living and working in slums and informal settlements in the urban areas of Kenya through the provision of security of

tenure and physical and social infrastructure, as well as opportunities for housing improvement and income generation”.

KENSUP’s core objectives include projects on improvements of shelter and finance for affordable housing, upgrade of infrastructure mainly roads geared towards face lifting the house and sanitary conditions. Kibera in Nairobi was the pioneer project. As of 2007, Candiracci, S., & Syrjanen, R. (2007) note that, only 1 in 5 homes in Nairobi’s slums was connected to electricity which was available for less than 12 hours a day. Regrettably, the KENSUP project did not isolate electricity supply as a sole vital project but as part of provision of affordable housing. While most of KENSUP projects were hugely successful especially by their adoption of community central based approach, their contribution to electricity supply was highly limited.

Government ambitions embedded in “Kenya Vision 2030” fuelled the Kenya Slum Electrification Program (KSEP) established in 2011 and “Nairobi Metro 2030” plan intended to transform Nairobi into an African World Class Metropolis (De Bercegol, 2018). It is under this premise that most of the successes were achieved especially through employment of KENSUP model of community centric approach that involves local community leaders, members, businesses and non-government organizations. The second phase of KSEP was considered highly successful following the measures taken by the World Bank, Kenya Power Company (KPC) and GBOPA partnerships and collaborations as explained earlier. Interestingly, while much success was achieved through this program, some parts of the larger Kibera slum remained unconnected and left loopholes for cartels to thrive in illegal connections.

De Bercegol (2018) concurs with Langat (2019) feature story on the battles between World Bank and cartels to control electricity in Kenya’s largest slum. These authors’ findings indicate that cartels limit and threaten the progress of KSEP program owing to their cheap flat monthly electricity charges as opposed to metered/token-based charges by Kenya Power Company (KPC), cheap illegal connections, insecurity to utility staff threatened by the cartels among other factors. Success however is not far away beyond reach with much success by KPC having been attained. De Bercegol (2018) notes that “KPC’s recent “pragmatic turn” in acknowledging the slum dwellers energy needs and practices, afford abilities and rights to the city and in collaborating

with technicians, former cartel members, protection teams and members of youth groups from the slums needs to be further developed and strengthened”.

2.2 Challenges Facing Slum Electrification

There are various challenges globally hindering the electrification of slum areas.

These are -

2.2.1 Poverty

Most slum dwellers are low-income earners with very low incomes. Costs such as Connection fees remain a huge barrier to most slum dwellers. The power utility firms demand, prepaid connectivity fees before they install electricity supply (USAID, 2004). There is also the added cost of internal wiring inside the customers' premises.

2.2.2 Land Tenure

In Kibera, just like many other slums in the world, the dwellers do not have title to land. The government owns all the land. The people settled there are more or less like squatters who have encroached on government land. This makes it difficult for the people to get bank loans for investment and electricity connection due to lack of collateral (Mitullah, 2003).

2.2.3 High Population Growth-Rate

The current challenges of urbanization facing the world today are a result of concentration of development opportunities within urban cities. Job opportunities in towns are attractive to rural population. They trigger rural-urban migration. By the year 2008, people living in towns, universally, had surpassed the 50% mark compared to those living in the rural areas. This was expected to go up to 70 % within the following thirty years (UNHABITAT 2009). High cost of living, difficult access to the formal land market, non-transparent allocation systems and land grabbing are some of the causes that, together with rapid urban growth and a stagnant economy, lead to slum formation. In Kenya, as well as other African countries, politicians also contribute to congestion in the cities. During the electioneering period, they encourage the rural residents to register as voters in their constituencies in towns in order to vote for them when the elections are called. They bring them in lorry and busloads. They also entice and facilitate the existing slum dwellers to bring their friends and relatives to increase vote count by giving them handouts. During the campaign period, they hire vehicles to bring people from the rural areas to attend the

rallies to portray show of might in purported popularity contests. When they land in towns, they are temporarily provided with freebies and accommodated in these slums until the elections are over. The politicians who get into power forget the people who contributed to their victory until the next electioneering year. Those who loose, have to nurse their wounds and have little time for their supporters.

In Kenya, just like in many other African countries, the rural folk believe that one can only find job opportunities and good life in towns. This is the same mentalities that lead to illegal immigrants to America believing that, it is the “dreamland”. The rural dwellers pester their relatives in towns to accommodate them as they search for jobs, as they believe that they would be hired sooner rather later. Frustrated in them in their failed attempts, they relocate to the slums where housing is cheap, as their well-off friends cannot accommodate them forever. Slums manifest themselves close to the town centers because the jobless can only afford walking as a means of transport.

The Informal settlements are by nature, contested spaces. They are normally located in government land reserved for future developments. In Kenya, the colonial government settled the Nubians in Kibera as a reward for fighting, as allies, in the First World War, but did not provide them with title deeds. However, later, other migrants invaded this settlement. Due to the growing population, the place turned into a slum resulting in crime and deteriorated living conditions (Parsons, 1997). The government then decided to close down this settlement, without much success (Edkdale, 2011).

The residents remained adamant. It came up with another strategy of abandoning all development plans and essential services, in the hope that, the residents would find it unbearable and leave voluntarily. Unfortunately, this did not also work. This trend continued even after Kenya attained independence. As a result, the crisis reached unprecedented levels.

2.3 Opportunities for Slum Electrification

The World Bank through Energy sector management assistance program realized that Informal settlements are endowed with a variety of opportunities which present a great potential that can be harnessed towards slum electrification (World-Bank, 2011)

2.3.1 Increasing Energy Demand

According to Energy Regulatory commission (June 2018), the peak demand is 1,800 megawatts and is expected to grow at the rate of 4% per year. In Kenya, according to the census done in 1999 there was a population increase of 35% from the previous census done ten years earlier.

2.3.2 Donor Interest

The International Monetary Fund (IMF), the World Bank and other donor agencies' continued interest in improving the living conditions of the informal settlements throughout the world is commendable. One way of improving living conditions in slums is through service and utility provision such as water, electricity, sewerage, roads etc. This is a great opportunity that can be exploited to electrify the slums.

2.4 Policy Framework

According to a World Bank report (2000), Energy policies have a key role in the development and growth strategies of governments. Ready access to reliable, reasonably priced energy, particularly by industry, agriculture, and the commercial sector is an important catalyst for growth. For households, electricity connectivity can boost welfare by reducing time spent collecting biomass fuels for cooking or heating purposes or by boosting the productivity and income of household businesses. This report also outlines the different benefits derived by the impoverished as direct effects on health, education, economic opportunities, trickle effects of increased productivity and fiscal space (coupled with pro poor policies). Despite these benefits, there is always an evident variance in access to the service between the poor and the rich throughout the world.

2.4.1 Sustainable Development Goals (SDGs)

SDG goal no. 7 targets universal availability of low-priced green energy by 2030 (UN, 2015). There are enormous benefits that emanate from subsidized green energy. SMEs, like the green grocers, Posho millers, barbers, kiosks owners, among others, would be in a position to extend business hours far into the night. Students in schools, colleges and even at home would have more study hours, thus improving their performance. Unfortunately, despite the high visibility of NGOs presence in Kibera little has been done on adoption of green energy (Gongera and Gicheru, 2016). According to these authors, only 10% had adopted this technology. Kibera Community Youth Program (KCYP) operates a solar photovoltaic assembly that

creates employment assembling small and affordable solar panels (UNEP, 2008). The SDGs process was launched in September 2016, by the ministry of devolution and planning, which coordinates the implementation and monitoring of the SDGs in Kenya (UN, 2017)

2.4.2 Africa Agenda 2063

The main objective of agenda 2063 was the formulation and implementation of the strategy to enhance growth and sustain development. It consisted of three aspects. It consisted of three aspects: -

Vision: This is the Africa continental prosperity dream come true by the year 2063. It envisioned the anticipated raised status of its citizens' welfare, 50 year down the road.

The transformation model: This included the formulation of goals, identification of priorities, targets setting and the implementation strategies.

The road map: This addressed issues to do with funding, implementation capacities, monitoring and evaluation. On energy one of the projects identified to enhance clean and affordable electric power, was the construction of the twin Inga dams located in the Western Democratic Republic of Congo (DRC). The project has the generation capacity of 43,200 megawatts.

2.4.3 Kenya Vision 2030

Vision 2030, is a strategy adopted by the Kenya government to transform the country into a,

“Middle income country providing a high-quality life to its citizens by the year 2030” (Government of Kenya, 2010). One of the objectives is to produce more green energy and lower the costs of power supply. The high cost of electricity is one of the principal contributors to low electricity connectivity in the urban informal settlements, as the majority of people cannot afford this exorbitant high cost of electricity.

2.4.4 Kenya Affordable Housing Program Development Guidelines

Affordable housing is one of the big four agenda for the current Kenya government regime. The other three agenda include health, manufacturing and food security. To facilitate the success of this agenda the government has pledged to donate land, construct the infrastructure around the housing sites, hasten approval process, sell the houses at affordable prices and provide friendly environment for the private sector developers. Developers and contractors under the supervision of program

management consultants would implement the construction of the houses. Site identification and compliance is an integral attribute of this project. The project planner is expected to consult various entities and submit proposed layout and construction drawings for approval before commencing work on the site. One such entity is Kenya Power. This will ensure that existing power wayleaves traces are not encroached upon. It is also of mutual interest that, the client submits these plans to the service provider to enable the design of a comprehensive electrical reticulation plan to ensure every housing unit has access to electrical power. The layout plan also facilitates computation of the expected power load demand. The housing estate may require installation of several transformers or a substation depending on the size of the project. In such a scenario, the client would have to surrender space for this infrastructure. A management company established under the current companies Act 2015 would undertake the maintenance of the completed housing units. The funding for the housing projects will be sourced from borrowings, member contributions and public contributions.

2.4.5 Nairobi City County Integrated Development Plan (CIDP) 2018-2022

According to the above plan, lack of clean energy is a challenge to development. Alternative sources of energy like charcoal, paraffin and firewood are the major causes of air pollution and respiratory diseases to the residents. The proportion of energy usage in Nairobi for lighting is 68.2% electricity, 28.8% paraffin, 2.9% gas and 1.7% dry cells. To address the issue of security the development plan has identified priority projects in the energy subsector to be undertaken in Kibra Sub County during the 2018-2022 planning period. The projects include installation of street and public lights in Lindi, Makina, Sarang'ombe and Woodley to enhance security.

2.4.6 Nairobi Integrated Urban Development Master plan (NIUPLAN)

The integrated plan was commissioned in 2014 to replace the Nairobi Metropolitan growth strategy that expired in the year 2000. It was meant to address the escalated traffic congestion, housing, unemployment, pollution, infrastructure and insecurity. The roadmap timelines were aligned to Kenya vision 2030 and Nairobi Metro 2030. The NIUPLAN formulation framework was guided by the physical planning act, the 2010 constitution of Kenya, The county government act (2012) and the urban areas and cities act (2011) among other legislative statutes.

The objective of this plan was to review the previous development plan and come up with an integrated strategic plan for Nairobi for the period covering up to 2030. NIUPLAN noted that 1,062,329 had been connected to supply by April 2013. The report did not, however, breakdown number of households and businesses connected. However, the supply was unreliable with blackout incidences more prevalent in Nairobi North and West regions. Other challenges included vandalism of transformers and illegal connectivity. NIUPLAN recommended a review of the power generation demand projection plans in order to balance demand and supply guided by the growth rate of the GDP and population increase forecast. The plan warned of generation of excess power production that would lead to excess energy management costs.

2.4.7 National Housing Policy for Kenya Sessional Paper No. 3 of 2016

The National Housing Policy appreciates land use planning and management as key inputs in provision of housing. It recognizes the deep socio-economic and political impacts of matters related with land. The policy aims at facilitating the provision of sufficient shelter and a healthy living condition at affordable cost to all socio-economic groups in order to foster sustainable human settlements. This is to curtail mushrooming of slums and informal settlements in cities and urban areas as well as minimize the number of Kenyans that live in houses that are below the habitable living conditions. Among its specific objectives are putting in place mechanism for provision of adequate and affordable housing, to support sustainable mixed-income housing developments that meet the needs of all socio-economic groups and to develop programs and projects for delivery of adequate and affordable housing including for rental particularly to the low-income households. These objectives are in recognition of the vital need to supply low cost quality housing for all citizens in all spheres of life.

The policy provides guidelines for rural housing, urban housing, slum upgrading and prevention, social housing, public and institutional housing, university and institutions of higher learning hostel accommodation, employer assisted housing, urban renewal and redevelopment, cooperative housing and urban sprawl and peri-urban housing dynamics. The policy promotes adoption of appropriate planning interventions and approaches to prevent slum growth as well as maintenance and service and

infrastructure provision for low cost housing affordable to all. The policy does recognize the presence of slum and informal settlements as existing owing to high cost of formal housing. It does not however recognize slums and informal settlements as part of affordable housing programs particularly due to the dangers associated with slum settlements. The policy advocates for adoption and promotion of affordable housing projects with low cost rent that is sufficient and easily accessible by all to reduce chances of slum growth and development of new slum settlements particularly in urban areas.

2.5 Legal Framework

2.5.1 The 2010 Constitution of Kenya

According to the constitution, land should be owned and utilized equitably, efficiently, productively and sustainably. The environment and the natural resources should be conserved and protected. It also states that, all land belongs to people of Kenya and this ownership should not discriminate any man or woman. The land is classified as public, community or private. The constitution also states that every citizen has a right to good housing, sanitation, healthcare and freedom from hunger.

2.5.2 The Energy Act 2019

The Act brings not only combines all other laws relating to energy to avoid duplication but also revises and creates new laws related to energy. The laws are to be enforced in both the national and devolved governments. The Act provides guidelines to be used in establishing energy entities, the powers and functions of the various energy subsector entities. It will also state the powers and functions of each of these entities. The Act will facilitate enhanced production of renewable energy including geothermal, petroleum and coal. The Act advocates for enhanced electricity connectivity. The Act requires the cabinet secretary come up with a five-year national energy policy in consultation with the stakeholders. All the county governments shall submit individual energy requirements to enable the cabinet secretary prepare the integrated national energy plan. The energy and petroleum authority established under this act shall regulate all the energy entities. Anyone wishing to generate, export, import, transmit, distribute or retail electricity will have to obtain a license from this authority.

2.5.3 County Government Act, 2012

The purpose of this act was to facilitate the establishment of the county governments. It defines the devolved units' duties, functions and powers in order to offer services to the people living in the counties. This act of government was enacted in 2012 just before the 2013 Kenya's presidential, parliamentary and county elections to align the country to the then newly passed 2010 constitution. The act dealt on how the capital city, other cities and urban areas would be governed. The act gives direction on the transitional process from the old order of the central government and the provincial administration to the newly established devolved governments. The act also gives emphasis on public participation. The citizens are entitled to access information and data regarding formulation and implementation of county policies. Furthermore, the citizens have the right to participate in the entire policy process. The act recognizes the vulnerable groups including the disabled, women, youth and the marginalized communities. Their grievances are to be given special attention. The act also encourages public private partnership dialogue, engagement and mutual participation in development projects.

2.5.4 The Land Act

This bill combines all the existing land laws with the aim of preserving good management of land and its resources. The act gives the cabinet secretary several responsibilities. With recommendations from the national land commission, he shall formulate and implement land policies, manage land information systems and create standards of service delivery. He shall also ensure professionalism in human resources and regulate the various professional bodies in the land sector. The act highlights the various methods of acquiring title to land. It also highlights the role of the national land commission in the management of public land. Guidelines pertaining to compulsory land acquisition are documented in the event the government intended to put up infrastructure, in public interest, like a highway, dam or any other utility beneficial to its citizens. In this case, the cabinet secretary would be required to submit a request to the commission to acquire the land on behalf of the government.

2.5.5 The Wayleaves Act Cap 292

This act gives direction on the procedures to be followed by the government on constructing an infrastructure on or underneath private land. The landowner must be notified in writing of this intention within a minimum period of one month. If the land

proprietor objects to this request, he shall write to the District Commissioner within the same month. The District Commissioner will inform the minister of this objection. The minister will then make an independent inquiry into the issue on whether there will be modification of the design or otherwise. The government will compensate for the crop damage. In case the landowner disputes the compensation amount, he shall apply to the district commissioner who will review the claim and come up with a new reasonable compensation subject to appeal to the provincial commissioner.

2.5.6 The Landlord and Tenant Bill, 2007

The bill was enacted in 2007 to revise all the previous laws relating to the renting of premises and to come up with a single legislation. The bill contains regulations that guide the coexistence between the landlord and the tenant. It regulates rental rates to guard against unrealistic hiking of rent. The bill also provides a framework for eviction notices and stipulates the rights and duties of the landlord and the tenant. It also provides for arbitration mechanism between the two parties. The bill established the landlord and tenant tribunal. The relevant cabinet secretary appoints the chairperson, the vice chairperson and other members of this tribunal. According to the bill, the monthly rent shall be agreed mutually between the tenant and the landlord and in case of a disagreement, the tribunal shall arbitrate. If a lord wishes to increase rent, he shall give the tent a notice of at least 90 days. A tenant may only sublet the premises with the consent of the landlord.

2.6 Institutional Framework

2.6.1 Physical Planning Department

The department's main objective is to ensure balanced national development for all the Kenyans. It does so by producing local and regional development plans through public participation. The regional development plan takes into consideration factors such as population density, land potential, employment, human settlement and incomes. The local physical plan considers the various land uses including industrial, residential, commercial, open spaces and public utilities. The department, which is headed by a director appointed by the public service commission, is also involved in extension of leases, change of user, amalgamation of land, change of user and subdivision of land.

2.6.2 The Electrical Energy Subsectors

There are several entities that are involved in generation, transmission, distribution and retailing of electricity. In the generation subsector, there are two generating parastatals bodies. Geothermal Development Company (GDC) generates geothermal power from steam fields. Kenya Electricity Generating Company (Kengen) generates 75% of the total electricity that is consumed in Kenya that sources from Hydro, wind, thermal and geothermal.

In the transmission subsector, Kenya Electricity Transmission Company otherwise referred to as KETRACO was established in 2008 to transmit high voltage electric power. The capacity of the transmission lines ranges between 132 and 400 KV. KETRACO's mandate is to transmit electrical power from the generation sources to Juja national control and other primary stations spread in the entire country. The Rural Electricity and Renewable Energy Corporation (REREC), was established to accelerate electricity connectivity in the rural areas and develop, manage and promote the use of renewable energy.

Its operations are fully funded by the government and donors. Finally yet importantly is Kenya Power. This is the mother of all the other electrical entities. It was formed in 1922 as East African Power and Lighting Company to serve all the three east African countries. The Kenya government holds majority shares in the company. Kenya Power Company buys electricity in wholesale from Kengen, Independent Power producers (IPPS) and other generating entities and sells at retail price to customers.

2.6.3 The World Bank Group (WBG)

The World Bank Group was founded in 1944. Its headquarters are based in Washington D.C in the United States. Its main objective is poverty reduction among the developing countries. The bank offers finance, technical assistance and advises these countries on policy formulation and implementation. The institution is composed of 189 countries who must also be members of IMF. The World Bank Group consists of five institutions; The International Bank for Reconstruction and Development (IBRD), International Development Association (IDA), International Finance Corporation (IFC), the Multilateral Investment Guarantee Agency (MIGA) and the International Centre for Settlement of Investment Disputes (ICSID).

2.6.4 International Monetary Fund (IMF)

IMF was formed consecutively with the World Bank Group at the Bretton Woods conference held in New Hampshire USA in 1944. The main objective is to stabilize the international monetary system. It monitors the world economy and that of the member countries. It also offers practical assistance and lends money to countries with challenges in balance of payments (BOP). Member countries must first join IMF to qualify for admission to the WBG. IMF members are required to deposit some money to benefit from this fund. A country with financial constraints is allowed to withdraw 140% of its deposits. The repayment period varies from four to ten years. The IMF's source of income comes from the member countries' contributions to sustain the fund. It also borrows money to supplement the above contributions.

2.6.5 The French Development Agency

AFD is a financial institution that supports developing nations in poverty reduction and economic growth. Since 1997, AFD has been extending support to Kenya government. The agency's focus in Kenya has been in the energy sector. AFD has formed partnership with the ministry of energy, Kengen, Geothermal Development Company (GDC) and Kenya Power. In the electricity sector, Kenya has benefited from 102 billion Kenya shilling donor aid from AFD. The objective of AFD presence in Kenya is the promotion in the use of renewable energy, Energy efficiency and electricity connectivity. The agency has also funded feasibility studies and reforms in the energy sector.

2.6.6 The Kenya Private Sector Alliance (KEPSA)

The Kenya private Alliance (KEPSA) was formed in 2003, with the aim of consolidating businessmen and women together in order to speak in one voice. It lobbies for a conducive business environment upon which businesses can operate. Kepsa has more than 500,000 members, who campaign for their interests in investment, trade and industrial relations. Kepsa has played a big role in influencing economic, business and political reforms. It participated in the formulation of 2010 Kenya constitution, economic recovery strategy of 2003 and Kenya vision 2030. Kepsa has contributed to the recognition of the private sector in the country. The sector has become more active in enhancing economic growth by engaging directly in dialogue with the presidency, cabinet secretaries, senators, parliamentarians, governors, the Attorney General and the chief justice.

2.6.7 The Kenya Land Alliance (KLA)

The Kenya Land Alliance was formed in 2013. Its main aim was to create policies and laws that advocate for equitable distribution of land and natural resources. In Kenya, the alliance creates communication network channels internally and internationally with its counterparts. It gathers data on land information that it shares with its members. It creates awareness on land issues among the communities and the public. It is also involved in land policy and reforms. The alliance was involved in the 2010 constitution making process ensuring topical issues on land; natural resources and environment were included in the review.

2.6.8 Consumer Federation of Kenya (COFEK)

The consumer federation of Kenya (COFEK) was formed in 2010. It is an independent association that fights for consumers' rights. It monitors and protects against fake and expired goods from the supplier to the consumer. COFEK lobbies for fair pricing in the market place in favour of the consumer in Kenya and the region. It abhors any form of exploitation in the market. COFEK is nonprofit organization that conducts research and consumer education. It is also concerned with legal representation of the consumer in litigations.

2.7 Conceptual Framework

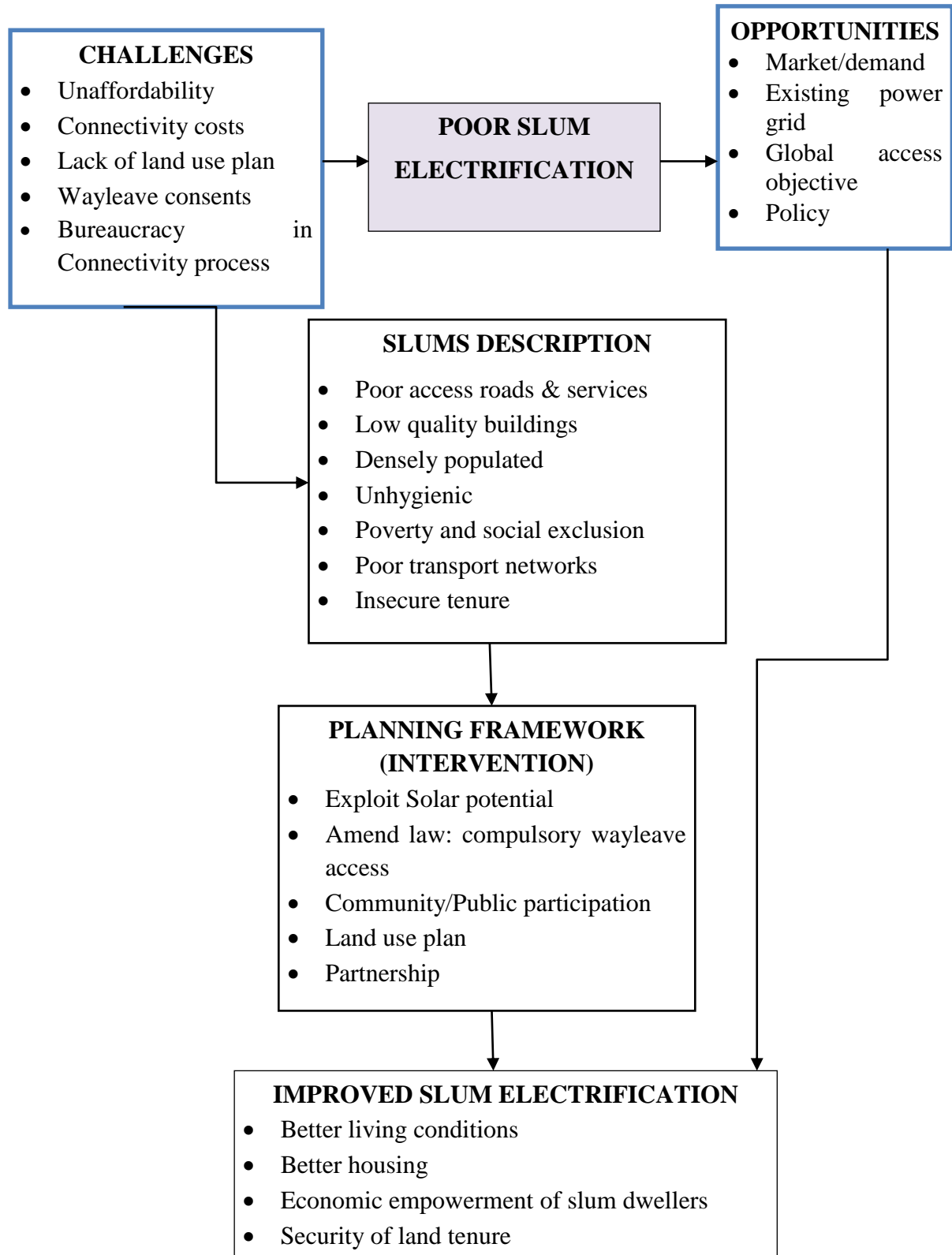


Figure 1: Conceptual Framework

Source: Author, 2020

The focus of this study is the achievement of universal electricity connectivity in informal settlement by using Silanga Village in Kibera slum as a case study. The reviewed literature gives the definition of poor slum electrification and highlights the bottlenecks that hinder slum electrification in both developed and developing countries. These include poverty, structural congestion, insecure land tenure, lack of land use plan and bureaucracy in connection processes. It revealed that low electricity connection is directly proportional to poverty levels within these slums. In informal settlements, poverty has led to low connectivity that in turn hampers the growth of businesses creating a vicious circle of poverty. By enhancing electricity connectivity interventions measures for the slums, this study envisages a situation of better living conditions for all slum dwellers.

Informal settlements also have many opportunities that if well harnessed, can be a catalyst to electricity provision within the settlements. Among these opportunities, include deliberate existing government policies aimed at electrifying informal settlements. The universal access to electricity objective also presents a great opportunity where every government needs to ensure everyone is connected to electricity.

Proper intervention measures Land use plan, deliberate policy, Public participation, Community participation, Partnership will increase the productivity of small and medium businesses, provide employment opportunities as well as reduce aspects of insecurity. This will improve the living standards of the people in informal settlements hence sustainable development in line with Kenya's Vision 2030.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Overview

Research methodology is a way of systematically solving the research problem that will assist in evaluation of various research decisions before they are taken (Kothari, 2004). This research is aimed at understanding the extent to which slum electrification has been achieved in Silanga village and the challenges towards universal electrification in the study area. The emphasis of this study was in Silanga village situated in Kibera informal settlement and sought to ascertain areas where electricity was present, how these connections were done, as well as the opportunities and challenges facing the slum electrification program within the slum.

Further, while efforts to achieve 100 percent electricity connectivity within the Kibera slum have been in place for decades, the process has in most of the cases faced resistance, insecurity challenges, failed to adopt the right mechanism to convince residents of the essence of legal connections, faced funding challenges and in the wake of illegal connections, has had to content with illegal power cartels who disconnect legal connections for their illegal business to thrive. Silanga village provides the best possible scenario within the larger Kibera slum that represents features and aspects that cut across the entire slum.

It is these aspects, features and characteristics of the village that informed the choice for the study area as it stands out uniquely to accurately represent the slum electricity connection status and challenges. Silanga village is highly populated, illegal electricity connections thrive in the village while legal connections are deemed costly, unavailable due to residents' failure to meet monthly bills, insecurity is the order of the day with high levels of legal electricity infrastructure vandalism and its location at the farthest and most interior part of the slum makes it a threat to utility staff. Silanga village therefore provides the best-case study platform to help understand the status and challenges of electricity connection in urban informal settlements, and as such justified for this study.

The findings from these objectives would be used to evaluate a workable slum electrification model applicable both in Kibera and other informal settlements in Kenya. This chapter highlights methods and techniques that the researcher employed in the course of his study. The format includes the research design, population and sampling design, data collection design, data analysis and presentation design, ethical considerations, data collection challenges and solutions in that order.



Plate 1: Research Team

Source; Field Survey, 2017

3.1 Research Design

Orodho (2003) defines research design as the scheme, outline or plan that is used to generate answers to research questions. Research design is, therefore, a strategy that is formulated to highlight how data will be collected and analyzed to effectively brainstorm and comprehensively address the research problem. This research is based on non-experimental research design that used a case study to obtain statistics to assess the relationships among the variables in exclusion of independent variables. A case study approach was preferred owing to its ability to provide a generalized perspective of an entire population and its ability to objectively represent an entire population of similar features, aspects and characteristics. A case study approach was also deemed suitable for this study since findings would represent an entire region with homogeneous characteristics and so would be applicable not only within the larger slum set up where the study area was located but also in similar settings countrywide and even globally. Finally, the case study approach was considered in the interest of cost and time constraints that would otherwise be impossible to achieve if an entire slum was to be considered.

3.2 Target Population and Sampling Design

3.2.1 Target Population

A population is defined as complete set of individuals, cases or objects with some common observable characteristics (Mugenda & Mugenda, 2003). It is the total collection of elements about which the study wishes to make some inferences (Cooper & Schindler, 2008). The target population in this study involved Kenya power staff, the area chief, focus group discussion for the vulnerable group that included the youth and women. It also involved all the households in Silanga village who are above 18 years of age. It also involved all the types of businesses that exist in the village, including but not limited to, retail & wholesale shops, supermarkets, cereal shops, butcheries, chemists, carpentry and welding workshops, saloons, laundry & dry cleaners, Bars & restaurants, mechanical garages, milk shops, Hardwares, mobile & Mpesa shops, cybercafé, tailor shops, electrical & electronic shops, video shops & halls, gas & kerosene shops, fuel stations, Posho mills, house hold shops, charcoal kiosks, clothing shops, hotel & Nyama Choma joints, radio/TV sales and repairs.



Plate 2: Researcher & assistants in the field

Source; Field Survey, 2017

3.2.2 Sampling Design

According to Merriam Webster dictionary, a sample is a finite part of a statistical population whose properties are studied to gain information about the whole. It is the process of determining the number of adequate units that will represent and give accurate view of the whole population. It is emphasized that to get a good representation of the population, the sample must be carefully and accurately selected (Denscombe, 1998).

The units of analysis in this study were the households and the business premises. The village has two distinct land uses namely; residential and commercial. The stratified simple random sampling approach was adopted since was representative of the population in each stratum. (Moore 2006).

The sample size was based on the minimum requirement attained from the following formula by Miller and Brewer (2003):

Equation 1

$$No = \frac{N}{1+N(e)^2}$$

Where No = Sample Size

N = Total Population

E = the desired level of precision (confidence level expressed as a decimal {for the study 0.08})

(i) Households

$$No = \frac{17363}{1+17363(0.08)^2}$$

=156 Questionnaires for the households

In order to save time and the challenges of the limited resources the entire population could not be interviewed. Therefore, an optimum sample size computation formula was adopted from Miller and Brewer (2003). Though the number of premises was less than the number of households, the author deliberately equalized the number of samples between the two land uses, to give more weight to the SMEs. This is in recognition of the role they play in spurring development and the creation of wealth among the communities.

(ii) Businesses

$$No = \frac{576}{1+576(0.08)^2}$$

=156 Questionnaires for the businesses

Households + Business Questionnaires: 156+156=313

Proposed total questionnaires = 312

Actual questionnaires administered (households 161 + Businesses 151) = 312.

One of the challenges, the author, encountered was the determination of the total business premises in the study area and the sub villages in Silanga that are crucial in stratification. Nowhere was this information documented in the literature review. The author had to do a physical count on the ground during reconnaissance with the help of a guide and a research assistant. The visit established that there are 576 business premises and 4 sub villages namely; Nyando/Sunday Studio, PCEA/NDP, Undugu/Bridge and ACK/Andolo. The selection of the samples for the households and the business premises was proportionately spread among these entire four sub villages.

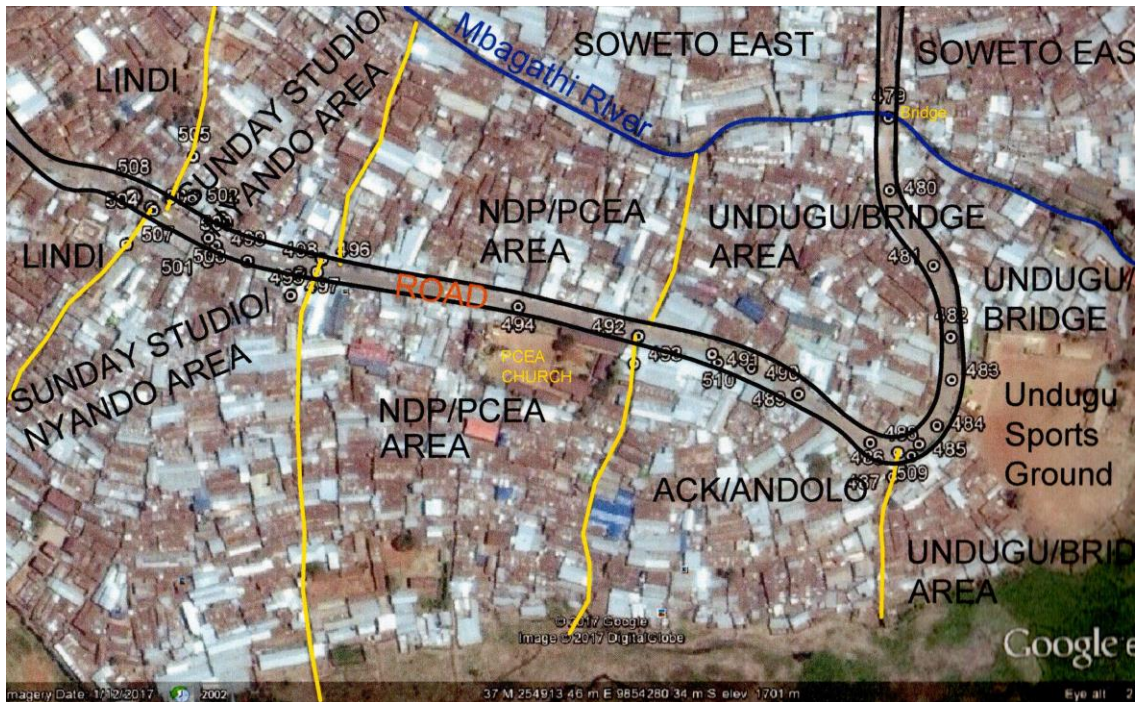
Table 2: Business Premises Samples Distribution

Business Type	Sunday Studio /Nyando Area	NDP /PCEA Area	Undugu /Bridge Area	ACK/ Andolo Area	Total Business Population	prop Total Samples in 4 villages
Retail Shops	(42) 11	(36) 10	(21) 6	(15) 4	114	31
Wholesale Shops	(4) 1	(2) 1	(1) 0	(0) 0	7	2
Supermarkets	(0) 0	(0) 0	(0) 0	(0) 0	0	0
Cereal Shops	(8) 2	(12) 3	(5) 1	(5) 2	30	8
Butcheries	(6) 2	(10) 3	(3) 1	(2) 0	21	6
Chemists	(9) 2	(12) 3	(5) 1	(1) 1	27	7
Carpenter Shops	(0) 0	(0) 0	(1) 1	(1) 0	2	1
Welding Shops	(1) 0	(0) 0	(1) 1	(0) 0	2	1
Saloons	(14) 4	(20) 5	(7) 2	(5) 1	46	12
Laundry/Dry Cleaners	(5) 1	(3) 1	(2) 1	(1) 0	11	3
Bars	(4) 1	(3) 1	(1) 1	(0) 0	8	2
Mechanics/ Garages	(0)0	(0)0	(0)0	(0)0	NIL	0

Milk Shops	(4) 1	(5) 1	(3) 1	(2) 1	14	4
Green Grocers	(31) 8	(26) 7	(8) 2	(9) 3	74	20
Hardware Shops	(3) 1	(1) 0	(1) 0	(0) 0	5	1
Mobile Phone /Mpesa shops	(21) 6	(13) 4	(6) 1	(4) 1	44	12
Cyber Café	(1) 1	(1) 0	(1) 1	(0) 0	4	1
Tailor Shops	(15) 4	(8) 2	(5) 1	(3) 1	31	8
Electrical Shops	(3) 1	(4) 1	(2) 0	(1) 0	9	2
Agrovet Shops	(0) 0	(0) 0	(0) 0	(0) 0	0	0
Video Shops	(2) 1	(1) 0	(3) 1	(0) 0	6	2
Gas Shops	(3) 1	(0) 0	(0) 0	(0) 0	3	1
Kerosene Shops	(5) 1	(4) 1	(4) 1	(2) 1	15	4
Petrol Shops	(2) 1	(0) 0	(0) 0	(0) 0	2	1
Petrol Stations	(0) 0	(0) 0	(0) 0	(0) 0	0	0
Posho Mills	(4) 1	(5) 1	(2) 1	(1) 0	12	3
House Hold Items Shops	(6) 2	(4) 1	(2) 1	(2) 0	14	4
Charcoal Shops	(12) 3	(10) 3	(6) 1	(4) 1	32	8
Clothing Shops	(4) 1	(3) 1	(0) 0	(0) 0	7	2
Nyama Choma	(4) 1	(4) 1	(1) 0	(1) 1	10	3
Hotels	(8) 2	(5) 1	(3) 1	(2) 1	18	5
Radio/TV Repair Shops	(4) 1	(3) 1	(1) 0	(1) 0	9	2
	49	48	29	24	576	156

Key: The figure inside brackets e.g. (42)8 indicates total business premises population in a particular sub village, while the figure outside is the computed no. of samples.

Source: Field Survey, 2017



Map 2: Silanga sub villages

Source: Google Maps, 2017

Computation of samples for each business type for all the four villages combined

The numbers of samples for each business type, for all the villages, combined in the table above, were computed as follows: -

Total population of a business divided by total samples multiplied by total samples

$$= \frac{N}{TB} (TS)$$

Where, N = the Total Population for all the sub villages for individual business type

TB = Total Businesses in the entire Silanga

TS = Total Samples

Example: Total Retail shops (N) =114 (see table above)

Total Businesses (TB)=576

Total samples for retail shops (TS)= 156 (see computation above)

$$114/576 * 156 = 31$$

Computation of samples for each business type for each village

The number of samples for each business type in each sub village in the table above were computed as follows: -

$$= \frac{n(ts)}{tb}$$

Where, n = the total population for each sub village for each individual business type

tb = Total Businesses for individual business type for all the sub villages

ts = Total computed Samples for all sub villages for each individual business type

Example: Retail shops in Sunday Studio sub village n= 42

Total retail shops in all the villages tb= 114

Total computed samples for individual business type for all the sub villages ts=31

$$42/114*31=11$$

Households Samples Distribution

According to latest Government of Kenya census conducted in 2009, the population of Silanga was 17,363, where the males were 10,198 (58.7%) and the Female Population was 7,165 (41.3%)

Total Household Samples =161 (see computation above)

Male population = 10,198 (58.7%) = 95

Female Population = 7,165 (41.3%) = 66

Total samples =161 (see table below)

As has been stated above, the sub villages had not been formally recognized as administrative units and therefore their individual population could not be established during the census exercise. An assumption was made that the four villages had equal population. The households sample size was computed proportionally among the total male and female population distributed equally among the villages.

Table 3: Sample Frame for Households

	SUNDAY STUDIO/NYANDO AREA	NDP/PCEA AREA	UNDUGU/ BRIDGE AREA	ACK/ANDOLO AREA	TOTAL SAMPLES
Male	(23)26	(23)18	(23)12	(23)18	(92)74
Female	(16)14	(16)19	(16)21	(16)33	(65)87
Total	40	37	33	51	161

Key: (xx)y proposed samples enclosed in brackets. Y outside the brackets denotes actual sample

Source; Field Survey, 2017

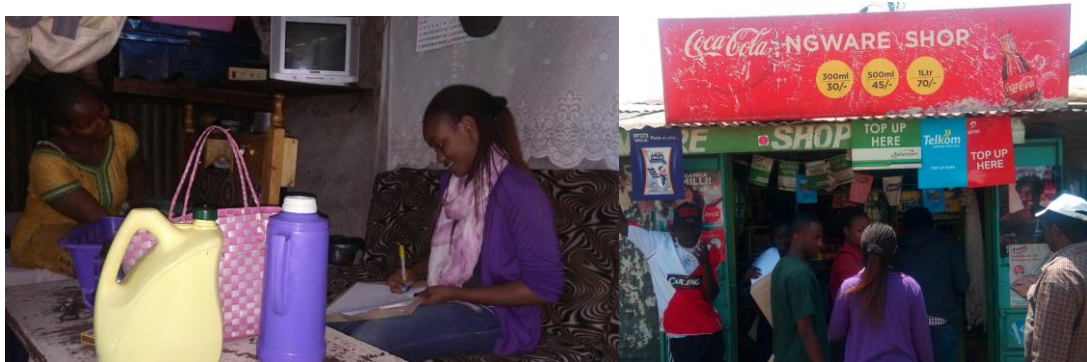


Plate 3: Administration of household questionnaires

Source; Field Survey, 2017

3.3 Data Collection

Both qualitative and quantitative data was collected for the study. Interviews, discussions, observations and photography methods were used to gather both quantitative and qualitative data from respondents within the study area. Household questionnaires, key informant interviews schedules, observation and photography instruments of data collection were employed in collection of both qualitative and quantitative data. The first task was the recruitment and training of research assistants.

The researcher approached the supervisor and the lecturers from the department of Urban and Regional Planning at the University of Nairobi to assist in scout for reputable, serious, honest and competent assistants among the 3rd year undergraduate students with previous field research experience. The seven research assistants from

the various communities in Kenya were identified. They were deliberately chosen in order to ease communication challenges among the different communities residing in Kibera. Three other research assistants were recruited from Silanga village through the office of the assistant commissioner. These three were seasoned research assistants who have been working on part time bases for Kilimanjaro Initiative, an NGO that has been operating in the area for more than ten years. The three played multiple roles of security, conducted interviews and acted as link between the research team and the residents who they were familiar with.

The research assistants underwent training under the watch of the research on how to conduct the interviews. They were coached on how to approach the respondents with courtesy and maximum respect. They were advised to communicate using the language the interviewees were comfortable with. They were taken through all the questions on the household and business questionnaires to enable them own the questionnaires. They were encouraged to comment and insert their input.

A mock data collection exercise was conducted by pairing the assistants, with one assistant acting as then interviewer and the partner as the interviewee. A pretest questionnaire was administered in Soweto East village that had the same homogeneous as Silanga to determine the effectiveness. This was done and analyzed to the satisfaction of the researcher. Each research assistant was provided with a copy of research permit from National Commission for Science Technology and Innovation (NACOSTI) advised to always carry it along in case of any query in the course of questionnaire administration exercise. The research assistants were also provided with reflective jackets to be worn in the field to make the exercise more official.

3.4 Data Analysis and Presentation

After the completion of the fieldwork, the researcher checked all the questionnaires to ensure there were no errors or inconsistencies. The coded data were typed on to an excel sheet and exported to SPSS for analysis particularly for quantitative data. Bivariate analysis was done and presented in charts, graphs and tables specifically for quantitative data. Text narratives were used to present qualitative data. Key informant interviews and focus group discussions were analyzed manually by themes.

3.5 Ethical Considerations

In research, ethics involves protection and confidentiality of the respondents' views. The author assured the interviewees that the responses that they would provide would be treated with a lot of confidentiality and would only be used for academic purposes and not for any other purpose.

3.6 Data Collection Challenges and Solutions

One of the mandatory requirements in research is the determination of the target population. Unlike the household population that was readily available from the Kenya National Bureau of Statistics nowhere in the literature review was the number of business premises documented. To solve this challenge, the researcher did a physical head count of all the business premises in the four sub villages that comprise Silanga.

The second challenge was security. Like any other slum in the world, visitors are prone to intimidation, mugging and insecurity in general from the locals who are suspicious of strangers. To address this, three local, competent research assistants familiar with the Silanga slum dwellers were identified and hired. Acting as guides, they created awareness and friendly atmosphere between the locals and the research team. The office of the assistant commissioner also played the role of informing the residents of the presence of the research project.

The third challenge was in sampling due the big population size according to 2009 census and housing report the total population for Kibera was 170,070. Prior to sampling design, the researcher did a reconnaissance in all the villages in Kibera including Kianda, Soweto East, Soweto West, Gatwekera, Kambi Muru, Kianda, Raila, Kisumu Ndogo, Lindi, Karanja, Olympic, Laini Saba, Silanga, Makina and Mashimoni. It was discovered the characteristics of these villages were homogeneous. The researcher decided to pick the samples from one of the villages to represent all the other villages.

The next task was to identify one village that was not only representative of all the similar characteristics found in the above villages but also others found in other slums in the world. The researcher found that Silanga villages had identical features as the

above villages but also had, over and above these components, other extra unique attributes. It borders Nairobi dam. These waters would be interest in finding out how they could be harnessed to generate green energy to serve the entire Kibera slum. Undugu sports ground found in Silanga is also a physical feature that could utilized to come up with an ideal recreation model for welfare, peace and harmony among all the villages.

CHAPTER FOUR

BACKGROUND ON THE AREA OF STUDY

4.0 Introduction

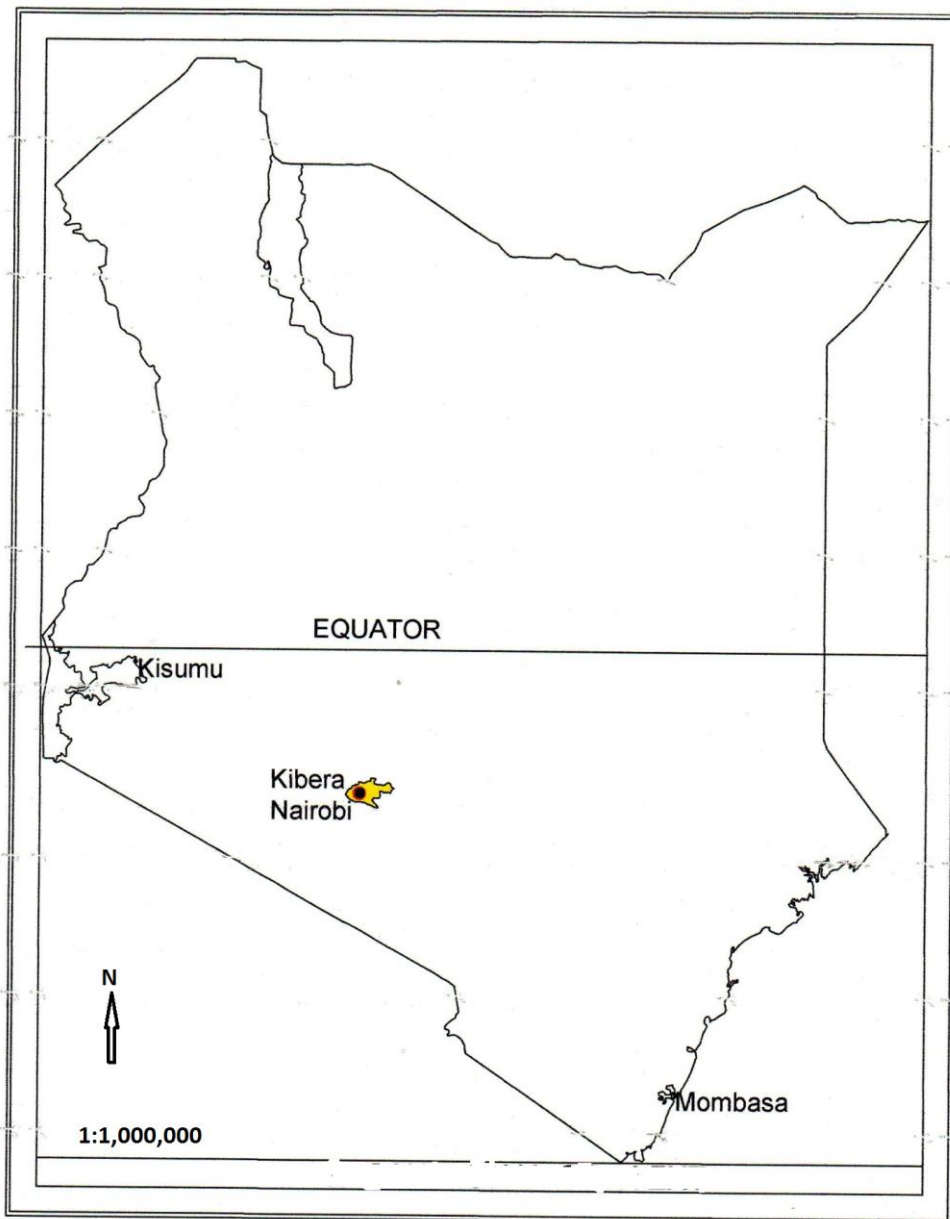
The section starts with description of the locational and national context of the project area, then goes on to discuss the climate, historical background, population and demographic characteristics, housing, education and security. It also looks at the characteristics of the study area (Silanga) in terms of social-economic characteristics and infrastructure services. The land use systems and institutional framework of Silanga are also looked into.

4.1 Location Context of the Study Area

The area is situated in Kibra constituency in the South Western part of the Nairobi Capital City. The neighbouring estates include Ngumo, Nairobi Dam, Karanja Road, Nyayo and Olympic estates. Ngong River runs in the middle of the slum draining into the Nairobi dam.

4.1.1 National Context of Project Area

The project area is in Kenya within the Nairobi city county that was originally Nairobi province. Map 3 shows its location in the National context.

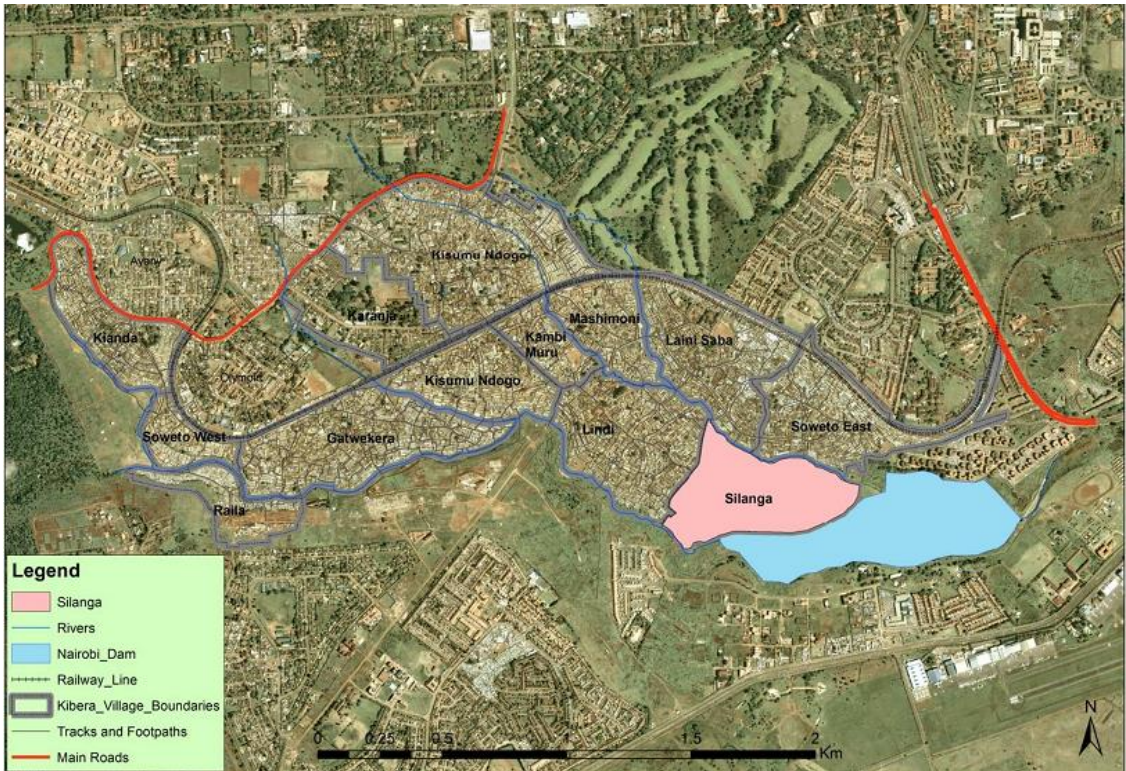


Map 3: Kibera at National Context

Source: Survey of Kenya (2013)

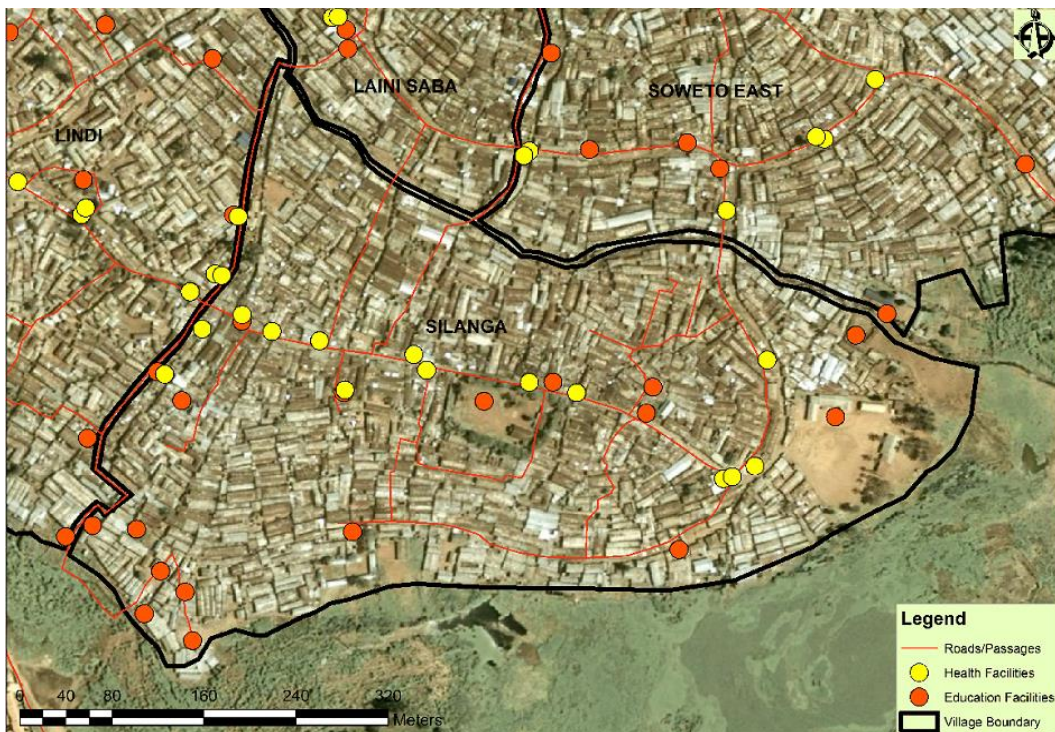
4.1.2 Local Context of the Project Area

The figure below shows the location of Silanga, it neighbors other village slums in Kibera as shown below. It is approximately 5KM Southwest of the CBD of the city of Nairobi.



Map 4: Study Area at Local Context

Source: Google Maps, 2017

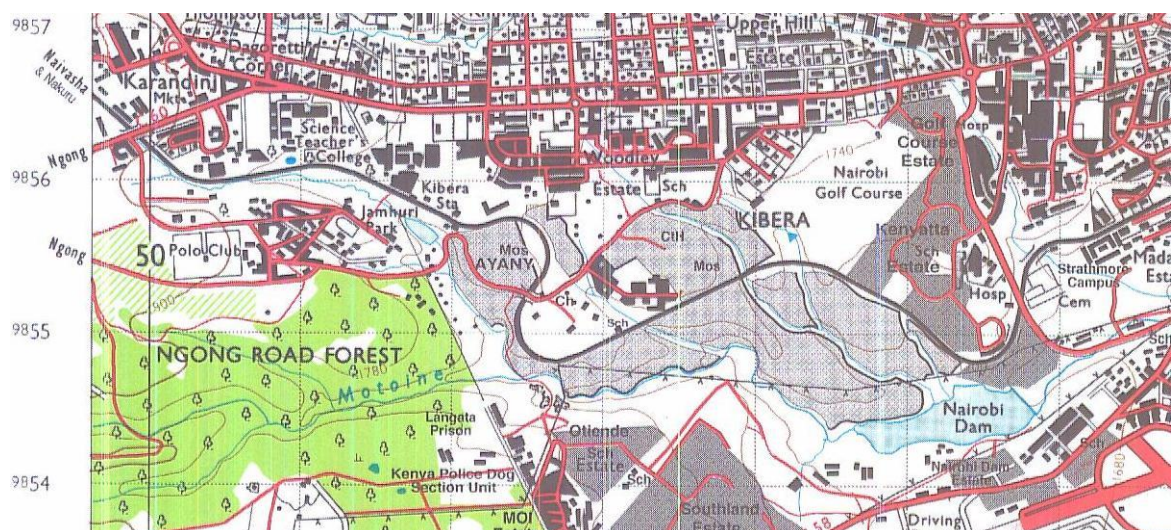


Map 5: Silanga Village

Source: Google Maps, 2017

4.2 Climate

The Kibera climate is that of Nairobi. Kibera is situated in the south of the equator, within the following UTM Grid corner coordinates; (North West A: X: 252,000 Y: 9,856,000: North East B: X: 256,000 Y: 9,856,000: South West C: X: 252,000 Y: 9,854,000 & South East D: X: 256,000: Y: 9,854,000 BCD). The altitude ranges from 1680 meters around the Nairobi dam in the South and 1740 meters near the Nairobi Kisumu railway line in the north above mean sea level. They are two rainy seasons in the year. The long rains seasons start from late March to June while the short rains occur between October and December. The average daily temperature is 25° C. The temperatures rarely go below 10° C even in the coldest month of July. From the observation of the coordinates of the Y-axis above, Kibera is located only 145 kilometers south of equator. Because of this proximate, the slum enjoys an average 12 hours of sunlight throughout the year. Therefore, the slum lies in a strategic position with a potential of tapping the solar energy from the sun. The weather is also favorable because, with the sun never being far away from the equator, the slum enjoys summer almost throughout the year unlike other regions in the world, which have to cope with winter, summer, spring and autumn. Unfortunately, the government has failed to take advantage of this natural resource. The extent of the use of green energy in Kibera has not documented.



Map 6: Part of Nairobi Topographical Sheet No. 148/4

Source: Survey of Kenya, 2013

4.3 Historical Background

Kibera is located in Nairobi the capital city of Kenya. To understand the Kibera as a settlement it is important to understand how Nairobi came into being. Nairobi came into prominence during the construction of the Kenya Uganda railway between 1896 and 1905. In 1896 it was identified a strategic transport depot for the construction company. It was preferred because its climate was cool and had and the waters clean. Silanga village is found in Kibera. The name Kibera was derived from “Kibrah” a Nubian word that means “forest”. The Nubians originally, from Egypt and Sudan were recruited by the Britain to fight in the First World War.

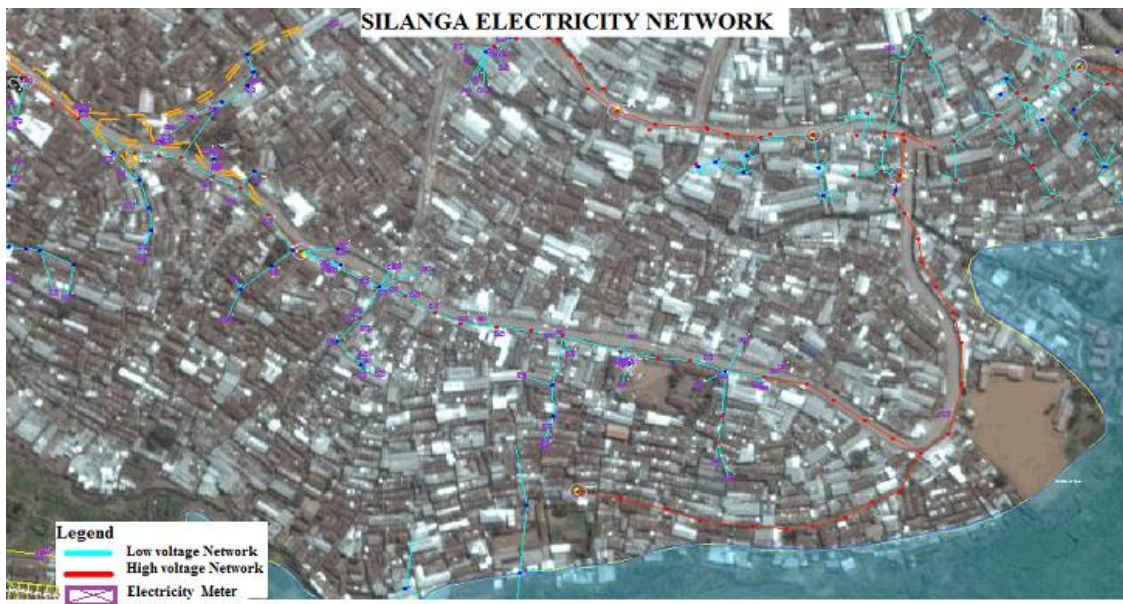
At the end of the war the government settled them in Kibera. Unfortunately, they were not given the titles to the land. With the passage of time Kibera’s population swelled. This was because Africans were not allowed to live in Nairobi except for those who got passes to work for the Europeans on short periods. They therefore took advantages of this loophole and invaded Kibera. This led to increasing crime and deterioration of living conditions. Insecurity became a threat to the European settlers. The government tried without success to demolish the settlement or relocate the residents.

The government then tried to evict the new settlers and retain the first Nubian generation. It proved difficult to distinguish between those entitled to the land and the encroachers. The government considered other options to evict the dwellers. One way was to withhold development plans on Kibera infrastructure. The assumption was that, the denial of the services and subsequent deterioration of living conditions would eventually lead to the residents voluntarily seeking accommodation elsewhere. However, this was not to be. It seemed the dwellers and the new immigrants did not mind the services denial. Unplanned structures continued to litter every available space including infrastructure reserves (Edikdale, 2011)



Plate 4: Silanga Village Current Power Connection Status

Source: Field survey, 2017



Map 7: Silanga Electricity Network

Source: Kenya Power, 2017

The map above shows power line within the village. The red line denotes the high voltage network while the blue represents the low voltage network. The high voltage line capacity, running through Kibera, is 11,000 Volts and cannot be connected directly to the customer. A transformer would need to be installed to make it viable

for domestic and commercial use. A high voltage line needs a wayleaves reserve of 5 meters on both sides from the centerline of central conductor but due to limited space in urban areas three meters can tolerated.

In Kibera, it is a challenge to obtain such a clearance because of mushroom structures that are constructed without approving authorities like the National Construction Authority, the Urban Roads authority and the Nairobi City County. The challenge of installing low voltage service lines can be solved by installing coated or PVC insulated conductors. However, only the structures on the road frontage can be easily connected. The buildings on the subsequent rows can only be supplied by running the services on roofs of other houses or the walls along the narrow, unplanned lanes.

4.4 Population and Demographic Characteristics

Silanga has a population of 17,363 of whom 10,198 were male and 7,165 were female. It has a household number of 6,164 and it covers an area of 0.2sq.km with a density of 71,072 persons per sq.km as per the Kenya Census Report (2009).

4.5 Socio-economic Characteristics

Generally, most Silanga residents are not well endowed. Like many other slums, people who live in slums, are of low incomes, prefer to settle where they can access cheap housing. The land tenure in Kibera is of temporary nature. The residents live on the land more or less as squatters. Since, they do not own title to land, they cannot access loans from banks due to lack of loan security (Mitullah, 2003). People,

In Kibera, SMEs are the main mainstay for the locals. The small businesses run along the edges of the road reserve while the rentals occupy the plots in second and subsequent plot rows. They include butcheries, Mpesa Shops, Cyber Café, retail shops, cereals, greengrocers, Milk shops, Video Shops, Radio/TV repair, Water vendors etc.

4.5.1 Housing

Most of the residents live in rented houses. The single rooms are usually small with several measuring 10 by 10 feet or less. The building materials for these structures comprise of wood, mud with iron sheets roofing and are prone to fire outbreaks. Many of the premises are not connected to electricity (Kramer, 2006). The infrastructure is unplanned. There is no sewer reticulation network and tenants in a

block share common washroom located outside their dwellings. Other households do not have access to these facilities and result to “flying toilets”. The drainage system is also wanting. Domestic wastewater and storm water share the same open drains exposing the residents to unhygienic risks (Munguti & Mc Granahan, 2002).

4.5.2 Education

There is a shortage of public primary schools in Kibera (Onyango P & Tostensen, 2015). Well-wishers through donations run most of the available schools from individuals and corporate bodies that occasionally donate items like food, books, and desks, pens, building materials and teacher’s salaries. According to Strathmore University website, John Paul mixed secondary school, which opened its doors in 2004 with the funding from the Christ the King Catholic church operates with assistance from Strathmore University community outreach programme. The programme assists students who have successfully completed primary education but cannot afford secondary school fees. PCEA Silanga high school, which was constructed in 2007, is sponsored by Presbyterian Church of East Africa that also offers scholarships to needy students. Other schools captured by the Author include, Olympic primary school, Kibera primary school, Facing the Future School (FAFU) and Ayany primary school (Author, 2017).



Plate 5: Ayany & Kibera Primary Schools

Source: Kenyanlife.com/education, 2017



Plate 6: PCEA Silanga High School

Source: <https://informationcradle.com/kenya/education/p-c-e-a-silanga-high-school/>



Plate 7: Olympic Primary School & John Paul II Mixed Secondary School

Source: Field Survey, 2017

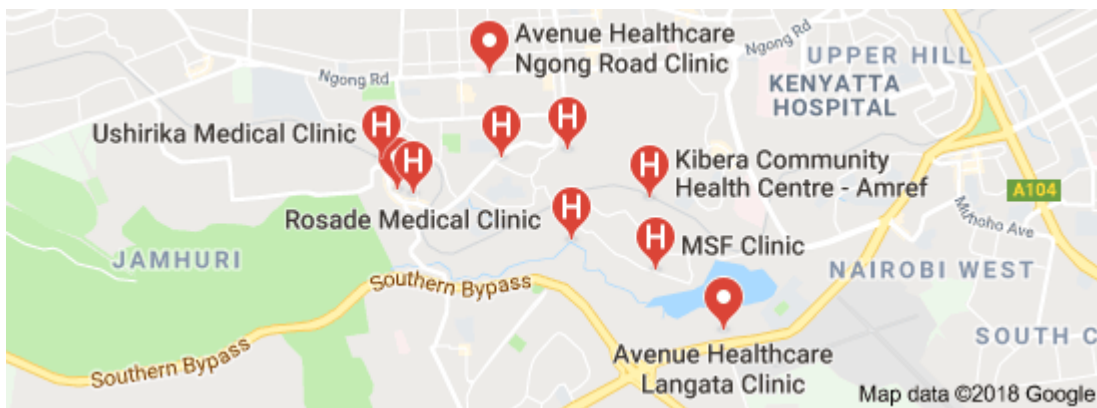
4.5.3 Security

Crime and victimization surveys indicate that Nairobi's crime rate is relatively high compared to other African cities. High insecurity in the slums and informal settlements is an issue for residents. A 2006 survey revealed that "At least one person per household reported actual experience of a criminal incident over the previous twelve months" (Amnesty-International, 2010)

4.6 Infrastructure

4.6.1 Health

The environment in Kibera is heavily polluted. This is so, because of many factors. First and foremost is because water and waste management institutions put in place are weak. There are few ablution units and human waste is a common sight especially in the narrow access lanes. Garbage collection system is not consistent. Mountains of garbage don the slum. According to UNDP, 2006, residents suffer cuts as common injuries due to items like nails, tins, broken bottles littering the streets. Clinics and Health centers are few and sparsely scattered. They include; Kibera South Healthy Centre, Rosade Medical Clinic, Ushirika Medical Clinic, MSF Clinic, Kibera Community Health Center (Amref) among others.



Map 8: Medical Facilities in Kibera

Source: Google Maps, 2018

4.6.2 Transport System

The Mombasa- Kisumu railway line passing across the settlement is of little use to the residents since there is no stopover for boarding or alighting. Most slum residents use buses and Matatus. Those, who cannot afford bus fare, have no other alternative, but walk to Nairobi or the industrial area for work or search of employment. Within this slum, there are no roads but pathways of one-meter width leading through the homes. These paths are also used as the drainage system, since there are neither soak pits, nor, drain pipes to collect the households' waste water.

4.6.3 Water

Nairobi City Water and Sewerage Company (NCWSC) mandate is to supply clean water to Nairobi residents. However, in Kibera, residents normally buy clean drinking water from water kiosks operated by water vendors (UNDP, 2011). There also exist illegal water connectivity activities, with the slum dwellers siphoning water using leaking pipes that lead to water contamination.



Plate 8: Water Meters Chamber

Source: Nairobi City Water and Sewerage Company, 2019

The water utility firm is currently building water meter chambers from where customers will be billed after opening water accounts to legalize the supply system (NCWSC, 2019). The firm believes this concept is ideal for identifying the customers who due to the status of the of the land tenancy do not have plot numbers.

CHAPTER FIVE

STUDY FINDINGS

5.0 Introduction

This chapter presents the main findings of the study that sought to find out the status and challenges of electricity connectivity, and the planning interventions that could be employed to fast track universal power supply to the settlement. Silanga village in Kibera, which was the target population, was densely populated recording 6,164 households and a population density of 71,072 per square kilometer as per the national census conducted in 1999. Unfortunately, the latest census conducted in 2019 did not capture data based on the villages but on the sub counties. The study found out that most of the residents were male at 59% while 41% were female.

This is perhaps an indication that life in the slums, like in war, is survival for the fittest. The man who is the head of the house leaves the family in the countryside and comes to work in Nairobi in order to provide for the family. They are attracted to the slums by the cheap house rents to enable them save the earnings, as they work in the capital city. There are two forms of tenancy in the settlement. 81% of the households are tenants who rented the houses and 19% are landlords who own the premises but had also opted to settle in those houses. This is because; even for the landlords renting houses in the formal settlement would eat into their savings and investments. For the businesses, 75% had rented the business premises and 25% owned the businesses as well as the premises.

The study also established that, the quest for electricity was so high; such that the power utility firm was not able meet this demand. This deficiency has led to the residents resulting to illegal means of obtaining connectivity. Some of those illegal connections were done by unskilled technicians that could have attributed to the rampant electricity related fire outbreaks. This was physically evident by the substandard electrical wiring witnessed in many of the premises. This was also evident in the literature review and the study findings. Frequent power blackouts were experienced in the slums due to overloaded transformers and poor network maintenance.

It took long for the power to be restored due to the laxity on the part of service provider staff. It was also difficult to compute the power demand load and consumption due to the unaccounted illegal connections. It was clear the culprits of illegal connections were hesitant to disclose this information for fear of prosecution and disconnection and attempts to capture this data proved futile. There were other challenges related to electricity connectivity slums. The residents decried that, they could not afford to pay, the high connectivity fees charged upfront by the service provider. They also complained that the monthly power bills were too high. The land tenure system in the slums is another challenge. The fact that the slum dwellers lived on government land meant that, they did not qualify for landownership documents like the title deeds.

The prospective power applicant could not, therefore, qualify for prospective funding from willing banks due to lack of collateral. The title deed certificate was also a mandatory attachment to power application form. Without this, the application stood incomplete. The main electricity infrastructure normally runs along the main road with the reticulation designed to pass along the lanes and the plot boundaries. Wayleaves acquisition consents must be obtained from these plot owners to enable provision. These consent documents must also be accompanied by copies of the title deed certificates, which they did not have.

Thus, even if the neighbors were willing to grant consents for the power lines to pass over their plots, the wayleaves document would be still, remain invalid. It was observed that the locals have encroached onto both sides of the road reserves, reserved for the physical infrastructure services such as telecommunication, powerlines, water and sewerage pipelines. The study was classified into main categories; at the household level, where 161 questionnaires were administered and 150 commercial users. It also used interview schedules to interview the Kenya Power representative based in Undugu, Silanga village, the chief and the NGO representative from Kilimanjaro initiative. There was also a focus group discussion among vulnerable groups that included the youth and women. The findings have been summarized alongside the objective of the study.

5.1 Social-Economic Backgrounds of the Respondents

The study had two main categories of respondents namely, households and businesses.

5.1.1 Social-Economic Background of the Households

The study found out that there was a high population density in Kibera. This was as result of rural urban migration and to some extent urban to urban migration. Many of the migrants are low-income earners who were attracted by the cheap rents in the slum. Some of the slum dwellers were evictees from other informal settlements, while others were descendants of the original colonial Nubian settlement established in 1918, after the First World War. A big proportion of the working population in the settlement work in Nairobi's industrial area because they can walk to and from work.

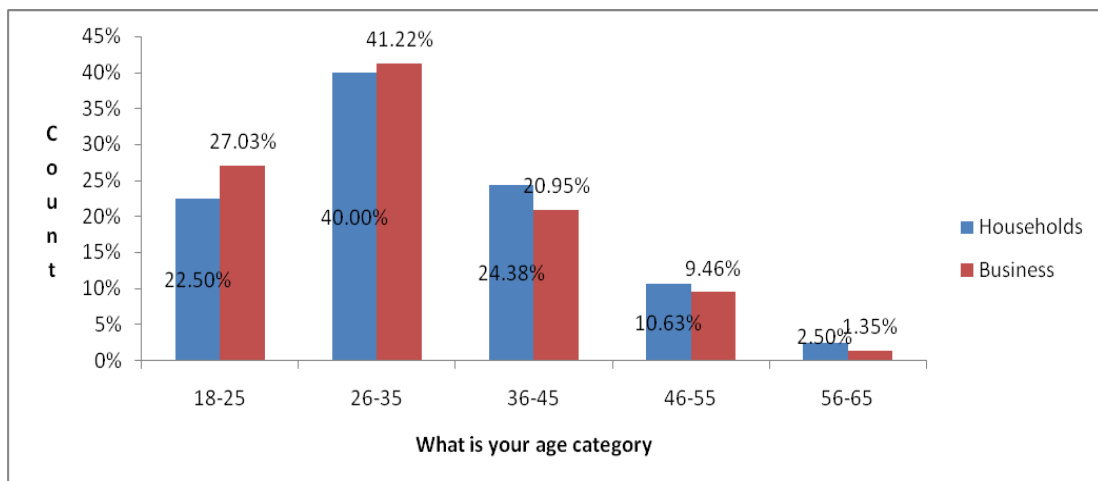


Figure 2: Average age of the residents

The high population has led to high demand for electricity mainly for lighting purposes with 82% of these households using it for illumination followed by paraffin, solar, portable, batteries and candles in that order. The study found out that 41% of the households use paraffin for cooking, 39% use charcoal, 15% gas, electricity 3%, 2% firewood and 1% use briquettes. On monthly expenses, 44% and 11% spend more than 1,000 Kenya Shillings on cooking and lighting respectively. The demographics show that most of the population is youthful with more than 62% and 68% below 35years for households and businesspersons respectively as shown in the figure above. The study show that Kibera residents are literate with 50% having achieved secondary level of education as depicted in the figure below.

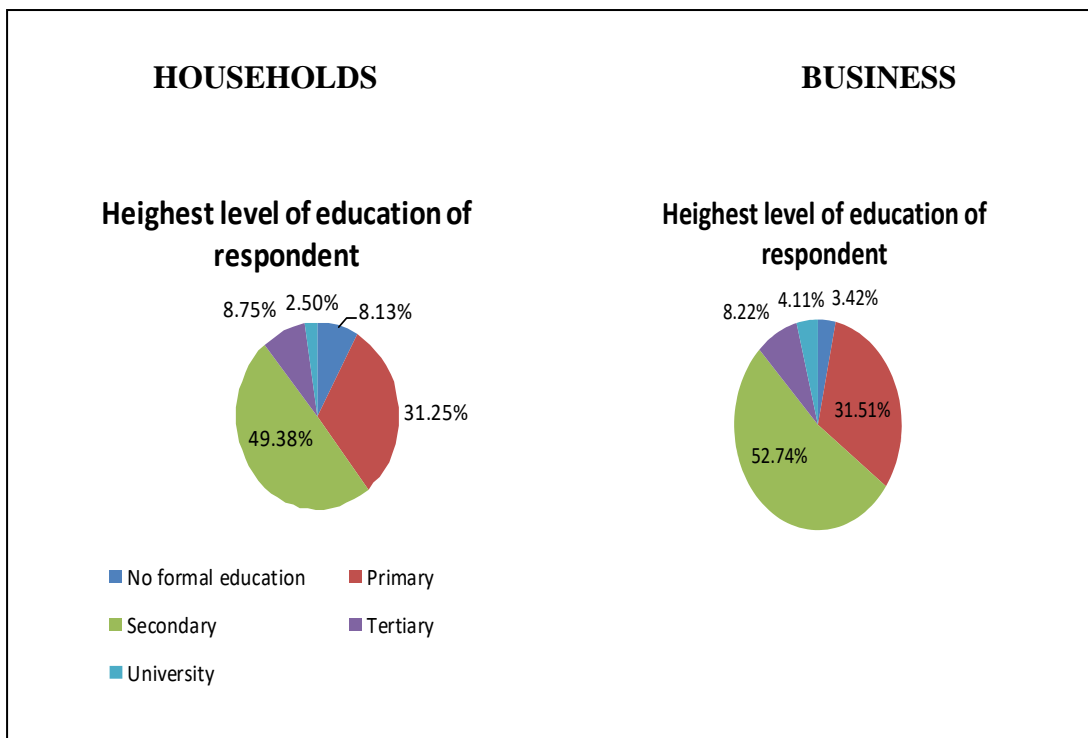


Figure 3: Education levels of the residents

The research found out that Connectivity levels depended on the income, the higher the income the higher the percentage of connectivity and vice versa. 14.4% earned less than 1000Kshs per month, 26.6% earned between 1,000 and 5,000, 23.0% earned between 5,000 and 10,000, 20.1% earned between 10,000 and 15,000, 4.3% earned between 15,000 and 20,000 and below while only 11.5% earned above 20,00Kshs per month. The statistics show that about 64% of the residents earn less than 10,000 Kshs per month, an indication that poverty levels in Kibera are too high for the residents to afford the formal connectivity fees charged by Kenya power.

This compares with the literature review on residents opting for illegal connectivity. 80.6% were tenants, 11.25% resident landlords and 8.13% were landlords. This again compares well with the literature review where the slum dwellers do own the premises but reside here, where they can afford the cheap housing. Only 2.5 used electrical energy for cooking because of resultant high monthly electricity bills. As with the literacy levels 8.1% had no formal education, 31.3% had completed the primary level, 49.4%, secondary school, 8.8% had gone through tertiary college and 2.5% had university degrees.

Table 4: Household/Business incomes versus Connectivity Analysis

Income per month in Kshs	HOUSEHOLD		BUSINESS	
	Percentage of Earnings	Connectivity 84.9%	Percentage of Earnings	Connectivity 79.3%
Below 1,000	14.4	6.1	4.1	4.6
1,000-5,000	26.6	9.4	19.5	5.2
5,000-10,000	23.0	11.3	33.3	12.7
10,000-15,000	20.1	18.5	19.5	13.8
15,000-20,000	4.3	19.7	4.9	17.1
Above 20,000	11.5	19.9	18.7	25.9

Source: Field Survey, 2017

5.1.2 Social-Economic Background of Business Owners

Businesses interviewed included Wholesalers, Retailers, Supermarkets, Cereal Shops, Butcheries, Chemists, Carpentry, Welding, Saloons, laundry, Bars, Garages, Milk Shops, Groceries, Hardwares, Mpesa, Cyber Café, Tailoring, Electrical, Agro vet shops among others. The study found out that 14% of the business community had been around for more than fifteen years and 60% of the businesses established within the five years from the date of research period. The age of the business owners ranged between 18 to 66 years. The monthly incomes were; 4.1% earning Kshs. 1,000 a month, 19.5% earning between Kshs. 1,000 and Kshs. 5,000, 33.3% earning between Kshs. 5,000 and Kshs. 10,000, 19.5% earning between Kshs. 10,000 and Kshs. 15,000, 4.9% earning between Kshs. 15,000 and Kshs. 20,000. Only 18.7% earned Kshs. 20,000 and above from the businesses. 3.4% of the businesspersons interviewed did not have formal education; while 31.5% had cleared the primary school level, 52.7 through with secondary and 4.1 were university graduates. The findings above show that business owners earn more than the households do with 18.7% earning more than 20,000 Kenya Shillings per month compared to 11.5% of the households. 79% of the businesses preferred electricity for lighting because it was cheaper, reliable and efficient compared to other forms of energy. The study also found out that 71% of the businesses preferred charcoal for cooking followed by paraffin at 15%

and 5% each of the rest using gas, electricity and firewood. On monthly expenses, 21% of the business spend more than 1,000 Kenya shillings on lighting and 4% spend the same amount on cooking.

5.2 Existing Electricity Connectivity

The study found out that, at household level 85% were connected to electricity compared to businesses premises at 79%, with 47% having been implemented in the year 2016.



Plate 9: Substandard wiring in the slums

Source: Field Survey, 2017

The researcher visited the Kenya Power information desk to seek an independent opinion. The customer service officer explained that, the steep rise in connectivity levels had been brought about by recent government interventions. The projects initiated in the last five years include GPOBA bank and the Last Mile, which is funded by African Development Fund (ADF), a concessional financing by African Development Bank. The objective of these two funds was to extend low voltage network within the maximum radius of 600 meters from the existing transformer to ensure that electricity connectivity for every household and business by the year 2020. However, the officer was also quick to state the status of legal and illegal connectivity could not be ascertained because the slum dwellers could not tell the truth for fear of disconnection.



Plate 10: Electricity Network Along the Main Road

Source: Field survey, 2017

However, 82% of the illegally connected households were willing to formalize the status of electricity connectivity. This was an indication that, the demerits of unsafe connectivity outweighed the advantages, as they had realized that cheap is expensive. This is probably because of the dangers, they had been exposed to, as a result of low quality and substandard and faulty wiring installed by unskilled electrical technicians, despite parting with money from their meagre resources. 75% of the residents had witnessed electricity related accidents in their houses, with 67% of the victims experiencing a recurrence. These accidents included fire outbreaks and electrocutions. The study also found that electricity supply was not reliable with 75% of the residents experiencing more than five blackouts in a month, which took the service provider between one and three days to restore.



Plate 11: Aftermath of fire outbreak in Kibera

Source: Field Survey, 2017

Many of the businesses and households which run along the main road, had electricity supply, as that is also where the main power line runs along. Households in the interior parts of the slum lacked electricity due to lack of wayleaves and high connection fees charged as it entailed extension of the new power line network.

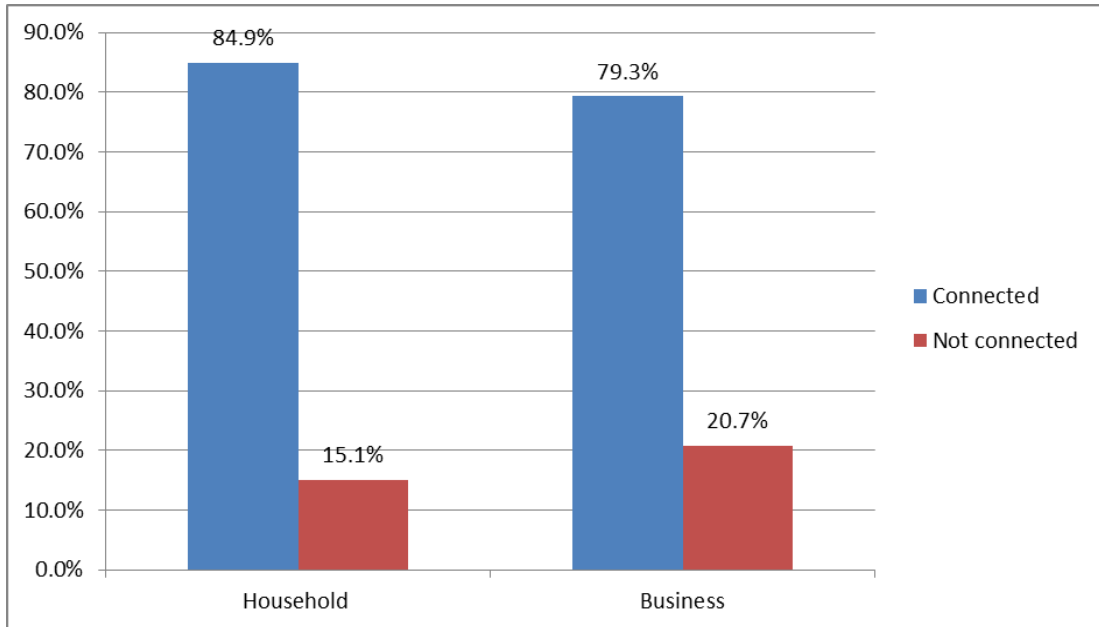
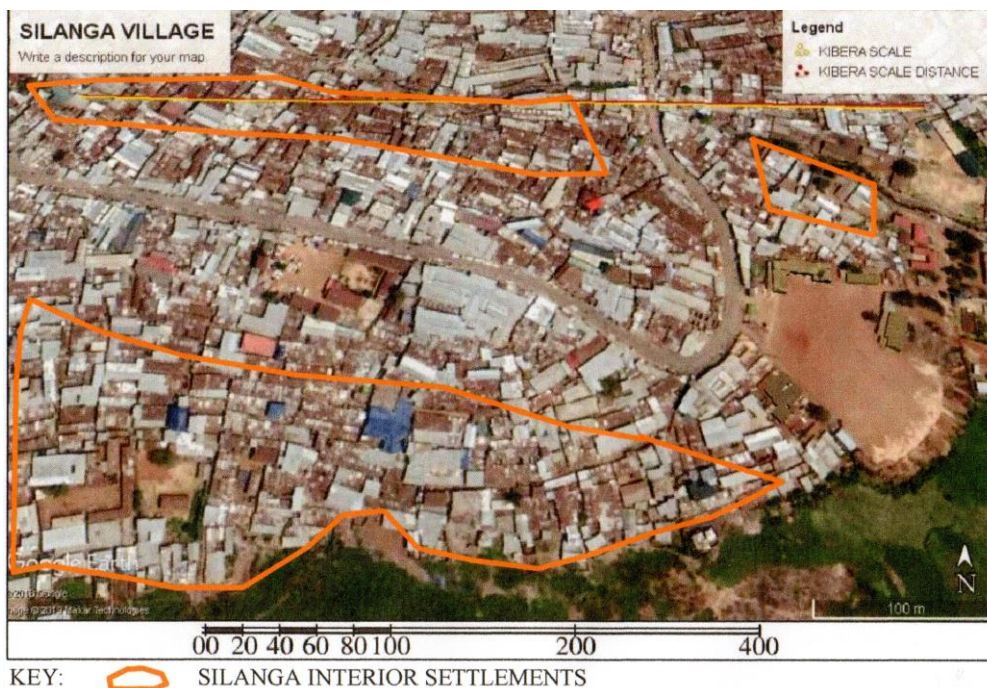


Figure 4: Household and Business Electricity Connection Status

Source: Field Survey, 2017



Map 9: Silanga Interior Settlement with limited connectivity

Source: Google Earth, 2019

5.3 Challenges Facing Electricity Connectivity

The study found out there are several challenges facing provision of electricity. Some these hindrances included connectivity costs, unreceptive neighbours, frequent power blackouts, theft, fire outbreaks, informal connections, Kenya Power delays, poor housing structures and layouts, no response from the utility supplier, corruption, among others. For the households, 38% of those interviewed, said connectivity fees were too high, 14.4% felt theft of electrical fittings and installations, 5.5% feared fire outbreaks, 2.7% blamed delays by the power utility firm and 3.6% blamed unresponsive neighbours. These findings correspond well with the views expressed during the focus group discussion. For business premises, 48.7% for those interviewed, and 5% cited connectivity delays.



Plate 12: Kibera Narrow Streets

Source: Field Survey, 2017

While the households complained of corruption, inaccessibility and neighbors' lack of cooperation in granting wayleaves consents, the business owners did not complain of corruption, probably, because they had the resources to influence the system. They also did not complain of inaccessibility because the business premises are located along the main road where the power line passes. However, both the households and businesses concurred that the high connectivity fees, fire outbreaks and frequent power blackouts are the main challenges to connectivity. As far as high connectivity

fees are concerned, it appears that, the approach to electrification is based on capitalism and not in the improvement for the welfare of the slum dwellers.

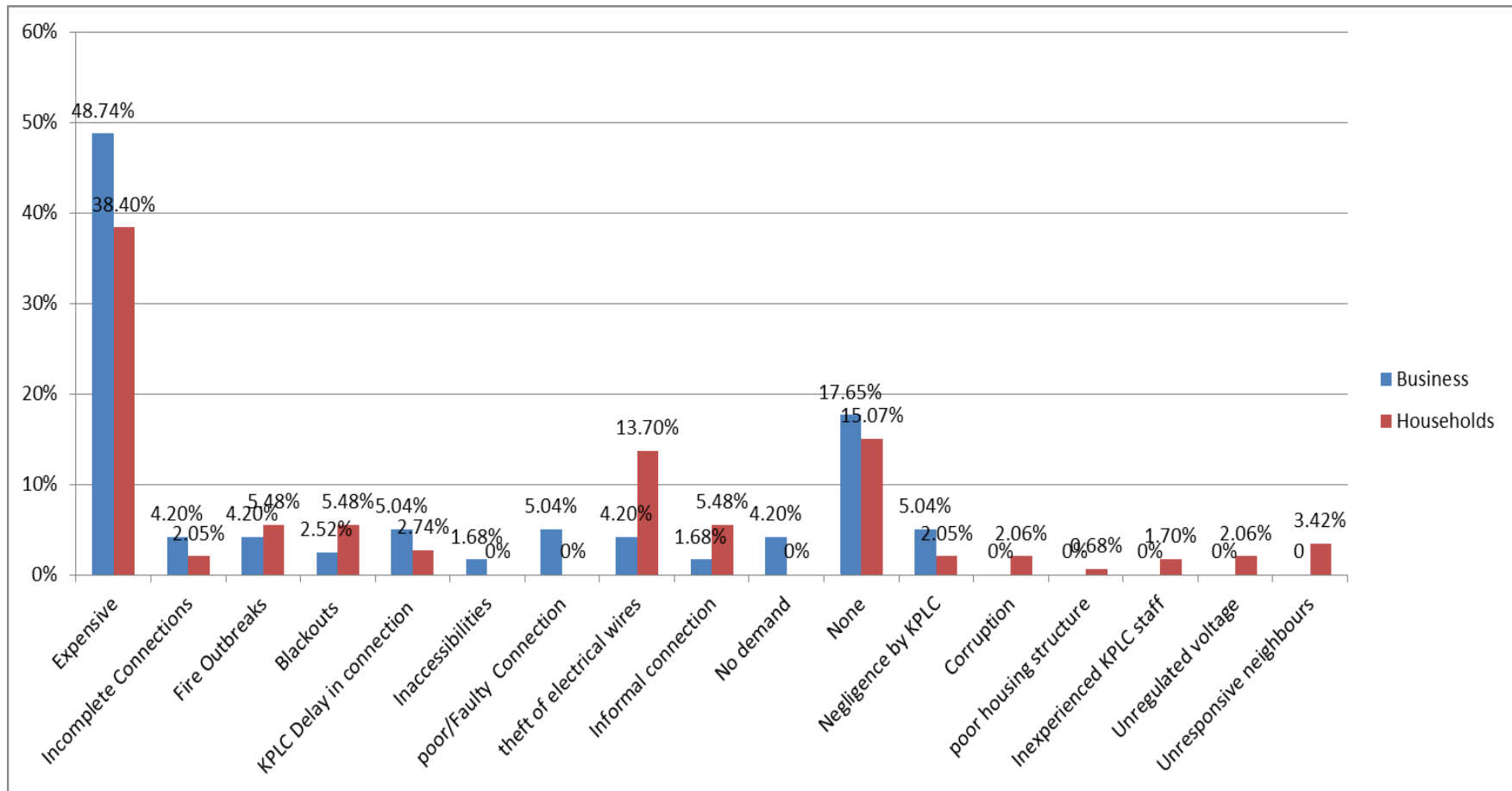


Figure 5: Household and Business Barriers to Electricity Connectivity

Source: Field Survey, 2017

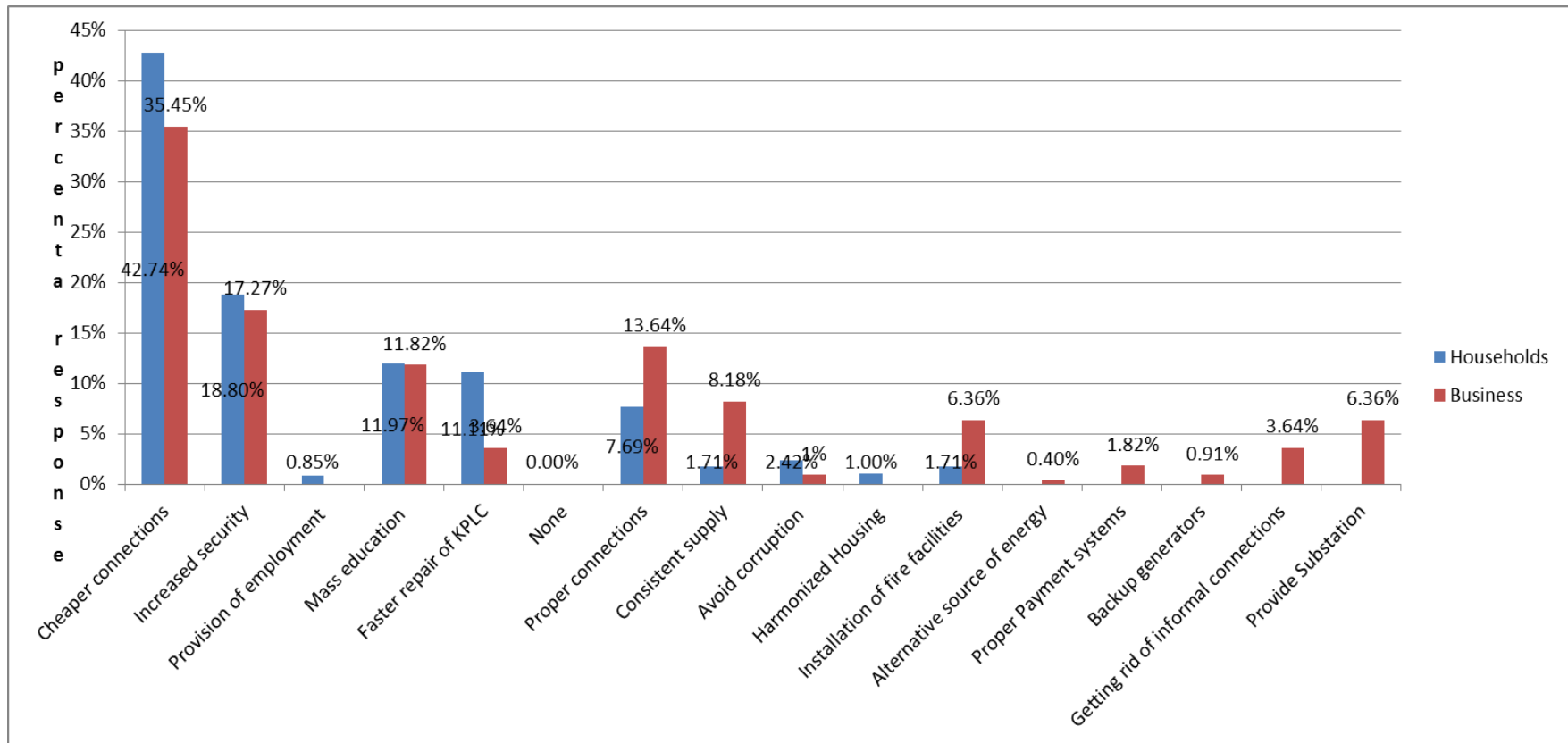


Figure 6: Remedies for Household and Business Electricity Connectivity

Source: Field Survey, 2017

5.4 Proposed Slum Electrification Planning interventions

The study found out that since the colonial period the government intended to do away with the slums. One way of doing this was to stop any planning interventions in the slums. The assumption was that, the denial of the services and subsequent deterioration of living conditions would eventually lead to the residents voluntarily seeking accommodation elsewhere. However, this was not to be. It seemed the dwellers and the new immigrants did not mind the services denial. Unplanned structures continued to litter every available space including infrastructure reserves (Edikdale, 2011). The study found that the slum dwellers were ready to welcome alternative sources of energy. The government should come with a policy on renewable energy. Incentives should be given for installation of solar panels. 2% of the respondents rooted for harmonized housing. The government can use this opportunity to clear the encroachments, with some compensation as an inducement to reclaim way wayleaves traces.

The study found out that, the current government policy on wayleaves acquisition and consents was wanting. Many a times, potential electricity customers were denied wayleaves consents, for the power lines access, by selfish neighbours even where, this action did not impact negatively on the environment. They pleaded with the government to enjoin, right of way, for power reticulation in the compulsory land acquisition act. This would empower, the service provider to put up power reticulation lines along the land and plot boundaries without opposition from the adjacent property owners.

Land Tenure was also sighted as a challenge for the provision of electricity to the informal settlements. This was, because the slum dwellers were settled on government land without titles to land. Kenya Power required a proof of land ownership for one to qualify for connectivity. This was a serious setback towards the universal electricity connectivity in the slums. The government should, probably, amend the law to remove this requirement. Alternatively, power could be supplied on temporary terms as it has always been done for the short-term project construction site offices.

Table 5: Synthesis of Findings

Research Objective	Study Findings	Conclusions	Recommendations
<p>To find out the existing electricity connectivity situation in Silanga village.</p>	<ul style="list-style-type: none"> • Electricity demand was so high such that the utility firm was not to meet this demand, resulting to illegal connectivity. • At the household level, 84.91% of the respondents had electricity in their homes, compared to 79.33% of the business premises. Formal connectivity for the households stood at 85% and businesses at 95%. Illegal connectivity for households and businesses stood at 6% and 4% respectively. However, the authenticity of legal and illegal connectivity is in doubt because the respondents expressed fear of 	<ul style="list-style-type: none"> • The responses from the slum dwellers indicated that there is 80% connectivity in Kibera. However, on further enquiries from the experts most of these connections are illegal. There was lack of full disclosure from the residents, for fear of disconnections. • The service provider was not able to compute the actual power demand load, due to illegal connectivity resulting in overloading of the system. • It was clear the most viable mode of lighting was 	<ul style="list-style-type: none"> • The government in conjunction with the power utility firms should up with a subsidized slum electrification program to ensure universal connectivity in Kibera and other slums. This model can be designed in the same manner as the Rural Energy Electrification and Renewable Energy Corporation (REREC). • The service provider to ensure stable, safe and reliable supply. To visit all the premises to ensure all those connected have got meters and in good working conditions. Illegal connections to be formalized without victimization. This enable Kenya

	<p>victimization.</p> <ul style="list-style-type: none"> • For lighting, most residents preferred electricity for lighting but opted charcoal for cooking. • Frequent blackouts are experienced due to overloaded transformers and poor network maintenance. • Electricity supply was unstable and unreliable in Kibera with 75% experiencing more than 5 blackouts in a month, which took Kenya Power between one to three days to restore. • Illegally connected electricity users expressed desire to have the status legalized with 75% regretted witnessing electricity related accidents that included fire outbreaks and electrocutions. • Electricity connectivity was 	<p>electricity while charcoal was cheaper for cooking purposes</p> <ul style="list-style-type: none"> • Electricity supply was unreliable with blackouts experienced time and again. • Laxity was noted on the part of the service provider. Response rate in the face of power blackouts was low. • The residents, who were victims of the calamities brought about by illegal connections, were ready & willing to formalize the status of connectivity. • Premises along the main road frontage enjoyed cheap connection rates since the main electricity network was 	<p>Power to compute optimum power demand load.</p>
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	<p>concentrated along the main road but the interior settlements had challenges of the unplanned structures and narrow alleys that obstructed the wayleaves traces.</p>	<p>close by and therefore almost every premise had power.</p>	
<p>To find out the challenges facing electrification in Silanga village.</p>	<p>Challenges to connectivity include:</p> <ul style="list-style-type: none"> • High connectivity fees and bills • Unreceptive neighbors with respect to granting wayleaves consents. • Connectivity delays by the power utility firm. • Unplanned layout of the structures & narrow alleys leaving no space to put up electricity infrastructure • Existing corruption in the offices of service provider – first come first served policy not adhered to. 	<ul style="list-style-type: none"> • There is no clear policy identifying slum dwellers as a vulnerable group in need of energy subsidies. • Powerlines wayleaves and other infrastructure reserves have been encroached due to the unplanned settlement and neighbors are unwilling to grant wayleaves consents. • The connectivity process by the service provider is wanting with applicants experiencing unnecessary 	<ul style="list-style-type: none"> • The utility firm should lower electricity connection fees and if possible, come up with a policy where the customer pays connectivity fees in installments after connection. • Kenya power marketers should pay regular visits to the slums and engage the residents in mutual discussion on all aspects of connectivity. Neighbors will appreciate the need to grant wayleaves consents. • Kenya Power should connect the applicants on first come first served bases to restore customer confidence

		<p>delays.</p> <ul style="list-style-type: none"> • There is no development plan for the settlement and locals without approved plans • The power utility firm has not put up strict managerial practices and internal controls in regard to power supply in the slums 	<p>and to deter illegal connectivity.</p> <ul style="list-style-type: none"> • The government should involve the anticorruption unit in investigating the corruption within the offices of the utility firm
<p>To explore planning interventions towards improvement of slum electrification in Silanga village.</p>	<ul style="list-style-type: none"> • The study found out that since the colonial period there had been deliberate effort to ignore planning in the slums to encourage dwellers move away from the slums and settle elsewhere. This strategy, however did not work. • Harmonized housing • The slum dwellers welcomed alternative sources of energy 	<ul style="list-style-type: none"> • For a long time and up to until recently planning in the slums has been deliberately ignored. • Some of the interventions include proper electricity infrastructure and subsidized slum electrification programme • The government should make 	<ul style="list-style-type: none"> • The government should come with policies that recognize the presence of the slums and provide essential services to the dwellers. • With public participation, the dwellers will move away from the infrastructure reserves and even set aside land for public utilities that includes power wayleaves. • The government to come up with a

	<ul style="list-style-type: none"> • The government to amend the law to facilitate compulsory power wayleaves acquisition along the property boundaries. • Power utility firm to waive the title deed submission requirements as part of the mandatory application documents 	<p>amendments to the compulsory land acquisition Act to facilitate creation of power wayleaves</p>	<p>policy on green energy and gives incentives to investors and individuals installing solar panels.</p> <ul style="list-style-type: none"> • The government to amend the law to facilitate compulsory power wayleaves acquisition along the property boundaries. • The existing transformers' 600 meters radius supply capacity to be maximized by connecting more premises through the last mile programme.
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Source: Field Survey, 2017

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

Kibera had a high population density. The slum dwellers were attracted to the location by the cheap house rents and the proximity to the capital city with residents able to walk to and from work. There was great demand for electricity but the high cost of connectivity and the monthly bills resulted in illegal connectivity that appeared cheap at face value. Illegal connectivity had led to electricity related accidents including fire outbreaks and electrocutions resulting from substandard electrical wiring evident in and outside the structures. Electricity was unreliable with residents witnessing frequent power blackouts due to overloaded transformers and poor network maintenance. The study also clearly found out that electrification of Kibera slum has been hindered by the low-income levels of the residents, poor housing structures that are prone to fire outbreaks; poor infrastructure and connectivity delays by the service provider. On the other hand, Kenya power had challenges in extending the service to the interior settlements due to the unplanned structures that blocked the potential power wayleaves. Wayleaves consents were difficult to obtain since the slum dwellers did not possess title deeds that was a mandatory document in wayleaves acquisition process. Subsidized connection fees, reduced billing rates, consistent supply, installation of firefighting facilities, and corruption free environment were cited by the slum dwellers as the major strategies that can improve power supply uptake. Enhanced electricity connectivity would improve the security situation, lead up to a twenty-four-hour working economy and create job opportunities for the slum dwellers. The study revealed several issues as per objective.

6.2 Study Conclusions

6.2.1 Current Electricity Connectivity Situation in Kibera

It was clear from the findings that electricity demand in Kibera was so high, such that the service provider was unable to meet the demand with residents resulting to illegal means of connectivity. Unskilled personnel, taking advantage of this desperate situation, to make some money, did many of these connections. The illegal electrical wiring was substandard, some melting due to heavier electrical load and others dangerously exposed. The rampant electricity related accidents, including fire

outbreaks and electrocutions could be attributed to this state of affairs. Many of the residents had experienced and realized the dangers of illegal connectivity and expressed their desire to formalize the connectivity status. The Electricity supply in Kibera was not reliable, occasioned by frequent blackouts that took time to restore. This was as a result of the said unaccounted connections, which overloaded the system since it was difficult to determine the stable power demand load, to put in place. Power stability was also affected by poor network maintenance on the part of the service provider.

Most residents preferred electricity for lighting because it was cheaper and efficient compared to other forms of energy while charcoal was preferred for cooking. Electricity reticulation was concentrated on the premises running along and near the main road. This was because, there was a cleared wayleaves trace and the fact that, the main powerline was already existing and therefore cheaper to connect to.

6.2.2 Challenges Facing Slum Electrification

It was quite clear that, there is existed various challenges hindering universal electricity connectivity in Kibera. The Government had put more emphasis on rural electrification at the expense of the urban slums. For instance, Rural Electrification Authority was established by the energy Act of 2006 and later enhanced to Rural Electrification and Renewable Energy Corporation in 2019 with the mandate of enhancing electrification in the rural areas.

The study found that the greatest challenges towards electrification in the slum were the high connectivity fees and the monthly bills such that many of the slum dwellers could not afford. The residents, with the situation aggravated by the low incomes, were left with no alternative but to seek cheaper but illegal connections from the ready and willing unskilled personnel out to make a living. Illegal connectivity came with many disadvantages. One of them is failure to plan, account and compute optimum power demand load resulting in overloaded network and subsequent power blackouts. Most of the slum dwellers are willing to pay for power supply if the terms and mode of payment was customer friendly. Due to the haphazard layout of the structures there is little space left for putting up or expanding electricity infrastructure. This coupled with lack of title to land and the unresponsive neighbors has made it extremely difficult in obtaining wayleaves consents.

6.2.3 Planning Interventions towards Improvement of Slum Electrification

It is clear from the study that since the colonial period and until recently the strategy adopted to eliminate the slums had been to stop any physical development plans in these settlements to encourage self-eviction of the residents to other planned areas. Unfortunately, this has not worked. The study found that the slum dwellers are ready and willing to engage with the government and power utility firm to accelerate electrification. Some of the interventions include proper electricity infrastructure and subsidized slum electrification Programmes. Residents welcomed the idea of creating renewable sources of energy especially the solar energy. The settlement lies within the equator and therefore enjoys 12 hours of sunlight throughout the year. They urged the government to give incentives to solar energy investors as a promotion of this venture. Acquisition of wayleaves was also hindrance to the extension of electricity reticulation. It was clear that, the dwellers proposal to enhance the mandate of compulsory land acquisition act in wayleaves traces was valid. At the current state, it was extremely a challenge, constructing a powerline along the plot boundaries because adjacent landowners were unwilling to grant wayleaves consents. There was a proposal to give some inducement to the structure owners as a means of reclaiming the encroached power wayleaves. This would be a major boost, in expanding the power grid. The study also established that, to make the dream of universal connectivity come true, there was need for removing the mandatory requirement of attaching a copy title deed on electricity application. Alternatively, connectivity could be done on temporary terms as had always been done for the short-term project construction site offices.

6.3 Recommendations

6.3.1 Electricity Accessibility

It is evident from discussion on informal settlements that, reliable and consistent supply of energy enhances investments in SMEs that rely on electricity. In Kibera, the study has shown that universal electricity supply has not been attained. The government in conjunction with the power utility firms should up with a subsidized slum electrification programme to ensure universal connectivity in Kibera and other slums. This model can be designed in the same manner as the Rural Energy

Electrification and Renewable Energy Corporation (REREC). This corporation was formed as a result of the enactment of the Energy Act 2019.

The mandate of REREC is to ensure universal electrification of rural areas and to promote use of renewable energy in Kenya. The corporation is a nonprofit making organization that is funded by the exchequer. The organization operates in a similar manner as the Constituency Development Fund (CDF). In liaison with members of parliament, it identifies public utilities, includes schools, trading centers, health centers to be connected in a financial year. This model can also be emulated in the slum by establishing a similar revolving fund. This could be done by establishing a pilot slum electricity project through public participation. The residents would be encouraged to provide power line way leaves in exchange of connectivity. The utility firm would then construct electricity reticulation from which residents would be connected.

Kenya Power should come up with a massive audit plan with the aim at restoring safe, stable and reliable supply. This would involve inspecting all connected structures. This would determine legal and illegal connections. Each installed meter should be checked whether it was “selling”, malfunctioning or bypassed. Faulty meters to be replaced and new meters installed where there is electricity but no meters, without necessarily penalizing the culprits. This exercise will enable Kenya power to compute optimum power demand load and thus restore stability in the network.

6.3.2 Slum Electrification Challenges

Challenges to connectivity include high connectivity fees and bills. The utility firm should lower electricity connection fees and if possible, come up with a policy where the customer pays connectivity fees in installments after connection. This model proved a success story in a project dubbed “converting consumers into customers in slums at Sao Paulo city” in Brazil. In Kibera, this has not been implemented due to lack of funding. The government can solve this problem by establishing a levy, similar to REP levy. This levy, which amounts to 5% of the consumed by the customer, is allocated to REREC and utilized in expanding electricity connectivity in the rural areas. The government can either establish a new authority or enhance the mandate of the REREC to cater for the urban slums electrification.

The government, through the Ethics and anti-corruption commission, should intervene to weed out the runaway corruption the power utility firm to ensure proper service delivery. This ensure the cartels within and without the system are brought to book and to ensure connectivity on first come, first served.

6.3.3 Planning Interventions towards Improvement of Slum Electrification

The government should come with policies that recognize the presence of the slums and provide essential services to the dwellers. Green energy adoption in the slums is very low. A few NGOs have been engaged in this endeavor, in Kibera, but in a very small scale. The government has concentrated in green energy only in the semi-arid regions, like the North Eastern and other areas not covered by the electricity grid but has completely ignored the slums. There is great potential of solar energy in the Kenya. Geographically, the equatorial line runs along the east and West direction dividing the country into two halves. Due to this strategic alignment of the equator, the country enjoys twelve hours of sunlight throughout the year. Kenya does not experience any winter season but only a short spell of low temperatures occurrence in the month of July. The government should, therefore, to come up with a policy on green energy and give incentives to agencies and individuals willing to invest in solar energy. This together with the expanded mandate of REA, renamed Rural Electrification and Renewable Energy Corporation, should give the necessary synergy to enhanced installation of solar power facilities in the slums.

The presence of the existing main high voltage power lines and the transformers running along the main road should be exploited to the maximum, to save costs on extending electricity network to the households and business premises. A transformer is capable of supplying customers with a maximum of 600 meters radius. The government should come up with the aim of supplying all customers the within that radius. To implement this, the land acquisition act should be amended to facilitate compulsory power wayleaves acquisition along the property boundaries. This will provide the much sort powerline reserves hindered electricity reticulation. The new act should also state that plot owners should not put structures from beacon to beacon but should leave a minimum of one and half meters one each side of the boundaries for the passage electricity conductors.

Those who have encroached on the power wayleaves should be given a token compensation as an inducement to demolish the encroaching structures to create room for universal slum electrification.

The government should also relax the stringent connectivity requirements. Slum dwellers living on government do not have any land ownership papers. The attachment of the copies of title deeds to the application should be done away with. All applicants deserve electricity, at least even, on temporary terms.

6.5 Suggestion for Future Research

Due to the scope of this study, the researcher was unable to independently verify between illegal and official connection. The study found out that there was a contradiction among the slum dwellers on one hand and the experts and focus group discussion on the other hand. According to the business respondents 95% were legally connected compared to 85% of the households with an average of 5% confessing illegal connection. According to the focus group discussions and the experts, illegal connectivity in the area was prevalent. These statistics were also not available anywhere in the literature review. Worse still, the service provider did not have these records. Chances are that the slum dwellers could have lied in fear of disconnection or legal action being taken against them. The researcher recommends that a study be done to establish the extent of illegal and legal connectivity.

REFERENCES

- Berg, B. L. (2006), *Qualitative research methods for the social sciences*, Pearson Education Inc. USA.
- Bruce, J. W. and Migot Adhola (1994), Ed, *Searching for land tenure security in Africa*, World Bank, Washington
- Cheema, S.G (1993), *Urban management: Policies and innovations in developing countries*, Praegar, WestPoint.
- Candiracci, S., & Syrjanen, R. (2007). *UN-Habitat and the Kenya slum upgrading programme*. United Nations Human Settlements Programme (UN-HABITAT).
- Cloke, P (1983), *An introduction to rural settlement planning*, University press, Cambridge
- Consumer Federation of Kenya (COFEK). About us. Available at www.cofek.co.ke/index.php/who-we-are/about-us. (Accessed 19 May 2019).
- Cooper, D. R and Schindler, P. S (2006), *Business research methods*, 9th ed, McGraw-Hill, New Delhi.
- De Bercegol, R., & Monstadt, J. (2018). The Kenya slum electrification program. local politics of electricity networks in Kibera. *Energy Research & Social Science*, 41, 249-258.
- Desu, M. M. and Raghavarao, D (1990), *Sample size methodology*, Academic Press, Boston.
- Electric Power Act (2010). Available at <https://www.erc.go.ke/wp-content/uploads/2018/12/Electrical-Installation-Work-Rules-2006.pdf>. (Accessed 01 April 2019)
- Edkdale B. (2011), *Kibera's history*. Available at <http://www.brianekdale.com/uploads/kiberahistory.pdf>. (Accessed 22 May 2019).
- Gongera E.G and Gicheru E.N. (2016), *Analysis of Green Energy Adoption on Household Development in Kenya: Case of Kibera Slums*. Nairobi. Available at

<https://iiste.org/Journals/index.php/JETP/article/view/33075/33971>. (Accessed 24 April 2019)

Hall, H (1992), *Urban & regional planning*, 3rd ed. Routledge, London

Hobbs, F.D and Doling J. F (1981), *Planning for engineers and surveyors*, Pergamon press, Oxford.

Japan International Cooperation Agency (JICA), (2014), *Nairobi integrated urban plan (NIUPLAN)*. Available at: www.kpda.or.ke/.../

Nairobi%20Integarted%20Urban%20Development%20Master%20Plan.pdf.

(Accessed 29 April 2019)

John Paul II Secondary School. Available at:

christthekingkibera.blogspot.com/p/education.html. (Accessed 24 May 2019).

Karekezi S. Otukey J. & Kanyanta G. (2014). *Energy poverty in developing countries' urban poor communities: assessment and recommendations: country report 2014: Case study Kenya*. Nairobi. Available at

http://www.gnesd.org/upload/gnesd/pdfs/upea%20iii/afrepren_final.pdf. (Accessed 10 April 2019).

Kenya, Government of (2012), *county governments act*. Nairobi. Available at kenyalaw.org/.../Acts%20and%20Regulations/.../County%20Governments%20Act%20Cap./... (Accessed 12 May 2019).

Kenya, Government of (2019), *Energy bill 2017*. Nairobi. Available at: kenyalaw.org/kl/fileadmin/.../bills/2017/EnergyBill_2017.pdf. (Accessed 29 April 2019)

Kenya, Government of (2018), Housing and Urban Development Department, *Kenya affordable housing programme; development framework guidelines*. Available at:

www.housingandurban.go.ke/.../Development-Framework-Guidelines-Release-Version.pdf. (Accessed 25 April 2019)

Kenya, Government of (2012), *land act 2012*. Nairobi. Available at www.parliament.go.ke/sites/default/files/2017.../LandAct2012.pdf. (Accessed 12 May 2019)

Kenya, Government of (2016). National Housing Policy for Kenya. Sessional Paper No. 3 of 2016. Available at <https://www.housingandurban.go.ke/wp-content/uploads/2019/10/Updated-Sessional-Paper-No.3-of-2016-National-Housing-Policy.pdf>.

Kenya, Government of (1996), Physical planning Act 1996, revised edition 2012 (2010) Nairobi. Available at kenyalaw.org/.../Acts%20and%20Regulations/.../Physical%20Planning%20Act%20Cap./PhysicalPlanningAct6of199... (Accessed 13 May 2019)

Kenya Land Alliance. Available at: <https://www.kenyalandalliance.or.ke/>. (Accessed 18 May 2019)

Kenya National Bureau of Statistics (KNBS) and Society of International Development (SID) joint report, (2013) *exploring Kenya's inequality, pulling apart or pulling together*. Available at:

<file:///C:/Users/kpl14796.KPLC/Desktop/SID%20Abridged%20Small%20Version%20Final%20Download%20Report.pdf>. (Accessed 10 December 2015)

Kenya National Bureau of Statistics (2009), *statistical abstract*, Government Printer, Nairobi.

Kenya National Bureau of Statistics, (2010), *The 2009 Kenya Population and Housing Census volume 1C; Population distribution by administrative units*. KNBS, Nairobi.

Kenya National Bureau of Statistics, (2010). *The 2009 Kenya population and housing census volume 1B; population distribution by political units*. KNBS, Nairobi.

Kenya National Bureau of Statistics, *Economic survey 2011* NAIROBI. Available at: <https://www.knbs.or.ke/download/economic-survey-2011/>. (Accessed 09 April 2019).

Kenya National Bureau of Statistics, *Economic survey 2012* Nairobi. Available at: <https://www.knbs.or.ke/download/economic-survey-2012/>. (Accessed 07 April 2019).

Kenya National Bureau of Statistics, *Economic survey 2013* NAIROBI. Available at: <https://www.knbs.or.ke/download/economic-survey-2013/>. (Accessed 07 April 2019).

Kenya National Bureau of Statistics, *Economic survey 2014* NAIROBI. Available at: <https://www.knbs.or.ke/download/economic-survey-2014/>. (Accessed 07 April 2019).

Kenya National Bureau of Statistics, *Economic survey 2015* NAIROBI. Available at: <https://www.knbs.or.ke/download/economic-survey-2015/>. (Accessed 07 April 2019).

Kenya National Bureau of Statistics, *Economic survey 2016* NAIROBI. Available at: <https://www.knbs.or.ke/download/economic-survey-2016/>. (Accessed 07 April 2019).

Kenya National Bureau of Statistics, *Economic survey 2017* NAIROBI. Available at: <https://www.knbs.or.ke/download/economic-survey-2017/>. (Accessed 07 April 2019).

Kenya National Bureau of Statistics, *Economic survey 2018* NAIROBI. Available at:

<https://africacheck.org/wp-content/.../2018/05/Economic-Survey-2018.pdf>.

(Accessed 06 April 2019).

Kenya National Bureau of Statistics, *Economic survey 2019* NAIROBI. Available at:

<https://africacheck.org/wp-content/uploads/2019/05/Final-Economic-Survey-2019.pdf>

Kenya Power press release, (2015) 150,000 connections in slum electrification project: Nairobi. Available at: <http://www.kplc.co.ke/content/item/636/kenya-power-targets-150,000-connections-in-slum-electrification-project>. (Accessed 13 December 2015).

Kenya Power, (2016), Corporate profile. Nairobi. Available at

https://kplc.co.ke/img/full/VFMLsdIDFa0N_KENYA%20POWER%20OUR%20CORPORATE%20WORLD%2029%20March.pdf . (Accessed 14 May 2019)

KEPSA. About KEPSA. Available at

<https://kepsa.or.ke/about-us/> . (Accessed 18 May 2019).

Kitio, V and Ochieng, O *UN-HABITAT, Enhanced Energy Access for the Urban*

Poor: Best Practice Casebook (online) Nairobi, available at:

<http://mirror.unhabitat.org/downloads/docs/Enhanced%20Energy%20Access%20for%20Urban%20poor%20Best%20Practice%20Case%20book.pdf> (Accessed 6

December 2015).

Kyessi, G. A (2004), *Community participation in urban infrastructure provision: servicing informal settlements in Dar es Salaam*, Springs Centre Dortmund, Dar es Salaam.

Kothari C.R (2004), *Research methodology: Methods and techniques (2nd revised edition)*. New age International (P) ltd publishers. New Delhi. Available at:

<https://www.studocu.com/en/document/jomo-kenyatta-university-of-agriculture-and->

[technology/human-resource-management/lecture-notes/2004-kothari-research-methodology-methods-and-techniques/1183816/view](https://www.researchgate.net/publication/268118381/methodology-methods-and-techniques/1183816/view). (Accessed 12 April 2019).

Mace, A. E (1964), *sample size determination*, Reinhold, New York

McCollum, D. et al. *SDG7 Ensure access to affordable, reliable, sustainable and modern energy for all*. Available at <https://council.science/cms/.../SDGs-interactions-7-clean-energy.pdf>. Accessed 24 April 2019)

Mc Granahan, G (2002), *Public Private partnerships and the poor: Case study-Kibera. Small enterprises and water provision in Kibera Nairobi*. Loughborough University, London.

Mitullah, W 2003, *Understanding Slums: Case Studies for the Global Report on Human Settlements; the Case of Nairobi, Kenya*. UNHABITAT, Nairobi.

Mohammed H. A & Muhammad S.S (2006), *Informal settlements: policy, land use and tenure; the causes and consequences of informal settlements in Zanzibar*. Available at: https://www.fig.net/resources/.../ts35_01_ali_sulaiman_0320.pdf. (Accessed 6 April 2019).

Mugenda, O and Mugenda A. G (2003), *Research methods; quantitative and qualitative approaches*, Acts, Nairobi.

Nairobi City County, (2017), *City integrated development plan (CIDP)*. Nairobi. Available at: [www.kpda.or.ke/.../CIDP/Nairobi%20County%20Intergrated%20Development%20Plan%20\(CIDP\)%...](http://www.kpda.or.ke/.../CIDP/Nairobi%20County%20Intergrated%20Development%20Plan%20(CIDP)%...) (Accessed 29 April 2019)

Nairobi Water & Sewerage Company (2019), *Water meter chambers*. Available at: <https://www.nairobewater.co.ke/>. (Accessed 25 May 2019).

Odeh, R. E and Fox, M (1991), *Sample size choice: Charts for experiments with linear models*, 2nd ed, Marcel Dekker, New York.

Orodho, A. J (2003). *Essentials of educational and social sciences research method*. Masola publishers. Nairobi.

Republic of Kenya, Ministry of Housing, (2004), *National housing policy for Kenya*. Available at: www.mintoreal.com/policy.../kenya-national-housing-policy? Kenya-national-housing-policy. (Accessed 25 April 2019)

Republic of Kenya, KENSUP (2004), *Slum upgrading Strategy Volume 1 Implementation Strategy 2005-2020* Nairobi.

Republic of Kenya, Ministry of lands, (2008), *Physical planning handbook*, Government printer. Nairobi.

Republic of Kenya, Ministry of Lands and Settlement, (1978), *Human settlements in Kenya; a strategy for urban and rural development*, Colourprint Limited, Nairobi

Republic of Kenya (1996), *the physical planning act, chapter 286*, edn, Government printer, Onyango P & Tostensen. 2015. *The situation of youth and children in Kibera*. Chr Michelsen Institute . Available at: <https://www.cmi.no/publications/file/5527-the-situation-of-youth-and-children-in-kibera.pdf> (Accessed 24 May 2019).

Shahid Mohammad, (2009), *Urban, Peri-Urban, slum electrification; Kenya experience* (online) Nairobi. Available at: Available at: http://siteresources.worldbank.org/EXTAFRREGTOPENERGY/Resources/717305-1264695610003/6743444-1268073502059/5.3.Kenya_periurban_electrification.pdf (Accessed 13 December 2015)

Strathmore University, Community Service Centre. *John Paul II mixed secondary school*. Available at: <http://www.strathmore.edu/csc/?p=407#>. (Accessed 24 May 2019)

The African Union Commission (2015), *Agenda 2063: framework document; the Africa we want*. Addis Ababa. Available at:

<https://www.un.org/en/africa/osaa/pdf/au/agenda2063-framework.pdf> . (Accessed 25 April 2015)

The French Development Agency (AFD). AFD and Kenya; Support in balanced and resilient growth. Available at <https://www.afd.fr/en/page-region-pays/kenya>. (Accessed 17 May 2019).

The state department of energy (2018). Available at http://energy.go.ke/?page_id=122. (Accessed 23 April 2019).

The World Bank, (2015) *Bringing Electricity to Kenya's Slums: Hard Lessons Lead to Great Gain*. Available at <https://www.worldbank.org/en/news/feature/2015/08/17/bringing-electricity-to-kenyas-slums-hard-lessons-lead-to-great-gains>. (Accessed 20 November 2019)

The word Bank Group and the International Monetary Fund: Available at www.worldbank.org/en/about/.../the-world-bank-group-and-the-imf. (Accessed 15/5/2019).

Thorn-White L.W, Silberman L and Anderson, P. R (1940), *Nairobi master Plan for a colonial capital*, His Majesty Stationery Office, London.

UN, (2017) *Sustainable development goals: knowledge platform*. Available at <https://sustainabledevelopment.un.org/memberstates/kenya.Nairobi>. (Accessed 24 April 2019).

UNDP, (2007), *Human Development Report 2007/2008 Fighting climate change: human security in a divided world*. United Nations Development Programme: New York.

UNDP, (2011), *Small-Scale Water Providers in Kenya: Pioneers or Predators?*

Available at: [www.undp.org/content/dam/undp/library/.../Kenya%20paper\(web\).pdf](http://www.undp.org/content/dam/undp/library/.../Kenya%20paper(web).pdf).

(Accessed 24 May 2019).

UNDP, (2015), Strategic Development Goals. Available at:

https://www.undp.org/content/.../undp/.../SDGs_Booklet_Web_En.pdf. (Accessed 24

April 2019).

UN Habitat, (1999), *Re-assessment of urban planning and development regulations in African cities*, UN Habitat, Nairobi.

USAID, (2009) *converting consumers into customers*. Brazil. Available at

<https://energy-access.gnesd.org/projects/30-converting-consumers-into-customers-in-slums-at-sao-paulo-city.html> (Accessed 28 September 2019)

Wayleaves Act Cap 292 (Revised 2010). Available at

<http://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/WayleavesCap292.pdf> .

(Accessed 01 April 2019).

APPENDICES

APPENDIX I: HOUSEHOLD QUESTIONNAIRE

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

I am a student at the University of Nairobi undertaking a Master's Degree in Urban and Regional Planning at the School of Built Environment. As part of the requirement for the degree, I am undertaking a research project on the opportunities for enhancing electricity connectivity in urban informal settlements case of Kibera informal settlement (Silanga village). I would like to request for your participation in this questionnaire. The information obtained is intended purely for academic purposes and as such will be treated with utmost confidentiality.

A. GENERAL INFORMATION

1. Name (optional): _____

2. What is your age category

Below 20 years.....21-30 years.....31-40 years..... 41 and above years.....

3. What is your Gender?

Male..... Female.....

4. What is your highest level of education?

a) None

b) Primary

c) Secondary

d) Tertiary

e) University

5. Are you a tenant or the owner of the premises/house that you reside in? (Tick only one of the options below which applies in the space provided to the right)

Tenant	
Land lord	

B. ELECTRICITY INFORMATION

6. Do you have electricity in your premises? (a)Yes..... (b)No....

7. Type of electricity connection in the house.

a) Formal

- b) Informal
- c) None
8. If formal, in which month and year were you connected to electricity?
- I. Year..... II. Month.....
9. If informal, would you like to access formal connection? (a) Yes (b) No
10. What do you think are the barriers towards formal connections in the slums?

11. How far are you from the transformer?
 a) 1m – 600m b) 601m – 1Km c) over 1Km
12. Is the electricity supply used for commercial or domestic uses? (*Tick the options below which applies in the space provided to the right*)

Domestic uses	
Commercial uses	
Both	

13. Source of lighting in the houses (*Tick only one of the options below which applies in the space provided to the right*)
- a) Electricity
- b) Paraffin
- c) Solar energy
- d) Portable battery
- e) Candle
14. Source of cooking energy
- a) Charcoal
- b) Electricity
- c) Firewood
- d) Briquettes
- e) Paraffin

f) Gas

14. How much do you spend on both lighting and cooking energy?
.....

C: Challenges facing Electricity connection in the Slum

15. i) Within you stay in this area have there been any projects that have targeted formal electrification and upgrading in this area?

a) Yes..... b) No

ii) If yes, which ones?
.....

16. From your own point of view, which challenges face the provision of the electricity services and facilities in such settlements?

.....
.....
.....
.....

17. What do you propose as remedy to the challenges mentioned above?

.....
.....
.....
.....
.....

18. What is the nature of your neighborhood security?

a) Secure..... b) Insecure

19. If secure, what has contributed to the neighborhood being secure?
.....

.....

20. If not secure, what are the causes of insecurity?

.....
.....

APPENDIX II: BUSINESS QUESTIONNAIRE

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

I am a student at the University of Nairobi undertaking a Master's Degree in Urban and Regional Planning at the School of Built Environment. As part of the requirement for the degree, I am undertaking a research project on the opportunities for enhancing electricity connectivity in urban informal settlements case of Kibera informal settlement (Silanga village). I would like to request for your participation in this questionnaire. The information obtained is intended purely for academic purposes and as such will be treated with utmost confidentiality.

A. GENERAL INFORMATION

4. Name (optional): _____

5. What is your age category?

Below 20 years.....21-30 years.....31-40 years..... 41 and above
years.....

6. What is your Gender

Male..... Female.....

7. What is your highest level of education?

- a) None
- b) Primary
- c) Secondary
- d) Tertiary
- e) University

8. Are you a tenant or the owner of the premises/house that you reside in? (Tick only one of the options below which applies in the space provided to the right)

Tenant	
Land lord	

8. What type of business do you run?.....

B. ELECTRICITY INFORMATION

9. Do you have electricity in your premises? (a)Yes.... (b)No....

10. Type of electricity connection in the house.

- a) Formal
- b) Informal
- c) None

8. If formal, in which month and year where you connected to electricity?

I. Year..... II. Month.....

9. If informal, would you like to access formal connection? (a) Yes (b) No

10. What do you think are the barriers towards formal connections in the slums?

.....

.....

.....

.....

.....

11. How far are you from the transformer?

- a) 1m – 600m
- b) 601m – 1Km
- c) over 1Km

12. What sources of energy do you use in your shop?

- a) Charcoal
- b) Electricity
- c) Firewood
- d) Briquettes
- e) Paraffin
- f) Gas

13. What is your monthly income from the business?

1	0-1000	
2	1000-5000	
3	5000-10000	
4	10000-15000	
5	15000-20000	
6	20000 and above	

14. How much do you spend on energy?

C: Challenges facing Electricity connection in the Slum

15. i) Within your stay in this area have there been any projects that have targeted formal electrification and upgrading in this area?

a) Yes..... b) No

ii) If yes, which ones?

.....

16. From your own point of view, which challenges face the provision of the electricity services and facilities in such settlements?

.....

.....

.....

.....

17. What do you propose as remedy to the challenges mentioned above?

.....

.....

.....

.....

.....

18. What are the benefits of using electricity as compared to other energy sources?

19. What is the nature of your neighborhood security?

a) Secure b) Insecure

20. If secure, what has contributed to the neighborhood being secure?

.....

.....

21. If not secure, what are the causes of insecurity?

.....

.....

APPENDIX III: INTERVIEW SCHEDULE (KEY INFORMANTS)

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

- 1. Name of respondent.....
- 2. Date of interview.....
- 3. Title/position.....
- 4. Organization.....
- 5. Department.....

Power Services provision

6. Indicate your slum electricity Provision Services (Past and Present) on the table below.

No.	Project/Programme	Duration	Threats and opportunities

Challenges of Electricity Provision

7. What have been the problems of infrastructure provision in Silanga?.....
.....
.....

Suggested improvement of Infrastructure Provision

8. In what ways can Electricity provision in Silanga settlements be enhanced?.....
.....
.....

9. In your own opinion which stakeholders do you think determine the success of Power provision in Silanga?
.....

APPENDIX IV: FOCUS GROUP DISCUSSIONS

INTRODUCTORY REMARKS

I am John Njihia, a student at the University of Nairobi, undertaking a Master’s Degree in Urban and Regional Planning at the School of Built Environment. The study is on the opportunities for enhancing electricity connectivity in urban informal settlements case of Kibera informal settlement (Silanga village). I would like to collect data that will assist in accomplishing the objectives of this study. Your contribution will be much appreciated and the information provided will be treated with utmost confidentiality. I wish to conduct a discussion with you on some questions.

1. What are the cheap sources of Energy you know?

.....
.....
.....
.....

2. What are the challenges facing power provision in Silanga Village?

.....
.....
.....

3. What should be done to improve electricity connectivity in Silanga village?

.....
.....
.....
.....

4. In what ways can power provision in the Silanga Village be enhanced?

.....
.....
.....

5. What ways does power inadequacy affect residents in Silanga village?

.....
.....
.....

6. Who (which entity) is responsible for power connectivity within the Silanga Village?

.....
.....
.....
.....

7. What needs to be done to enable residents get electric connection?