FACTORS INFLUENCING COMMUNITY DEVELOPMENT: A CASE OF THE RURAL ELECTRIFICATION PROJECT IN KITUI COUNTY, KENYA

BY
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DECLARATION

This research paper is my original work and has never been submitted for examination in any institution.

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DEDICATION

I dedicate this research paper to my father Patrick Musyoka, Mother Jullianah Musyoka, Sisters Munanie, Ndunge, Mwende and my best friend Muusya for their tireless support, input, encouragement and understanding and without whom I wouldn't have successfully completed this research paper.

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LIST OF ABBREVIATIONS AND ACRONYMS

AFD	French Development Agency
EDF	Eléctricité de France
ESMAP	Energy Sector Management Assistance Program
FGDs	Focus group discussions
GDP	Gross Domestic Product
HV	High Voltage
ICT	Information and Communication Technology
IRR	Internal Rates of Return
KPLC	Kenya Power and Lighting Company Limited
KV	Kilovolt
KWh	Kilowatt hour
KES/KSH	Kenya Shillings
LV	Low Voltage
MV	Medium Voltage
MW	Mega Watt (one million watt)
MOE	Ministry of Energy
NGOs	Non Governmental Organizations

NDF	Nordic Development Fund
PV	Photovoltaic
REP	Rural Electrification Programme
UN	United Nations
UNDP	United Nations Development Programme
WHO	World Health Organisation

ABSTRACT

This research focused on the factors influencing Community Development in relation to the Rural Electrification Project funded by the French Development Agency in Kitui County. The purpose of the study was to identify to what extent the various components of the Rural Electrification project had influenced community development in Kitui County to inform the various stakeholders in the sector especially on future prospected project appraisals and to learn from best practices for replication and mistakes or failures for corrective action. Literature reviewed for this study, identified a need to go beyond the usual measurement of project outputs for rural electrification projects and to identify the components of the projects that influenced socio-economic development and changes in production and lifestyles and beneficiary communities. The study was based on a with-without study from a survey carried out in electrified and non-electrified commercial centres, social and administrative amenities and households in the County. The study used the survey methodology and qualitative data collection tools to collect data from the three main categories of beneficiaries targeted for the project. Documentary information and coverage on the project was also used to obtain information on the project implementation in the chosen locality of study. All data obtained for this study was analysed using content analysis and descriptive analysis methods. A positive outcome of the project on the community was identified where the priority centres had connected and were using electricity in their day to day activities. However it emerged that low connectivity characterised this project in most centres therefore portraying a major setback in an area that had high expectation and a general desire to use electricity for upward economic mobility. The conclusions of this study are intended for the purpose of informing the conception and implementation of future rural electrification projects by various stakeholders in the sector notably the respective government agencies, donors and the beneficiary communities. It is recommended that further studies also be carried out on the long term impacts that bring about economic, social, environmental and cultural change to communities and more particularly rural communities where rural electrification projects have been implemented.

CHAPTER ONE

INTRODUCTION

1.1. Background to the Study

Most rural communities in developing countries are often disadvantaged in terms of access to essential types of services such as adequate and clean water, health facilities, proper infrastructure (roads), markets, information, and electricity among others. In fact for Kenya, and most developing countries, poverty and socio-economic deprivation are characteristic of rural areas, where about three-quarters of the population dwells (World Bank, 2006). Any effort for ensuring sustainable development to Kenya as a developing country must therefore have a strong element of poverty alleviation especially for the rural communities.

One of the important factors contributing to poverty in the rural communities of Kenya and in the world is the lack or under-provision of key resources, like modern energy, that could be used for economic activities and social advancement. General unavailability of suitable energy, especially electricity, has meant absence or very slow rate of modernization of farming which is the most import economic activity in the rural areas, industrialization, commerce and social undertakings, and general development (Barnes et al, 1996.)

Most rural households consume traditional energy sources derived from wood fuel, charcoal, agricultural residues and cow dung. In fact, the dominant energy source for non-electrified households in Kenya is primarily wood fuel and charcoal. Its use is common among households in rural areas, because it is relatively cheap and widely available and in fact 80% of these households consume this type of fuel.

The need to improve the access to modern energy in the rural areas led to the establishment of the rural electrification programme by the government of Kenya in 1973 as the primary means of electrifying rural areas (Walubengo and Oyango, 1992). The Kenya Government through the Ministry of Energy (MoE) contracted the services of the national utility, the Kenya Power & Lighting Company (KPLC), to oversee the planning, execution, operation and management of the REP countrywide (MoE, 2003). At the onset a deliberate policy decision was made to

prioritize electrification of the administrative district headquarters, public and commercial services (e.g., market centers, schools, hospitals, etc) as well as rural industries for instance coffee, tea and sugar factories, (Walubengo and Oyango, 1992).

The government continued giving direct budgetary support to the REP until the late 1990s when a lack of resources led to creation of a rural electrification fund through a levy of 5% on all electricity consumers. By June 2002 after years of grid extension and expenditure of nearly 150 million USD, less than 75 000 customers had been served, amounting to less than 3% of rural residents. Approximately 60% of the money was spent on financing new extensions, with the remainder devoted to operation and maintenance (Theuri, 2004).

This 3% level of population with electricity was very low compared to the average for the developing world which is estimated at about 35% to 40%. (REA strategic plan 2008-2010). It is this low level of connectivity that saw the Government, through the Economic Recovery Strategy Plan (2003) and Sessional Paper No. 4 (2004) on Energy undertake to accelerate the pace of rural electrification through the creation of a special purpose rural electrification agency with the objective of increasing provision of electricity as a means to promote sustainable social economic development of rural communities.

Vision 2030 Kenya's development blue print has energy development as one of its key foundations and this is what informed the Rural Electrification Authority's (REA) strategic plan 2008-2010 and the Rural Electrification Programme Master Plan - 2009. It has a specific objective in the energy sector to develop programmes targeting the connection to electricity of one million households between 2008 and 2012 (First five year medium-term rolling plan of the vision). It was projected that out of the one million households, 650,000 households will be in the rural areas. (REA, 2007)

The Energy Access Scale-up Programme through which one million households were to be connected with electricity over five years was to target connecting all major trading centres, secondary and primary schools, community water supply works and health centres in the country. This programme will be financed by the Government as well as development partners.

A total of 215 rural electrification projects, estimated to cost Kshs. 1,483 million, were also scheduled to be completed by February 2008. The Government also intended to spend Kshs. 180 million to provide solar electricity generators to 74 public institutions including boarding primary and secondary schools, health centres and dispensaries in Baringo, Marakwet, Samburu, West Pokot, Turkana, Makueni, Narok, Kajiado, Moyale, Marsabit and Mandera districts. (The Government of Kenya, 2007)

Donor assistance has been a major source of funding for the Rural Electrification Programme (REP). Donors such as the World Bank, the Japanese government through JBIC, The Spanish Cooperation, Nordic Development Fund (NDF), GTZ (Germany) and South Korea, the French Development Agency, The Finnish Government have made huge investments to the REP mainly through the 'Project Approach' and under various financial tools such as grants, conventional loans and soft loans. Notable is the Finnish Government contribution to the establishment of the REA, World Bank who was leading the project "Energy Sector Recovery Project" (2004-2013) and French Development Agency which has contributed mainly to the construction of infrastructure in the rural areas.

1.1.1. The French Development Agency Funded Rural Electrification Project

In the year 2000, the French Development Agency supported through a 9.15 millions Euros (Ksh 945 M) loan a project for rural electrification in Western Kenya aimed at achieving 2,500 connections (for public institutions such as schools, health centres and trading centres). The project was successfully completed in 2005.

The Agency in 2006 signed an agreement to finance another 30 million Euros (3.15 billion Ksh) for the Phase II of its rural electrification program in Kenya. This project was to cover 6 provinces (Western, Nyanza, Rift Valley, Central, Eastern and Coast).

The project consisted of two components;

i) Investment component of 28 million euros targeting the installation of 2,300 kms of low and medium voltage lines and the connection of at least 2,500 priority connections (market centres, schools, health centres and hospitals and administrative buildings). In the long term, 50,000 household were to benefit from these investments. A total of 1.2 million inhabitants were to be connected to electricity signifying 3.1% of the total current population of Kenya.

ii) Institutional support component of 2 million euros to support MoE in the reform of creation of the Rural Electrification Authority and KPLC management of the rural electrification network and to support KPLC and REA for the implementation of a new connection policy in rural areas.

The investment component was to see the financing of the extension of the electricity network through the construction of medium (33 and 11 KV) and low voltage lines and the installation of transformers in 156 zones spread out within the six provinces with priority areas selected being high populated schemes with a high level of commercial and economic activity.

The institutional component was to mainly focus on supporting the MOE in the reform of the KPLC management delegation agreement and to provide advisory services to KPLC with a view to adapting a commercial connection policy through the implementation of a service connection fund in the pilot zones that were to be selected.

The overall objective of the project was to bring about increased and sustainable access to reliable and economical energy in rural areas across Kenya. The key indicators were defined as follows:

Indicator I: Extension of electricity to 50,000 new clients in rural areas of Kenya including domestic; small traders/markets; small industry; social infrastructure (schools, hospitals, boreholes).

This was in line with the national strategy in the Energy sector as stated in the Energy Act of 2006, which included providing rural population with reliable and affordable access to electricity, by reaching 20% of the rural population in 2010 (475,000 customers) and 40% in 2020.

Indicator II: Improving technical and financial performance of distribution in rural areas by 2009 through:

i) Reducing administrative and commercial costs by 16%;
ii) Reducing rate of loss from 25% in 2005 to 20% in 2009; and
iii) Reducing the average level of operational subsidies from 48% in 2003 to 28% in 2009 excluding increase in tariff

The specific objectives of the project were:

i) Support economic growth in the rural areas through the provision of power supply to commercial activities, agricultural sector, fisheries existing in the different schemes selected for the project
ii) Improve the working conditions in priority centers, schools and health facilities
iii) Improve the technical and financial performance of power distribution in rural areas
iv) Improve regulation and governance of the rural electrification sub-sector.

1.1.2. The Locality of Study - Kitui County

Kitui County was one of the beneficiaries of the Rural Electrification Project with 5 of its constituencies - Kitui West, Kitui Central, Mutito, Mwingi North and South having centres falling under the selected priority areas, has been chosen as the main area of study for the evaluation of the impact of the REP on community development.

Kitui County is one of the 13 administrative counties in Eastern Province. It is a combination of three major districts Kitui District, Mwingi District and Mutomo District. Its capital town is Kitui. The county is divided into 19 administrative divisions, 95 locations and 314 sub locations.

Kitui county is located in the southern part of Kenya. It borders Machakos county to the west, the Tana river to the east and Voi and Taita Taveta to the south and Embu, Meru and Garissa Districts to the north.

The county experiences high temperatures throughout the year, which range from 16 C to 34C. The hot months are between June and September and January and February. The minimum mean annual temperatures are 280C in the western parts and 220C in the eastern parts. Maximum mean annual temperatures, on the other hand, are 28C in the western parts and 32C in the eastern parts. Due to limited rainfall received, surface water sources are very scarce. The major sources of surface water are seasonal rivers that form during the rainy seasons and dry up immediately after the rains.

The vast majority of the economy of this county is based on subsistence farming, despite the fact that the agriculture is an extremely challenging endeavor giving the sporadic rainfall. In the recent past it has been confirmed that there are iron ore deposits in Ikutha area of Kitui County, limestone deposits in Mutomo, coal deposits in Mutito, Mwingi and Kitui areas of Kitui County (National Assembly of Kenya, 2011). The coal deposits in Kitui are billed as one of the best alternative source of cheaper energy at a time when the country needs affordable power to drive Vision 2030, and to make Kenya an industrialized country in 20 years.

The Mui basin where the coal deposits are confirmed to have been found has been sub-divided into Sombe, Kabati, Itiko, Mutito, Yoonye, Kateiko, Isekele and Karunga but activities have only concentrated in Kateiko and Yoonye. The deposits are an extension of the African Karoo formation, which runs from South Africa to Somalia through Mozambique, Tanzania and Kenya. In South Africa, where coal mining is a major activity, about 90 per cent of the electricity is coal-fired and is four times cheaper than in Kenya.

Government geologists have drilled 62 exploration wells at different selected sites in the past eight years to ascertain, among other things, the coal quality and recommend its best method of extraction. The government has moved to concession the 490.5 square kilometer basin and the Ministry of Energy in November 2010 received bids from 16 international coal mining firms

interested in undertaking the mining of the energy resource and is currently in the process of reviewing the bids.

Other economic activities that would do well in this area if facilitated by electricity include local industries such as wood carvings that can be exported thus earning the people some money and the country foreign exchange and Horticulture especially through fruits (mangoes, pawpaws, melons, guavas, passion fruits, avocados, jack fruit) growing and processing. The weather in Kitui favours fruit growing and facilitation of a construction of juice production industries would greatly improve the economy of the County.

1.1.3. The Energy/Electricity situation in Kitui County

Kitui County has a poverty index of 63% (Muvali, 2007) meaning that more than half the population is poor. The county's energy provisions have previously proven to be a great challenge. The majority of the population was dependent on the traditional fuels (wood-charcoal, crop residue maize stalks, cobs and dung and using inefficient technologies (open fires). This combination barely allowed fulfillment of the basic human needs of nutrition, warmth and light, let alone the possibility of harnessing energy for productive uses which might begin to permit escape from the cycles of poverty. Charcoal burning and selling in many parts of the county is causing heavy pressure on the forests and tree resources of an already arid zone.

Many water projects in the district have collapsed due to the lack of decentralized, affordable and sustainable energy sources in the district. Many boreholes have been sunk by the government and other organizations but after the end of funding period the projects collapse since the community is unable to sustain the projects by the provision of chemical fuels to run generators which seem to be very expensive.

Social facilities such as schools, dispensaries have been operating with difficulty due to the lack of electricity. Most schools operate during the day due to the lack of lighting systems. ICT programmes in school are important but they are limited due to the lack of power. Many organizations are willing to donate computers but the requisite is that the schools should be able

to provide power. This has been seen as a major drawback in many schools and has been attributed to low performance in such remote areas as compared to urban areas where electricity supply and use is available. The dispensaries have not been performing important activities such as refrigeration of vaccines and sterilization of equipment. The equipment in these dispensaries is sterilized using kerosene which makes patients lose confidence with the nurses. Vaccines in such remote areas are either not there, imported from other areas for one-day use or kept by use of 13.7 litre-gas cylinders.

Rural electrification therefore has been seen as the way out for combating all the problems mentioned above. Electricity has been greatly associated with development and more so by the rural poor, as the way out of poverty and also somewhat an avenue for bridging the gap between the urban and rural areas. .

1.2. Statement of the Problem

An investment of approximately 270 Million Kenya shillings (Electricite de France, 2010) out of the total 2.8 billion Kenya Shillings funding by the French Development Agency for the Rural Electrification Project was made in Kitui County. Did this huge investment in the rural electrification project contribute any change in terms of Community Development in Kitui County? Did the Rural Electrification project contributed to positive change in Kitui County in terms of income growth for productive enterprises that are using electricity to conduct their day to day businesses, improved agriculture and production, better functioning social facilities such as schools and health centers, significantly better communication, information transmission and awareness levels, employment creation and increased environmental conservation. This is what the study intended to investigate.

1.3. Purpose of the Study

The purpose of the study was to identify to what extent the various components of the Rural Electrification project influenced community development in Kitui County and to inform the various stakeholders in the sector especially on future prospected project appraisals to learn from best practices for replication and mistakes or failures for corrective action.

1.4. Objectives of the study

The overall objective of this research was to evaluate the extent to which the Rural Electrification Project funded by the French Development agency contributed to Community Development in Kitui County, with specific objectives being to:

1) Evaluate the extent to which the selection of the schemes and priority centers to benefit from the Rural Electrification Project influenced community development in the County.
2) Identify whether the construction and extension of the electricity networks (in terms of KV lines constructed) in the priority areas chosen influenced community development in the County.
3) Assess whether the level of connectivity for commercial enterprises, social amenities and households influenced community development in the County.
4) Establish whether community participation in the implementation of the project, enhanced community development.

1.5. Research Questions

1) How did the selection of the schemes and priority centers to benefit from the Rural Electrification Project enhance community development?
2) How did the construction and extension of the networks (in terms of KV lines constructed) influence community development?
3) How was the level of connectivity for commercial enterprises, social amenities and households a determinant for community development in the County?
4) How did the participation of the community during the implementation of the project at its various stages from conception to completion enhance community development in the County?

1.6. Significance of the Study

Donors who finance development projects have commonly asked simply: was the project completed? Were the required numbers of miles of power lines constructed within the allotted time period, were the funds spent in the prescribed way? etc. Rural electrification projects should vary this theme to whether real or actual development and change in the target schemes has been achieved or is foreseen in the future.

The French Development Agency is prospecting on another project (REP Phase III) in the sector and this study gave an insight on the issues such as best practices to replicate onto the new phase and corrective action to be taken on the previous negative aspects to ensure these do not occur in the third phase of the project. The study was also aimed at informing the main stakeholders in the sector, notably Rural Electrification Authority (REA), Kenya Power and Lighting Company (KPLC) and Ministry of Energy (MOE) on the actual impact on the ground of the project in this sample area and the best practices to use in consultation with donors for the subsequent projects. This is in a bid to ensure more participatory, impact oriented and sustainable projects.

1.7. Delimitation of the Study

The success of this study was envisaged due to the preliminary support and availability of documentary and qualitative information that has been readily provided by the various stakeholders involved in the project that is the Donor, Ministry of Energy, the Rural Electrification Authority and Kenya Power and Lighting Company. The knowledge of the local language of the area of study and target population by the researcher was also advantageous especially as regards obtaining information through the survey methods.

1.8. Limitations of the Study

The limitations of this study were:

(i) The project had just come to an end (2010) as such the long term socio-economic, environmental, cultural impacts were not captured in this study. Recommendations were

therefore be made for subsequent studies after a certain period of time (probably 3 years and beyond) to identify the long term impact of the project.

(ii) Specific case studies cannot be carried out on particular commercial, social and household targets due to time, budget and logistics constraints, therefore the study was limited to random sampling from the 56 priority centres grouped into 8 beneficiary schemes. This meant that special impacts of rural electrification on particular commercial enterprises, social facilities or households were overlooked. This study however sought to ensure that the sampling was as representative as possible for each beneficiary scheme.

(iii) As is characteristic of most outcome and impact studies, it was difficult to identify whether a particular outcome was directly related to rural electrification or there may have been other related factors that contributed to the outcome. The survey methods used in the study however endeavored to make close comparisons of the pre-rural electrification era and post-rural electrification era to minimize this difficulty.

1.9. Basic Assumptions of the Study

For this study, it was assumed that the target population would co-operate, and would provide accurate information on the immediate and foreseen impacts of the Rural Electrification Project. The sample areas that were selected for the study in the beneficiary schemes was deemed to be adequate for generalization for the entire beneficiary schemes and representative for the County. It was also assumed that all documented information on the process of implementation of the project was a true reflection of the actual situation on the ground especially in cases where it was not easy to verify information during the study.

1.10. Definitions of Significant Terms

The following are the key significant terms used in the study:

Community Development:

Community development is the planned evolution of all aspects of community well-being (economic, social, environmental and cultural). It is a 'grassroots' process by which communities become more responsible, organize and plan together; develop healthy options, empower themselves, reduce ignorance, poverty and suffering, create employment and economic

opportunities and achieve social, economic, cultural and environment goals. Community development is a way to enhance the resources of a community and often has sustainability and increased quality of life as its primary focus. (Frank and Smith, 1999).

Effective community development mostly happens when a challenge or opportunity presents itself and the community responds. When change is taking place community development is understood to be a positive approach to accept and manage this change. Opportunities and change can therefore be used positively by any community to enhance its economic, social, environmental and cultural well being.

The above definitions of community development shall therefore be used for purposes of this study.

Priority Centers/Zones:

These were the areas that were selected as beneficiaries of the Rural Electrification Project. These areas were those that are highly populated and with high level of commercial and economic activity. The centres were primarily commercial centres, social and administrative amenities such schools, health centres and provincial administrative centres or offices. Households were also to benefit from the project.

Schemes:

The selected priority areas to benefit from the Rural Electrification Project were classified under groups identified as schemes. This was aimed at facilitating the awarding of contracts for works and also for Survey, designing and wayleaves acquisition for the networks.

Electricity Network Extension:

Electricity Network Extension for the Rural Electrification Project signifies the construction of medium (33 and 11KV) and low voltage lines and installation of transformers in the selected priority centres.

Wayleaves acquisition and Compensation:

Wayleaves acquisition is the legal process of acquiring the authority to construct or carry any infrastructure through privately owned land. Good is made of all damage done, and compensation or payment to the owner is made of any tree or crops destroyed or damaged, in the process of construction. (Wayleaves Act, 1912)

Load centres:

The sets of equipments installed away from sources of power generation, performing the processes of transmission/transformation and distribution of electrical energy to consumer in various parts of a consumer region.

1.11. Organisation of the Study

The study looked at the issues that are related and that have led to the need for this study. The importance of rural electrification in any country's economic, social and cultural development was emphasized through analysis of various major milestones on the Rural Electrification Programme in Kenya. Through the literature review to this study, it came to the light that various governments including Kenya had taken a big step in the implementation of major rural electrification projects through government budget and other sources such as donor funding. The huge investments in these rural electrification projects therefore justified the need for continuous analysis of the real outcomes and impact experienced by the target communities to ensure conception and implementation of projects that are constantly improving and taking into account the needs, aspirations and expectations of local communities. This is the principle on which this study was organized. Data was collected using the survey research design and analysed, presented and interpreted using content analysis and descriptive analysis methodologies. Discussions on how the various factors that influenced community development with regard to the rural electrification were carried with recommendations being given on weaknesses to improve on in future similar projects and further studies to be carried out on rural electrification projects.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Given its substantial benefits, electrification and especially rural electrification (along with access to other sources of modern energy) has been identified as essential for fulfilling the Millennium Development Goals (MDGs) (UNDP, 2005). In this regard, the literature reviewed in this chapter identified the main components or features of most rural electrification projects and how the conception of projects had managed to gear these components toward the development of most rural communities. Socio-economic impacts of rural electrification projects that have been studied and the research methodologies used in these studies were also analyzed. In conclusion this chapter looked at the gaps that exist in the various REP impact studies reviewed and the emerging conceptual framework thereby orienting this study.

2.2. Selection of beneficiary areas for Rural Electrification Projects

An Asian Development Bank funded rural electrification project in Bhutan (ADB 2010) identified rural households to benefit for electrification through an extensive structured process that involved consultation with district, a cluster of neighbouring villages within a district that are grouped together for administrative purposes, and village leaders. This consultation was consistent with the objective of decentralizing decision making to support good governance. Various analyses (design, financial, economic, social and environmental) for the rural electrification were formulated and on the basis of these analyses, the project was formulated to fund the electrification of 8,000 households in eight districts, which were selected using poverty alleviation and economic criteria.

Neiz (2010) in his comparative study on rural electrification in China, Brazil, India and South Africa concluded that a prerequisite to any rural electrification programme is the collection of sound statistical data to map out the electrification needs of any target area. The shaping of the programme (including the choice of technologies for electrification and deadlines) will greatly depend on the geographical distribution of the rural population, the density of this population and

its level of electrification. Lack of information about the location of populations without access to electricity will cause serious delays in the implementation of an electrification process not to mention the risk of overlooking small-scale infrastructures (isolated schools, health centres, etc.) or remote communities unable to inform about their needs because of their geographical distance. In addition, the choice of the suitable technology for electrification can only be done efficiently when targets are clearly defined, such as the expected use of electricity and particularly its productive use.

According to a World Bank report (2008), many countries, communities to be connected to the grid are identified on a "least-cost" basis, favoring larger communities nearer to the existing grid, roads, and towns. The World Bank has promoted this approach, which is often necessary to secure the financial viability of the rural electrification program, in a number of countries. For example, the recent Peru Rural Electrification Project changed community prioritization from the government's "social criteria" to a least-cost approach. While necessary for the financial health of the service provider, there is a clear trade-off with reaching the more disadvantaged. Hence some countries include social variables in their eligibility criteria. In a small number of cases, Rural Electrification Funds have been used to offset the financial loss incurred by private companies extending coverage to less advantaged rural areas.

In Uganda, the Rural Electrification Authority is seeking financing from a development back to finance rural electrification where the selection process of the beneficiary districts was based on the growth centres, which do not have access to electricity and connectivity to the existing power grids. An examination of the clientele willing to use electricity in the areas and availability of clients for future expansions was also conducted. (Uganda Rural Electrification Authority, 2011)

2.3. Extension of networks and installation of transformers in Rural Electrification Projects

Most electrification models are based on extension of distribution lines networks and subsequent installation of transformers in order to attain universal rural access. According to a comparative study by Neiz (2010), most identified countries for the study which included, China, Brazil, India and South Africa, based their programmes on models geared towards extension of networks with

a view that this would promote social and economic development in rural areas and to attain more equitable distribution of developmental benefits.

2.4. Level of connectivity and community development

In his study of rural electrification in Sub-Saharan Africa, Tanguy (2009) reveals that in all studies and literature it is noted that the success of the interventions of rural electrification is linked to the rate or level of connectivity and the utilization of the electricity. These two elements are notably a challenge in Sub-Saharan Africa and also in most developing rural poor communities around the world. Additional interventions and approaches have minimally best put in place and if so few studies have been conducted to identify their success and to reduce the notable failures of rural electrification programmes due to these two elements. Tanguy identified that most rural communities were too poor to afford the connection fees and to buy the equipment that is associated with electricity use. In a study carried out in Botswana for example the average rate of connection was 12% in electrified villages and varied from 2-27% depending on the different villages. Another study carried out by Bernard and Torero (2008) found out that the average connection rate in 14 villages in Ethiopia that were electrified was 38%.

Another study conducted by Energy Sector Management Assistance Program - ESMAP (2007) in Senegal, revealed that the rate of connection for electrified villages was 30%. These low connection rates are not only linked to the technologies accompanying the use of electricity and cost associated but also to the lack of information on the uses of electricity through publicity campaigns. Some countries though have taken big steps to educate the public of the uses and benefits of rural electrification as shown in the publicity pictures here below.

Figure 2.4.1. Publicity campaigns for the utilisation of electricity in rural areas in Senegal (Tanguy, 2010)

The presence of an electric source alone does not cause development. It has to be used (Cecelski (1992). Barnes (2005) also rationalizes that Rural Electrification together with complimentary programs are needed to make its impact felt and the investments more justifiable. According to Cecelski (1992), it is important to keep in mind, that the demand for electricity is a derived demand; the demand for electricity for pumps is a result of the demand for irrigation; the demand for electricity for motive power in small industries derives from demand for their products; the demand for lighting could result from demands for education, necessitating reading at night, etc. Thus, the benefits obtainable from electrification will depend equally upon complementary investment decisions and inputs, availability of credit for necessary electricity using devices, the existence of transport, schools and other infrastructure, government information services, and so on.

A study on the socio-economic impact of rural electrification in Bhutan (Bhandari 2006) focused on the impact of electricity on the income, health and education of the rural Bhutanese. The results were based on a with-without study from a survey carried out in four electrified villages and another four non-electrified villages in central Bhutan. The study concluded that electrified households could extend their activities by a few hours after sunset. One natural change observed in their lifestyle was that many households chose to do indoor household chores such as washing, cooking, and cleaning in the evenings and occupy themselves with other productive work during the daytime. The farmers would use electric light in the evenings to package the vegetables properly and prepare their produce to sell the following day. The study also found out that there was increased availability of, and the improved, health services generated by public investments in electricity-dependent facilities. Vaccines and medicines could now be kept refrigerated in the hospital; people no longer need to go to other health facilities to receive vaccination and other basic treatment. As a result, they saved time and money on transportation and lost wages. Electrified suction machines in the electrified hospitals enables safer and more efficient child delivery and the services could be availed at nights during emergencies. At night, wound dressing, wound stitching and removal of foreign bodies from wounds were more convenient. It was also discovered that there were more students studying for longer durations in the electrified villages when compared to the study durations of students of non-electrified villages. Data collected identified that the participation from electrified villages was found to be twice as much as that from the non-electrified villages. The extended evenings, presence of TV, the ability to attend non formal education, facilitated higher literacy and school enrollment rates. As such there was expectation of higher literacy and school enrollment in the electrified villages when compared to the non-electrified villages.

A study conducted in Nepal (Pandey 2009) on a programme dubbed 'Community Rural Electrification identified that the lowland Terai region of Nepal was fertile farmland for paddy, corn and wheat crops; but, unfortunately, had lacked irrigation facilities in many areas. With electricity from the programme, people began using five horsepower single-phase motors to pump ground water through shallow tube wells. This was common in the Terai region; while in hill areas the villagers constructed huge water storage tanks and filled them with river water by pumping for irrigation purposes. People also began irrigating their kitchen gardens supported by

one-half or one horsepower single-phase motors and also hand pumps, for tapping ground water. Rural farmers were therefore able to produce their own farm produce for local consumption, and to market in urban areas.

On the social side, for the households with electricity supply the improvements noted were: increases in average annual income; average annual household expense on education; average annual health care expenditure generally for housewives; adult literacy rates, and quality of education and in the socio-economic status of women; and in-migration into electrified village. Nepal's rural electrification programme was found to have given impetus to entrepreneurship in the rural areas and is seen as a success story.

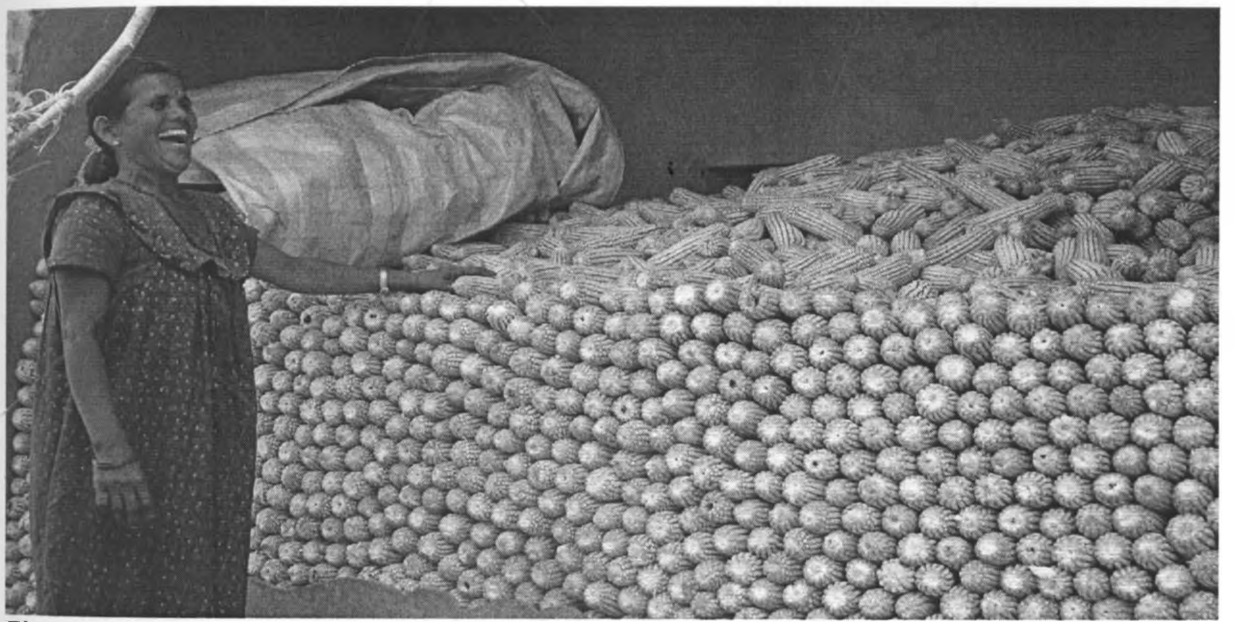

Figure 2.4.2 Prosperity through irrigation in Terai region of Nepal (source: HYDRO NEPAL ISSUE NO. 4 JANUARY, 2009)

Barkat et al (2002) in their study in Bangladesh found out that the average income from activities of electrified villages was 64.5% higher than that of non-electrified villages. This difference could however be directly linked to the initial differences in the villages that had led to some villages being beneficiaries of the REP over others.

This case is the same as in a study carried out by Dinkelman (2008) in South Africa. The comparison of the evolution of the rate of employment of women in electrified and non-electrified villages is not significant. The beneficiaries of the REP were those that had neglected

since the end of Apartheid. In the selection of the villages for comparison by ensuring the similarities of both villages, the study concluded that electrification led to a 13% increase in the participation of women in the job market.

Wolde-Rufael (2006) in his study used information from 17 African countries to test the existence of a causal relationship between the consumption of electricity especially in rural areas and the Gross domestic product (GDP). The study concluded a causal relationship in 12 countries.

A study (R. Tobich etal, 2008) was carried out by the Norwegian Agency for Development Co-operation on the impact of its Rural Electrification intervention programmes in Namibia from 1990-2000. The prime objective of the assessment was to draw conclusions from the experiences with the rural electrification intervention, and to compare these with conclusions drawn from rural electrification interventions in other countries, for the benefit of future such funding assistance initiatives.

According to the study rural communities greatly benefited from rural electrification, through tangible improvements in the provision of social services, better telecommunications, infrastructure, more reliable water supply services, an enhanced business environment, and better access to regional and local government services, most of which would not have been possible without access to electricity. The study also concluded that emergence of small businesses did not appear to be a typical consequence of rural electrification. But existing businesses benefited greatly from access to electricity through an improved business environment, better energy economy, greater convenience, and the possibility of offering a wider range of goods and services. Access to electricity in isolation, however, was found to be usually insufficient to promote business development, which also depends on factors such as access to finance, credits and markets, and training and development. Benefits on income and profits were found to be minimal. The rural electricity industry had created some employment opportunities, and there was a general perception among rural folk that electrification was creating work and opportunities in other sectors, but this was difficult to confirm.

A World Bank IEG study (2008) focusing on cross-sectional data from Ghana, Peru, Lao People's Democratic Republic, and the Philippines, found that access to electricity increases hours that household members put into businesses, use of electrical equipment and tools, thereby increasing productivity and profit coupled with improved community which are operated for longer hours and are more profitable. On the other hand, electricity has an insignificant effect on agricultural output and income. Of the 702 farm households surveyed, animal manure as fertilizer appears to be the only factor affecting agricultural production.

Hutton G. et al. (2006) in their evaluation of the costs and benefits of household energy and health interventions concluded that access to electricity is understood to reverse health risks through increased use of electrical appliances for cooking and heating purposes. The health benefits from rural electrification operate through a number of health channels: improvements to health clinics, better health from cleaner indoor air as households reduce the use of polluting fuels for cooking, lighting and heating.

A cost benefit analysis of the REP in Swaziland (Jansen, Van der Linden & Vos, 1997) analysed the socio-economic consequences of electrification: the impact, positive and negative. The study also provided an insight on the economic consequences of electrification from three perspectlves: the utility, the individual consumer and the society. The study carried out surveys on rural Swazi household before and after grid connection with specific emphasis on household energy use and expenditure patterns before and after grid connection. The final perspective identified great value of REP to the Swazi economy in general.

Barnes (2004) reports that in Costa Rica after the electrification of rural areas, significant social improvements took place: the number of education institutions with lighting and night classes increased considerably, new hospitals were set up and the number of health centers increased.

A study by Ebohon (1996) identified a causal relationship between energy provision and economic growth in Nigeria and Tanzania. Thus justifying the association that electrification

projects in developing countries could contribute to the economic development of rural areas especially where energy supply constraints are restraining the process of economic growth.

However some studies indicate that rural electrification did not have a turn around effect on the improvement of environmental conservation. Hiemstravan der Horst et Hovorka (2008) in their study in Botswana, found out that after 11 years since electrification, villages that had been beneficiaries of the programme in South Africa still used firewood for their household energy needs. Modern sources of energy notably electricity therefore were seen as a substitute due the cost of electricity and also cultural orientation – such as the taste of food cooked with firewood as compared to that cooked with electricity.

In Guatemala, one study (Ahmed, 2005) found that the incidence of respiratory illnesses is higher among households that use fuel wood for cooking and heating purposes. Ahmed (2005) showed that the unadjusted odds of having suffered from acute respiratory infections are almost twice as high among children who live in households using high-pollution biomass fuels than among those living in households using low-pollution natural gas or electricity for cooking. An ESMAP study (2002) reported that electrified households experience fewer incidences of coughing, wheezing, fever, and shortness of breath.

Jacobson (2007) in his study in Kenya discovered that the only 'economical use of electricity was for facilitation of activities at night such as accounting and reconciliations for small businesses or the preparation for courses and classes by teachers. This he said would be attributed to the kind of equipment used for example solar kits which do not allow for heavy use of power say for example kitchen equipment or refrigeration equipment.

In general electricity as identified by most impact studies has some causal effect on development and it is therefore necessary to go beyond the usual ex-post evaluations studies on the general performance outcomes of rural electrification and analyse the immediate and long term impacts that bring about economic, social, environmental and cultural change to communities and more particularly rural communities.

2.5. Participation of communities in Rural Electrification Project implementation

According to a comparative study on rural electrification policies in emerging economies conducted by Neiz (2010), involving rural communities in the decision-making process has substantially contributed to the effectiveness of electrification programmes. Rural electrification is normally seen as the outcome of the sole efforts of governments (central, local or regional) and/or of international development or funding agencies. But the involvement of rural communities in the process, particularly their participation in decision-making committees, has added value to the planning and implementation process and given the communities a sense of ownership of the process. Neiz (2010) identifies that both India and Brazil have taken this into account. India, acknowledging that most of the burden of doing without electricity falls on women, has arranged for women to be represented in District Committees, thereby helping in the co-ordination and control of electrification extensions within their district. These committees also check the quality of power and consumer satisfaction, and promote energy efficiency measures. According to the government of India's statement, the "participation of women in meeting energy needs, especially electricity, is essential for effective, efficient and sustainable implementation of rural electrification programs." Similarly, Brazil through its electrification programme ensured the involvement of rural communities in Management Committees which work to prioritise activities within the electrification process.

2.6. Sustainability of Rural Electrification Projects and Community Development

A study was conducted in Nepal (Pandey 2009) on a programme dubbed 'Community Rural Electrification. The programme carried out in 52 districts targeting 150 -200 households was based on the idea of involving the rural communities, with their commitment first in cash. The residents of rural villages came together and established 4502 rural electricity cooperatives.
The communities then willingly contributed 20% matching fund against the 80% contribution from the Government of Nepal of the total rural electrification cost.

The assessment concluded that the rural electrification scheme of access to clean energy with community involvement in Nepal had created rural entrepreneurship, marketing innovations and

social responsibility, with opportunities to develop other product/ service areas powered by electricity.

The involvement of community in rural electrification scheme helped them to develop the real sense of ownership of the project. The Rural community became very much conscious about damage or loss of community assets installed during the project. Thus, the electrification program not only created a sense of social ownership, but also enhanced the safety and security of national assets where in community-owned electricity distribution areas, local people discarded habits of electricity theft.

2.7. Impact assessment methodologies, measurement and data analysis in REP studies

According to most impact studies (Djeflat, 1985; Fluitman, 1983; Lim, 1984; Samanta and Sunderam, 1983) and those analyzed previously in this paper are descriptive in nature with minimal use of statistical tools. Some later studies (World Bank, 2002; Barkat et al. 2003, Yang 2003) do include some statistical analysis to varying extents and for different deductions. An attempt to use the Human Development Index (HDI) as an index to compare the differences between the electrified villages and the non-electrified villages has been made in the study of rural electrification in Bhutan – India. (Bhandari, 2006).

A study by R. Tobich etal, (2008) used the survey method in gathering information from 216 households in nine rural localities that had benefited from the programme. Statistics gathered in the survey differentiate between electrified and un-electrified study areas to be able to compare differences. The key survey tools used were Information gathered by way of structured household questionnaires, key informant (KI) interviews and focus group discussions (FGDs) Comparative impact assessment was used to study patterns of socioeconomic and demographic development in un-electrified localities and compare these with development patterns in electrified settlements.

Bhandari (2006) in his study of the socio-economic impact of REP in Bhutan, India adopted both qualitative and quantitative techniques in the research. Face to face structured interviews for

electrified households and key informants in electrified villages and non-electrified village were used to collect data for the study. He also used the statistical methods where Chi-square test and the independent t-test were used to analyze data. Factor analysis a statistical procedure used to identify the interrelationships that exist among a large number of variables was also used in this study.

Statistical analysis have also been used for assessing difference in reading hours [World Bank, 2002] among children in electrified and non-electrified households, influence of electrification on maternal health [Sharan et al. 2005], macro level impacts on poverty [Yang, 2003], modeling of electricity consumption [Nasr et al., 2000] and a host of other issues.

Khandker, Barnes and Samad (2009) in their study used Propensity score matching (PSM) technique to evaluate the impact of REP in selected villages in Bangladesh. This technique involved matching households with and without electricity based on observed pre-intervention characteristics. After the matching is done, it becomes possible to observe the difference of average outcome values between these two groups. The PSM technique calculated for both treated (with electricity) and untreated (without electricity) samples, the probability of treatment or electrification as a function of household or village characteristics from a logit or probit model. One disadvantage of PSM method is that matching process may discard a significant number of observations from the original sample non-randomly, making the working sample unrepresentative.

Asian Development Bank (2010) in their impact assessment study on whether REP improves quality of life focused on the impact of rural electrification in three broad areas: economic, environmental and social. They used logical causal models as well as propensity matching methodologies to evaluate the impact of REP in Bhutan. Causal models were generally used to link access to electricity with desired outcomes such as improved household health, education, income and/or energy cost saving.

Kirubi's (2006) study on how important modern energy for micro-enterprises in rural Kenya used qualitative data collection methods where participatory rural appraisal methodology was

used with direct observation and semi structured interviews conducted with key informants in the selected villages. Data analysis in this study was mainly descriptive.

2.8. Conceptual Framework

The conceptual framework behind this research is based on the Theory of Change approach as enhanced by Weiss (1995) where in any development project; there is a chain that links the intervention's inputs and activities to its outputs and impacts. Weiss advanced the 'Theory of Change" as a way to describe the set of assumptions that explain both the mini-steps that lead to the long term goal of interest and the connections between program activities and outcomes that occur at each step of the way. She challenged designers of complex community-based initiatives to be specific about the theories of change guiding their work and suggested that doing so would improve their overall evaluation plans and would strengthen their ability to claim credit for outcomes and impacts that were predicted in their theory.

The theory looks at the intervention, what its intended and measurable outcomes are and, how data is to be collected and analyzed such that the causal links between interventions and outcomes and impacts are described in the most compelling way.

The theory of change was also enhanced as a concept aimed at evaluating the effectiveness of projects by drawing out the underlying assumptions about how they lead to social change.

In the application of this theory to this study, electricity (throught the huge investment of 270 Million Ksh) is seen to have been brought to Kitui County through extension of networks, installation and loading of transformers (inputs); households, commercial centres and social amenities are then wired and connected and use electricity in their day to day activities and in turn were expected to use this electricity to develop their community and themselves and to better interact with their environment (impact).

Reliable power supply, maintenance of the networks and transformers is deemed necessary for sustainability of impacts on community development by the Rural Electrification Project.

This study will therefore focus on the immediate and predicted long term impact of electrification and its outcomes on community development with major indicators of community development being income growth, creation of employment opportunities, better agricultural performance and production, improved communication and awareness, improved functioning of social amenities and increased environmental conservation.

Figure 2.8.1 below represents this framework of the dependent variable -Y (community development), the independent variable (X) and the indicators of community development to be assessed and the moderating variable (MV – Sustainability).

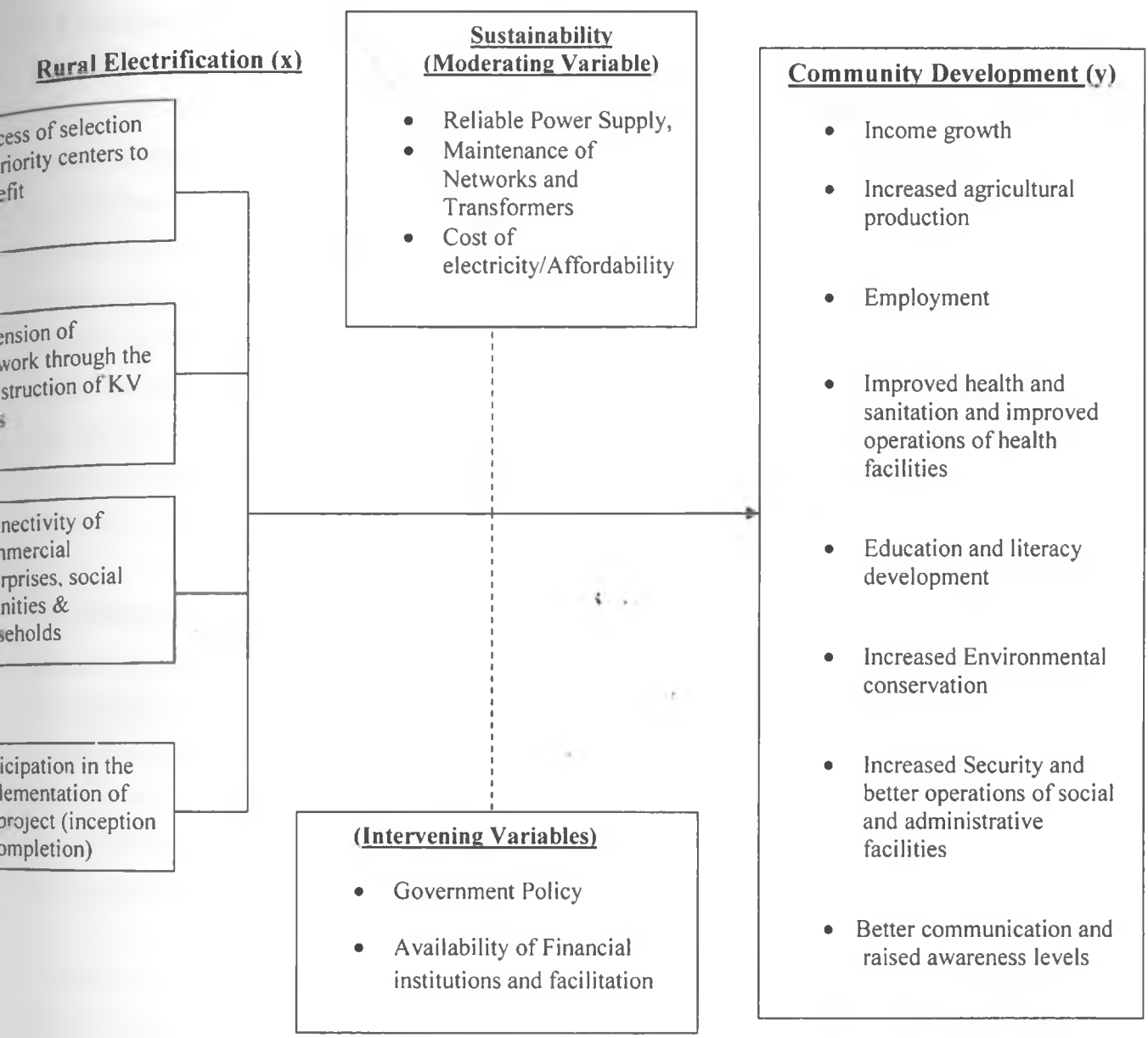

Figure 2.8.1: Conceptual Framework

2.9. Summary of literature review

Many general studies on rural electrification as it relates to development have been carried out (Barnes, Peskin and Fitzgerald 2003; Barnes 1988; Butler, Poe and Tendler 1980; Fluitman 1983; Saunders etal 1975), but there have been few systematic impact studies of particular rural electrification projects. Most of the past evaluation works on specific rural electrification projects has concentrated on project outputs (for example, number of communities or households connected). Such assessments usually do not measure the nature and extent of the accrued benefits, let alone establish the causality as to whether the measured benefits are attributable to electrification. This is particularly true in attempting to analyze the impact of rural electrification on economic and social development, since the primary interest here is not the direct output--electricity--out the more indirect changes in production and lifestyles which result from its use (Cecelski, 1992).

Another problem is the need to know both the "before" and "after" situation in order to measure impacts accurately. Besides all the difficulties normally associated with consumer surveys in developing countries and among the poor, surveys made prior to electrification can only ask for approximations of intended use, while those carried out afterwards must rely upon the memory of users as to energy consumption and prices as changes in productivity are not; and indirect benefits such as environmental improvement are even more difficult to assign. Too many effects will only become evident years after the project has been completed.

According to Cecelski (1992), evaluations should generate information on the effects of rural electrification on economic development by studying the change in standards of living, output employment and other variables after rural electrification. This information should be collected for periods spanning the onset of the completion period to several years so that the long term effects of rural electrification can be examined. This kind of information is currently not being gathered on rural electrification projects and it is recommended that it should be systematically incorporated into future project appraisals. In addition the implementation process right from the conception to the completion should be more participatory and constantly involve the concerned communities in order to ensure sustainability of most projects. Very few projects have been identified as being participatory especially in involving the communities concerned.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter will detail the target population for the study, the research design that was used and the methodologies that were used for data collection and analysis.

3.2. Research Design

This research was guided by the survey method of research to assess benefits of Rural Electrification in Kitui County. The study also used content study research method, where documentation on the project, its different phases was studied and relevant information for this study obtained. Documents related to the feasibility study for the project, mid-term evaluations and review, project final reports and service provider records were relevant to this study and were be sort from the key stakeholders namely the Donor (AFD), REA and KPLC.

The survey carried out questionnaire guided face to face interviews for commercial and administrative centres, health centres and hospitals, schools and education facilities and households that are connected with electricity and those that are not connected. Focus group discussions were conducted with opinion leaders and key informants from four focus groups in the County (community representatives, institutional leaders, business owners, the electricity supply authority and individual beneficiaries) to capture perceptions and experiences from the respective perspectives especially as relates to the process of selection of the priority areas to benefit from the REP.

Questionnaires included information on pre-rural electrification and post-rural electrification characteristics, consumption, costs, revenues, income, energy use patterns and electric appliances use. There were also energy questions in the survey covering the process of implementation of the project and community information on the same, connection, quality of service and general perception by the community of the REP.

3.3. Target Population

This study was carried out in Kitui County. The population studied was also one of the target beneficiary populations for the Rural Electrification Project in Eastern Province.

Table 3.1 (appendix B) details the target priority areas for the REP in Kitui County. 4 districts were selected, divided into 8 schemes with 55 beneficiary priority areas (schools, markets, and health centres) Households in the vicinity of these of these priority areas were also considered as beneficiaries of the project. The number of target connections for this County was 2 032 connections.

This study's target population was all the 55 beneficiary priority areas grouped into 8 scheme and households in the areas. The target was then sampled from each of the 8 schemes.

The population in this target area is generally poor with 60% of its population living below the poverty line. Just like any other rural area that was the target for this project in the 6 provinces of Kenya, Kitui County identified the REP as a mark of development brought to the grassroots. This population has therefore been chosen to act as a representative of the other rural areas in the six provinces with close to or similar characteristics in terms of economic, social, political and cultural attributes that were beneficiaries of the project in order to identify the impact that the REP had on community development in these rural areas.

3.4. Sample Size and Sampling Procedure

The sampling framework to be used in this study was guided by the already clustered target areas, which had been grouped into 4 districts, 8 schemes and then 55 priority areas.
The study adopted a multistage sampling methodology with a random sampling of the 55 priority areas clustered into 8 schemes being carried out first. Table 3.1 (Appendix B) indicates the 55 priority areas clustered into 8 schemes. (EDF, January 2010)

The sampling framework to be used in this study was guided by the already clustered target areas, which have been grouped into 4 districts, 8 schemes and then 55 priority areas. The study

adopted a cluster sampling methodology with a random sampling of the 55 priority areas clustered into 8 schemes being carried out first. Using the below formula (Magnani, R.1997):

$$n = \frac{t^2 \times p(1-p)}{m^2}$$

Description:

n = required sample size

t = confidence level at 95% (standard value of 1.96)

p = number of priority areas identified for the project in each scheme over the total number of areas

m = margin of error at 5% (standard value of 0.05)

For each sample randomly selected, N was then divided amongst the number of clusters to identify the sample for each cluster = n/8 and then by 3 for the three number of target groups (households, social institutions and commercial enterprises).

Table 3.2. below indicates how the sample was distributed.

Scheme N°	N° of Priority areas identified for the Project	Random Sample selected for the study in each scheme	Number of households per chosen priority area (electrified and non electrified) 50-50	Number of social amenities (schools, health centres and administrative centres) (electrified and non electrified) in each priority area	Number of Commercial enterprises (electrified and non electrified)
14	4	13	4	5	4
15A	8	24	8	8	8
16	3	9	3	3	3
17	13	17	6	6	5
50	6	19	6	6	7
55	9	25	8	9	8
56	5	15	5	5	5
57	7	21	7	7	7
	55	**143**	**47**	**49**	**47**

Table 3.2: Distribution of the sample participants for the study

3.5. Data Collection Tools

In order to obtain insights into the specific mechanisms by which rural electrification affected the target area of study, information on the use of electricity, electric consumers and general observations and impressions of the population on the project, several data collection tools were employed.

Content information and coverage on the project was obtained from the various reports produced at the onset, during implementation and at the completion of the project. The reports concerned were the feasibility report, the project appraisal report, the progress reports and project completion report. Records on connections, disconnections and general customer information obtained from the service provider were also studied.

Qualitative approach was identified for the collection of data where two guidelines were used in order to obtain the necessary output for the survey. These guides included in the appendix A were:

i) 4 Questionnaire guides (both open and closed ended) for the one on one interviews (for social and administrative institutions, for households, for commercial enterprises and for electricity provider - KPLC)

ii) Focus group discussion guidelines

The target population was mostly rural and the English language posed a problem for most Key informants targeted. It was therefore thought wise to use guidelines in form of questionnaires and FGDs guidelines which guided the interviewer who mostly used the local language to obtain the information required during the interviews and recorded it through writing down notes. For each scheme it was desirable that there is at least one focus group meeting.

The questionnaire guide had been constructed in modular format such a way that it would be used for both the electrified and non-electrified respondents and the information required to make the comparative analysis would be obtained.

3.5.1 Pilot testing research

A pilot testing research was conducted in one of the areas that were not sampled among the sample size of 143 but that had also been a beneficiary of the project. The research questionnaire guideline was administered for a sample of the priority areas targeted (for social and administrative institutions, for households and for commercial enterprises). The response rate was good.

3.5.2 Validity of the instrument

According to Ezemenari and Rudqvist (1999), Qualitative methods rely less on statistical precision to ensure validity because often, the sample size is such that statistical tests are not possible. Thus, triangulation is often used to ensure data validity. In this study therefore three methods of triangulation were employed. These were:

i) Data Triangulation :

Data was collected from different participants in different occupations, status positions for each of the three target priority beneficiaries of the project. (Commercial – barbers, welders, etc) Social amenities (Elementary, Primary and Secondary and schools, health centres, hospitals, Administrative offices- Chiefs, District Commissioners etc.

ii) Investigator Triangulation

Here different qualified evaluators were used to carry out the data collection using the survey instruments discussed earlier on in this report.

iii) Method Triangulation

Method triangulation was also applied through the use of multiple data collection instruments in the study. These data collection instruments included questionnaire guided interviews, Focus group discussions and document analysis.

3.5.3 Reliability of the instrument

For reliability, triangulation was used and the test retest method was also applied. Method triangulation where questionnaire guided interviews and focus group discussions were used to collect information. In each sampled area there was at least one focus group discussion that incorporated all the priority beneficiaries that had been interviewed using the questionnaire guide.

3.6. Data Collection Procedure

The study prepared the data collection procedure, where the initial stage was the construction of the data collection instruments which were provided to the competent study investigators with clear instructions and explanations on their administration in the field and the expected deliverables at the end of the study. A schedule of the period of the study which was three weeks was also prepared and the timings for carrying out the collection of data were indicated in the schedule. Regular weekly briefs were held for communication on progress of the data collection in the field. At the end of the study, presentation of all filled out questionnaires and information from the focus group discussions was presented and interpreted.

3.7. Data Analysis Technique

There was need to analyze whether there was a causal link between the entire process of the implementation of the rural electrification project and community development, the two variables identified in this study. The relationship existing between the two variables; Rural electrification (X) and Community development (Y) was analyzed using Content analysis and Descriptive analysis methodologies. The following simple steps were used in the analysis:

(i) the identification of the main issues or themes raised by the interviewees and the documents studied;
(ii) the grouping of more detailed topics within each of these themes
(iii) the specification of what was actually said, (the 'components') within each theme;
(iv) finally the construction of an overall picture by exploring the inter-relationships between the identified variables for this study.

3.8. Operational Definition of Variables

This study intended to look at two variables that is, Rural Electrification (X) the components of which were factors affecting Community Development (Y) with a bid to identify the causal relationship between the two. Rural Electrification which in this study was identified as the selection of priority areas, extension of Low voltage and Medium voltage lines, installation and loading of transformer centers and finally connection to households, commercial centres, social amenities and administrative centres and participation the community in the implementation process.

Electricity connection and use was then intended to translate into change to the community in terms of growth of income from commercial enterprises, employment creation, better agricultural productivity, enhanced functioning of health facilities translating to better community health and sanitation, better functions of the administrative centres in terms of service delivery to the community, enhanced communication and media awareness. This is what had been identified as community development for purposes of this study. Table 3.3 here below outlines the different variables their indicators and their methods of data collection and analysis.

Objectives	Variable	Indicator	Measurement	Scale	Data Collection	Data Analysis
i) To evaluate the extent to which the selection of the schemes and priority centers to benefit from the Rural Electrification Project influenced community development in the County.	Process of selection of priority centres (x)	Selected priority centres in each district	-Criteria and rationale for selection of priority centres	Nominal	Documentary evidence of process of selection, interview guide and focus group discussion	Content analysis and descriptive analysis
ii) To identify whether the construction and extension of the electricity networks in the priority areas influenced community development	Construction and extension of networks (x)	Presence of low KV and High KV lines in target areas and transformers	-Number of kms of electricity network constructed vs initial target network	Nominal	Documentary evidence and observation	Descriptive analysis
	Community Development(y)	Income growth	-Change in income patterns	Ordinal	Interview guide and focus group discussions	Content analysis

iii) To assess whether the level of connectivity for commercial enterprises, social amenities and households influenced community development	Level of Connectivity for priority areas (x)	Level of Connectivity of the priority areas	-Number of connected priority areas vs. actual target	Ordinal	Documentary evidence	Descriptive analysis
	Community Development (y)	Increased agricultural production	-Change in agricultural production	Ordinal	Interview guide	Content analysis
	Community Development (y)	Improved Health and Sanitation and operations of health facilities	-Change to use of electricity to perform day to day functions leading to change in health and sanitation	Ordinal	Interview guide	Content analysis
	Community Development (y)	Education and Literacy development	-Improved school performance and operations -Information technology aided studies	Ordinal	Interview guide	Content analysis
	Community Development (y)`	- Increased security - Better operations of	- Change in number of reported crimes	Ordinal	Interview guide	Content analysis

		social and administrative amenities
	Community Development (y)	Increased Environmental Conservation
	Community Development (y)	Better Communication and raised awareness levels
iv) To establish whether community participation in the implementation of the project enhanced community development	Community Participation (x)	Involvement of the community in the project processes
	Community	Employment creation

- Quicker /efficient administrative/social amenities		Focus group discussion	
-Reduced use of wood fuel and charcoal	Ordinal	Interview guide, focus group discussions	Content analysis
-Switch to using ICT equipment , TV, Radio, Computers for information	Nominal and Ordinal	Interview guide, Focus group discussions	Content analysis
- information on the project -Wayleaves compensation -Involvement in construction works process -Provision/supply of local materials	Nominal	Interview guide, Focus group discussions	Content analysis
- Emergence and	Nominal	Interview	Content

	Development (y)	
	Sustainability (Moderating Variable)	-Reliable po supply - Maintenan networks an transformers - Cost of electricity/af

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1. Introduction

This chapter consists of the presentation and analysis of the data collected with the objective of identifying a possible relation between the Rural Electrification Project Phase II and Community Development in Kitui County. The overall research results identified the possibilities that existed that the project had a major impact on the various indicators of community development as previously identified in the conceptual framework. Content analysis and descriptive analysis was used in the analysis of the data collected.

4.2. Selection of priority areas to benefit from the project

A feasibility study for the Rural Electrification Project was carried out and completed in November 2004 by a joint venture consultant – Electricité de France and Aberdare Engineering Ltd (AEL), a Nairobi based firm. The study was to survey potential consumer load centres identified by the MoE targeting domestic consumers, social and administrative centres, shops and businesses for the whole project. 10 investigators used the Global Positioning System (GPS) and recorded the GPS coordinates. For each scheme, the key load centers were identified, comprising mainly of businesses, markets, and public institutions such as health centers and schools. Based on the field survey of the potential schemes, technical aspects of the potential schemes were assessed and economic analysis was completed using rough assumptions of capital investments and number of potential connections. Based on this, the internal rates of return (IRR) were calculated for all the potential schemes. The methodology used to calculate the IRRs was

based on the investment cost, the load parameters and the economic calculations based on fuel costs to be substituted by the provision of electricity. Thus, by calculating the investment cost and the benefits, they estimated the annual cash flow from which the IRR was then calculated. Since EDF assumed that the connection of rural households is never economically justified even in developed countries, only the load centers were taken into account in the IRR calculations. This was under the assumptions that the connection fees of the domestic consumers cover only the cost of the service lines to the main LV lines. The load centers were prioritized for implementation based on the estimated IRRs. Any centre that had a positive IRR was chosen as a beneficiary for the project. From table 4.1 and 4.2 below it emerges that 100% of the Kitui County beneficiaries of the project were not informed or involved in the selection of the priority areas to benefit in the project. They were also not aware of the IRR method used for selection as is evident in table 4.3 where 87% of the respondents believed they benefited by being chosen as beneficiaries due their political support to a particular leader. Only 13% believed it was a government project seeking to enhance rural development.

Table 4.1 Involvement of the community in the selection process for priority areas

Scheme No.	Random Sample selected for the study in each scheme	Number of households per chosen priority area (electrified and non electrified) 50-50	Number of social amenities (schools, health centres and administrative centres) (electrified and non electrified) in each priority area	Number of Commercial enterprises (electrified and non electrified)	Information or Involvement in selection of priority areas
14	13	4	5	4	Nil
15A	24	8	8	8	Nil
16	9	3	3	3	Nil
17	17	6	6	5	Nil
50	19	6	6	7	Nil
55	25	8	9	8	Nil
56	15	5	5	5	Nil
57	21	7	7	7	Nil
Total	**143**	**47**	**49**	**47**	

Table 4.2. Reasons given for the selection of the priority areas

Random Sample selected for the study in each scheme	Number of households per chosen priority area (electrified and non electrified) 50-50	Number of social amenities (schools, health centres and administrative centres) (electrified and non electrified) in each priority area	Number of Commercial enterprises (electrified and non electrified)	Reasons given for selection of particular priority area to benefit by the respondents	
				Political support for local leader	Other reasons - government project, rural development
13	4	5	4	10	2
24	8	8	8	22	2
9	3	3	3	5	0
17	6	6	5	15	1
19	6	6	7	15	4
25	8	9	8	25	0
15	5	5	5	15	0
21	7	7	7	18	2
143	**47**	**49**	**47**	**125**	**11**

Table 4.3. Analysis of the reason for the selection of priority areas

Scheme N°	N total	Mean	Standard Deviation	Sum	Percentage
Political support of area politician	8	15.625	6.32314	125	87.41%
Other reasons	8	1.375	1.40789	11	7.69%
Sample selected	8	17.875	5.48862	143	100%

From the Tables 4.1 and 4.2 and using the mean indicated in table 4.3, we can derive that 87.41% of the respondents believed that the beneficiary areas and schemes were as a result of their support for the local political leader. A standard deviation of 6.32 reveals a greater dispersion where almost the total population was unaware of any other reason for selection of priority areas to benefit other than due to political support for the local leader. It is also emerges that 100% of the respondents were not involved in the selection of the priority areas to benefit (Table 4.1).

4.3. Construction and extension of networks

This being the major component of the project saw the construction and extension of 168 085 Km of MV route networks and 28 191 of LV networks. Table 4.4 (in the appendices) and figure 4.1.1 indicate that 100% of the initial target of construction of the networks was actually achieved.

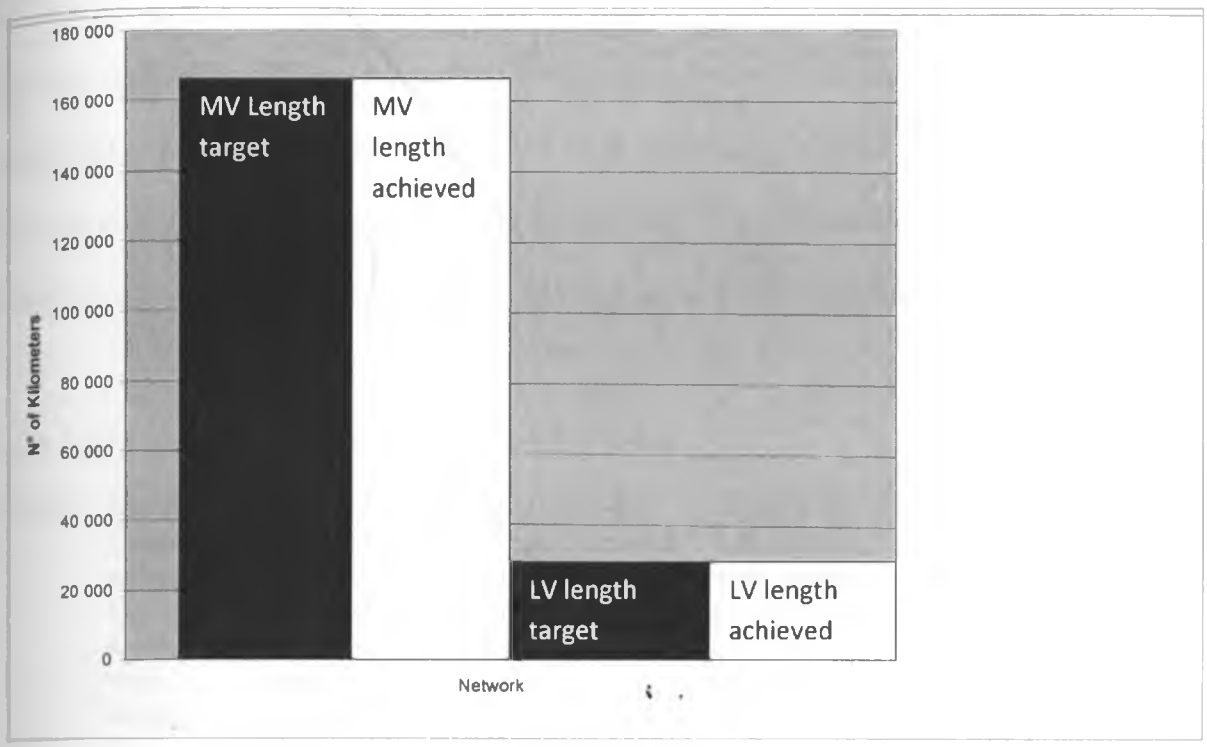

Figure 4.1.1: Initial target of construction of networks vs. actual construction

4.4. Level of Connectivity for priority areas

Table 4.5. (in the appendix) indicates that the targeted connections for the project were 2032 connections at the time of completion of the project the only attained connections were 337 connections with 709 service lines having been metered.

The data obtained in Tables 4.6 and 4.7 reflect that only 64 respondents out of the total 143 respondents sampled in the 8 schemes had been connected. In total for all the schemes as reflected in table 4.7 the connectivity level is only 44%. This low connectivity level is primarily caused by lack of both connection and wiring fees as reflected in table 4.8.

Table 4.6 Level of connectivity in the sampled schemes

Scheme N°	Random Sample selected for the study in each scheme	Number of households per chosen priority area (electrified and non electrified) 50-50	Number of social amenities (schools, health centres and administrative centres) (electrified and non electrified) in each priority area	Number of Commercial enterprises (electrified and non electrified)	Connected	Not connected
14	13	4	5	4	4	9
15A	24	8	8	8	2	22
16	9	3	3	3	4	5
17	17	6	6	5	10	7
50	19	6	6	7	9	10
55	25	8	9	8	3	22
56	15	5	5	5	12	3
57	21	7	7	7	20	1
Total	143	47	49	47	64	79

Table 4.7 Analysis of the level of connectivity

Scheme N°	N total	Mean	Standard Deviation	Sum	Percentage
Connected	8	8	6.07101	64	44.76%
Not Connected	8	9.875	8.04341	79	55.24%
Sample selected	8	17.875	5.48862	143	100%

Table 4.8. Reasons for non-connectivity in the sampled areas

Scheme N°	Random Sample selected for the study in each scheme	Number of households per chosen priority area (electrified and non electrified) 50-50	Number of social amenities (schools, health centres and administrative centres) (electrified and non electrified) in each priority area	Number of Commercial enterprises (electrified and non electrified)	Reasons for not connecting		
					Lack of connection fee	Lack of wiring fee	Lack of both connection and wiring fees
14	13	4	5	4	9	9	9
15A	24	8	8	8	10	12	12
16	9	3	3	3	5	5	5
17	17	6	6	5	6	5	5
50	19	6	6	7	10	10	10
55	25	8	9	8	22	15	15
56	15	5	5	5	3	0	0
57	21	7	7	7	1	0	0
Total	**143**	**47**	**49**	**47**	**66**	**56**	**56**

4.5. Community Participation

As earlier indicated in Table 4.1 the community of Kitui County was not at all involved in the selection of the priority areas to benefit from the project.

4.5.1. Dissemination of Information concerning the project

Table 4.9 indicates that the information concerning the project to the community emanated 75% from the Politicians and 22% from the media and local administration. There was absolutely no Information from the project designers to the community on the processes and phases, including requirements from them for the project. According to project final evaluation report (2010) due to the non involvement of the community and awareness on issues relating to the project, for some schemes, complaints and debates ensued. These were not resolved even after work commenced, leading to additional delays and displacement of poles which were already built by the contractors. Unfortunately, this created misunderstanding and waste of money as redesign was to be re-done at the cost of the project. The re-calculation of materials needed for the actual work and an increased invoice paid to the contractors also led to increase in cost of materials and delays in ordering.

Table 4.9 Sources of information for the community on the project

Scheme N°	Random Sample selected for the study in each scheme	Number of households per chosen priority area (electrified and non electrified) 50-50	Number of social amenities (schools, health centres and administrative centres) (electrified and non electrified) in each priority area	Number of Commercial enterprises (electrified and non electrified)	Community Participation Information on the Project (sources)		
					Politicians	Media & Local administration	Project designers
14	13	4	5	4	13	0	0
15A	24	8	8	8	20	4	0
16	9	3	3	3	7	2	0
17	17	6	6	5	17	0	0
50	19	6	6	7	18	1	0
55	25	8	9	8	2	20	0
56	15	5	5	5	10	5	0
57	21	7	7	7	21	0	0
Total	**143**	**47**	**49**	**47**	**108**	**32**	**0**

4.5.2. Compensation for Wayleaves

The Energy Act (2006) requires that consent of the land owner through whose land an electric supply line will pass must give consent before the land is entered upon to carry out a survey and/or to lay or connect an electric supply line. The law requires that the consent to enter the land must have been concluded and compensations made prior to commencement of construction.

The acquisition of way-leaves was a critical component in the project design and involved the following activities:

1. General survey of the proposed areas to be covered by the distribution network;
2. Design the transmission lines network and sites for load centers;
3. Acquire consent for the way-leaves;
4. Assess damages to property and recommend compensation;
5. Peg for the poles for HV, LV and the distribution substations (transformers) sites; and
6. Pay the compensation in consultation with local administration

Table 4.10 and figure 4.1.2 indicates the respondents affected by wayleaves compensation, those who were compensated and those who were not compensated. It also reflects status of awareness of the process of compensation by the 43 respondents. Of these respondents, 32 were compensated for poles and networks passing through their land representing 74.4% of the total affected, while 11 representing 25.5% of those affected were not compensated. Again out of the total 43 respondents, 33 respondents representing 76% of the total affected were not aware of the

rationale, process for compensation and had complaints about the whole process. In Appendix E there is a letter of complaint for non compensation for wayleaves acquisition.

Table 4.10. Compensation for wayleaves

Scheme N°	Sample selected in each scheme	Number of households	Number of social amenities	Number of Commercial enterprises	Community Participation Wayleaves Compensation			
					Affected	Compensated	Not compensated	Unaware of Process/ rationale for compensa with complaints
14	13	4	5	4	2	1	1	1
15A	24	8	8	8	6	0	6	6
16	9	3	3	3	0	0	0	0
17	17	6	6	5	8	7	1	1
50	19	6	6	7	10	10	0	10
55	25	8	9	8	5	5	0	5
56	15	5	5	5	3	0	3	3
57	21	7	7	7	9	9	0	7
Total	**143**	**47**	**49**	**47**	**43**	**32**	**11**	**33**

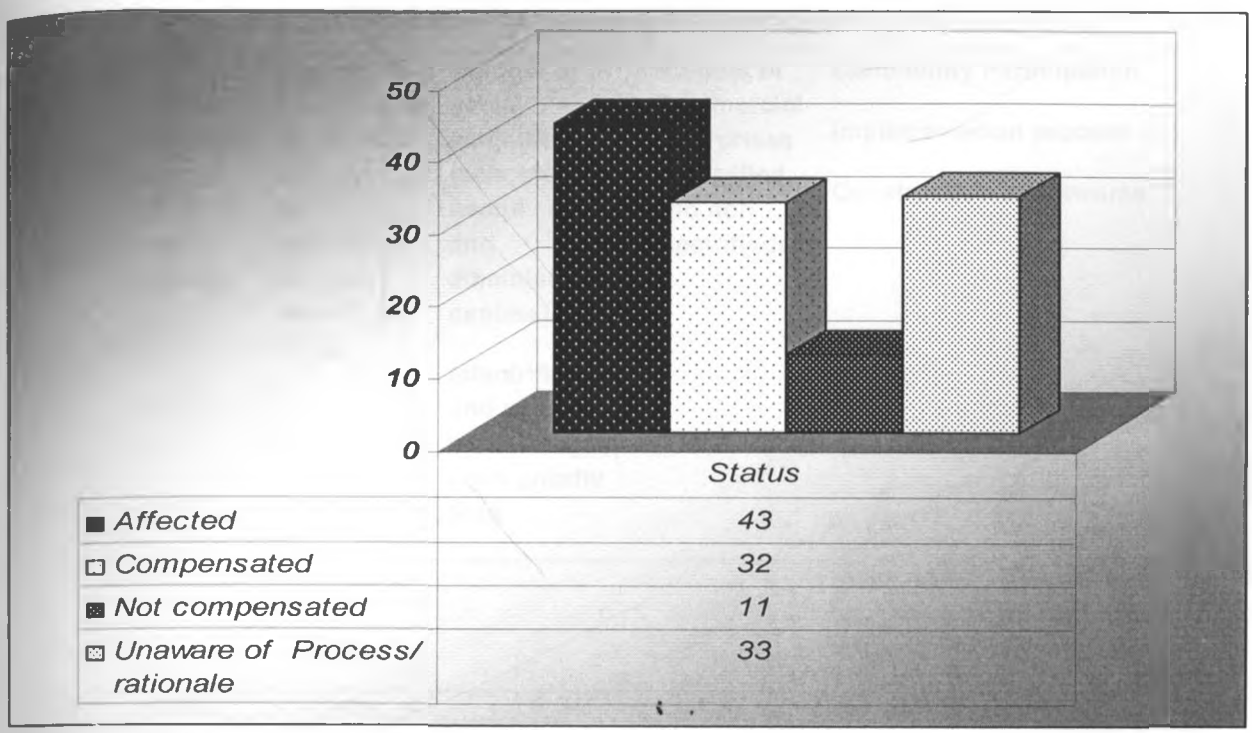

Figure 4.1.2: Status of wayleaves compensation

4.5.3. Participation in the implementation process

Table 4.11 below indicates that the community was 100% involved in the construction of networks, where they were employed to perform tasks which included digging of holes, pegging and erection of poles.

Table 4.11: Community participation in the implementation process

Scheme N°	Random Sample selected for the study in each scheme	Number of households per chosen priority area (electrified and non electrified) 50-50	Number of social amenities (schools, health centres and administrative centres) (electrified and non electrified) in each priority area	Number of Commercial enterprises (electrified and non electrified)	Community Participation Implementation process – Construction of networks	
					Respondent for Yes - Involved	Respondents for NO - Not involved
14	13	4	5	4	13	0
15A	24	8	8	8	24	0
16	9	3	3	3	9	0
17	17	6	6	5	17	0
50	19	6	6	7	19	0
55	25	8	9	8	25	0
56	15	5	5	5	15	0
57	21	7	7	7	21	0
Total	**143**	**47**	**49**	**47**	**143**	**0**

4.6. Community Development

The study endeavored to identify the level of community development experienced since the onset of the construction of networks and eventual connectivity of the different priority areas that benefited and that were using electricity for their day to day activities. In this regard, the various indicators of community development as identified in the conceptual framework were studied in

depth through either selection of two or three respondents to for each indicator and the use of the focus group discussions to come up with information on the eventual benefits. This was in order to be able to get the situation before the rural electrification and situation after. Most respondents were not in a position to give this information especially as concerns previous incomes compared to current ones.

4.6.1. Income growth and employment creation

With regard to income growth and employment creation, the two cases below were intensively looked into.

Case one – Commercial Centre - Cyber café offering ICT services. –Mbitini town (29 year old owner).

This cyber café carries out printing services mostly for schools within the area that are not connected to electricity and do not have the equipment or technical operation know how of most ICT equipment.

One owner respondent was making at least 40 000 KSh per month gross salary. Seeing as the premises were hers she was not paying rent, Her only expense was the loans she was paying off for the equipment she had bought, computer, scanner, colour printer, photocopier and digital camera and the monthly electricity expenses, which all totaled to 10 000 ksh. – (3 500Ksh – monthly bill and 6 500 Ksh – Loan repayment and the other expenses related to running of the machines. Her estimated profit per month was between 15 000 and 25 000 KSh. a month. She was in the process of training one more employee to work for her at her premises.

Case two – Commercial centre - 25 year old business owner - Welding, Phone battery charging, barber shop and small workshop training enterprise. – Kasanga Market in Mwingi

Before the extension of networks, Mr. Mutuku was not running the business. However after connection he now successfully runs his business and has employed two extra staff. He is able to make a minimum of 30 000 KSh a month. He pays no rent since the premise belongs to his parents. His monthly electricity bill totals to between 1500 and 1800 Ksh. His montly profit therefore is an average of 28 200 Ksh. Mr. Mutuku prospects on creating a proper schooling workshop where he can train more of his fellow youth on the welding skills. He also had plans to expand his barber shop to also include a salon.

4.6.2. Improved health and sanitation

Four dispensaries and health centres were interviewed during the study and all of them were connected to electricity (Table 4.12). These dispensaries and health centres informed the study that they can now fully operate maternities and even operate them at night. They are now able to store vaccines and drugs in coolers in the dispensaries and have significantly reduced referrals of patients to the main Kitui District Hospital. They have also obtained modern laboratory equipment that uses electricity to manage their operations, which to the community has reduced years and years of long treks or rough terrains to seek treatment in the District hospitals where help could not be given at the local health centres. The respondents also were happy about the presence of electricity for example in schemes such as Katheka Market which had facilitated the pumping of water from a borehole that is been used by the dispensary and the community of that

area and thus improving sanitation and reducing infections and diseases related to unclean water and poor hygiene.

Table 4.12. Level of connectivity of health centres and dispensaries sampled

Scheme N°	Number of social amenities (Health centres /Dispensaries interviewed	Connected and using electricity for day to day activities
14	0	
15A	1	yes
16	1	Yes
17	1	yes
50	1	Yes
55	0	
56	0	
57	0	
Total	**4**	

4.6.3. Education and literacy development

A total of 8 school heads and administrators were interviewed during the study. Out of these four were connected while the other 4 were not connected as indicated in table 16. Those that were connected informed the survey that since they were connected they were able to use computers for administrative purposes such as typing exams. They were also able to train the students in ICT, conduct media aided studies and using storage devices such as Compact Discs, Digital Versatile Discs (DVD's) and also to use electronic devices of entertainment such as Television Sets and Radios. They were also now able to use electricity and electric equipment for printing of standard exam papers.

Most schools were very content that they can now carry out more studies at night and also provide adequate security to their students due to connectivity. One school was using electricity to pump water for their day to day use. However connectivity for most of the schools was a challenge due to high connectivity and wiring fees, high power tarrifs, and electric equipment being too expensive (Table 4.13)

Table 4.13. Connectivity of schools and reasons for non-connectivity

Scheme N°	Number of social amenities (schools) (electrified and non electrified) in each priority area Interviewed	Connected	Not connected	Reason not connected
14	1	1	0	
15A	0	0	0	
16	1	1	0	
17	2	1	1	Lack of connectivity and wiring fee
50	1	0	1	Lack of connectivity and wiring fee
55	1	0	1	Too expensive and electric equipment expensive too
56	1	1	0	
57	1	0	1	Cost of connection and wiring
Total	8	4	4	

4.6.4. Increased security and better operation of administrative and social amenities

The 2 local provincial administrations interviewed using focus group discussion guidelines and some opinion leaders, together with a few business men at large confirmed that there was better operation of social amenities and administration offices due to connectivity. Some Communities were using power to pump water from a borehole for their day to day use. Reduced commuter time and cost of commuting to perform duties such as phone charging, administrative duties such as typing of official documents, and printing, scanning and sending emails in Kitui town centre was notable since the onset of the Rural Electrification Project. They also confirmed that most administrative and social amenities notably schools and vocational centers were able to now conduct their operations very late and operated more effectively. District administrative centres and police posts were also operating optimally and 24 hours due to connectivity to electricity.

4.6.5. Increased environmental conservation

Table 4.14 indicate 79 out of the total 143 respondents that is 55.2% of the respondents were not connected to electricity and were still using other sources of energy such as firewood, charcoal, paraffin and diesel. 64 out of the total 143 respondents that is 44.7% of the respondents who are connected to electricity were still using other forms of fuel for their day to day activities. To them it is relatively cheaper. The electric appliances that can be used are extremely expensive and not able to cook for large families at once and also for schools and in consideration of the fact that most of these Community households are large comprising of 6-15 members. Almost all of those interviewed substituted electricity for lighting with paraffin lamps. It was noted also that firewood and cooking with firewood was generally a cultural issue, deeply rooted in the communities of Kitui County. Most respondents informed the survey that they preferred food

cooked with firewood as it tasted sweeter than food cooked with any other type of fuel and they would choose firewood over electricity for cooking.

Table 4.14: Use of electricity and other fuel sources

Scheme No.	Random Sample selected for the study in each scheme	Number of households per chosen priority area (electrified and non electrified) 50-50	Number of social amenities (schools, health centres and administrative centres) (electrified and non electrified) in each priority area	Number of Commercial enterprises (electrified and non electrified)	Using charcoal and firewood, diesel, paraffin	Using both electricity and other forms of fuel
14	13	4	5	4	9	4
15A	24	8	8	8	22	2
16	9	3	3	3	5	4
17	17	6	6	5	7	10
50	19	6	6	7	10	9
55	25	8	9	8	22	3
56	15	5	5	5	3	12
57	21	7	7	7	1	20
Total	**143**	**47**	**49**	**47**	**79**	**64**

4.6.6. Better Communication and raised awareness levels.

Most households, commercial enterprise owners and social amenities interviewed consider the communication and awareness levels to have risen since the connection of their premises to electricity. .This is especially significant in the use of mobile phone technology to pass information, media accessibility and awareness. Most households can now be kept informed of

local and world's events through their television sets and radios which now use electricity. Previously most households used batteries for their radios and did not have television sets. Schools can now keep Television sets and radios for information and media aided learning.

The presence of business in most markets that can serve as points for charging mobile phones and batteries has greatly enhanced the use of mobile phones and television sets for communication and information.

4.6.7. Increased agricultural production

Significantly absent in all the schemes and areas where the research was conducted was the utilization of electricity to improve agriculture. Kitui County as earlier discussed conducts mainly subsistence agriculture and it would have been of huge significance to have seen electricity being used to pump water for irrigation purposes. This is however not the case for all of the respondents in the survey.

4.7. Sustainability

A brief questionnaire guided interview was conducted with the local KPLC agency in order to establish the sustainability of the project. In the interview with the customers, there was an attempt to identify whether the project would be sustainable.

4.7.1. Soft loans to facilitate connectivity

A pilot revolving fund – Stima loan- had been introduced to accelerate connectivity. This fund recently was exhausted. This fund was intended at providing loans to customers to enable them be connected and slowly offset the loan in their monthly electricity bills. A customer had to make a down payment of 9 000 KSh and then they would be connected. After connection the

customer would then offset the loan in their monthly electricity bills. KPLC hoped that this fund will be renewed otherwise it provides a real setback to the continuity of connections in this county.

4.7.2. Operation and Maintenance

According to KPLC, the number of reported vandalisms of transformers is relatively low in this region. However most of all interviewed customers complained of constant blackouts especially during rainy seasons and lack of adequate communication in the event the provider – KPLC – is going to switch of power for routine maintenance. KPLC however confirmed that routine maintenance exercises were always communicated through the local dailies. It was noted that however very few customers in this region bought newspapers especially those in the outskirts of Kitui town.

4.7.3 Disconnections

KPLC reported a maximum of 20 disconnections per day for non- payment of bills amounting to 10% of all their connections. Reconnection is always accompanied by a fee which the customers are sometimes not able to pay or may take quite a while before finding the funds.

KPLC also informed the survey that the cost of the electricity bill seemed also relatively high especially for households. Most commercial enterprises, social amenities and administrative centres whose monthly bills ranged from 1 000 Ksh to 6 000 Ksh were however able to pay their bills since they have a readily somewhat income or have government budgetary support for recurring expenses.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, RECOMMENDATIONS AND CONCLUSIONS

5.1. Introduction

Preliminary emerging issues from the findings presented in the previous chapter illuminate the general desire by the community in Kitui County for electricity for development. This chapter will seek to give a summary of the key findings of the research and from this findings discuss in detail the relationship or influence of the Rural Electrification Project on development in the communities of Kitui County. It will also identify some recommendations and give conclusions that can be useful for the main stakeholders in the energy sector and especially with regard to lessons learnt from the Rural Electrification project and the planning for future similar projects.

5.2. Summary of Findings

In view of the main findings during the survey it can be concluded that there have been significant gains of the Rural Electrification Project, with increased employment creation and income growths in commercial enterprises that are connected to electricity. Social amenities and administrative centres that are connected are also functioning optimally and there were increased levels of communication and awareness. 87% of the respondents in the study believed they benefited by being chosen as beneficiaries to the project due their political support to a particular local leader. Only 13% believed it was a government project seeking to enhance rural development. The findings also concluded that 100% of the initial target of construction of the networks was actually achieved but connectivity levels were still very low falling at 44% with 33% of the respondents who were not connected reporting that this was due to lack of both

connection and wiring fees. The soft loans provided through the Stima Loan for connectivity had also recently been exhausted. With regard to community participation, it was noted that 100% of the respondents were happy with the project because it has incorporated the youth in the implementation process by employing them in the digging, pegging and erection of poles. However with regard to wayleaves compensation 74.4% of those who land was affected by wayleaves acquisition were compensated. 76% of the respondents did however not understand the rationale or process used in wayleaves compensation and had complaints about how the process was carried out. Community development was emerging in those commercial centres, social amenities and households that were connected. However notable is the low conservation of the environment as 69% of those using electricity were also using charcoal, firewood, diesel and paraffin for their day to day activities.

It was also noted with regard to sustainability and from the findings that 90% of the respondents who were connected complained of constant blackouts and lack of information on the routine maintenance schedules despite the fact that KPLC confirmed that these were announced in the local dailies. Vandalisms of cables and transformers were rare but there was a high rate of disconnections of 20 per day totaling to 10% of all KPLC connections due to non-payment of bills.

5.3. Discussions of the Study

The rural electrification Project was seen as the Kitui Community as the upward spur economically and socially. Most of the respondents were happy to see the extension of networks even into the remotest of markets and town centres, district offices, schools, dispensaries and health centres. However from the findings it can be noted that several hindrances including

primordially the relatively high connection costs have slowed down the rate of development aided by electricity in terms of employment, income growth, better agricultural production, improved literacy levels and improved health and sanitation. Environmental conservation has also suffered a major setback as traditional and other forms of non–environmentally friendly energy continued to play a major part of this community's day to day life. The findings however reveal a very positive influence of the project on the various priority centres; commercial centres, social and administrative amenities that are connected and using electricity for their day to day activities.

5.3.1. Selection of priority areas to benefit from the project and Community Development

From the data analysis it can be identified that this process of selection of the priority areas very minimally involved the community and as a result the process was subject to abuse by local leaders and politicians. 90% of those interviewed during the survey indicated that the reason why some areas were selected over other areas was due to political support for a particular leader. Political leaders had used the project as a campaign tool indicating to a somewhat non-informed population that they were the ones bringing electrification to their constituents and the areas that had not benefited were victims of non-supportive behavior for the particular population. This had created a false perception of how development projects come about and brought out the gap that exists between most project beneficiaries and the project implementation processes. The lack of information on the process of selection of areas to benefit to the population brings out an ignorant community that awaits projects and that have no say on how, where and when projects that are supposed to benefit them are conceived or implemented.

KPLC the operation and maintenance agency especially the agency in Kitui County also complained of having been minimally involved in the process of selection of the areas to benefit. The local agency being the final operating and maintenance agency felt that it should have been involved in the selection in order to identify areas that would optimize connections. As a result there were centres that benefited that were not optimally using power over some centres that would have optimally used electricity due the highly capable population and infrastructure available.

IRR was the only criterion used in the prioritization and selection of the schemes to benefit. The social profile of the communities, poverty levels, levels of awareness, and attitude towards development and new innovations were not considered in this selection. This in turn seemed to have brought about the major setbacks to economic development, income growth, employment creation especially due to low connectivity. The lack of knowledge on socio-economic capabilities of the community seemed to have led to the overlooking of the issues related to connectivity and utilization of electricity for development.

In previous literature reviewed in this paper it was noted that countries such as China, Brazil, India and South Africa had a prerequisite to any rural electrification programme where sound data was collected on the electrification needs of the target area and the expected use of electricity particularly for productive use. This would therefore enable for choice of the suitable technology and processes to ensure maximum benefits to the communities concerned especially the most disadvantaged. This seemed to have been overlooked in the project here in Kitui County and would be a lesson to learn for subsequent projects.

5.3.2. Extension of networks, installation of transformers and Community Development

This being the major component of the project saw the construction and extension of 168 085 Km of MV route networks and 28 191 of LV networks as revealed in the data analysis. The networks were quite expansive cutting across rough terrains and fulfilling the objective of bringing power close to the community. On sighting the construction of the networks the communities started acquiring commercial premises for business and started wiring the premises in readiness for the acquisition of electricity. The extension of the network was seen by 80% of the respondents in the survey as the hope that finally they could get electricity to their homes, schools, business premises and utilize it to advance the performance of their day to day activities. In the literature review to this paper it was identified that most rural electrification in China, Brazil, India and South Africa are geared towards extension of networks with a view to promoting socio-economic development in rural areas which was the case also with the Kenyan Rural Electrification Project.

5.3.3 Level of Connectivity and Community Development

The table 5.1 below indicates the connection rates for the different priority beneficiaries for the project:

Table 5.1: KPLC Connection rates

Priority centre	Type of Connection	Amount	Meter deposit	Total
Schools	single phase	32,480	5, 000	37,480
Schools	3 phase	46,400	5,000	51,400
Clinics	3 phase	46,400	5,000	51,400
Business	Single phase	17,400	5,000	22,400
Business	3 phase	46,400	5,000	51,400
Household	Single phase	32,480	5,000	37,480

The above rates are evidently quite high for the rural population. As earlier indicated in this paper the poverty index of Kitui county is 63% meaning that more than half the population is poor. In addition there are costs that are associated with wiring before connections can be done. These costs for most of the respondents were relatively high depending on the premise and electricity usage and as can be seen from the level of connectivity and the reasons for non-connectivity.

The project included a component on connectivity through a revolving fund. This fund was run under the marketing name Stima Loan. This facility provided connection to customers who were able to make a deposit of an amount of 9,000 Ksh. They would then offset the loan in their subsequent bills. It was however also difficult for most of the population to rise the deposit required for the Stima loan.

There is a general feeling that the social amenities, commercial centres, households and administrative centres that were not connected were disadvantaged in so many ways and could

not perform their duties more efficiently. The impossibility of landlords to connect their premises both residential and commercial was an impediment for those willing to use power to conduct their business affairs or use it for domestic purposes.

This cost related disadvantage was and remains a major setback to wiring, connectivity and the utilization of electric gadgets for community development. For a project where network extension was 100% and connectivity at 44% it can be said that the project's major setback in bringing the highly expected change in terms of community development was connectivity. In the studies reviewed in the literature discussions earlier, connectivity still remains a challenge especially in Sub-Saharan Africa. Most rural communities are seen as too poor to afford the connection fees and to buy the associated equipment. The same case applying for the Rural Electrification Project in Kenya, there is therefore need to intensely look at this component in the conception and appraisal of projects, to ensure better designed projects that are geared towards connectivity for community development.

Despite this low level of connectivity there were very positive aspects on the upward mobility or change that had been experienced by the community especially the for the few that connected to electricity. These aspects and indicators of the change that had taken place are discussed below.

5.3.3.1 Income growth and employment creation

Several commercial premises interviewed in the various schemes indicated that their income had increased since the onset of Rural Electrification and connection. Most barbershops and salons that used manual machines before now have electrical machines that work faster so they have more customers. These barbershops are also able to now charge mobile phones for the household communities that are not connected. Other business, such as hotels which were now

able to operate late hours and store their supplies in refrigerators operated by electricity. Posho mills using electricity were operating better than those using diesel and therefore more attractive to the community and increasing income to the operators. Commercial enterprises creating employment have emerged in most of the targeted areas. Most significant was Mbitini and Kisasi markets south of Kitui town. Businesses have emerged and are running profitably. Mbitini market is located 34 KM from Kitui town. The terrain is mostly rocky and the road network significantly underdeveloped. However it is a complete different kind of scenario on getting to these markets where businesses are being conducted and it is a beehive of activity. Notable are the 4 cyber-cafes that are being successfully run by residents of the town. Previously residents of this area would travel all the way to Kitui town to access ICT services. Services such as photocopying, printing, scanning, internet browsing and photo printing which were only accessible in the town centre 34 KM away are now accessible in Mbitini town. Most Schools that were interviewed indicated that they have had to employ extra qualified staff to teach computer studies and to operate computers and other ICT equipment for administrative work. There are several photos in the appendices to this paper showing several businesses running using electricity.

5.3.3.2. Increased agricultural production

It has been noted from the data analysis that significantly absent in all the sampled schemes and areas where the research was conducted was the utilization of electricity to improve agriculture. For an area like Kitui County that greatly needs to improve it's agriculturally activities, this is a major setback. Drilling of boreholes however cost lots of money and unless there are subsidies to farmers for this then they cannot use electricity to pump water from bore holes to their farms.

The use of other electrically operated equipment such as chaff cutters is also expensive in consideration of the fact that there is need to buy the equipment. In the literature review it emerged that in Terai Nepal, electric hand pumps and horsepower motors were used for irrigation and thus the rural communities were able to produce their own farm produce for local consumption and to markets in urban areas. This could have been the scenario anticipated at the onset of the Rural Electrification Project, however consideration of the associated cost of equipment and other costs, information and know how on the use of electricity for agriculture was not considered , and therefore leading to non-utilization of electricity in agriculture in this County for development.

5.3.3.3. Improved functions of social amenities and administrative centres

Electricity in schemes such as Katheka Market has facilitated the pumping of water from a borehole that is been used by the community of this area. Most dispensaries and health centres can now fully operate maternities and even at night. They are able to store vaccines and medicine. Schools are also operating long hours and are able to have computer aided studies and proper storage of data. They are also able to use power for electric operated administrative duties, such as typing exams. Administrative centres are happy about the improved security of the connected areas and better operations of the centres. This is a positive aspect if it can be sustained and increase of connectivity to the centres that are not connected is enhanced.

5.3.3.4 Increased environmental conservation

Communities in Kitui County are still using other sources of energy such as firewood, charcoal, paraffin and diesel despite being connected to Electricity. They seem to see these other fuels as

cheaper. It was noted also that firewood and cooking with firewood was generally a cultural issue, deeply rooted in the communities of Kitui County. Most respondents informed the survey that they preferred food cooked with firewood as it tasted sweeter than food cooked with any other type of fuel and they would choose firewood over electricity for cooking. This is therefore a major setback to the conservation of forests in this area and especially more so due to the aridity experienced in the County. This aspect was also noted in the literature review as one that affects many African countries. The Study in Botswana found that 11 years since electrification villages still used electricity alongside firewood. Their cultural orientation especially the taste of food cooked with firewood being better emerges as a similarity with the situation in Kitui County. The cost of electricity is also a similarity in both areas. These are aspects that greatly need to be looked at during the onset of a particular project to understand a population's culture so to understand how best to design a project.

5.3.3.5. Better communication and raised awareness levels.

Most households, commercial enterprise owners and social amenities consider the communication and awareness levels to have risen since the connection of their premises to electricity. This is especially significant in the use of mobile phone technology to pass information, media accessibility and awareness. Most households can now be kept informed of the country's and world's happenings through their television sets and radios which now use electricity.

5.3.4 Community Participation and Community Development

Due to the non involvement of the community and awareness on issues relating to the project, for some schemes, complaints and debates ensued. Attached to the appendices in this paper are

complaints from some customers on wayleaves acquisition. It is clear from the findings that the involvement of the community concerned was very minimal. From the onset in the selection of the priority areas, the community only learnt about it from politicians who had distorted information on the reasons why the particular areas were selected to benefit. This reduced the project to a political weapon used by politicians to dupe the community and use it for political gain. The project designers on the other hand did nothing to remedy the situation and did not take time to inform the community through the local administration of the processes involved in the project and what was required of them. It is only in the construction process where the community youth were called upon and employed in the erection of poles.

5.3.4.1. Compensation for Wayleaves

Way leaves compensation for most land was not very involving and the community seemed not to be aware of what was the rationale or what was required of them, the processes of compensation and where to lodge complaints. Some of the customers gave their land away for free. Another farmer who responded to our enquiry on this indicated that he was not given room to negotiate the compensation rate nor was he aware of any process for appeal. The surveyors that had entered his land did not talk to him; and during the meeting held to explain the benefits by politicians of the anticipated electrification no information was forthcoming with regard to the rates of compensation. According to him had he known the low rates of compensation he would not have agreed to allow the power lines through his property.

There were no negotiations involved and nowhere to take their complaints on the amounts which they thought were not fair. Some saw no need for compensation since the poles and power lines would supply electricity to them and community at large. Attached in appendices to this report is

a letter of complaint from the respondents for non-compensation for wayleaves acquisition leaving questions of the entire process and how it was carried out. Lack of information and communication to the community greatly influenced the setbacks in the wayleaves acquisition and compensation component of this project.

When communities don't participate in the processes of the project, then they are not prepared for the project and cannot voice their problems early for a solution to be found. In this project the lack of participation of the communities can be attributed to the low connectivity as if the high cost of connection had been made an issue of concern early in the project, then a solution would probably have been found. The issue would not have been raised though since there was no forum for the community to be given an interpretation of the project and what was required of them.

In the literature reviewed earlier in this paper it is clear that future projects need to learn from countries like India and Brazil who have incorporated the participation at all levels of the communities. The government of India notes that a participatory process is essential for effective, efficient and sustainable rural electrification programs. Brazil also ensured through its programmes that rural communities are involved in management committees in the electrification processes.

5.3.5. Sustainability

Most of the communities in this area are relatively poor and the area is currently faced with increased famine due to the failure of the long rains mostly expected between the months of March to June. This has therefore significantly reduced the total disposable income for the communities. The total connections in this area are significantly low as compared to the

potential customers in this region. Most customers are not able to afford the 20 400ksh and 50 400 Ksh required for connection for commercial centres for single phase and three phase and 39 000 Ksh for household connections. The issue of the wiring of the premises charges also emerges where charges ranging from 6 000 – 15 000 for wiring or premises be it commercial, household or social amenity. These fees and charges combined are relatively high for the average communities living in the Kitui County. The pilot revolving fund – Stima loan- that had been introduced to accelerate connection has recently come to an end. It is hoped that this fund will be renewed otherwise it provides a real setback to the continuity of connections in this county. A solution needs to be found for sustainability purposes of this project. There is no sense in having networks, where the community cannot connect to electricity and use it for upward mobility.. The level of disconnections reported by KPLC amounting to 10% of all their connections is relatively high. This is also a huge setback to the initial gains of connections. Reconnection is always accompanied by a fee which the customers are sometimes not able to pay or may take quite a while before finding the funds. The sustainability of the project greatly depends on these connections. It also becomes unsustainable if the operating agency KPLC is not able to connect customers or disconnects them regularly amounting to wastage of huge investments in the project. It is therefore up to the operating agency and the various stakeholders in the sector to come up with an aggressive marketing campaign and better ways of ensuring that connectivity is upgraded and disconnections are reduced.

Most interviewed customers complained of constant blackouts especially during rainy seasons and lack of adequate communication in the event the provider – KPLC – is going to switch of power for routine maintenance. KPLC however confirmed that routine maintenance exercises were always communicated through the local dailies. However very few customers in this region

buy newspapers, especially those in the outskirts of Kitui town. KPLC could therefore probably explore ways of passing this information through the local stations.

In the literature reviewed in this paper for Nepal's Community Rural Electrification it was identified that the programme had created rural entrepreneurship, marketing innovations, social responsibility and a real sense of ownership for the project thus creating a sustainable project.

5.4. Conclusions of the Study

In comparison to many other countries that have implemented rural electrification projects as seen in the literature reviewed in this paper, electricity supply to these rural areas had brought about increased average annual income, high education and literacy levels, entrepreneurship, increased agricultural productivity, improved security and environmental conservation. It will be noted however that for the Rural Electrification Project, in Kitui County, these gains have been felt on a low scale or not at all, due to the low level of connectivity and lack of participation of the community in the implementation process of the project. It is also important to note that benefits obtainable from rural electrification will depend upon complementary investment decisions and inputs, availability of credit for necessary wiring and connectivity and also electric devises, stakeholders' information services and aggressive time based and well coordinated marketing campaigns. Sustainability of these projects will only be assured if there is a sense of ownership by the communities concerned and facilitation to connect to electricity and use it for economic upward mobility.

5.5. Recommendations of the Study

5.5.1. Recommendations for future rural electrification projects

There were several setbacks identified in Rural Electrification Project and its implementation in Kitui County. In the event that other projects are to follow the implementation of this phase, from the literature reviewed, the findings in the field, and the discussions, the research would recommend that there is a more integrated process of identification of the projects and selection of priority areas to benefit from the project. More social parameters should be included in the appraisal in order to take into consideration the needs and capabilities of the communities that are to benefit from the project. This greatly applied to selection of future schemes to benefit which should not be based only on estimated Internal Rates of Return (IRRs). A more integrated criterion could be used and should include not only economic viability but also social perceptions and cultural values, capabilities and willingness to pay for electricity once the network is installed.

The issue of wiring and connectivity costs should be addressed at the onset of any future rural electrification project. The option of soft loans to facilitate wiring and connections to be would made available through an established revolving fund could be considered. Any now phase of the project that should come up should look at consolidating the gains of the first phase and correcting the setbacks especially as concerns connectivity. This issue of connectivity also being very pertinent it would be recommended that the operating agency - KPLC reviews the connection fees for the rural communities with an aim to enhance connectivity.

Community participation is also a very key aspect of any project implementation process. As identified in the literature review projects that have active participation of the communities concerned are more efficient and sustainable. It is recommended that any future rural electrification project, should at every stage involve the communities concerned, by ensuring there are proper channels of communication that convey accurate information about the processes of the project and what is expected from the concerned community. There is also need to launch an early extensive marketing campaign on potential uses of electricity accompanied in association with the local administration and various stakeholders notably agricultural officers, banks, vocational centres and training schools to ensure that community development actually takes place was a huge investment of extension of networks is done.

The KPLC agency in Kitui County had confirmed that routine maintenance exercises were always communicated through the local dailies. It was noted that however very few customers in this region bought newspapers especially those in the outskirts of Kitui town. KPLC could therefore probably explore ways of passing this information through the two local stations (Muusyi FM and Syokimau FM) which were widely listened to by the community to enable the communities plan for these routine maintenances.

5.5.2. Recommendations for further studies

In general electricity as identified by most impact and outcome studies has some causal effect on development and it is therefore necessary to go beyond the usual ex-post evaluations studies on the general performance outcomes of rural electrification and analyze the immediate and long term impacts that bring about economic, social, environmental and cultural change to communities and more particularly rural communities. This study would therefore recommend

an impact study to be carried within two and three years since the closure of the project to analyze this long term impacts and outcomes.

An in depth analysis and individual study could also be carried out for each of the various indicators of Community Development identified in this study, to analyze the extent to which the Rural electrification project significantly improved income growth, employment creation, environmental conservation, better communication and awareness levels and better functioning of the social amenities that were connected to electricity.

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APPENDICES

Appendix A: Survey Instruments

i) House-hold Questionnaire guide (Category A)
ii) Social institutions and administrative centres questionnaire guide (Category B)
iii) Commercial entreprises questionnaire guide (Category C)
iv) Electricity supplier questionnaire guide (Category D)
v) Focus Group Discussion Guideline

KEY INFORMANT QUESTIONNNAIRE

CATEGORY A - Household Questionnaire –
(for both electrified and un-electrified households)

ENUMERATOR: .....
A Scheme: ..... **B. Priority Area #:** ..... **C. Date:** ...../...../20011

1) Respondent details

a) Household details

How many people live here? a) adults:..... b) children? .....

2) Household electrified? a☐ Yes b☐ No

a) If no, would you like to have electricity? a☐ Yes b☐ No

Why not electrified/don't you have electricity?
.....

b) How were you electrified/got electricity? (Process ?) and why?
.....
.....
.....
.....

3) How did you learn about the Rural Electrification Project and the areas to benefit from the project?
.....
.....
.....
.....

4) Were you involved in any way in the different processes of the project, poles erection, digging of holes and pegging, way leaves acquisition, wiring etc?

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

5) a) Have the electricity poles passed on your land? a☐ Yes b☐ No

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

6) Household income

a) What is this household's income per month? Ksh.....
b) Is this income dependent on Electricity? .....
c) Has your income changed since electrification a☐ Yes b☐ No
d) If yes how?

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

7) What fuel do you use for:

a) Cooking .....

b) Lighting .....

c) Other .....

8) Appliances

a) What electrical appliances do you own?

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

9) Expenditure on energy:

a) How often do you buy

i) Wood? ..... ii) Electricity? .....
iii) Paraffin? ..... iv) Gas? .....
v) Candles? ..... vi) Batteries? .....
vii) other .....

c) How much do you pay per bundle of wood/Parraffin, batteries, candles .....

d) What amount of electricity do you buy at a time? Ksh..... max Ksh.....min

e) Do you think that having electricity has made your life easy/convenient? a☐ Yes b☐ No

f) Do you think that having electricity has saved you money? a☐ Yes b☐ No
If so, can you estimate how much money it saves you per month? Ksh .....

g) Do you think that having electricity has improved your

- agricultural production
- health and sanitation
- environment
- Education and literacy levels (for you and your children?)
- Improved security

a□ Yes b□ No

How?

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

Non electrified

h) Do you think that you are disadvantaged that you do not have electricity? How do you think your life would improve if you had electricity / what kind of development would you expect?

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

10. Likes and dislikes

a) What three things do you like about electricity?

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

11). What three things do you not like most about electricity?)

a□ Cheap	b□ Expensive to use	c □ Safe
d□ Dangerous to use	e□ Clean	f □ Expensive to buy appliances
g□ Easy to use	h□ Difficult to use	I □ Allows you to do more things
j □ Saves you time	k□ Electricity is unreliable	l □ Streetlights

12). Have you ever been disconnected? a□ Yes b□ No

- If yes why were you disconnected?

.....
.....

13) How long did it take you to get connected and what was the procedure?

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

14) Do you think the presence of electricity has helped you to communicate better and to raise your awareness levels?

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

Notes

KEY INFORMANT QUESTIONNNAIRE

CATEGORY B: INSTITUTIONAL FOCUS – (Schools, Health centres and administrative facilities)

ENUMERATOR: .....

Scheme: ..... **Priority area #:** ..... **Date:** ...../...../2011

a□ a single-phase connection? b□ a three-phase connection?

RESPONDENT NAME AND POSITION:

.....

1) Are you connected? How did you get connected and why?

.....

.....

If not connected why you are not connected and do you think this has any influence on the functions of your institution?

.....

.....

.....

2). How did you learn about the Rural Electrification Project and the areas to benefit from the project?

.....

.....

3). Why do you think this area was chosen to benefit from the project?

.....

.....

4) Were you involved in the implementation of the project in any way? If yes how?

.....

.....

.....

5) How has electrification influenced development of your institution?

How?

.....

.....

.....

6) Has electrification improved your institution's efficiency (doing the same things with fewer expenses and/or staff?

a☐ Yes b☐ no

In what way?

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

7) What new processes have been introduced as a result of electrification, that couldn't be done without electricity?

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

8) Has your institution employed additional or less staff as a direct or indirect result of electrification?

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.....

9) What were the main challenges and opportunities for your institution before electrification?

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.....
.....

10) What are the main challenges and opportunities for your institution now?

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.....

11) What are the main uses of electricity in your institution (list appliances/equipment/machinery)?

.....

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.....

.....

.....

.....

12) What other energy sources/fuels does your institution use, and for what applications/uses?

.....

.....

.....

.....

13) Did electrification bring about money savings for your institution? Can you quantify these?

.....

.....

.....

.....

14) What electricity-related problems are encountered by your institution? (quality of supply and safety issues etc)

.....

.....

.....

.....

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.....

.....

15) Is electricity affordable in relation to other energy sources?

.....

.....

16) What is your institution's average monthly expenditure on electricity? (Check electricity bill if possible) .....

17) What percentage of your institutions total overheads is for electricity?

.....

18) Do you think the presence of electricity has helped you to communicate better and to raise your awareness levels?

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

19) Have you ever been disconnected?

- If yes why were you disconnected?

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

19) How long did it take you to get connected and what was the procedure?

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

Notes

KEY INFORMANT QUESTIONNNAIRE
CATEGORY C: COMMERCIAL ENTREPRISES

□Large businesses □Small businesses □shops

□ a single-phase connection? b□ a three-phase connection?

ENUMERATOR: .....

Scheme .....**Priority area #:** ..... **Date:** ...../...../2011

RESPONDENT NAME AND POSITION:
.....

1) Are you connected? How did you get connected and why?
.....
.....

2) If not connected why you are not connected and do you think this has any influence on the functions of your institution?
.....
.....
.....

3). How did you learn about the Rural Electrification Project and the areas to benefit from the project?
.....
.....

4). Why do you think this area was chosen to benefit from the project?
.....
.....

5) Were you involved in the implementation of the project in any way? If yes how?
.....
.....
.....

6) How has electrification influenced the development of your business? How?
.....
.....
.....
.....
7) What other factors have influenced development of your business?

.....
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8) What were the main challenges and opportunities for your business before electrification?

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.....

9) What are the main challenges and opportunities for your business now?

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

10) What are the main uses of electricity in your business (list appliances/equipment/machinery)?

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

11) What other energy sources/fuels does your business use, and for what applications/uses?

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

12) Did electrification bring about money savings for your business? Can you quantify this?

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

13) Has electrification improved your business' net income (profit)? (yes or no) .....
In what way?

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

14) Has electrification improved productivity? (yes or no)

In what way?

.....

.....

.....

15) What new processes have been introduced as a result of electrification, that couldn't be done without electricity?

.....

.....

.....

.....

16) Has your business employed additional or less staff as a direct or indirect result of electrification?

.....

.....

.....

.....

17) Is electricity affordable in relation to other energy sources you used previously?

.....

.....

.....

18) What is your business' average monthly expenditure on electricity? (check electricity bill if possible)

.....

.....

19) What percentage of your business' total overheads is for electricity?

.....

.....

20) What electricity-related problems do you encounter in your business? (quality of supply and safety issues)

.....

.....

.....

.....

21) Have you ever been disconnected?

- If yes why were you disconnected?

22) How long did it take you to get connected and what was the procedure?

23) Do you think the presence of electricity has helped you to communicate better and to raise your awareness levels?

.....

.....

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.....

Notes

KEY INFORMANT QUESTIONNNAIRE
CATEGORY D: ELECTRICITY FOCUS - KPLC AGENT – (Electricity Supplier)

ENUMERATOR: .....

RESPONDENT NAME AND POSITION:
.....

1) What services is this office responsible for (pre-paid sales/maintenance/connections)?
.....
.....

2) How many staff are stationed at this office and which areas do they cover?
.....
3) How many schemes, are served by this office?
.....

4) How many electricity customers are there in these County?
a) single phase ..... b) three phase .....

5) How many customers does this office serve per week on average?
.....
.....

6) How many power outages are experienced in this area per month on average?
.....

7) What are the primary reasons for these outages?
.....
.....
.....

8) How long does it take on average to restore the power supply after an outage?
.....

9) How does the office respond to calls for repairs and maintenance (response time, staff availability)?.....
.....
.....
.....

10) How could quality of supply be improved?
.....
.....
.....

.....

.....

11) What percentage of un-electrified households/commercial centres/ health centres are there in this area and what is the main reason for this?

.....

12) How many applications for connection does this office receive per month on average?

.....

13) How long does it take from the time of application for a customer to be connected

.....

14) What are the general requirements before connection?

.....

15) How many new customers are connected in this area per month, on average?

.....

16) What is the average rate of disconnections in this area?

.....

Notes

Focus Group Discussions Guidelines

Questions

1. How did you learn about the Rural Electrification Project?
2. Were you involved in the selection of the priority areas to benefit in the Project?
3. Do you have any idea how the selection of the priority areas was done?
4. Do you feel the selection of the priority areas was fair?
5. Were members of the this community involved in the process of implementation of the project (works, supply of materials, employment, etc)
6. How was the wayleaves acquisition conducted? Were land owners compensated adequately?
7. Are there members of this community who are not connected to electricity and why are they not connected?
8. Has connection enabled productive uses of electricity? In what way?
9. Has electrification helped to create employment and income in the community? If so, how? If not, why not?
10. Has electrification helped to improve education and health services in your community? If so, how? If not, why not?
11. Has electrification contributed to safety in your community? If so, how? If not, why not?
12. How has electrification influenced the reduction of the destruction of the environment, especially forests?
13. Do you think the availability of electricity has increased communication and awareness levels?
14. What are the main aspects that you like about electricity?
15. What are the main aspects you don't like about electricity?
16. Is electricity reliable?
17. Are there many power outages, vandalisms? How do these influence use of electricity?

18. What were the main challenges (and opportunities) for your community before electrification? ?

19. What were the main challenges (and opportunities) for your community after electrification?

Appendix B: Excel tables for priority areas, network extension and connections

Table 1: Excel table showing priority areas chosen to benefit from the project in Kitui County

Table 7: Excel table showing initial target network extension vs. actual constructed network

Table 8: Excel table targeted areas for connection vs. connected areas

Sch No.		Project Name	District	Tx Rating	Voltage KV	MV Route Length	LV Route Length	Number of connections targeted	Number of Priority Connections identified at Design
EASTERN PROVINCE (KITUI COUNTY									
14	1	Katheka Mkt	Kitui West			2 152	2 622	49	38
	2	Katheka Sch		50 KVA	33			1	1
	3	Kakumiti Mkt		200 KVA	33			121	96
	4	Kakumiti (Chaani)						12	10
15A	5	Kwa Mona,	Kitui West			11 035	3 062	65	55
	6	Kwa Mona(Kwa Ndonga H/C)		50 KVA	33			1	1
	7	Kwa Mona(Kyunduani Dispensary)						1	1
	8	Kwa Chenza,		50 KVA	33			55	50
	9	Kwa Vonza		200 KVA	33			89	76
	10	Ndumoni A		50 KVA	33				
	11	Ndumoni B		50 KVA	33				
	12	Kwa Vonza(Ndumoni Mkt)						38	30
16	13	Miambani Mkt.	Kitui Central	100 KVA	11	25 981	1 351	61	55
	14	Miambani C. Mission						1	1
	15	St.Mary's(Miambani)Sec. Sch.						1	1
17	16	Nzambani Mkt	Kitui Mutomo	100 KVA	11	16 811	2 445	13	8
	17	Nzambani Sec Sch		100 KVA	11			1	1
	18	Kwa Kinyai Mkt.		50 KVA	11			9	6
	19	Kwa Kinyai (Mulundi, Kavaa and Kwa Kame)						99	89
	20	Kyambiti Mkt.		50 KVA	11			31	29
	21	Kyambiti Sec. Sch.		100 KVA	11			1	1
	22	Yanzuu Dispensary		50 KVA	11			1	1
	23	Kilonzo Sec. Sch.						1	1
	24	Mwembe Tayari & Kyanika mkts						19	15
	25	Nzewani Mkts						31	26
	26	Kilonzo Market		100 KVA	11				
	27	Mulundi School		100 KVA	11				
	28	Mathulini Market		25 KVA	11	0	1 045		
50	29	Nzawa,	Mwingi	100 KVA	33	22 770	3 707	76	68
	30	Katoteni		100 KVA	33			105	95
	31	Kakululo		LV only				30	22
	32	Ngongeni		50 KVA	33			58	48
	33	Kasanga,		100 KVA	33			84	78
	34	Kanyaa Mkt.		200 KVA	33			161	150
55	35	Kathukini Mkt.	Kitui Central			33 523	5 488	37	29
	36	Kwa Muli Mkt.		100 KVA	33			34	25
	37	Kaluluini Mkt.						70	60
	38	Katulani Mkt.		100 KVA	33			145	130
	39	Nzukini Mkt.		50 KVA	33			13	10
	40	Kathungi Mkt.		50 KVA	33			39	30
	41	Maliku Mkt.		50 KVA	33			30	25
	42	Kavisuni Mkt.		200 KVA	33			30	25
	43	Kangalu Market							
56	44	Katyethoka Mkt.	Kitui Central	50 KVA	33	10 872	2 194	26	18
	45	Wanzua Mkt.		100 KVA	11			36	29
	46	Kwa Mutheke Mkt.		50 KVA	11			33	27
	47	Kasyala Mkt.		100 KVA	11			51	45
	48	Mwembe Tayari(Eng. Ngilu Sec. sch.)						10	8
57	49	Kyangungani Mkt.	Kitui Central	50 KVA	11	44 941	6 277	22	18
	50	Kisasi Mkt.		200 KVA	11			233	190
	51	Mosa Mkt.		200 KVA	11			76	60
	52	Mbitini Mkt.		200 KVA	11			245	220
	53	Katwala mkt		100 KVA	11			12	10
	54	Kitungani mkts		50 KVA	11			11	10
	55	Ngangani mkts		200				11	10
							TOTAL	**2379**	**2032**

Sch No.		Project Name	District	Tx Rating	Voltage KV	MV Route Length targette	LV Route Length targetted	MV Route Length achieved	LV Route Length achieved
EASTERN PROVINCE (KITUI COUNTY									
14	1	Katheka Mkt	Kitui West			2 152	2 622	2 152	2 622
	2	Katheka Sch		50 KVA	33				
	3	Kakumiti Mkt		200 KVA	33				
	4	Kakumiti (Chaani)							
15A	5	Kwa Mona,	Kitui West			11 035	3 062	11 035	3 062
	6	Kwa Mona(Kwa Ndonga H/C)		50 KVA	33				
	7	Kwa Mona(Kyunduani Dispensary)							
	8	Kwa Chenza,		50 KVA	33				
	9	Kwa Vonza		200 KVA	33				
	10	Ndumoni A		50 KVA	33				
	11	Ndumoni B		50 KVA	33				
	12	Kwa Vonza(Ndumoni Mkt)							
16	13	Miambani Mkt.	Kitui Central	100 KVA	11	25 981	1 351	25 981	1 351
	14	Miambani C. Mission							
	15	St.Mary's(Miambani)Sec. Sch.							
17	16	Nzambani Mkt	Kitui Mutomo	100 KVA	11	16 811	2 445	16 811	2 445
	17	Nzambani Sec Sch		100 KVA	11				
	18	Kwa Kinyai Mkt.		50 KVA	11				
	19	Kwa Kinyai (Mulundi, Kavaa and Kwa Kame)							
	20	Kyambiti Mkt.		50 KVA	11				
	21	Kyambiti Sec. Sch.		100 KVA	11				
	22	Yanzuu Dispensary		50 KVA	11				
	23	Kilonzo Sec. Sch.							
	24	Mwembe Tayari & Kyanika mkts							
	25	Nzewani Mkts							
	26	Kilonzo Market		100 KVA	11				
	27	Mulundi School		100 KVA	11				
	28	Mathulini Market		25 KVA	11	0	1 045	0	1 045
50	29	Nzawa,	Mwingi	100 KVA	33	22 770	3 707	22 770	3 707
	30	Katoteni		100 KVA	33				
	31	Kakululo		LV only					
	32	Ngongeni		50 KVA	33				
	33	Kasanga,		100 KVA	33				
	34	Kanyaa Mkt.		200 KVA	33				
55	35	Kathukini Mkt.	Kitui Central			33 523	5 488	33 523	5 488
	36	Kwa Muli Mkt.		100 KVA	33				
	37	Kaluluini Mkt.							
	38	Katulani Mkt.		100 KVA	33				
	39	Nzukini Mkt.		50 KVA	33				
	40	Kathungi Mkt.		50 KVA	33				
	41	Maliku Mkt.		50 KVA	33				
	42	Kavisuni Mkt.		200 KVA	33				
	43	Kangalu Market							
56	44	Katyethoka Mkt.	Kitui Central	50 KVA	33	10 872	2 194	10 872	2 194
	45	Wanzua Mkt.		100 KVA	11				
	46	Kwa Mutheke Mkt.		50 KVA	11				
	47	Kasyala Mkt.		100 KVA	11				
	48	Mwembe Tayari(Eng. Ngilu Sec. sch.)							
57	49	Kyangungani Mkt.	Kitui Central	50 KVA	11	44 941	6 277	44 941	6 277
	50	Kisasi Mkt.		200 KVA	11				
	51	Mosa Mkt.		200 KVA	11				
	52	Mbitini Mkt.		200 KVA	11				
	53	Katwala mkt		100 KVA	11				
	54	Kitungani mkts		50 KVA	11				
	55	Ngangani mkts		200					
TOTAL						168 085	28 191	168 085	28 191

Sch No.		Project Name	District	Tx Rating	Voltage KV	MV Route Length	LV Route Length	Number of connections targeted	Number of Priority Connections identified at Design	Number of Quotations given	Number of Connections done 3 Ø	Number of Connections done s Ø	S/lines installed by KPLC	S/Lines installed by REA	Service Lines Metered 3 Ø	Service Lines Metered s Ø
		EASTERN PROVINCE														
14	35	Katheka Mkt	Kitui West			2 152	2 622	49	38			5				7
	36	Katheka Sch		50 KVA	33			1	1			13			1	15
	37	Kakumiti Mkt		200 KVA	33			121	96	48					2	25
	38	Kakumiti (Chaani)						12	10							
15A	39	Kwa Mona,	Kitui West			11 035	3 062	65	55	28						10
	40	Kwa Mona(Kwa Ndonga H/C)		50 KVA	33			1	1			16				
	41	Kwa Mona(Kyunduani Dispensary)						1	1							
	42	Kwa Chenza,		50 KVA	33			55	50	21		14				14
	43	Kwa Vonza		200 KVA	33			89	76	64		55				65
	44	Ndumoni A		50 KVA	33							1				
	45	Ndumoni B		50 KVA	33											
	46	Kwa Vonza(Ndumoni Mkt)						38	30			1				1
16	47	Miambani Mkt.	Kitui Central	100 KVA	11	25 981	1 351	61	55		1	1				1
	48	Miambani C. Mission						1	1							1
	49	St.Mary's(Miambani)Sec. Sch.						1	1							
17	50	Nzambani Mkt	Kitui Mutomo	100 KVA	11	16 811	2 445	13	8							20
	51	Nzambani Sec Sch		100 KVA	11			1	1						1	10
	52	Kwa Kinyai Mkt.		50 KVA	11			9	6							15
	53	Kwa Kinyai (Mulundi, Kavaa and Kwa Kame)						99	89			8				10
	54	Kyambiti Mkt.		50 KVA	11			31	29	11		2			1	30
	55	Kyambiti Sec. Sch.		100 KVA	11			1	1		1				1	2
	56	Yanzuu Dispensary		50 KVA	11			1	1						1	2
	57	Kilonzo Sec. Sch.						1	1		1	1			1	5
	58	Mwembe Tayari & Kyanika mkts						19	15						2	50
	59	Nzewani Mkts						31	26							15
	60	Kilonzo Market		100 KVA	11											
	61	Mulundi School		100 KVA	11											20
	62	Mathulini Market		25 KVA	11	0	1 045					6				
50	111	Nzawa,	Mwingi	100 KVA	33	22 770	3 707	76	68	23		23				27
	112	Katoteni		100 KVA	33			105	95	59		4				8
	113	Kakululq		LV only				30	22			17				17
	114	Ngongeni		50 KVA	33			58	48	34		4				4
	115	Kasanga,		100 KVA	33			84	78	35	2	14				14
	116	Kanyaa Mkt.		200 KVA	33			161	150	59	1	25				25
55	117	Kathukini Mkt.	Kitui Central			33 523	5 488	37	29							
	118	Kwa Muli Mkt.		100 KVA	33			34	25			5				9
	119	Kaluluini Mkt.						70	60	49						2
	120	Katulani Mkt.		100 KVA	33			145	130	19	2	9				15
	121	Nzukini Mkt.		50 KVA	33			13	10							12
	122	Kathungi Mkt.		50 KVA	33			39	30			4				11
	123	Maliku Mkt.		50 KVA	33			30	25		1	4				9
	124	Kavisuni Mkt.		200 KVA	33			30	25	13	3	8				25
	125	Kangalu Market										4				9
56	126	Katyethoka Mkt.	Kitui Central	50 KVA	33	10 872	2 194	26	18			2				9
	127	Wanzua Mkt.		100 KVA	11			36	29			2			1	19
	128	Kwa Mutheke Mkt.		50 KVA	11			33	27			3				9
	129	Kasyala Mkt.		100 KVA	11			51	45		1	4				16
	130	Mwembe Tayari(Eng. Ngilu Sec. sch.)						10	8						1	10
57	131	Kyangungani Mkt.	Kitui Central	50 KVA	11	44 941	6 277	22	18							12
	132	Kisasi Mkt.		200 KVA	11			233	190	60	1	27				50
	133	Mosa Mkt.		200 KVA	11			76	60	16						10
	134	Mbitini Mkt.		200 KVA	11			245	220	35		25				50
	135	Katwala mkt		100 KVA	11			12	10			9				10
	136	Kitungani mkts		50 KVA	11			11	10			7				9
	137	Ngangani mkts		200				11	10			14				
							TOTAL	**2379**	**2032**	**574**	**14**	**337**	**0**	**0**	**12**	**709**

Appendix C: MAPS

Map C1. Showing location of Kitui County: Source: www.friendsofkitui.com

Appendix D: Letter of complaint concerning acquisition and compensation for wayleaves

THE DISTRICT COMMISSIONER
KITUI CENTRAL DISTRICT
P.O. BOX 1
KITUI

DATE: 25TH. JULY 2011

Dear Sir,

RE: COMPASATION OF DESTROYED CROPS/VEGETATION AND ERECTING ELECTRICITY POLES ON OUR LANDS.

REFERENCE LINE NO: R.25802008070014.

We herby jointly write to present our claim that the following plots which belongs to the here below undersigned owners have been used by the Kenya Rural Electrification Authority without our consent when they were erecting the Kyamathyaka , Kwa-vonza line in 2007/2008.

We therefore humbly request you to investigate, hence advice and assist us so as to be compensated the above named properties.

Herein, please find numbers of our National Identification Cards and the numbers of the plots in question.

Yours faithfully,

PLOT NO.	OWNERS NAME	ID/NO.	SIGNATURE
3	MASESI NZUSI(Dead) JOSEPH MUTUA MASESI (Son)	0576116	
195	KAKITI NGALAKA (Dead) NZEMBEI KAKITI (Son)	16085811	
195	KAKITI NGALAKA(Dead) HENRY KAKITI (Son)	4416927	
209	NDONI MBULA (Dead) MWIKALI NDONI(Wife)	1149090	
157	MUTWII SIMBA (Dead) NGONZI MUTWII (Son)	4340276	
172	MUNYOKI SIMBA	1149270	Munyoki
211	MUNYAU NGIO MUSYIMI	1149705	
212	MWATI KAKITI	1149979	
217	MUNYAU NGIO MUSYIMI	1149705	
562	JOSEPH MAKUSU WANGYA	10678579	
215	KAKITI NGALAKA (Dead) CHARLES KISOO KAKITI (Son)	10323193	
59	MUTUNGA KINGEE	0272530	Mutunga
4	PATRICK KATUMU NZUSI	4824753	

CC. TO:

1. THE MINISTER
   MINISTRY OF ENERGY
   NAIROBI.

2. THE DIRECTOR
   KENYA RURAL ELECTRIFICATION AUTHORITY
   CHACERY HOUSE
   6TH. FLOOR
   P.O. BOX 34585-00100
   NAIROBI.

3. THE COUNCELLOR
   KYANGWITHYA WEST WARD
   KITUI CENTRAL CONSTITUENCY
   KITUI CENTRAL DISTRICT.
   KITUI.

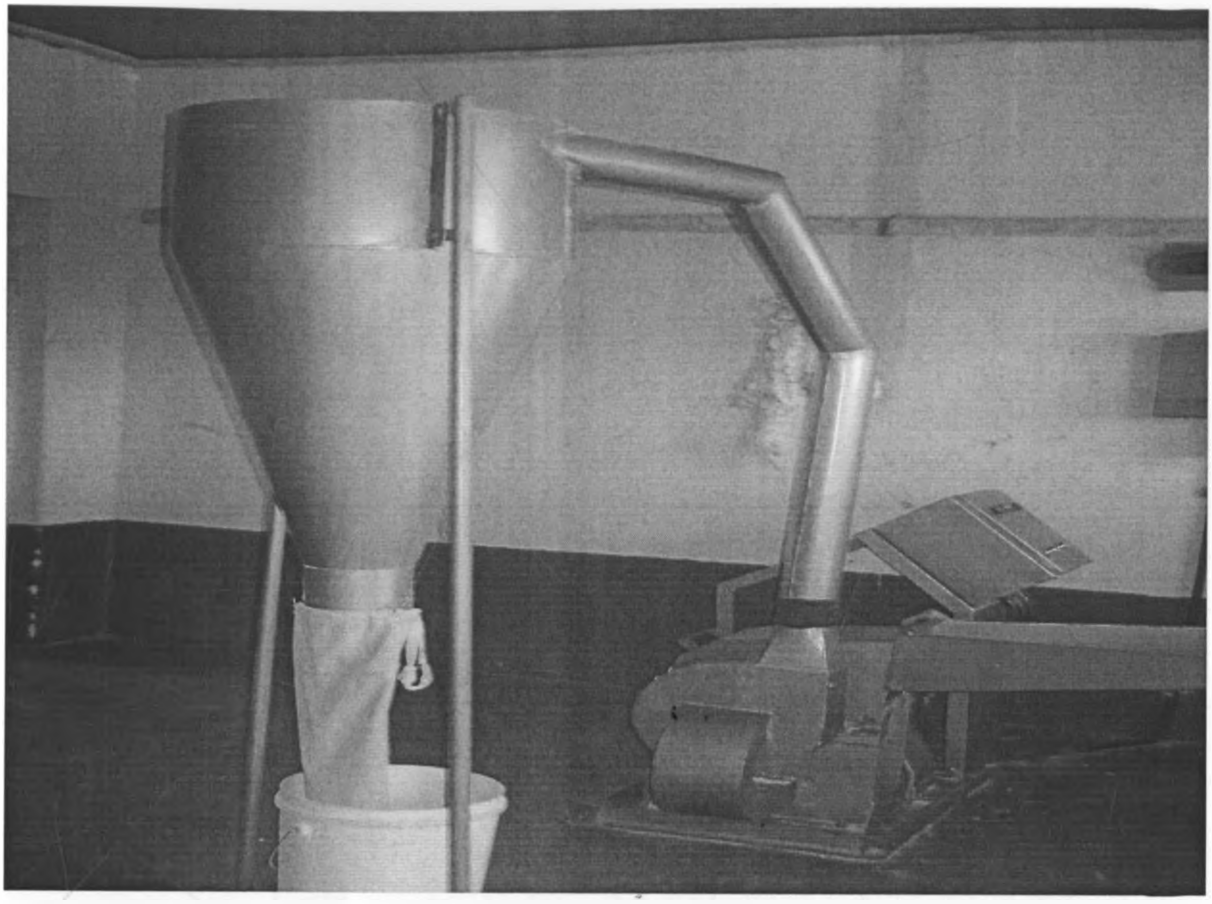
4. LOCATIONAL CHIEF
   KYANGWITHYA WEST LOC.
   KITUI CENTRAL DISTRICT

5. ASSISTANT CHIEF
   MULUTU SUB-LOC.
   KYYANGWITHYA LOC.
   KITUI.

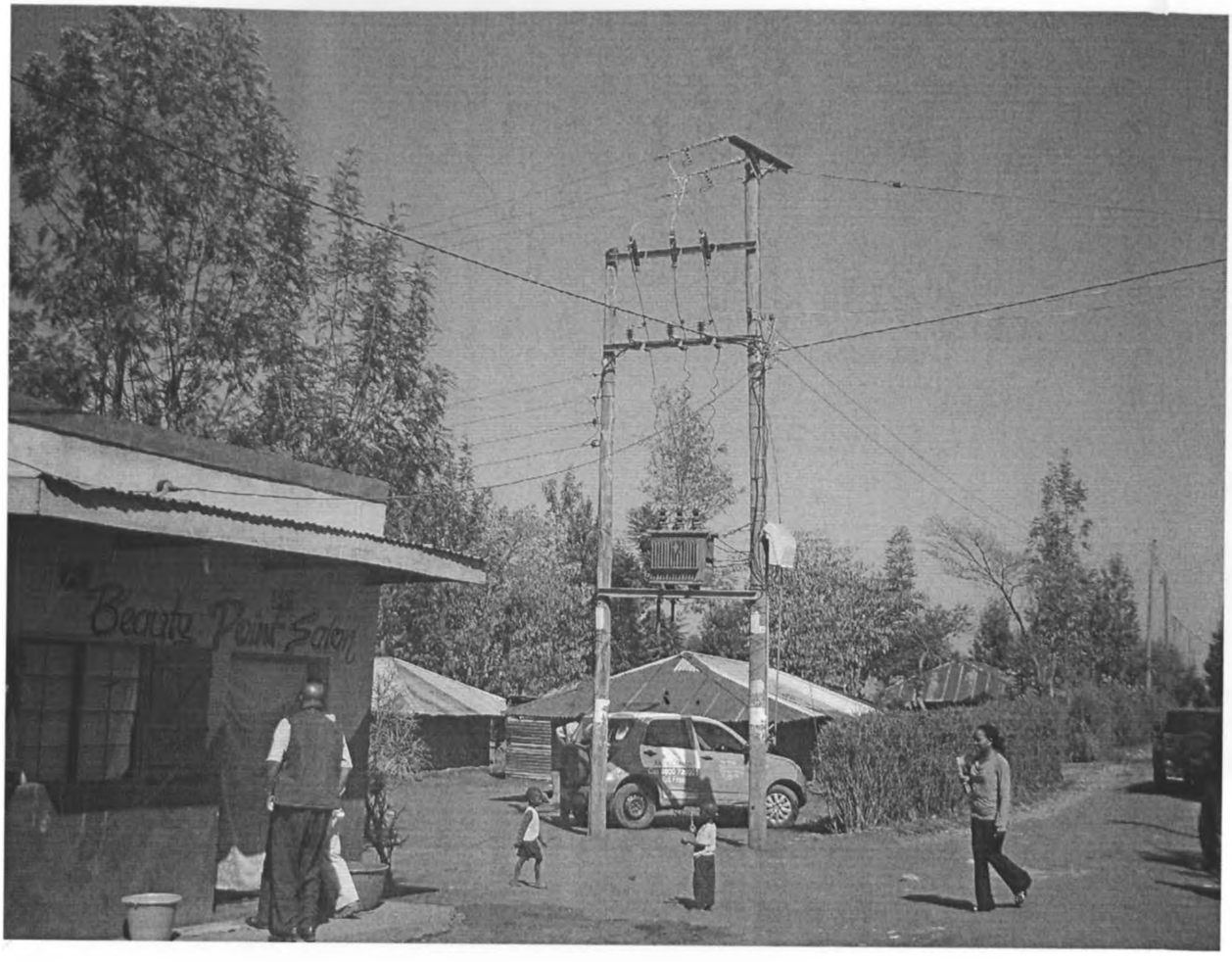
6. ASSISTANT CHIEF
   NDUMONI SUB-LOCATION
   KYANGWITHYA WEST LOC.
   KITUI CENTRAL DISTRICT.

Appendix E: Photos of network extension and commercial enterprises operating with electricity in the various schemes in Kitui County.

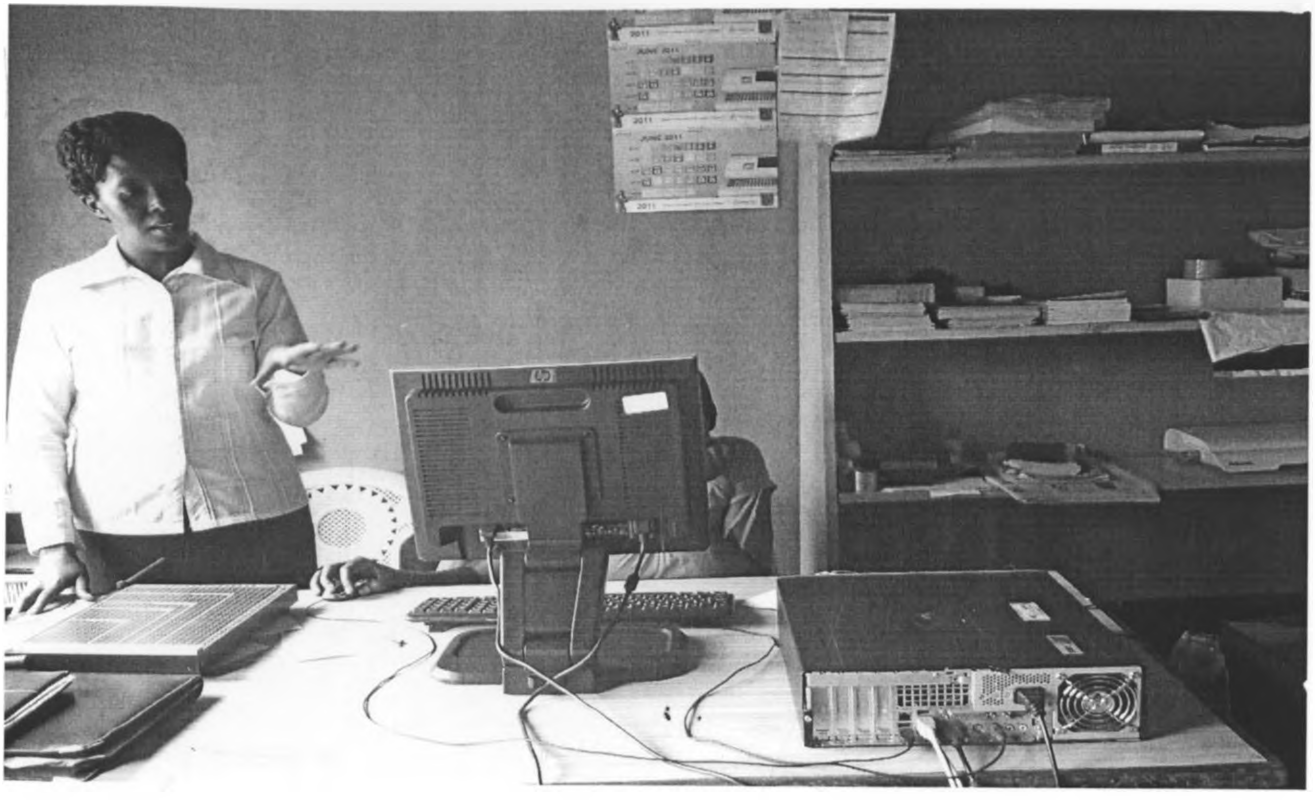
Appendix E1: Network extension in Kwa Mutheke (Scheme 56)



Appendix E2: Posho Mill operating using electricity in Katheka Market (Scheme 14)



Appendix E3. : Salon and Barbershop operating with electricity –Mbitini (Scheme 57)



Appendix E4: Cyber café and printing services – Mbitini (Scheme 57)

Appendix F: Correspondence requesting for facilitation of the field survey and appreciation for facilitation

MUSYOKA Magdalene

De: MUSYOKA Magdalene
Envoyé: jeudi 30 juin 2011 14:08
À: 'CWasonga@KPLC.co.ke'; 'MNjiraini@kplc.co.ke'; 'AMunge@kplc.co.ke'; 'GOrieba@kplc.co.ke'
Cc: CONCELLON Maitane; TOBIN Lara; 'John Njaaga'
Objet: Research on the Impact of the AFD funded Rural Electrification Project in Kitui County

Dear all,

I hope you are all keeping well.

I would really wish to appreciate your excellent facilitation and well organised field trips to the various AFD Rural Electrification Project beneficiary schemes as I carried out my research on the impact of the project in Kitui County. My appreciation also goes to the team at the KPLC office in Kitui who were available to provide all relevant information concerning the project.

It was indeed a great learning opportunity, a chance to experience the positive impact of the project and the great work that the Mount Kenya South team has carried out since the project was handed over to KPLC, especially as concerns connectivity even in the remotest areas of the County.

Once again my gratitude to you all for your invaluable time, facilitation and information.

Kind regards,

Magdalene Mumbi MUSYOKA

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MUSYOKA Magdalene

De: MUSYOKA Magdalene
Envoyé: mercredi 8 juin 2011 15:44
À: 'CWasonga@KPLC.co.ke'
Cc: CONCELLON Maitane; TOBIN Lara
Objet: Research on the Impact of the AFD funded Rural Electrification Project in Kitui County

Dear Caleb,

Following our telephone conversation and as earlier discussed, I intend to carry out a research on the Impact of the Rural Electrification Project in Kitui County which was funded by the French Development Agency through the Ministries of Finance and Energy.

I would therefore wish to officially inform you of my intention to visit the 8 beneficiary schemes in Kitui County to extensively conduct this research. I wish to conduct interviews with the beneficiary and non-beneficiary households, commercial centres, social and administrative centres. The field visits will be carried out for a period of two weeks starting from the 13th to the 24th of June 2011.

I would be grateful if your office would facilitate and guide visits to the various schemes to conduct the research. An initial guide on the various load centres probably on the initial two to three days of the field visits would enable me select a suitable sample out of the 55 priority areas to carry out the extensive research in the period of two weeks. I would also wish to conduct a one on one interview with the local KPLC agency in Kitui County.

This research will be a credible exercise which will be carried out for the purpose of providing information especially to the main stakeholders on this project and for informing future projects. I therefore request for accurate and complete information which I assure all facilitators and respondents will be handled with utmost confidentiality and used only for purposes related to current and future projects.

I highly appreciate your facilitation in conducting this research.

Thanks and kind regards,

Magdalene MUSYOKA

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