

## The effects of rural electrification on the rural poor people in Zambia: case study of Solwezi community

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### Abstract

Despite the fact that there are many studies on the impacts of rural electrification and rural electrification programs, the many studies carried out to assess the impact of rural electrification are limited and most of the findings are based only on the correlation between rural electrification and development, without taking any selection or program-placement biases into account, for example how it affect different groups example the poor. This study thus aimed to explore both the positive and negative effects of rural electrification on the rural poor people, and bring out other salient features and challenges that come along with rural electrification. The general objective was to investigate the effects of rural electrification on the rural poor people in Zambia. The specific objectives were to find out if there are other effects (the negative effects) of rural electrification apart from the common economic and social benefits that are already noted by other scholars, to determine if the rural poor people benefit from rural electrification as much as the rich do, to establish to what extent the poor benefit from rural electrification, to deepen knowledge on the relationship between rural electrification and poverty reduction in rural and Peri-Urban areas, to assess the impact of access to electricity on the use of other fuels the poor use in rural communities, to identify the most significant changes brought to rural people by up taking electricity services. For the purpose of the study, attention was given to select an area which had been electrified 2- 3 years back as the pre-electrification era data had to be collected from the memory of the members. 100 households were selected using Simple Random Sampling method. Two (2) focused group discussions were also held in order to get diverse views and to allow for researcher observation. There were 2 sets of questionnaires; 1 was administered to respondents from the households and 1 for focused group discussions. The questionnaire included both open (unstructured) and closed (structured) type items. The data collected was analyzed using quantitative and qualitative approaches. Responses to closed questions and open ended questions were analyzed normally to bring out frequencies of responses on the variable that guided the study. The research demonstrated among others that rural electrification has both positive and negative effects on the rural people in the Zambian communities, that despite the importance and significance of electricity to economic growth and social development, the electrification of rural areas that have been lacking electricity supply for a long time result in mixed impacts on the rural people and that the poor, especially the very poor do not benefit from rural electrification. The study also revealed that the extent of benefit by the poor was insignificant, that rural electrification by itself does not directly lead to sustainable development or economic growth that can subsequently lead to poverty reduction and that rural electrification has no effect on the use of other rural energy sources such as charcoal, fire wood candles etc. Further, the study revealed the most significant changes brought by rural electrification, which included both positive and negative changes. The study recommended among other things that government or decision makers should introduce pricing policies that would make electricity affordable to the poor in rural areas, introduction of credit facilities and possibly micro credit institutions specifically to bell out those households that would not manage to pay connection charges and associated cost at once, involving poorer rural benefiting communities in the tariff-setting process, introduce measures including complementary economic development programmes, alongside the provision of electricity, need to package rural electrification programmes with measures and incentives such as social safety nets and should be accompanied by other critical business services and social/public services.

**Keywords:** effects of rural electrification, the rural poor people, Zambia

### 1. Introduction

Rural electrification is expected to improve rural people's quality of life and spur growth on a range of socioeconomic fronts, and thus rural electrification has long been top on the development agenda of many developing countries. It is recognized as a very important process to provide access to modern energy, especially to the poor people in developing countries like Zambia. Nevertheless, the vast majority of the population in these countries is still in the darkness and living standards in communities that benefited from the programmes remain below desired levels. These projects do not start with an assessment of the needs of the people that they are meant to serve. The rural electrification evaluation programs at present are confined to measure only quantifiable variables, such as

the number of households electrified while effects of electrification on the poor rural people remains less exploited. Where the poor constitute a very large proportion of the population, it is important to analyze effects on different sections. This study would mitigate that gap as it aims to gauge the effects of rural electrification.

#### 1.1 Statement of the Problem

Despite the fact that there are many studies on rural electrification and rural electrification programmes and processes in general, there is little if any, studies on the effects of rural electrification on the rural poor people apart from the much talk about economic benefits or positive welfare impacts of rural electrification for rural areas or communities and on

the local people in these rural areas. Example of such literature include Riddle *et al* (2006) <sup>[1]</sup>, Ellegård *et al* (2004) <sup>[2]</sup>, Cecelski *et al* (2005) <sup>[3]</sup>, Kahandker *et al* (2009) <sup>[4]</sup> and IEG (Independent Evaluation Group)-World Bank (2008) <sup>[5]</sup>. Many studies carried out to assess the impact of rural electrification are very much limited and most of the findings are based only on the correlation between rural electrification and development, without taking any selection or program-placement biases into account, for example how it affect different groups example the poor. Thus, despite huge investments in the sector, little is known about the effective impact of Rural Electrification on households' well-being and the poor in particular.

Apart from that, many communities remain poor and the wellbeing of members unchanged and nothing to show for, despite benefiting from the programme. Additionally, many rural electrification programmes end up not meeting the objectives example, not providing development assistance through the supply of electricity services to stimulate economic productivity and enhance the quality of life in rural areas, failure to raise the incomes of rural households, effectively design tariffs and adapt regulatory systems that can make electricity more affordable to poorer communities and low income households etc.

The evidence for this conclusion can be seen in the World Bank's ratings for the rural electrification projects it supports. Only 68 % of electrification projects supported since 1995 to 2008 had been ranked satisfactory, which represented a drop from earlier periods, and is below the rated assessment for all World Bank projects in general (IEG-World Bank 2008)<sup>[5]</sup>.

The researcher proposed to explore effects of rural electrification on the rural poor people. The study focused on meeting the gap of carrying out an analysis of rural electrification and assessing the socio economic impact of electrification.

### 1.2 Purpose of the Study

Rural electrification is a very important process to provide access to modern energy, especially to the poor people in developing countries like Zambia. Rural electrification programs focus on providing development assistance through the supply of electricity services to stimulate economic productivity and enhance the quality of life in rural areas. These projects usually do not start with an assessment of the needs of the poor people that they are meant to serve. The rural electricity evaluation programs at present are confined to measure only quantifiable variables, such as the number of households electrified while the effects of electrification on rural poor is seldom evaluated and one sided. This study aimed at mitigating that gap as it aimed to gauge the impact of rural electrification on the poor people. The purpose of the study was to investigate the effects of rural electrification on the rural poor people and make the findings help in making rural electrification programmes more responsive to the poor rural people the programmes are set to benefit. It was projected that well planned, well packaged, carefully targeted and effectively implemented rural electrification programs had the potential of opening up opportunities for low income rural people to increase their income and thereby accelerating rural development (IEG-World Bank 2008) <sup>[5]</sup>.

### 1.3 General Objective

The general objective was to investigate the effects of rural electrification on the rural poor people in Zambia with a case study involving Solwezi district.

### 1.4 Specific Objectives

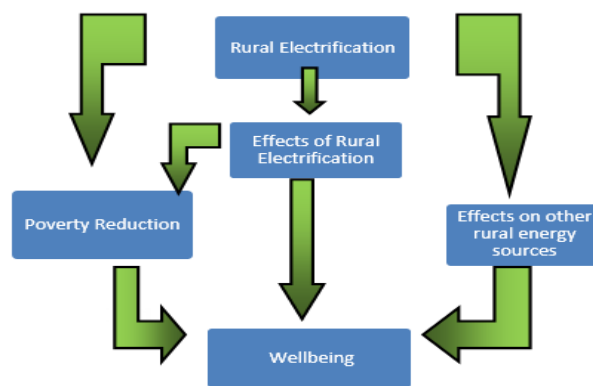
1. To find out if there are other effects (the negative effects) of rural electrification apart from the common economic and social benefits that are already noted by other scholars.
2. To determine if the rural poor people benefit from rural electrification as much as the rich do.
3. To establish to what extent the poor benefit from rural electrification.
4. To deepen knowledge on the relationship between rural electrification and poverty reduction in rural and Peri-Urban areas.
5. To assess the impact of access to electricity on the use of other fuels the poor use in rural communities.
6. To identify the most significant changes brought to rural people by up taking electricity services.

### 1.5 Research Questions

1. What are the negative effects of rural electrification on the poor rural population?
2. Do the rural poor people benefit from rural electrification as much as the rich do?
3. What is the relationship between rural electrification and poverty reduction in rural and Peri-Urban areas?
4. To what extent do the poor benefit from rural electrification?
5. What is the impact of access to electricity on the use of other fuels the poor use in rural?
6. What are the most significant changes brought to rural people by up taking electricity services?

### 1.6 Conceptual Framework of the study

A model of the Conceptual Framework for this study is as shown below:



### 1.7 Limitation

Given the small sample size, findings of this research would not be used to make conclusions or generalize to a larger, representative population. Also, since the households were randomly selected, it was not obvious that all households selected had been there in the area for the period before electrification to have been able to give accurate pre-electrification era data. The other limitation was on how to categorize poor and rich households. However, the proxy

means test (PMT) that was employed by the researcher is the most effective method so far, as to the knowledge of the researcher, to identify who is poor and who is rich on the ground.

## 2. Literature Review

Rural electrification is a key element in the global energy development agenda. Access to basic, clean services is essential for sustainable development and poverty eradication. In Zambia, electricity has been accorded prominence in the country's poverty reduction strategy (Wang, 2007) [6]. Thus, there is a definite need to establish reliable sources of electricity in rural areas. Still, many people worldwide lack access to modern energy, such as electricity. According to recent research studies, more than 1.6 billion people in the world are without electricity and majority of these people are in rural areas of the developing world, where the pace of electrification remains slow (Barnes 2012) [7]. Support to rural electrification is therefore given high priority by the national and donor organizations. Electricity is one of the primary inputs for economic and social development since its provision is crucial for improving living standards, supporting development and fostering social activities (United Nations 2005) [8].

The support of donors and public sectors to Rural Electrification rests on three complementary sets of justifications. First, Rural Electrification is believed to help alleviate poverty. In the short and medium run, local economic growth enabled by access to a reliable source of power can directly and indirectly benefit the poor through higher productivity and enhanced employment opportunities. Further, human capital development (in terms of health and education) facilitated by electricity can help lift constraints to the poor's economic and social well-being. In the longer run, Rural Electrification is said to reduce environmental pressures, thereby facilitating the environmental sustainability of the local development process.

In the last decade, governments for example, have been making various efforts at the policy level to facilitate increased levels of access and affordability of electricity in the rural areas.

However, the introduction of market based reforms in the power sector in the last decade has affected existing institutional and financing arrangements for the rural electrification (Haanyika 2005) [9]. With the privatization and commercialization of power supply activities, rural electrification is being classified as a social activity that must be directly supported by government resources. Consequently, implementation of reforms has affected the rate of electrification and affordability of electricity in rural areas and thus accessibility by the rural poor people.

The Government of Zambia created the Rural Electrification Authority (REA) to implement innovative approaches to rural electrification and oversee the Rural Electricity Fund (REF). However, Traditional rural electrification has often failed (USAID 2005) [10]. According to this report, this is because it is generally based on grid extension with minor off-grid investments; Grid extension is too expensive for most rural consumers; Traditional master plan methods are too expensive and time consuming to produce; Traditional master plan methods are geared towards the grid connected utilities' traditional customer base – rural customers are very different

and the approach to electrification must be very different for rural electrification to succeed, and, Traditional methods fail to involve local communities in the process.

With the electricity access rates at 25% at national level and only 5% in rural areas for a population of 13 million people, low electrification rates continue to be one of the significant challenges. To address this, Government through the Rural Electrification Master Plan (REM) targeted to increase electrification rates to 66% of households by 2030. 90% would be for urban areas and 51% would be for rural areas. The REM has identified 1,217 rural growth centers as priority for electrification throughout the country.

However, in a country with an ailing economy, high inflation and high prices amidst low disposable incomes, the major challenge for citizens especially in rural areas to access electricity becomes affordability of capital contribution or connection fees and consumption fees. In realizing this, ZESCO and the Rural Electrification Authority (REA) have embarked on facilitating a connection fee subsidy scheme aimed at extending electricity to many more households (PMRC 2013) [11]. *The connection prices still are too high for an average rural dweller even if they are subsidized to assure affordability. No wonder rural electrification is said to benefit the non poor more than the poor, whom it is set to benefit. Therefore, access to electricity by the rural poor people would still be low in Zambia especially that the other major challenge for these citizens is affordability of capital contribution or connection fees and consumption fees.*

However, Power tariffs in Zambia are said to be amongst the lowest in the sub region (PMRC 2013 [11] & REA n.d. [12]). *In that regard one would think that electricity should be affordable to many rural dwellers. However, in my opinion, I think power tariffs are unaffordable to the majority rural people in Zambia. Thus, these efforts face a lot of hardship hence the need to identify means of increasing access to energy in a sustainable manner.*

Bernard (2010) [13] also acknowledges that connection rates by rural African households to electricity where the provision exists remain low. He adds that low connection rates are particularly prevalent among poorer households. Bernard (2010) [13] citing Heltberg (2003) showed that less than 5 percent of the households in the lowest income quintile in Ghana and South Africa have access to electricity, while it reaches 25 and 50 percent for the highest quintile. *This alone shows that non poor benefit more than the poor, whom it is set to benefit.*

This is supported by the Independent Evaluation Group-World Bank (IEG- World Bank) (2008) [5] report that stated that it was widely recognized that the larger share of benefits from rural electrification is captured by the non-poor. IEG analysis showed that this continued to be the case, although the gap closes as coverage expands. The report identified two factors underpinning this anti-poor pattern in electrification, that is, which communities get connected and which households can afford the connection once the grid is available. The report acknowledged that although this was necessary for the financial health of the service provider, there was a clear trade-off with reaching the more disadvantaged. *I agree especially with the second factor which can also be thought in the same way as were community members benefit by getting a subsidized connection, those who are poor cannot not still pay consumption charges and as a result supply is cut*

*and a particular household cannot benefit any more.*

The report also observed that increases in coverage come from extensive growth (extending the grid to new communities) rather than intensive growth (connecting the unconnected in already electrified villages). The report further stated that once electricity arrives in a village, the connection charge is a hurdle that prevents the poor from connecting to the grid, even though the benefits they would derive would exceed the cost of supply. Even in villages that had been connected for 15–20 years, it was not uncommon for from 20 to 25 percent of households to remain unconnected (IEG-World Bank 2008)<sup>[5]</sup>. *This is to say that there are still high percentages that do not connect.* Generally, many scholars recognize that the power sector plays a key role in economic development. These scholars have stated and have found the electricity sector to be a key driver of economic growth of any given country, Zambia in particular. *Not disputing to this, literature however fails to account for how individual poor or rural households benefit from rural electrification and more importantly how it affect them positively/negatively.*

Scholars such as Hanyika (2005)<sup>[9]</sup> also added that electricity can meet a diversity of human energy needs compared to the other forms of energy, and that access to reliable and affordable electricity to rural areas has the potential to improve the provision of social services such as health and education. IEG-World Bank (2008)<sup>[5]</sup> report also acknowledged this and attributed this positive impact of rural electrification on service provision to the greater willingness of health and education workers to stay in communities that have electricity.

The study carried out by Elleg`ard *et al* (2004)<sup>[2]</sup> in the Eastern province of Zambia on the experience from the solar energy project found that people benefited. The most benefit cited was that children were now able to have the possibility to do their homework in the evening. It was also found that the other most highly valued feature was that energy contributes to increased income earning opportunities especially in the service sector.

Bernard (2010)<sup>[13]</sup> however argues that productive use of electricity remains low in rural areas. Use of electricity in rural areas is still mainly dedicated to illumination and radio or television, and the rare utilization for agriculture, handicraft, and services are far below the important growth catalyzing effect expected.

IEG- World Bank (2008)<sup>[5]</sup>, also reviews that the dominant use of electricity in rural households is lighting. All households use it for this purpose, and many use little electricity for anything else, thus few households use electricity for productive purposes. *Surly these are not productive or economical uses of electricity to assure income earning opportunities for the poor households. Increased income earning opportunities cannot be assured if these households are not engaged in any economic activity or productive uses of electricity.*

Contrary, IEG's analysis showed that the number of enterprises grows as a result of electrification and that these enterprises operate for more hours. There is, therefore, according to IEG- World Bank (2008)<sup>[5]</sup> a positive impact on household income. *However, the broader literature has found these effects to be less than expected, except when there has been a specific program to promote productive uses of electricity.*

In addition, scholars such as Riddle *et al* (2006)<sup>[11]</sup> have also added that access to electricity is a prerequisite to the improvement of the basic services of health and education. They further add that the provision of affordable and reliable electricity to the poor empowers them to assume a productive role in the economy and society. In the case of Vietnam study for example, electricity greatly contributed to social economic development. It had a strong positive impact on rural life, it support more efficient agricultural production, facilitates the diversification of economic activity including the development of local crafty and industry, and contributes to an increase in knowledge and skills. It had a major beneficial impact on women, pre-empting the use of unclean fuels for cooking and accompanying risk of diseases and death, Riddle *et al* (2006)<sup>[11]</sup>.

A study in Tunisia, (Cecelski *et al* 2005)<sup>[3]</sup>, also found that rural electrification raised rural living standards. It supported both education and health. In the rapid rural appraisal done for the Tunisia case study, households with school age children cited improved home work and school performance as a primary benefits of rural electrification. In general, the study found that these households perceived multiple positive linkages between rural electrification and education, health and quality of life (Cecelski *et al* 2005)<sup>[3]</sup>. *The study however did not come out clearly on whether there were negative linkages and how it impacted the poor.*

In a study in Ghana, Obeng & Evers (2009)<sup>[14]</sup> also added that although electricity per se does not alleviate poverty, its link to poverty cannot be denied. They further stated that besides the harsh living condition poor people find themselves, they also feel a sense of social exclusion. Given this context, it is therefore very crucial to lie together territorially disjoined or isolated rural areas by providing a physical infrastructure such as electricity to increase social resilience as well as facilitate direct social production processes.

On the expenditure side, rural households in developing countries spend between US\$ 20 per month on kerosene and candles, or other energy products (Plastow and Goldstone 2001) as cited by Obeng & Evers (2009)<sup>[14]</sup>. With the use of Kerosene and dry cells, it is observed that monthly expenses can be as costly as US\$ 10 per family (Lorenzo 1997) as cited by Obeng & Evers (2009)<sup>[14]</sup>.

A case study from Bangladesh also showed similar results. Using a cross- sectional survey conducted in 2005 of some 20,000 households in rural Bangladesh, the study found that grid electrification has significant positive impacts on households' income, expenditure, and educational outcomes (Kahandker *et al* 2009)<sup>[4]</sup>. Households' economic activities, both inside and outside the home benefit a lot from electricity. This study in Bangladesh also found that rich households benefit more from electrification than poor households. It also found that income benefits of electrification, on an average, exceed cost by a wide margin (Kahandker *et al* 2009)<sup>[4]</sup>.

In a study in Rwanda, to investigate the rural electrification impacts on different indicators, in which the study examined the effect of electrification status on lighting usage, the time children dedicate to studying at home, energy expenditures, and income using cross-sectional data from rural Rwanda by collecting household data in villages with access to the grid of at least four years duration on the one hand and in villages without access to grid electricity on the other hand, which accounted for self-selection and regional differences, the study

found robust evidence for positive effects on lighting usage (Bensch *et al* 2011)<sup>[15]</sup>. However, effects on income and children's home studying become insignificant if regional differences are accounted for (Bensch *et al* 2011)<sup>[15]</sup>.

In another more recent study by Shahidur R. Khandker, Hussain A. Samad, Rubaba Ali and Douglas F. Barnes (2012)<sup>[16]</sup>, the estimation results indicated that electrification has significant positive effects on time allocation for fuel collection, as well as income, expenditure, and poverty incidence. It also has a positive impact on children's schooling, which can increase future income. This showed that electricity not only alleviates poverty in the near term but also holds the potential to do so over the longer run. *The study however failed to show the immediate effects especially the negative effects so that these can be taken into consideration when implementing future rural electrification programs so that they can be mitigated or avoided.* Also, despite such significant benefits of electrification, the study showed however that the household access rate in rural India is substantially lower (about 60 percent) than that for village electrification (about 90 percent) (Khandker *et al* 2012)<sup>[16]</sup>. Possible reasons for households not adopting electricity are high connection costs among others. Rural households in India depend mainly on agriculture-based seasonal income, from which saving enough for the connection cost may be difficult. *Similarly, the fact that the incomes are seasonal, paying for service charges prove very difficult for many rural dwellers. Therefore, the larger share of benefits accrues to wealthier rural households, with poorer ones having a more limited use of electricity.*

### 3. Methodology

The methodology explained how the study was conducted. For the purpose of this study, Attention was given to select a village/area which had been electrified 2- 3 years back as the pre-electrification era data had to be collected from the memory of the villagers/ community members. If the area that was electrified a long time ago (5-10 years ago) was picked, then the accuracy of the data to be collected through surveying would be lesser as people tend to forget the history. Also if the electrification had taken place before a reasonable longer period of less than 1 -2 years for example, then people would not have been susceptible to the effects of electrification. Thus selecting an area with the above criterion and comparing the scenario before electrification and after electrification, the differential impact/effect of electrification is thus determined.

#### 3.1 Research Design

The design used was non experiment because the research was done or carried out in uncontrolled environment and natural setting. The design looked at the frequency of answers and focused on answers given by all respondents. That is, it mainly focused on data that was quantitative in nature. However some qualitative approach was also used in order to gain a better understanding and possibly enable a better and more insightful interpretation of the results from the quantitative study.

To identify who were the poor and who were rich, the researcher used a Proxy Means Test (PMT) and the occupation of the household head during data analysis. A proxy means test predicts a household's income by collecting simple information about the assets they own (J-PAL Policy Briefcase 2013)<sup>[17]</sup>. It is basically to identify a set of durables

easy to observe and if you own any of them or any five (5) of them for example, then you are not poor. That is, to identify that if you own a car, a big brick house or a motor cycle, you are not poor. It is the most effective method so far, as to my knowledge, to identify who is poor and who is rich on the ground. Thus, the proxy means test (PMT) has the lower error rate as compared to other common methods of identifying who is poor. In this research therefore, any household owning a house, a shop or a car and any household with its head employed was considered and categorized as rich.

#### 3.2 Sampling Frame

The sampling frame consisted of a representative of each household that was sampled from the selected area in Solwezi district of north western province of Zambia, in this case Wisdom compound. Mainly, this research targeted the heads of these households.

#### 3.3 Target Units

The main target units in the research or study were the households that were sampled from the area or community that was selected. A total of 100 households were selected using a Simple Random Sampling method of sampling. This type of sampling is where each and every item in the population has an equal chance of being included in the sample and each one of the possible samples, in case of finite universe, has the same probability of being selected or picked (Kumar 2011)<sup>[18]</sup>. The procedure gives each item an equal probability of being selected. Two (2) focused group discussions were also held in order to get diverse views and also to allow for researcher observation. Discussions with the focus groups are used in order to triangulate the information obtained so that more complete picture of the scenario can be obtained (Denscombe 2007)<sup>[19]</sup>. Staff from the electricity company/Rural Electrification Authority were also consulted in order to get necessary data.

#### 3.4 Data Collection

Both secondary and primary data were collected in the research. The secondary data was used in developing and coming up with the literature review and acted as the basis for confirming the research findings from primary sources. The secondary data for this research was collected from published books, published materials and mainly from the internet. And as for primary data, it was collected from the field by the researcher. And major sources of primary data were the heads of each household selected from the selected area.

#### 3.5 Research Instruments

One instrument of data collection was used in this research or study. The questionnaire was administered by the researcher. There were two (2) sets of questionnaires; one (1) was administered to respondents from the households and one (1) for focused group discussions. The questionnaire included both open (unstructured) and closed (structured) type items developed by the researcher.

#### 3.6 Data Analysis

The data collected was analyzed using quantitative and qualitative approaches. Responses to closed questions and open ended questions were analyzed normally to bring out frequencies of responses on the variable that guided the study.

The responses that come from open ended questions were grouped according to similarities. The responses then were captured and analyzed.

**4. Findings and Discussion of Results**

**4.1 Effects of rural electrification programs**

The analysis on the effects that rural electrification programs come with established that whenever an area is electrified or benefit from rural electrification program, both positive and

negative effects are experiences in the benefiting area as illustrated in the table 1.0. The analysis also established that there are more positive (benefits) effects as compared to negative (costs) effects of rural electrification. Table 1.0 shows this point. The analysis therefore revealed that they are other effects (negative effects) apart from the economic and social benefits (positive effects) that are noted by other scholars.

**Table 1:** Distribution of respondents according to what effects they thought rural electrification comes with

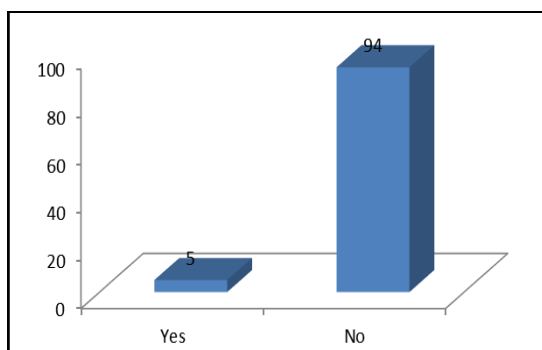
Sample size	Type of response	Frequency	Percentage (%)
100	Both positive & negative	52	52
	Only negative	2	2
	Only positive	37	37
	I don't know	5	5
Not indicating option		3	3
Total		100	100

Source: Author (2016)

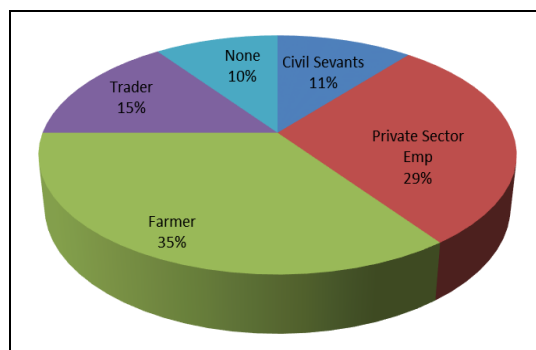
**4.2 Benefit by the poor to rural electrification**

It was found that the poor, especially the very poor do not benefit from rural electrification as illustrated in figure 1.0. This is to say, the rich benefit more to rural electrification than the poor that the program is set to benefit. This is also supported by Table 2.0 that shows that, of the sampled

respondents, the categories with the highest percentage of the "not connected" are those that can be grouped as the poor, example those doing nothing and those doing farming which was found to be dominant in the area as illustrated in figure 2.0.



**Fig 1:** Distribution of respondents according to opinion on whether the poor had benefited from electrification.



Source: Author (2016)

**Fig 2:** Distribution according to occupation of respondents

**Table 2:** Occupation against connection to electricity

Type of response	Totals	Connected	Not connected	% Of connected	% Of not connected
Civil Servant	11	4	7	38	63
Private Sector Employee	29	21	8	72	28
Farmer	35	10	25	29	71
Trader	15	5	10	33	67
None	10	1	9	10	90
Total	100	41	59	59	41

Source: Author (2016)

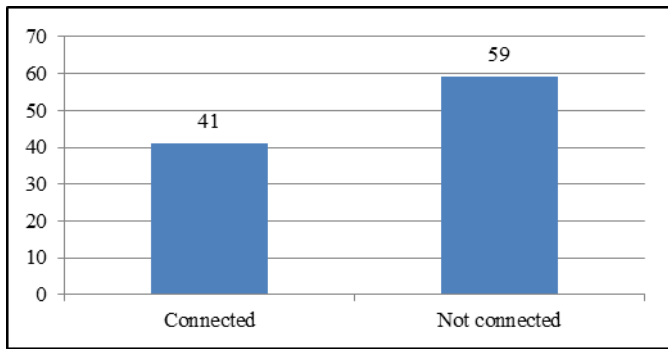
This is further supported by Table 3.0. The table shows that more than half of the households that were categorized as rich (households that owned at least 1 of the selected items- house, car or shop) were connected indicating that more rich households benefited from the program. This explains to why

only a few households were connected to electricity and many not connected as it can be seen in figure 3.0. The objective of the program is to connect all willing households but this is usually not attained as many households fail to pay connection and especially other related charges.

**Table 3:** Owning selected items against connection to electricity

Sample size	Type of response	House	House & Shop	House & Car	Shop	Car	Total
100 (41 connected)	Connected	9	1	1	6	5	22
	Not connected	15	0	1	0	2	18
Total		24	1	2	6	7	40

Source: Author (2016)



Source: Author (2016)

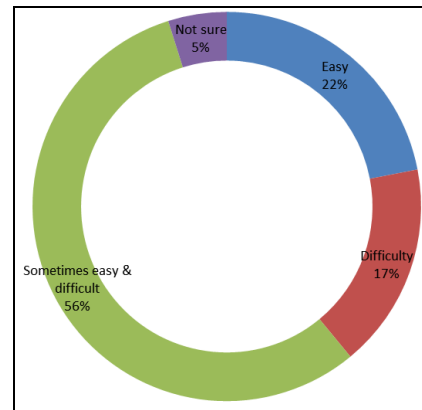
Fig 3: Distributions of respondents according to connectivity to power.

Despite that, the analysis however also found that connection charges were on average and fair for households. This is illustrated in table 4.0. It was also established, as it can be seen in Figures 4.0 that the issue of paying for electricity bills was sometimes easy and sometimes difficult indicating that paying consumption fees was never an easy thing for many households especially the poorer households.

Table 4: Distribution of respondents according to their rating of connection fees/charges.

Sample size	Type of response	Frequency	Percentage (%)
100	Very low	6	6
	Very high	30	31
	On average/fair	59	60
	Don't know	3	3
Total		98	100

Source: Author (2016)



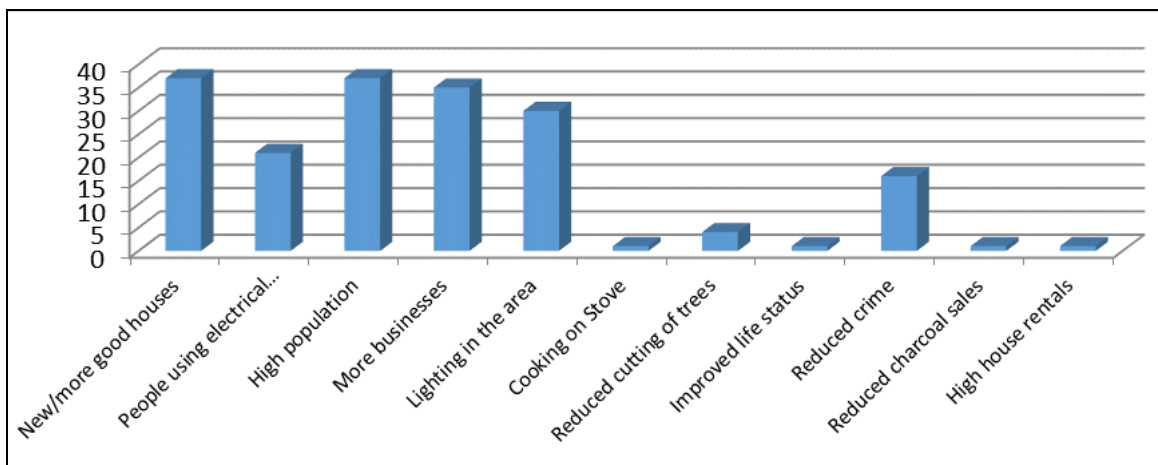
Source: Author (2016)

Fig 4: Distribution of respondents according to issue of payment for electricity bills.

It was found that the extent of benefit by the poor was insignificant, firstly in the sense that the very poor in the rural areas that benefit from the program do not access electricity hence do not benefit from rural electrification as it tends only to be accessed by the well to do or the elites in such rural areas. The fact that there are still high percentages that do not connect is evidence. Secondly, the benefit only end at being employed as general workers (unskilled Labor Force) during the project implementation phase.

**4.3 Most significant changes brought by electrification**

The analysis also found that the most significant changes brought by rural electrification include New/more good houses, People using electrical Appliances, High population, More businesses, Lighting in the area, Reduced cutting of trees, Improved life status, Reduced crime, Reduced charcoal sales and High house rentals in the area. Figure 5.0 confirmed this. It was therefore established that the two (2) major changes are High population in the area and New/more good houses being built in the area.



Source: Author (2016)

Fig 5: Distribution of significant changes in the area for up taking electricity services as noticed by respondents (number of times it was listed by respective respondents).

**4.4 Effects on other rural energy sources**

It was established that rural electrification has no effect on the use of other rural energy sources such as charcoal, fire wood

candles etc. Therefore, the analysis in Table 5.0 confirmed that even after electrification of the area, consumption of tradition energy sources remained the same and unchanged.

**Table 5:** Distribution of respondents according to rate of consumption of major sources after electrification

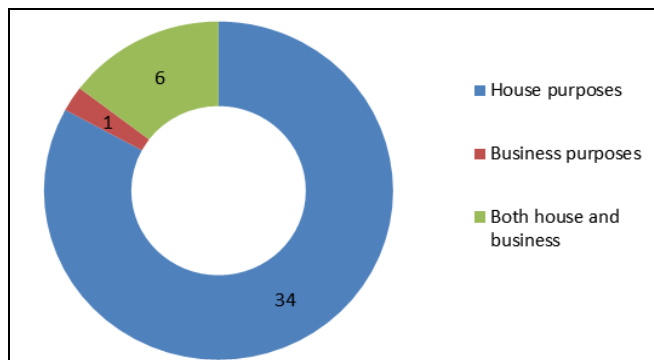
Sample size	Type of response	Frequency	Percentage (%)
100	It has increased	9	9
	It has reduced	18	18
	Remained unchanged	70	70
	I don't know	1	1
Not indicated		2	2
Total		100	100

Source: Author (2016)

Even households that benefited from electrification indicated that they continued using tradition energy sources as a supplementary to electricity. It was indicated that they used these sources as a way of reducing electricity consumption hence reducing bills. Power failure was another reason that was indicated for resorting to tradition energy sources despite having electricity. In the recent past for example, electricity tariffs have been on the raise making most people turn to cheaper energy sources like charcoal. Charcoal is viewed by many people both in urban and rural areas as a cheaper source of energy to electricity.

**4.5 Effect on poverty reduction**

It was established that rural electrification by itself does not directly lead to sustainable development or economic growth. Firstly, the productive uses are mainly constituted by low – load uses. It was found that the main uses of electricity were concentrated in house purposes Figure 6.0 illustrates this scenario. Productive uses of electricity were constituted by uses such as lighting for extension of working hours for shops and bars.



Source: Author (2016)

**Fig 6:** Distribution of respondents according to household's main usage of electricity.

Secondly, it was revealed that most households were not involved in any economic activities enabled by power or electricity. This is confirmed in table 6.0. It was observed that in cases where there were some form of economic activities, very lighter forms of income generating activities were under

taken such as ice blocks making, popcorn popping, scones baking and so on, which in the view of the researcher cannot directly lead to sustainable development or economic growth of the communities and the district in general.

**Table 6:** Distribution of respondents according to household involvement in economic activity enabled by electricity

Sample size	Type of response	Frequency	Percentage (%)
100 (41 connected)	Yes	8	20
	No	33	80
Total		41	100

Source: Author (2016)

It was also revealed that rural electrification in the area of research did not contribute positively to income generation of households. This can be confirmed in Table 7.0. It was established that introduction of electricity resulted in loss of income for some individuals that were in the business of

selling charcoal, candles, firewood etc. For many other people, especially the poor were faced with a problem of paying for electricity connection charges and other related costs such as wiring, and afterwards had to be contended with the issue of paying for consumption charges.

**Table 7:** Distribution of respondents according to electrification's contribution to income generation of households

Sample size	Type of response	Frequency	Percentage (%)
100	Contributed positively	20	20
	Contributed negatively	44	44
Not indicating option		36	36
Total		100	100

Source: Author (2016)

Furthermore, rural electrification in itself does not lead to the proliferation of businesses such as small and medium enterprises (SMEs). This is confirmed in table 8.0. The analysis established that electrification did not lead to creation

or increase in businesses in the area. There are other factors also that are found to be critical for accelerating businesses in the area and in a country. Electricity is just one of those key factors and not the only one.

**Table 8:** Distribution of respondents according to whether electrification had resulted in a proliferation of SMEs

Sample size	Type of response	Frequency	Percentage (%)
100	Yes	36	36
	No	63	63
Not indicating option		1	1
Total		100	100

Source: Author (2016)

This is however contrary to table 9.0 that showed that rural electrification programmes boosts business investments as viewed by the respondents

**Table 9:** Distribution of the effects of rural electrification programmes as viewed by respondents (number of times it was listed by respective respondents).

Sample size	Type of response	Frequency	Percentage (%)
100	Allows for the use of electrical appliances	37	20
	Boosts business/investments	30	16
	Provides a reliable source of energy	16	09
	Burden to pay charges and associated costs	38	20
	Good to environment	28	15
	Saving of time & making life easier	21	11
	Source of employment	2	1
	Kill businesses like charcoal& candle	7	4
	Risky eg to people and equipment	2	1
	Boosts social service eg hospitals	2	1
	Reduction of crime	2	1
	Segregation between poor & rich	2	1
Total		187	100

Source: Author (2016)

**4.6 Effect on wellbeing**

It was revealed that the wellbeing of the majority dwellers in the area remained the same or unchanged. Table 10.0 shows this result. In additional, it was revealed that rural electrification in regard to the area of research did not contribute positively to income generation of households. This can be confirmed in Table 11.0. Introduction of electricity

result in loss of income for some individuals that are in the business of selling charcoal, candles, firewood etc. For many other people, especially the poor are to be faced with a problem of paying for electricity connection charges and other related costs such as wiring, and afterwards be contended with the issue of paying for consumption charges.

**Table 10:** Distribution of respondents according to effect of rural electrification on wellbeing of people

Sample size	Type of response	Frequency	Percentage (%)
100	Wellbeing Improved	22	22
	Wellbeing decreased	2	2
	Remained unchanged	67	67
Not indicating option		9	9
Total		100	100

Source: Author (2016)

**Table 11:** Distribution of respondents according to electrification`s contribution to income generation of households

Sample size	Type of response	Frequency	Percentage (%)
100	Contributed positively	20	20
	Contributed negatively	44	44
Not indicating option		36	36
Total		100	100

Source: Author (2016)

The other reasons to no change in wellbeing include reasons such as unproductive usage of electricity, most households not being involved in any economic activities enabled by power or electricity and also electricity not leading to the proliferation of businesses such as small and medium enterprises (SMEs) in

the area. It was found that the majority of the dwellers were of the view that their households and the community in general did not benefit from the rural electrification process in terms of the advantage the community had in terms of employment and

gain in terms of corporate social responsibility and other support to the vulnerable in society and the general

community members. Tables 12.0 and 13.0 illustrate this outlook.

**Table 12:** Distribution of respondents according to whether electrification process benefited the community

Sample size	Type of response	Frequency	Percentage (%)
100	Yes	24	24
	Not	69	69
Not indicating option		7	7
Total		100	100

Source: Author (2016)

**Table 13:** Distribution of respondents according to whether electrification process benefited their household

Sample size	Type of response	Frequency	Percentage (%)
100	Yes	38	38
	Not	60	60
Not indicating option		2	2
Total		100	100

Source: Author (2016)

**5. Conclusions**

- Rural electrification is a very important process to provide access to modern energy, especially to the poor people in developing countries like Zambia as these programs seek at providing development assistance through the supply of electricity services to stimulate economic productivity and enhance the quality of life in rural areas. However, as these projects usually do not start with an assessment of the needs of the poor people that they are meant to serve, programmes end up not being responsive to the poor rural people they are set to benefit. This is to say, there are important development benefits that can be gained from rural electrification, but in order to achieve these benefits (rural development objectives) there needs to be an integrated approach and combined efforts from all the stakeholders.
- The study revealed that there are other effects (negative effects) of rural electrification apart from the common economic and social benefits (positive effects) that are already noted by other scholars. The study revealed that despite the importance of electricity to economic growth and social development as noted in the literature review, the electrification of rural areas that have been lacking electricity supply for a long time result also in unfavorable effects on the rural poor people. More notably, introduction of electricity result in loss of income for individuals that are in the business of selling charcoal, candles, firewood etc and also lose of income for households that need to pay for connection charges and other related costs such as wiring and consumptions charges.
- It was found that the poor, especially the very poor do not benefit from rural electrification. This is to say, the rich benefit more to rural electrification than the poor that the program is set to benefit. it is clear that the very poor in rural areas of Zambia do not access electricity hence do not benefit from rural electrification as it tends only to be accessed by the well to do or the elites in such rural areas.
- It was found that the extent of benefit by the poor was insignificant. The benefit by the poor is mainly /only end at being employed as general workers (unskilled Labor Force) during the project implementation phase.
- The study also revealed that or showed that rural

electrification by itself does not directly lead to sustainable development or economic growth that can subsequently lead to poverty reduction as productive uses are mainly constituted by low –load uses. It was established that the main uses of electricity in rural areas of Zambia are concentrated in house purposes such as house lighting, cooking and other lighter forms. The study revealed that most households in electrified areas are not involved in any economic activities enabled by power or electricity. It was observed that in cases where there were some form of economic activities, productive uses of electricity are constituted by uses such as lighting for extension of working hours for shops and bars, and to enable lighter forms of income generating activities in households such as ice blocks making, pop corn popping, scones baking and so on, which in the view of the researcher cannot directly lead to sustainable development or economic growth of the communities and the district in general and eventually result in poverty reduction and wellbeing of the community members.

- It was established that rural electrification has no effect on the use of other rural energy sources such as charcoal, fire wood candles etc. It was found that there was no increase or decrease in the consumption of tradition energy sources. It was found that even households that benefited from electrification continued using tradition energy sources as supplementary to electricity.
- The study found that the most significant changes brought by rural electrification which included both positive and negative changes were; New/more good houses, People using electrical Appliances, High population, More new businesses, Lighting in the area, Reduced cutting of trees, Improved life status, Reduced crime, Reduced charcoal sales and High house rentals in the area.

Following The above conclusions, the following are the recommendations to improve the effects and make rural electrification programs more responsive to the rural poor, the people that the programs are set to benefit

**6. Recommendations**

- Since the benefits of rural electrification cannot be visible without enhancing accessibility of electricity to rural people it is set to benefit, the government or decision

makers need to introduce pricing policies that would make electricity affordable to the poor in rural areas. Such policies like capital subsidy for creating infrastructure and targeting to electrify all rural households would be important. As revealed in the study, the average rural electricity price is high, and connection charges and other associated costs are costly and negatively impacting the poor, and leading to low electricity consumption in rural areas and low connection percentages respectively.

- A major step towards improving access for the poor therefore should be taken. The use of partial/full subsidies schemes that retain an incentive element need to be employed. However, subsidies should be designed in such a way that only the poorest segments of society benefit from them, and not the better-off community members or communities. In addition, introduction of credit facilities and possibly micro credit institutions specifically to bill out those households that would not manage to pay connection charges and associated cost (such as wiring of buildings to be electrified) at once would be critical.
- To benefit the rural poor, electricity needs to be sold at a very low price. Therefore, there is need for rural electricity management units not to operate on the basis of profit. Rural electricity tariffs should be subsidized so that the capacity for the poor to pay is improved. This is also important in encouraging households to make an energy usage shift. That is, reducing consumption of fuels such as: kerosene, firewood and charcoal as electricity subsidies will ensure that energy expense levels are kept and maintained at the same level.
- More importantly the government should set an electricity ceiling sale price for rural areas and in particular poor households as this will be positively affecting rural economic activity. However, this government – regulated ceiling price for rural electricity supply should be set at the rate affordable to the poorest people as if not so, the ceiling price would still burden the poorest people.
- Importantly, involving poorer rural benefiting communities in the tariff-setting process will secure better and more adequate tariff systems. Involvement of these communities in the process will give the communities a sense of ownership of the process which is critical to the effectiveness of the electrification programs. This also should include the employment of the locals during the project implementation phase.
- Besides that, the government should come up with or put in place mechanisms and incentives such as loans, tax exemption, special treatment etc; to encourage or drive rural people, in particular the poor, to get into economic activities that electricity can enable so that the economic benefits of rural electrification can be realized or so that rural electrification can lead to the economic development of their communities and wellbeing of rural households especially of the poor.
- Rural economic development needs more than just household electrification. Firstly, Constraints on the availability of energy and its affordability affect economic development, especially in rural areas. Secondly, other measures including complementary economic development programmes, alongside the provision of electricity are also very critical in boosting business development and economic growth. In this respect, there is need also for

measures that would ensure that rural areas are governed by good rural markets and have access to credits.

- Similarly, In order to achieve rural development objective of rural electrification, there needs to be an integrated approach to rural electrification programs and improved water and sanitation, information and telecommunication, education, health and transport services. Therefore, rural electrification should be accompanied by other critical business services and social services. In this regard, the importance of complementary services and appropriate institutions to support rural electrification can never be over emphasized. Joint efforts with other ministries or development agencies are therefore recommended to enhance the economic benefits of electrification.
- In the same way, there is need to package rural electrification programmes with measures and incentives such as social safety nets for those adversely affected by the introduction of electricity supply in their areas. This is to say, the government should develop complementary policies to ease and mitigate the cost of adjustment and to facilitate the cream of rural electrification to benefit the poor and in particular those who took advantage of lack of electricity in their areas to earn a living, for instance, charcoal and fire wood dealers.
- And in promoting rural electrification to lead to sustainable development, the government should introduce incentives to encourage productive and effective uses that are constituted by high – load uses to enable heavy forms of income generating activities in rural areas. This is to say, there is need for incentives to encourage rural industrialization and the setting up of industries in rural areas that electricity can enable. The inclusion of complementary services for example, advocacy to take-up and use electricity including training is another important element for creating the change in attitude. The services be made up of sensitization campaigns to raise awareness amongst households, enterprises and social institutions of both the advantages and disadvantages of electricity for example.
- There is also need to recognize that access to electricity is a right and that electricity is essentially a public service. With this view, there should not be any case of preferences being given to certain areas in the name of economically productive areas. Instead, all areas should be given equal chance, and only ensure that measures are in place to make all areas economically productive.
- All in all, a distinction should be made regarding the type of policy that ought to be used to improve connection and boost economic growth in rural areas where electricity has arrived, and towards expanding electricity to areas where it does not presently exist.

## 7. Further Research

The research focused on the effects of rural electrification on the rural poor people in Zambia, case study of Wisdom Compound community of Solwezi district in North Western province. There is need for further research on the subject in other geographical and areas of distinct economic make ups.

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