



THE REPUBLIC OF UGANDA

UGANDA RURAL-URBAN ELECTRIFICATION SURVEY, 2012



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Uganda Bureau of Statistics
Plot 9, Colville Street
P.O. Box 7186, Kampala,
www.ubos.org

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ACRONYMS

CAO	Chief Administrative Officer
COBE	Census of Business Establishments
DISO	District Intelligence Security Officer
DPC	District Police Commander
EA	Enumeration Area
ERT	Energy for Rural Transformation
GPS	Global Positioning System
ISIC	International Standard Industrial Classification
LCV	Local Council V
LCI	Local Council I
MEMD	Ministry of Energy and Mineral Development
MOES	Ministry Of Education and Sports
MSML	Micro, Small, Medium and Large
PPS	Probability Proportion to Size
RDC	Resident District Commissioner
RUE	Rural-Urban Electrification
UBOS	Uganda Bureau of Statistics
UGX	Uganda Shillings
UNHS	Uganda National Household Survey
WENRECO	West Nile Rural Electrification Agency

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Finally, it is our sincere hope that the findings in this report provide useful information and guidance on how different stakeholders should intervene in the energy sector to ensure poverty reduction and rural transformation in the country.

DEFINITION OF KEY WORDS

Access to Electricity: Defined as the percentage of the population who are using and connected to Grid Electricity.

Activity: The actual activity a business is engaged in as specified in the International Standard Industrial Classification.

Activity Code: A four digit number referencing the activity as specified in the International Standard Industrial Classification.

Bagasse: The fibrous matter that remains after sugarcane or sorghum stalks are crushed to extract their juice. It is used as biofuels and in the manufacture of pulp and building materials as well as in the generation of electric power.

Business Establishment: A single unit which may or may not be part of an enterprise. It is situated at a single location e.g. an individual firm, mine or factory and undertakes productive activity in which the principal productive activity accounts for most of the value added.

Business Register: List of Business Establishments in the country at a particular time, normally used as a sampling frame for economic surveys.

Electrification: The process of powering by electricity, usually associated with changing over from another power source.

Electrification rate: Derived and defined as a linear combination of three sources of electricity. These are Grid, Solar and Generator power.

Enterprise: This is a group of businesses under one umbrella organisation. Consists of more than one business establishment and carries out one or several activities at one or more locations. May or may not be self-accounting.

Enumerator: One who lists or collects data from respondents.

Fluorescent lamp or Fluorescent tube: Low pressure mercury-vapour gas-discharge lamp that uses fluorescence to produce light.

Formal Business: Any business establishment operating within a fixed location which is officially registered (by the registrar of companies or of cooperative societies or other authority), has identifiable owners, meets its tax obligations, preferably with an annual turnover of more than 5 million shillings.

Industry: The economic sector to which the activity that the business establishment is undertaking belongs.

Generator: In electricity generation, an electric generator is a device, usually Diesel or Petrol powered, that converts mechanical energy to electrical energy.

Incandescent light bulb, incandescent lamp or incandescent light globe:An electric light which produces light with a filament wire heated to a high temperature by an electric current passing through it, until it glows (see Incandescence).

ISIC: International Standard of Industrial Classification of all Economic Activities (by the United Nations). It is an international coding system for all activities undertaken.

Legal Ownership: Defines the way businesses are officially (legally) owned.

Load Shedding: The deliberate switching off of electrical supply to parts of the electricity network and hence to the customers in those areas.

Off-grid: The situation of not being connected to a grid. The term is mainly used in relation to the major or national electrical grid. In electricity, off-grid can be stand-alone systems (SHS) or mini-grids typically constructed to provide a smaller community with electricity. Off-grid electrification is an approach to access electricity used in countries and areas with little access to electricity, due to scattered or distant population. It can be any kind of electricity generation. But the term **off-the-grid (OTG)** can also refer to living in a self-sufficient manner without reliance on one or more public utilities.

Paraffin Oil: An inflammable liquid hydrocarbon burned as fuel. Also known as Kerosene or stove oil, it is the most common fuel for lamps and portable lanterns. Paraffin oil is refined from petroleum and is relatively cheap to produce.

Proprietor: Owner of a business.

Reliability: A measure of power availability. In this survey respondents were asked if they had had problems with their energy source within the last six months.

Region: An administrative area with defined boundaries either by counties, districts, or any other specificity, which can clearly differentiate boundaries and is normally named according to the campus direction with respect to the surrounding area or tract of a country. Uganda has no formal administrative

regions but for purposes of this survey, the country was divided into five regions and these are Kampala, Central, Eastern, Northern and Western.

Respondent: A person who provides answers to the interviewer in a face to face interview or a person who records the answers in a self- administered questionnaire.

Response: An answer provided by the respondent during an interview/inquiry or the answer recorded by the respondent in a self- administered questionnaire.

Sector: Equivalent to a category in the ISIC which is normally made up of one or more activities. The expression can be used interchangeably with industry.

Sub-sector: Also called sub-industries, these are the detailed activities within a given industry.

Trade: The act of buying and selling goods and services whether new or used.

EXECUTIVE SUMMARY

A. BACKGROUND

The Uganda Bureau of Statistics (UBOS), on behalf of the Ministry of Energy and Mineral Development (MEMD), conducted the Uganda Rural- Urban Electrification (URUE) Survey in 2012. The survey covered 111 districts of Uganda and the Kampala Capital City Authority as at 2012.

The main objective of the URUE Survey 2012 was to verify and update the existing data on electrification levels as well as to provide baseline indicators for the different socio-economic sectors in the country to support future planning and reporting.

This report therefore presents the findings related to energy sources, reliability of these energy sources, incomes and expenditures and energy efficiency levels at the National and Regional levels for the Household, Business, Education and Health sectors.

The survey covered the following energy sources:

- Electricity (Solar, Grid, Off-Grid and Generator sets)
- Diesel
- Petrol
- Paraffin
- Gas
- Battery
- Charcoal
- Firewood
- Bagasse
- Sawdust

However, the report only presents detailed analysis of major energy sources. These are Grid Electricity, Solar and Generator Power. The report further presents access to power from those sources at the Household, Business, Education and Health. The Spatial Geo-Reference Report and the Predictive Model presentations are presented separately.

A nationally representative sample of Households, Business establishments, Education and Health institutions were selected to allow separate estimates at the National level, Rural and Urban areas.

Response Rates

Table E.1 shows the Response Rates for the 2012 URUE survey. A total of 10,000 households were sampled out of whom 9314 households were successfully interviewed, accounting for 93.1% response rate. Non-response mainly resulted from out migration and also non-coverage of two EAs (located in Kiboga and Kayunga districts). However, the business establishments had a 67 percent response rate, which was achieved resulting from a total sample of 1950 Business establishments. Education and

Health institutions registered complete coverage (100 percent) arising from samples of 639 and 130 institutions respectively.

Table E.1: Response Rate

Sector	Total Sample	Total responded	Percentage Response
Household	10,000	9314	93.1
Business	1950	1314	67.4
Education	639	639	100
Health	130	130	100

B. CHARACTERISTICS OF THE HOUSEHOLD, BUSINESS, EDUCATION AND HEALTH SECTOR.

The survey also collected information on the characteristics of Households as well as Business, Education and Health sector characteristics.

Household Characteristics

The total number of households surveyed was 9,314, out of which 86 percent were located in rural areas and 14.1 percent in urban areas. The average household size was estimated as 5.0. There were more male headed Households (51 percent) compared to female headed household (49 percent). The data showed that 73 percent of heads of Households were aged less than 30 years. Analysis of education level indicated that the majority of household heads in rural areas (58%) had attained education above secondary level while the majority of household heads in urban areas (45 percent) had attained post primary/apprentice level of education. The findings showed that 47.2 percent of the heads of households in rural areas were engaged in crop farming while 70.2 percent of the heads of household in urban areas were engaged in the Business sector. Analysis of housing conditions indicates that, overall, nearly 61.5 percent of household reside in detached dwelling units, followed by Grass thatched huts (26.4 percent). In rural areas, 58.1 percent of households used Tadooba paraffin for lighting. In the urban areas, it was observed that 91.5 percent and 88.1 percent of households used and owned mobile phones respectively while 75 percent and 65 percent used and owned mobile phones in rural areas.

Business Establishments

Businesses dealing in Agriculture, Education, Health & Social works and Food Processing were found in Rural areas, contributing 74.3 percent, 63.3 percent and 61.1 percent respectively. Over ninety percent of the Business establishments in the rural and urban areas use the mobile phone for communication. However, the survey results found out that only 30 percent of the respondents both in the Rural and Urban Business establishments use the Internet.

Education Institutions

The findings of the survey showed that 65.3 percent of the primary education institutions were located in rural areas. This was contrary to the secondary institutions where 36.3 percent of them were in urban areas. Over eighty percent of the education institutions surveyed used the mobile phone as a means of communication across urban and rural areas as well as across the regions. The usage of landline phones by Educational institutions remained as low as in the Businesses and Health institutions.

Health institutions

The survey findings indicated that 72.3 percent of hospitals were found in rural areas while 63.6 percent of medical and dental practices were found in urban areas. On the other hand, 76.9 percent of general clinics were found in rural areas. The finding further reveals that 92.0 percent of health institutions in rural areas used mobile phones to communicate. Generally speaking, over eighty percent of the health institution in all the regions used the mobile phone to communicate. Regional comparison indicated that Kampala had the highest number of Health institutions that used landline phones, contributing 33.9 percent as compared to only 3.7 percent of Health institutions.

C. ACCESS LEVEL OF VARIOUS ENERGY SOURCES AND THEIR CONTRIBUTION TO END USE REQUIREMENTS.

The section presents a summary on the various sources of energy accessed by Households, Business establishments and Education and Health institutions.

C.1 Access to Energy Sources at the National Level by Sector

Paraffin and Firewood are the most accessed Energy Sources at Household level

The survey analysed each energy source independently to arrive at its access level for a particular sector. The results indicate that at Household level Paraffin was the most accessed source of energy (77.6 percent) while in the Business and Health sectors Grid Electricity was the most accessed (61.4 percent and 60.8 percent respectively). Firewood was the highest accessed energy source (96.6 percent) in the Education sector, as shown in Table E.1 below.

Table E.2: Percentage distribution of current energy sources per sector at the National level

15% of Households have access Grid Electricity

Type of Energy Source	Household	Business	Education	Health
Grid Electricity	14.9	61.4	40.2	60.8
Diesel	0.5	8.2	9.0	24.9
Petrol	1.9	12.6	20.5	17.3
Paraffin	77.6	28.3	24.1	52.1
Gas	1.3	3.5	9.9	26.4
Solar	10.6	4.9	23.2	51.6
Battery	2.5	3.2	1.6	3.1
Charcoal	32.9	30.3	21.0	45.6
Firewood	76.5	14.4	96.6	16.1
Bagasse	0.5	0.1	0.5	0.0
Sawdust	0.6	0.3	0.9	0.0

C.2 Access to Energy sources at Residence level by Sector

87 % of Households in Rural areas access Firewood

In the Rural areas, the survey independently analysed each energy source to arrive at its access level for a particular sector. The results indicate that at the Household and Education level, Firewood was the most accessed source of energy (87.5 and 97.4 percent respectively) while at the Business and Health sectors, Grid Electricity (48.7 percent) and Solar Power (68.2 percent) were the most accessed energy sources as shown in Table E.2 below.

Table E.3: Percentage distribution of Current energy source at the Rural areas

Type of Energy Source	Household	Business	Education	Health
Grid Electricity	6.9	48.3	34.0	48.2
Diesel	0.5	6.5	8.9	25.6
Petrol	2.0	11.0	19.6	16.7
Paraffin	80.6	37.2	25.9	53.6
Gas	0.7	2.4	11.1	28.0
Solar	12.1	7.1	26.1	68.2
Battery	2.5	3.7	1.3	3.2
Charcoal	24.3	32.9	18.6	45.7
Firewood	87.5	21.4	97.4	24.0
Bagasse	0.6	0.0	0.6	0.0
Sawdust	0.6	0.6	0.5	0.0

6.9 % of Households access Grid Electricity in Rural areas

In the Urban areas, the survey independently analysed each energy source to arrive at its access level for a particular sector. The results indicate that at Household level Charcoal was the most accessed source of energy (73.1 percent) while at the Business and Health level Grid Electricity (73.5 and 84.8 percent respectively) was the most accessed energy source. Firewood (93 percent) was the most accessed energy source in the Education sector as shown in Table E.3 below.

Table E.4: Percentage distribution of energy sources in Urban areas.

Type of Energy Source	Household	Business	Education	Health
Grid Electricity	52.4	73.1	66.2	84.9
Diesel	0.2	9.3	9.2	23.7
Petrol	1.3	13.1	24.4	18.2
Paraffin	63.2	20.6	16.5	49.3
Gas	4.4	4.2	5.0	23.5
Solar	3.3	2.2	11.2	19.0
Battery	2.7	2.5	2.6	2.8
Charcoal	73.1	27.7	31.4	45.1
Firewood	24.4	7.7	93.1	1.3
Bagasse	0.0	0.2	0.0	0.0
Sawdust	0.4	0.1	2.7	0

C3. Contribution of energy sources to estimated total energy demand

Further analysis was done to compare how the different energy sources contributed to the gross energy demand of each unit in a sector.

National Level

The results in Table E.4 below show that at the National level, the highest share of energy needs are met as follows:

70 % of Total energy requirement at Households is met by Paraffin and Firewood at National level

- Paraffin (35.3 percent) at Household level
- Grid Electricity (38.5 percent) at Business level
- Grid Electricity (20.5) at Health level
- Firewood (39.1 percent) at Education level

Table E.5: Percentage Contribution of Energy Sources to estimated total Energy demand by sector at National Level

Energy Source	Household	Business	Education	Health
Grid Electricity	6.8	38.5	16.4	20.5
Diesel	0.2	4.7	3.6	8.4
Petrol	0.9	7.3	8.3	5.8
Paraffin	35.3	16.6	9.7	17.6
Gas	0.6	2	4.0	8.9
Solar	4.8	2.6	9.2	16.9
Battery	1.2	1.8	0.6	1.0
Charcoal	15.0	17.8	8.5	15.4
Firewood	34.8	8.5	39.1	5.5
Bagasse	0.2	0.1	0.2	0.0
Sawdust	0.3	0.2	0.4	0.0
Total	100.0	100.0	100.0	100.0

Rural and Urban areas

Firewood and paraffin are the commonly used energy sources in the Rural areas at Household level

Comparison within Rural areas at the household level shows that the highest proportion of energy source type commonly used, as shown in Table E.5 below, were:

- Firewood (40.1 percent) at Household level
- Grid electricity (29.6 percent) in the Business establishments
- Solar Power (21.5 percent) in the Health institutions

Table E.6: Percentage Comparison of energy sources to estimated total energy requirement in Rural areas

Energy Source	Household	Business	Education	Health
Grid Electricity	3.2	29.6	14.1	15.5
Diesel	0.2	3.8	3.7	8.2
Petrol	0.9	6.5	8.0	5.4
Paraffin	36.9	21.1	10.6	17.2
Gas	0.3	1.5	4.6	9.0
Solar	5.6	3.9	10.4	21.5
Battery	1.1	2.1	0.6	1.0
Charcoal	11.1	18.9	7.6	14.7
Firewood	40.1	12.3	40.0	7.7
Bagasse	0.3	0.00	0.2	0.0
Sawdust	0.3	0.3	0.2	0.0
Total	100.0	100.0	100.0	100.0

Table E.6 below shows the percentage comparison of energy sources to total energy demand in Urban areas. The findings show that the highest proportion of energy sources used to meet total demand as shown in Table E.6 below were:

Charcoal and paraffin were the most commonly used energy sources at the Household level in Urban areas

- Charcoal (32.4 percent) at Household level.
- Grid Electricity (47.5 percent) at Business level
- Firewood (35.4 percent) at Education sector level.
-

Table E.7: Percentage Comparison of energy sources to estimated total energy requirement in Urban areas

Energy Source	Household	Business	Education	Health
Grid Electricity	23.4	47.5	25.4	31.8
Diesel	0.1	5.7	3.5	8.9
Petrol	0.6	8.1	9.3	6.8
Paraffin	28.0	12.1	6.3	18.5
Gas	1.9	2.6	1.9	8.8
Solar	1.5	1.2	4.2	6.7
Battery	1.2	1.5	1.0	1.0
Charcoal	32.4	16.5	12.0	16.9
Firewood	10.8	4.6	35.4	0.5
Bagasse	0.0	0.1	0.0	0.0
Sawdust	0.2	0.1	1.0	0.0
Total	100.0	100.0	100.0	100.0

C.4 Electrification rate

The survey analysed the Electrification Rate for the household, Business, Education and Health sectors. In this survey, the electrification rate is derived and defined as a linear combination of three sources of electricity. These are Grid, Solar and Generator power. The findings show that the National Electrification Rate was highest in the Health sector. The electrification rate in the Health sector stood at 90.8 percent whereas at Household level the electrification rate stood at 26.1 percent as shown in the Table E.7 below.

26% of Households have electricity from at least one of Solar, Grid electricity and/or Generator energy sources

Table E.8: Percentage Distribution of Electrification rate at Residence and Regional level by Sector

Location		Household	Business	Education	Health
Residence	National	26.1	59.4	55.8	90.8
	Urban	54.8	65.7	70.7	92.3
	Rural	19.9	52.5	52.2	90.0
Region	Kampala	64.9	68.3	66.8	100.0
	Central	34.6	61.5	60.9	93.6
	Eastern	18.5	45.6	51.2	90.5
	Northern	11.8	61.2	51.1	87.7
	Western	24.8	53.1	57.3	83.8

C.5 Contribution of Energy Sources to Selected End Uses

The survey collected information on the contribution of the various energy sources to selected end uses (Lighting, Cooking/Water Heating and Phone Charging, Radio system, Television and Photocopy) by type of energy source across the four sectors. On average 53.3 percent of the total national Households used paraffin for lighting while firewood was mostly used for Cooking/Water Heating. The results also showed that Grid electricity was mostly used for electrical appliances such as Phones, Radio systems, Televisions and Photocopiers.

Over 53 percent of the lighting needs at Household level are met using paraffin.

Table E.9: Percentage Share of selected End Uses type by Energy Source at the National level at the Household sector

Energy Source	Cooking/ Water		Phone	Radio System	Television
	Lighting	Heating	Charging		
Electricity	16.3	3.2	53.4	53.4	71.4
Solar	11.5	0.4	37.5	17.0	15.0
Generator	2.3	0.4	6.7	7.5	11.6
Paraffin	53.3	0.3	0.0	0.0	0.0
Battery	8.5	0.2	2.4	22.1	2.0
Candle	4.6	0.0	0.0	0.0	0.0
Firewood	3.3	70.6	0.0	0.0	0.0
Charcoal	0.2	24.6	0.0	0.0	0.0
Gas	0.0	0.3	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0

Lighting was mostly attained using Grid Electricity with 53 % of the total end use in the Business sector

Analysis in the Business Sector showed that the highest share of requirement for Lighting was contributed by Electricity (52.5 percent) followed by Paraffin (16.7 percent). However, Cooking/Water Heating requirements were met 37.8 percent by Charcoal and 31.4 percent by Electricity, as shown in Table E.9 below.

Table E.10: Percentage contribution of energy sources to selected end uses at the National level in the Business sector

Uses - National	Cooking/Water					
	Lighting	Heating	Phone Charging	Radio System	Television	Photocopy
Electricity	52.5	31.4	76.5	78.4	76.4	32.0
Solar	3.3	1.5	5.3	4.3	1.5	12.4
Generator	13.0	6.0	16.8	12.9	21.0	55.6
Paraffin	16.7	0.0	0.0	0.0	0.0	0.0
Battery	6.6	0.0	1.4	4.4	1.2	0.0
Candle	7.5	0.0	0.0	0.0	0.0	0.0
Firewood	0.1	21.3	0.0	0.0	0.0	0.0
Charcoal	0.0	37.8	0.0	0.0	0.0	0.0
Gas	0.3	1.9	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table E.11 shows the results of further analysis undertaken within the Education Sector. The results revealed that:

- Electricity had the highest contribution to Lighting needs (38.8 percent) followed by Generator (23.4 percent).

- Firewood had the highest contribution to Cooking/Water heating needs (69.7 percent) followed by Electricity (16.0 percent).

Table E.11: The contribution of energy sources to selected end uses at the National level in the Education sector (Percentage)

End Uses - National	Lighting	Cooking/ Water Heating	Phone Charging	Radio System	Television	Computer	Photocopy
Electricity	38.8	16.0	57.5	72.4	63.1	52.6	59.7
Solar	22.1	1.3	19.8	5.1	8.3	19.1	9.8
Generator	23.4	2.8	22.5	20.1	28.6	28.3	30.5
Paraffin	11.2	0.0	0.0	0.0	0.0	0.0	0.0
Battery	3.2	0.0	0.1	2.49	0.0	0.0	0.0
Candle	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Firewood	0.1	69.7	0.0	0.0	0.0	0.0	0.0
Charcoal	0.0	9.8	0.0	0.0	0.0	0.0	0.0
Gas	0.6	0.4	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table E.12 shows the results of further analysis undertaken within the Health Sector. The results revealed that:

- Electricity had the highest contribution to Lighting needs (35.9 percent) followed by Solar (27.3 percent).
- Electricity also had the highest contribution (39.1 percent) to Cooking/Water Heating.

Paraffin met 16.7 percent of Lighting needs at National level in the Health sector

Table E.12: The contribution of energy sources to selected end uses at the National level in the Health sector (Percentage)

Uses - National	Lighting	Cooking/ Water Heating	Phone Charging	Radio System	Computer	Photocopy
Electricity	35.9	39.1	22.7	82.7	47.2	74.5
Solar	27.3	8.1	56.3	9.1	28.7	12.9
Generator	15.6	19.7	21.0	8.2	23.4	12.6
Paraffin	16.7	4.3	0.0	0.0	0.0	0.0
Battery	1.9	0.0	0.0	0.0	0.7	0.0
Candle	1.7	0.0	0.0	0.0	0.0	0.0
Firewood	0.0	5.2	0.0	0.0	0.0	0.0
Charcoal	0.0	19.3	0.0	0.0	0.0	0.0
Gas	0.9	4.4	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

D. GRID ELECTRICITY

Table E.13 is a summary of findings on estimated selected total end use energy requirements at the Household, Business, Education and Health institutions at the National level. The findings show that at the household level, lighting was the most common use of Grid Electricity. This was the same in the Businesses, followed by Education.

Table E.13 Summary of selected End Use of Grid Electricity at the National Level (Percentage)

End Use	Household	Business Level	Education Level	Health institutions
Lighting	23.1	31.5	21.1	24.1
Cooking	1.5	1.7	0.4	2.5
Ironing	15.0	3.5	5.0	8.8
Refrigeration	6.4	12.5	6.0	16.7
Washing	0.1	0.3	3.6	1.6
Water Heating/Cooking	2.2	3.4	1.0	10.0
Air conditioning	0.5	2.1	17.8	5.1
Phone Charging	19.3	18.1	9.5	4.8
Radio	13.1	9.0	11.4	8.9
Television	16.3	9.6	14.9	6.3
Computer	2.5	3.7	9.2	11.3
Photocopy	0.1	4.6		
Total	100.0	100.0	100.0	100.0

Analysis by Residence level

The survey analysed end use of Grid Electricity in Urban areas for the selected uses. The findings show that the most common use of grid electricity is for lighting, accounting for 22 percent at the household level, 31.3 percent in the Business sector, 20.4 percent in the Education Institutions and 24.3 percent in Health institutions. However, at the Household level, the second most common use for Grid electricity is Phone charging which was the same with the Business establishments as shown in Table E.14 below.

Table E.14 Summary of selected End Use of Grid Electricity in Urban areas (Percentage)

	Household	Business Level	Education Level	Health institutions
Lighting	22.0	31.3	20.4	24.3
Cooking	1.4	2.1	0.6	1.0
Ironing	15.6	3.0	3.9	12.4
Refrigeration	7.2	12.2	7.9	16.3
Washing	0.1	0.4	5.0	2.3
Water Heating/Cooking	2.4	4.0	0.6	13.2
Air conditioning	0.4	2.3	17.7	5.1
Phone Charging	18.3	17.3	10.2	3.6
Radio	13.0	8.8	9.1	5.8
Television	16.6	9.1	14.2	4.9
Computer	2.8	4.5	10.5	11.3
Photocopy	0.1	5.1		
Total	100.0	100.0	100.0	100.0

Table E.15 below shows a summary of selected end use total energy requirements in the Household, Business, Educational and Health institutions. The results show that in all the four sectors the most common use of Grid Electricity was for Lighting. The Lighting accounted for 24.9 percent at Household level, 31.7 percent in Business establishments, 21.7 percent in Educational institutions and 23.8 percent in Health institutions.

Table E.15 Summary of selected End Use of Grid Electricity in Rural areas (Percentage).

Selected End use	Household	Business	Education	Health institutions
Lighting	24.9	31.7	21.7	23.8
Cooking	1.7	1.1	0.3	3.8
Ironing	13.8	4.2	5.9	5.5
Refrigeration	5.1	13.0	4.6	17.1
Washing	0.1	0.1	2.5	1.0
Water Heating/Cooking	1.8	2.6	1.3	7.2
Air conditioning	0.6	1.7	17.9	5.1
Phone Charging	21.0	19.5	9.0	5.9
Radio	13.1	9.4	13.2	11.7
Television	15.9	10.5	15.5	7.6
Computer	2.1	2.4	8.3	11.3
Photocopy	-	3.9		
Total	100.0	100.0	100.0	100.0

E. SOLAR ENERGY

The survey also collected information on Usage of Solar Energy at the Households, Businesses, Education and Health levels.

Usage of Solar Energy at the National and Residence Levels by Sector

Table E.16 below shows the usage¹ of solar energy at the National and residence levels by sector. The summary results show that overall the solar energy use levels were highest in the Health sector (50.9 percent) and lowest in the business sector (5 percent). Analysis by residence shows that in the Rural areas use was highest in the Health sector (67.2 percent) and lowest in the business sector (2.2 percent).

Among Rural households 12.2 percent use solar energy as shown in Table E.12 below.

10.6% of Households at the National level use Solar energy

¹ Usage of Solar Energy refers to direct or indirect ownership of the solar equipment (Solar Panels, Solar Water heaters etc)

Table E.16: Percentage distribution of Solar energy access at National and residence levels by sector

LOCATION	HOUSEHOLD	BUSINESS	EDUCATION	HEALTH
National	10.6	5	23.2	50.9
Urban	3.3	7.1	12.2	18.9
Rural	12.2	2.2	26.1	67.2

Contribution of Solar Energy to Selected End Uses

Table E.17 shows that solar energy was mostly used for lighting and Phone charging at the national level across all the sectors.

Across the four Sectors, Lighting was the main end use with over 40 % followed by Phone Charging

Table E.17: Percentage distribution of solar energy use by sector at the National level

SOLAR ENERGY USE	HOUSEHOLD	BUSINESS	EDUCATION	HEALTH
Lighting	42.9	47.1	43.4	42.7
Phone Charging	35.6	30.2	22	26.6
Radio	10.9	15.8	2.8	0.0
Television	9	4.5	5.3	
Others	1.6	2.4	2	30.7
Computer	0.0	0.0	19	
Photocopy	0.0	0.0	5.5	
Total	100	100	100	100

F. GENERATOR POWER

Usage of Generator Power at the Household Level

The results showed that 36 percent of Education institutions, 31.2 percent of Health institutions, 18 percent of Businesses and 2.0 percent of Households use² generator power, as shown in Table E.14 below.

Only 2% of Rural Households used generators

Table E.15: Usage of Generator Power at the National and residence levels by sector.

	Household	Business	Education	Health
National	2.30	17.5	36	31.2
Urban	1.4	58	31	39.6
Rural	2.4	42	69	60.4

Contribution Generator power to Selected End Uses

The survey results showed that the main End Use for generator power was for lighting across the four sectors (Household, Business, Health and Education). At the Household level Television was noted to be the second most common use of generator power while in the Education and Health sectors, Computer Usage was noted to be the second most common use of generator power.

Lighting, Television and Phone Charging were main end-uses at the Household level.

² Usage is defined as direct or indirect ownership of a Generator set

Table E.16: Comparison of percentage distribution of generator use by sector.

	Household	Business	Education	Health
Lighting	27.3	31.4	30.8	27.8
Television	24.5	11.4	13.4	6.6
Phone Charging	22.4	17	16.6	11.2
Radio	16.1	6.7	6.4	2.3
Computer	3.1	14	18.6	14.4
Cooking/Water Heating	2.8	3	1.4	12.7
Saloon	2	1.9	0	0
Photocopying	1	6.9	10.7	5.4
Ironing	0.4	0.0	0.0	0.0
Machine operation	0.2	6.1	1.9	4.0
Refrigeration	0.2	0.9	0.2	5
Theatre	0.0	0.0	0.0	7.7
Incubation	0.0	0.0	0.0	2.9
Others	0.0	0.7	0.0	0.0
Total	100	100	100	100

G. RELIABILITY OF ENERGY SOURCES

Information on Reliability of Energy Sources was also collected for all the sectors. Reliability was defined as a measure of power availability and in this survey respondents were asked if they had experienced any problems with their energy source over the last six months.

Load Shedding of Grid Electricity Supply

Over 90 %
Respondents
experienced
load shedding
in 2010 and
2011

The findings showed that across the four sectors at the National level, over 90 percent of the respondents experienced load shedding in 2010 and 2011 and this was the same response in the Urban and Rural areas, as shown in Table E.17 below.

Table E.17: Percentage Distribution of Grid Electricity (Load Shedding) by Sector and Location

Location	Household	Business Establishments	Education	Health
National	92.9	96.2	95.4	93.1
Urban	92.7	95.8	93.8	95.9
Rural	93.2	96.8	96.5	89.1

Reliability of Solar Systems

90% of Solar
Energy was
Reliable at
Household
level

The findings show that 90 percent of the households had experienced no problems with their Solar Systems, as shown in Table E.18 below.

Table E.18: Percentage distribution of Solar energy reliability at the National Level

Level of Reliability	Household	Business	Education	Health
Very reliable	90.0	60.1	83.1	77.9
Reliable	10.0	28.1	16.9	22.1
Fairly reliable	0	11.1	0	0
Unreliable	0	0.7	0	0
Total	100.0	100.0	100.0	100.0

Reliability of Generator Power

Generator power was reported to be generally reliable across all the sectors. However, 13.5 percent of the Health institutions had experienced problems with their generator power systems, as shown in Table E.19 below.

44% of Health Institutions were very reliable

Table E.19: Percentage distribution of Generator energy reliability at the National Levels

Level of Reliability	Household	Business	Education	Health
Very reliable	40.8	36.2	26.1	43.8
Reliable	32.6	42.7	38.1	33.2
Fairly reliable	17.7	16.4	23.3	9.5
Unreliable	9.0	4.8	12.5	13.5
Total	100.0	100.0	100.0	100.0

H. ENERGY EFFICIENCY**Training on Energy Efficiency**

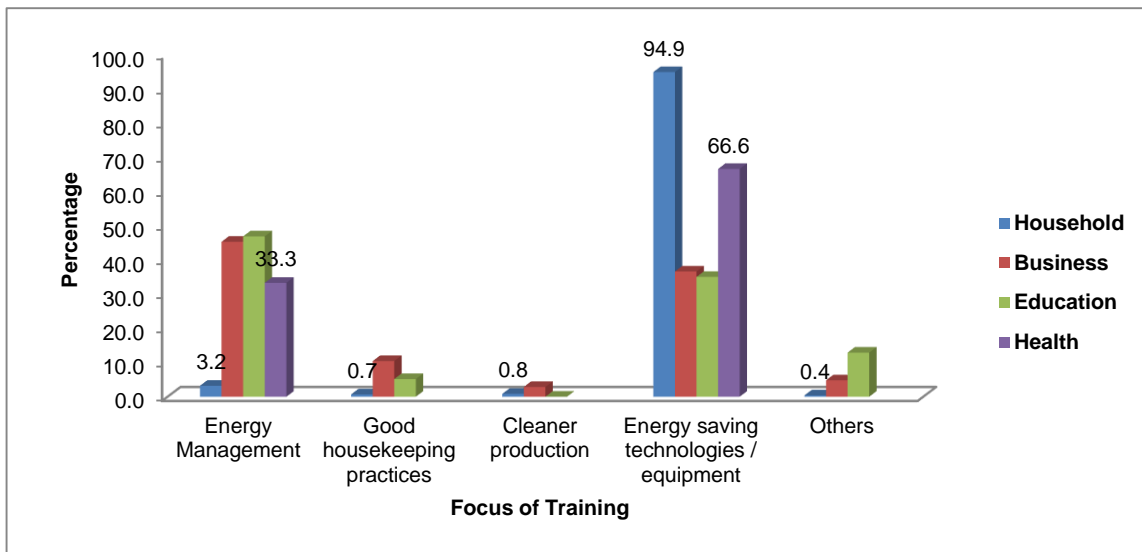
The survey collected information on Energy Efficiency improvements for all the sectors. The findings showed that 9.0 percent of Households received Training or Advice on energy efficiency. Of those households, 35.4 percent adopted energy savings measures with 95.0 percent of those measures being in the adoption of Energy Saving technologies as shown in the Table E.20 below and Figure E1.

Table E.20: Percentage Distribution of Households & Institutions who received and implemented energy savings measures

Energy Measure	Household	Business	Education	Health
Received training or advice	9.0	12.3	17.8	9.4
Adopted energy saving measures	31.4	44.9	46.8	56.0

9.0 % of Households received Energy efficiency trainings

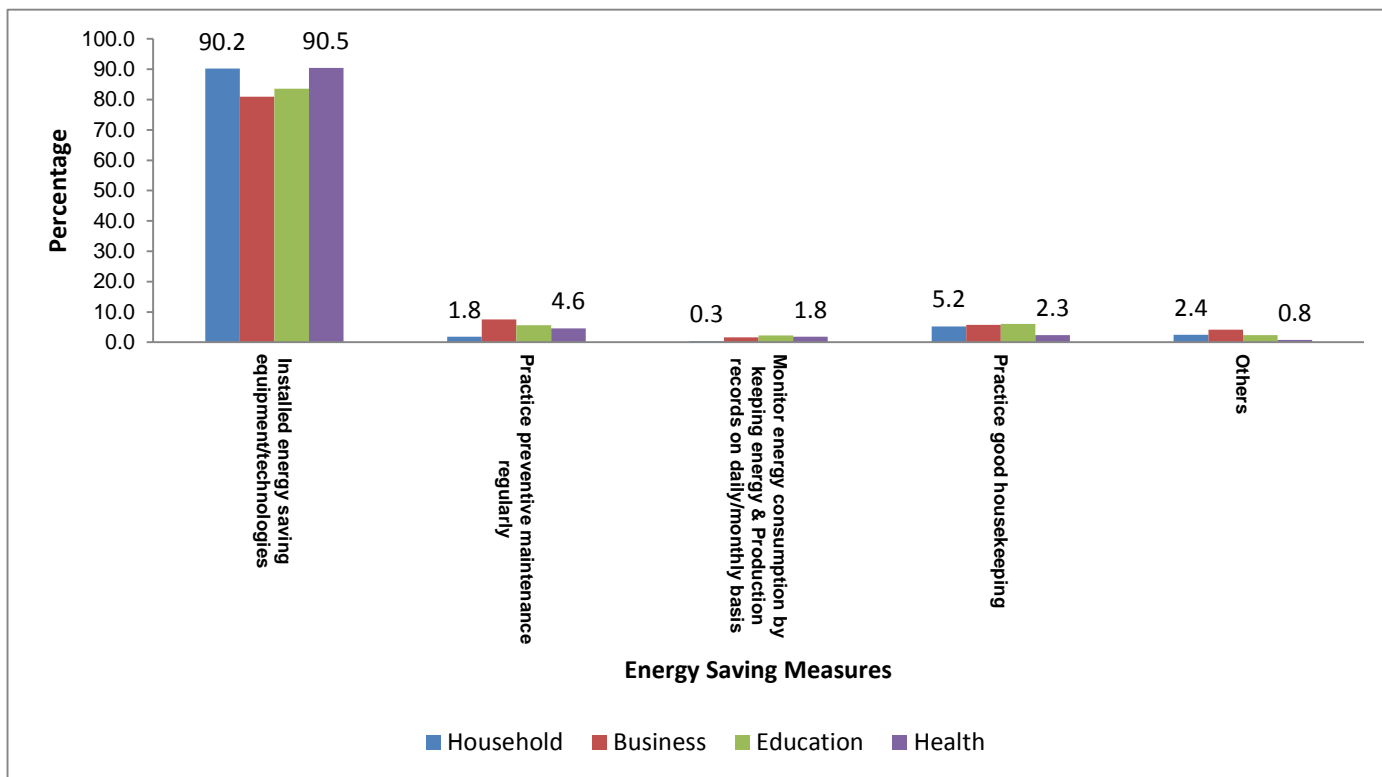
Figure E.1: Percentage distribution of Focus of Training by Sector



80% of Households adopted energy savings technologies

Information on adopting the use of the Energy Savings Methods and the type of method was also collected. The most commonly adopted energy savings measure was the installation of energy saving equipment, as shown in Figure E.2 below.

Figure E.2: Percentage Distribution of Energy Saving measures adopted



I. HOUSEHOLD INCOME AND EXPENDITURE ON ENERGY USED.

This section covered the household income earned from economic activities and expenditures on electricity used. The survey analysed the income by taking the medium average without adjusting for inflation and non-household family labour during the period (received in kind).

Average Monthly Household Income

Table E.21 below shows the main medium income earned by household, Business establishments, Education and Health institutions. The findings reveal that the average monthly income was at UGX 250,000/= while in the Rural areas the average income was reported to be at UGX 216,700/=. Analysis by residence in the Household, Business establishments as well as Education and Health always earn more than their Rural and National counterparts.

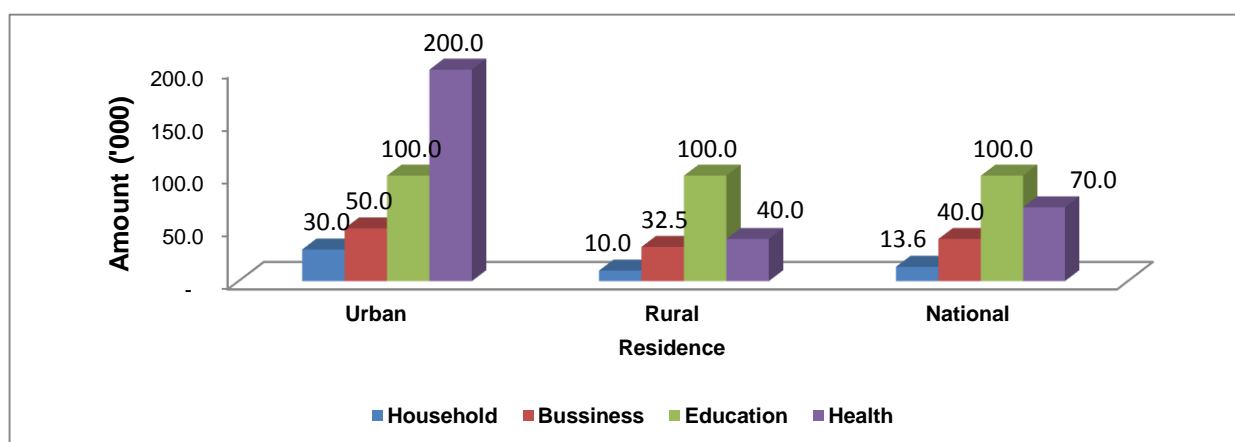
Table E.21 Average monthly Income by Residence and at the National level in Uganda Shillings. (UGX)

Residence	Household	Business Establishments	Education Institutions	Health institutions
Urban	450,000	450,000	5,471,200	1,183,200
Rural	216,700	483,400	1,801,400	366,700
National	250,000	475,000	2,394,100	625,000

Average Monthly Expenditures on Energy

The survey collected and analysed Households, Business establishments Education and Health institutions expenditures on Electricity. At the Household level, the findings showed that on average each household spends UGX 13,600 at the national level on Electricity. Analysis by residence shows that Urban Households spent more on electricity compared to their Rural Households who spent only UGX 10,000/=. However, the findings showed that Health institutions paid more on electricity used than in any of the four sectors (Households, Business, Education and Health) as shown in Table E.22.

Figure E.22 Average monthly Expenditure on Energy Used by Residence and at the National level in Uganda Shillings. (UGX)



When Income earned and expenditure on energy is compared, it is evident that the Households, Business establishments, Education and Health institutions have the ability to pay for their energy requirements.

J. WILLINGNESS TO PAY FOR THE ENERGY CONSUMED FOR THOSE INTERESTED IN GRID ELECTRICITY

The survey collected information on how much Households, Businesses, Education and Health institutions would be willing to pay for the energy consumed. The results showed that at the Household level, the highest responses were from households willing to pay between UGX 1,000 to UGX 10,000 per month (54.5 percent). In the Business establishments, the highest amount establishments' were willing to pay was more than UGX 100,001 monthly, accounting for 19.6 percent. This was similar to the case of Health institutions, as shown in Table E.22 below.

Table E.23 Distribution of a mount sectors are Willing to pay for energy consumed at the National level

Range of Amount Willing to Pay	Household	Business	Education	Health
1,000-10,000	54.5	35.8	8.6	4.31
11,000 -20,000	20.3	19.25	11.03	4.23
21,000-50,000	17.9	18.91	30.18	34.21
51,000-100,000	4.8	6.46	20.69	22.7
100,001 Plus	2.6	19.59	29.5	34.55
Total	100.0	100.0	100.0	100.0

Analysis by Rural residence showed that the highest amount Households and Business establishments were able to pay ranged from UGX1,000 to UGX10,000. However, in the Education and Health sectors, the highest amount these institutions were willing to pay was between UGX 21,000 to UGX 50,000, as shown in Table E.23 below.

Table E.24: Distribution of a mount sectors are Willing to pay for energy consumed in Rural areas

Range of Amount Willing to Pay	Household	Business	Education	Health
1,000-10,000	54.0	40.59	8.92	0
11,000 -20,000	20.0	19.33	10.9	4.93
21,000-50,000	18.3	21.21	29.2	38.65
51,000-100,000	5.0	7.02	21.88	26.45
100,001 Plus	2.6	11.86	29.1	29.98
Total	100.0		100	100

In the Urban areas, Business establishments and Health institutions were noted to be able and willing to pay more than UGX 100,000 monthly for energy consumed accounting for 37.6 percent and 62.2 percent respectively as shown in Table E.24 below. However, 59.4 percent of the Urban Households were noted to be able to pay between UGX 1,000 and UGX 10,000 and this scenario was not different from that pertaining in rural Households.

Table E.25 Distribution of amount sectors are Willing to pay for energy consumed in Urban areas

Range of Amount Willing to Pay	Household	Business	Education	Health
1,000-10,000	59.4	24.62	5.88	30.42
11,000 -20,000	22.2	19.04	12.13	0
21,000-50,000	13.6	13.56	38.57	7.35
51,000-100,000	2.5	5.16	10.49	0
100,001 Plus	2.3	37.62	32.94	62.23
Total	100.0	100.0	100.0	100.0

CHAPTER ONE

BACKGROUND, METHODOLOGY AND FIELD ORGANISATION

1.0 Introduction

Rural transformation is a priority in the Government of Uganda (GOU) National Development Plan (NDP) which depends mainly upon provision of infrastructure and functioning social services to promote growth and reduce poverty. Among the pillars of rural transformation are access to modern energy services and to Information Communication Technologies (ICTs). But that access is especially still a challenge in rural Uganda.

The GOU started implementation of the ten year three-phased Energy for Rural Transformation (ERT) Programme in August 2002, with a project development objective of increasing access to energy and ICTs in rural Uganda. The programme aimed at increasing rural access to energy from 1% in 2002 to 10% in 2012 through three means i) grid extension; ii) independent power producers and iii) solar energy.

The purpose of the ERT programme is to develop Uganda's energy and ICT sectors so that they can make a significant contribution to rural transformation i.e., these sectors facilitate a significant improvement in the productivity of enterprises as well as the households' quality of life.

One of the elements of the ERT programme is a cross-sectoral approach, under which an explicit effort is being made to ensure that end-user sectors such as Health, Agriculture, Education and Water benefit from the expansion of rural access to energy and ICTs. In this way, even those people who are not directly connected by the expansion will also benefit from the newly introduced services.

The ERT programme is spearheaded by the Ministry of Energy and Mineral Development (MEMD). However, within the energy sector, there are various entities extending energy services to the rural communities. Among those are the West Nile Rural Electrification Company (WENRECO), Fersult Engineering Services and WSS Services Uganda Limited.

The Uganda Rural-Urban Electrification (URUE) survey was carried out by Uganda Bureau of Statistics (UBOS) in collaboration with MEMD in order to acquire baseline data for the ERT Programme and also to update the existing data regarding the levels of electrification (Rural, Urban and National). The Information obtained will be used for planning appropriate interventions and in planning for the subsequent phases of the programme.

1.1 Survey objectives

The main objective of the URUE Survey 2012 was to verify and update the existing data on electrification levels and, more specifically, the survey sought to achieve the following objectives:

- a. Establish the extent of electrification in Households in the country at Rural, Urban, Regional and National levels.

- b. Establish the extent of electrification in Education and Health institutions and other Business establishments.
- c. Determine the monthly expenditure of Households, Educational and Health institutions and Business establishments on electricity and their approximate income to evaluate the ability to pay for electricity.
- d. Determine the various uses of electricity in Households, Educational and Health institutions and Business establishments.
- e. Determine the reliability of the different sources of electricity such as grid electricity, solar, diesel generator sets, biomass and others.
- f. Determine and establish the spatial geo-reference of the different energy alternatives in use such as solar biomass, diesel generator sets and others and the extent to which they are utilised.
- g. To compile input data for developing a predictive model to be used in determining the rate of Electrification.

1.2 Scope and Coverage

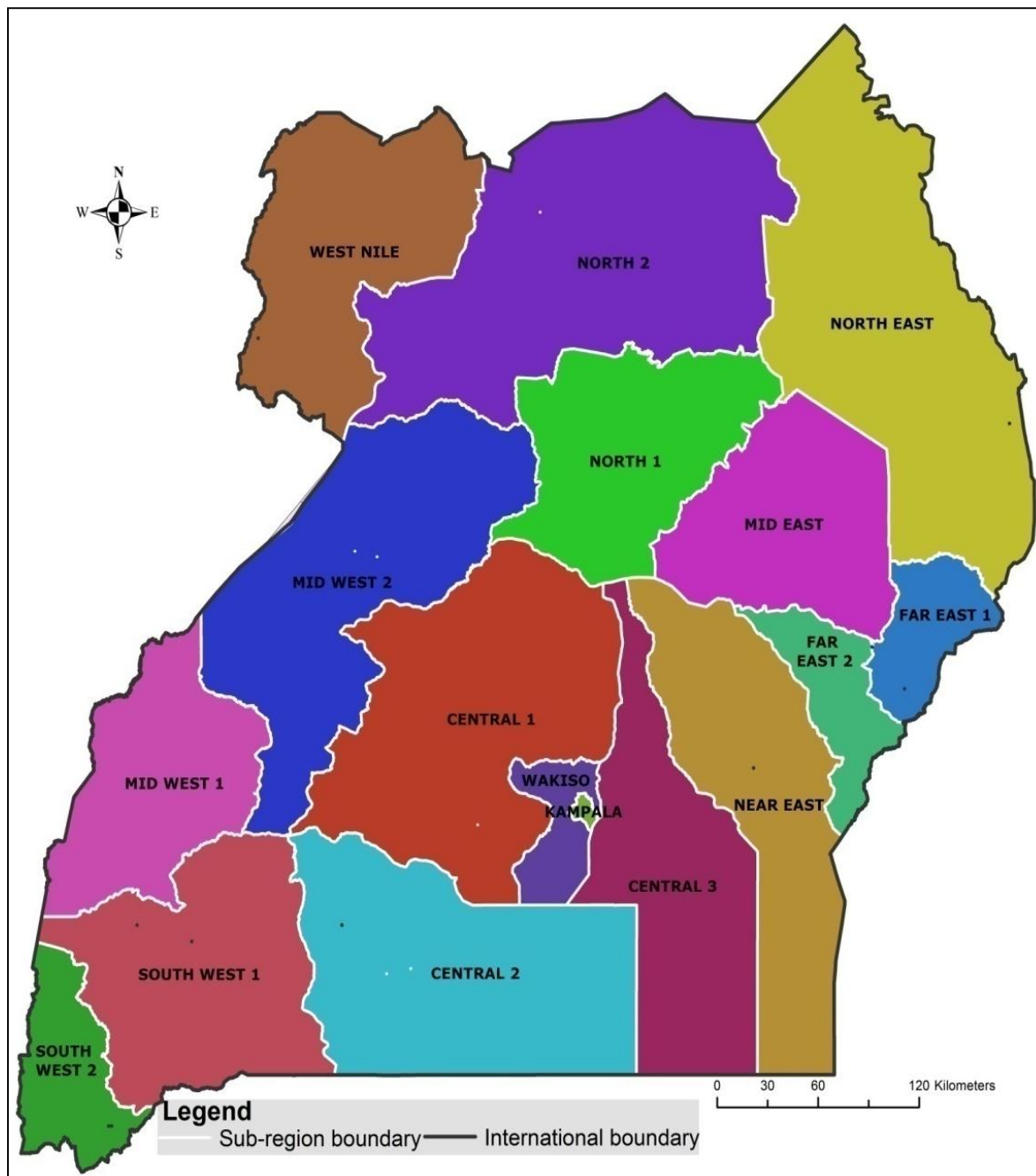
A nationally representative sample of Households, Education, Health institutions and Business establishments was selected to allow separate estimates at the National, Rural and Urban areas of the country. At the regional level, the statistical sub-strata are as shown in Table 1 and Figure 1 below.

Table 1.1: Statistical Sub-strata

Sub-Stratum	Sub-Stratum	Districts
Kampala	01	Kampala
Wakiso	02	Wakiso
Central 1	03	Luwero, Nakaseke, Nakasongola, Kiboga, Mubende, Mityana, Mpigi, Gomba, Butambala and Kyankwanzi
Central 2	04	Masaka, Kalangala, Sembabule, Rakai, Lyantonde, Bukomansimbi, Kalungu and Lwengo,
Central 3	05	Kayunga, Mukono, Buikwe and Buvuma
Near East	06	Kamuli, Kaliro, Namutumba, Iganga, Bugiri, Mayuge, Jinja, Luuka, Namayingo and Buyende
Far East 1	07	Bukwo, Kapchorwa, Sironko, Bududa, Mbale, Manafwa, Kween and Bulambuli,
Far East 2	08	Pallisa, Budaka, Butaleja, Tororo, Busia and Kibuku.
Mid-East	09	Amuria, Katakwi, Kumi, Kaberamaido, Bukedea, Soroti, Serere and Ngora.
North 1	10	Oyam, Apac, Lira, Amolatar, Dokolo, Alebtong, Kole and Otuke.
North 2	11	Amuru, Gulu, Kitgum, Pader, Agago, Lamwo and Nwoya.
North-East	12	Kaabong, Kotido, Moroto, Abim, Nakapiripirit, Amudat and Napak.
West Nile	13	Nebbi, Arua, Koboko, Maracha, Yumbe, Moyo, Adjumani and Zombo.
South West 1	14	Isingiro, Kiruhura, Ibanda, Mbarara, Bushenyi Ntungamo, Buhweju, Mitooma, Rubirizi and Sheema.
South West 2	15	Kabale, Kisoro, Kanungu and Rukungiri.
Mid-West 1	16	Kasese, Bundibugyo, Kabarole, Kamwenge, Kyenjojo and Ntoroko.
Mid-West 2	17	Kibaale, Hoima, Buliisa, Masindi, Kiryandongo and Kyegegwa.

Source: UBOS, 2002

Figure 1.1: Map of Uganda Showing Survey Sub-strata



Source: UBOS ERT Survey, 2012

Figure 1.1 Map of Uganda showing survey sub-strata

1.3 Survey Design

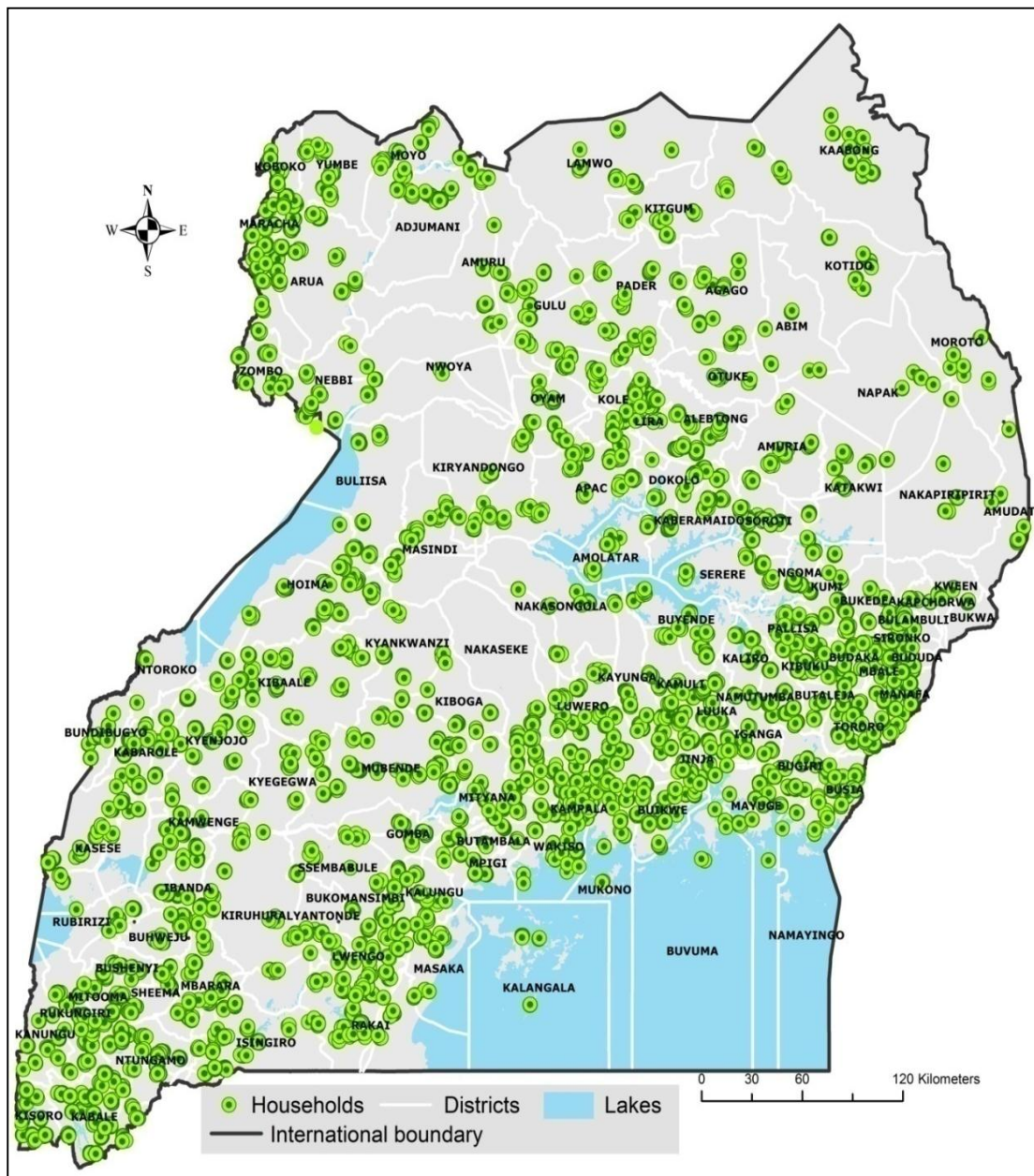
There were four categories of respondents. Those were Households, Business establishments, Health institutions and Educational institutions. Different survey designs were used for each of the four categories of respondents.

1.3.1 Households

The Uganda Rural-Urban Electrification (URUE) Survey 2012 was conducted using a two-stage sampling design. The first stage involved the sampling of the Enumeration Areas (EAs). The EAs were categorized by district into 17 groupings in line with the statistical sub-strata (strata), based on areas with similar socio-economic characteristics. After the grouping, Primary Sampling Units i.e. EAs were drawn from each stratum using Probability Proportion to Size (PPS). At the second stage, the households, the Ultimate Sampling Units were drawn using Systematic Sampling.

A total of 1,000 EAs representing the general household population were selected using the Uganda Population and Housing Census Frame for 2002. Ten households were sampled from each EA. Overall, 10,000 households were covered in the survey.

Figure 1.2: Map showing the scope of household coverage.



1.3.2 Business Establishments

The sampling frame for selecting establishments was the 2010/11 Census of Business Establishments (COBE). The focus was on all businesses irrespective of the number of employees and it covered the following sectors:

- Agriculture
- Mining and Quarrying
- Manufacturing
- Construction
- Trade
- Hotels and Restaurants
- Finance and Banking
- Insurance
- Transport, Posts and Telecommunications
- Real Estate and Business Services
- Community, Social and Personal Services

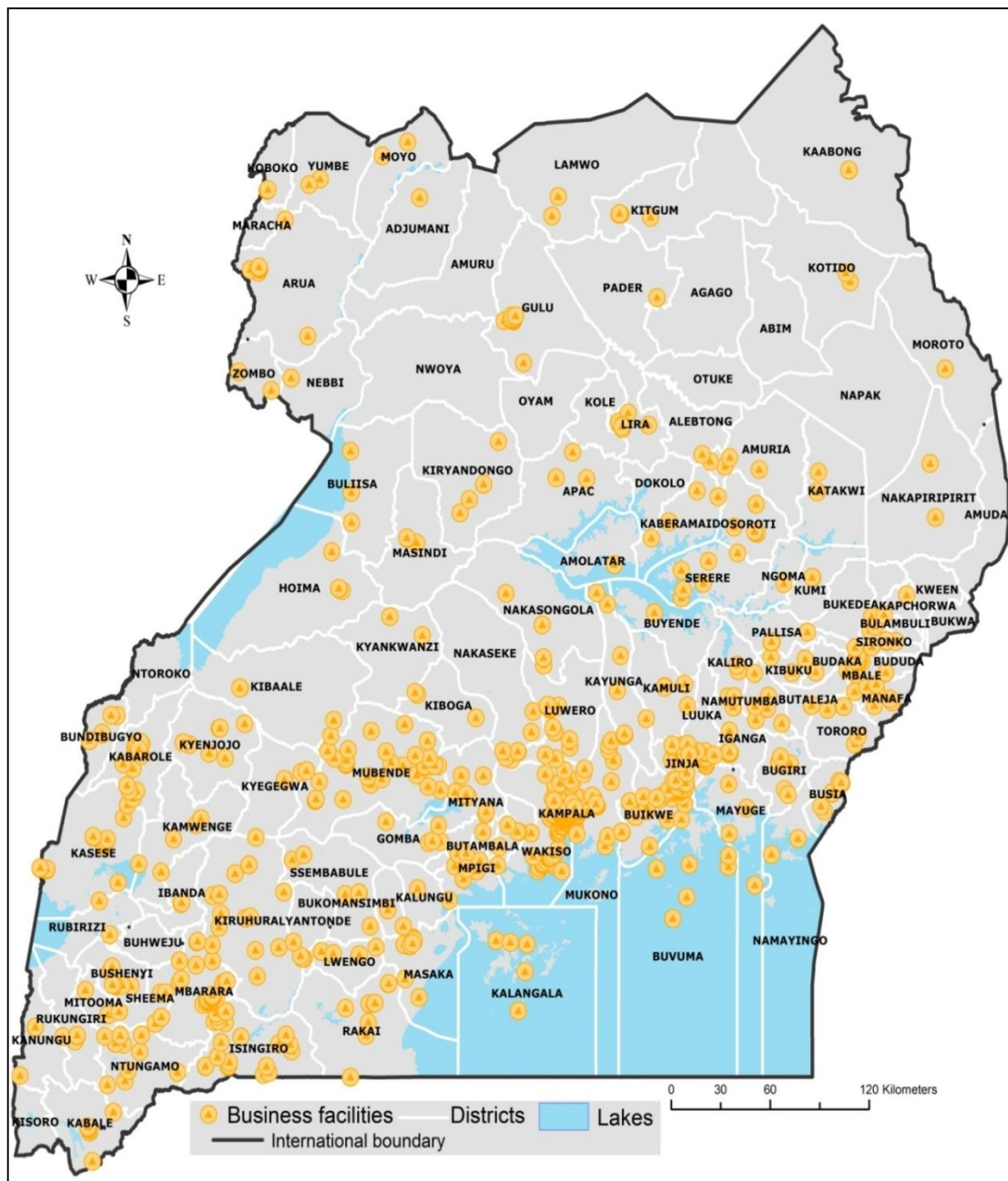
The sample was drawn from a population of 447,500 businesses and out of this 94 percent employed less than 5 persons while only 6 percent employed at least 5 persons. The sample size was 1500 and a provision of 30 percent was made for non-response such that the sample was increased by 450 to 1,950 as shown in Table 2 below. In order to allocate the sample size of 1,950, the population was stratified by Industry and by the 17 statistical regions and the businesses within each stratum were also determined using PPS.

Table 1.2: Sample of businesses by Employment Size

Employment Size	Total Businesses	Sample	Estimated Non Response	Total Sample
Only 1	271,250	483	145	628
2-4	150,341	267	80	347
5-9	16,929	490	147	637
10-19	5,731	166	50	216
20-49	2,539	73	22	95
>=50	723	21	6	27
Total	447,513	1,500	450	1,950

Source: UBOS COBE, 2011/2012

Figure1.3: Distribution of Business establishment covered



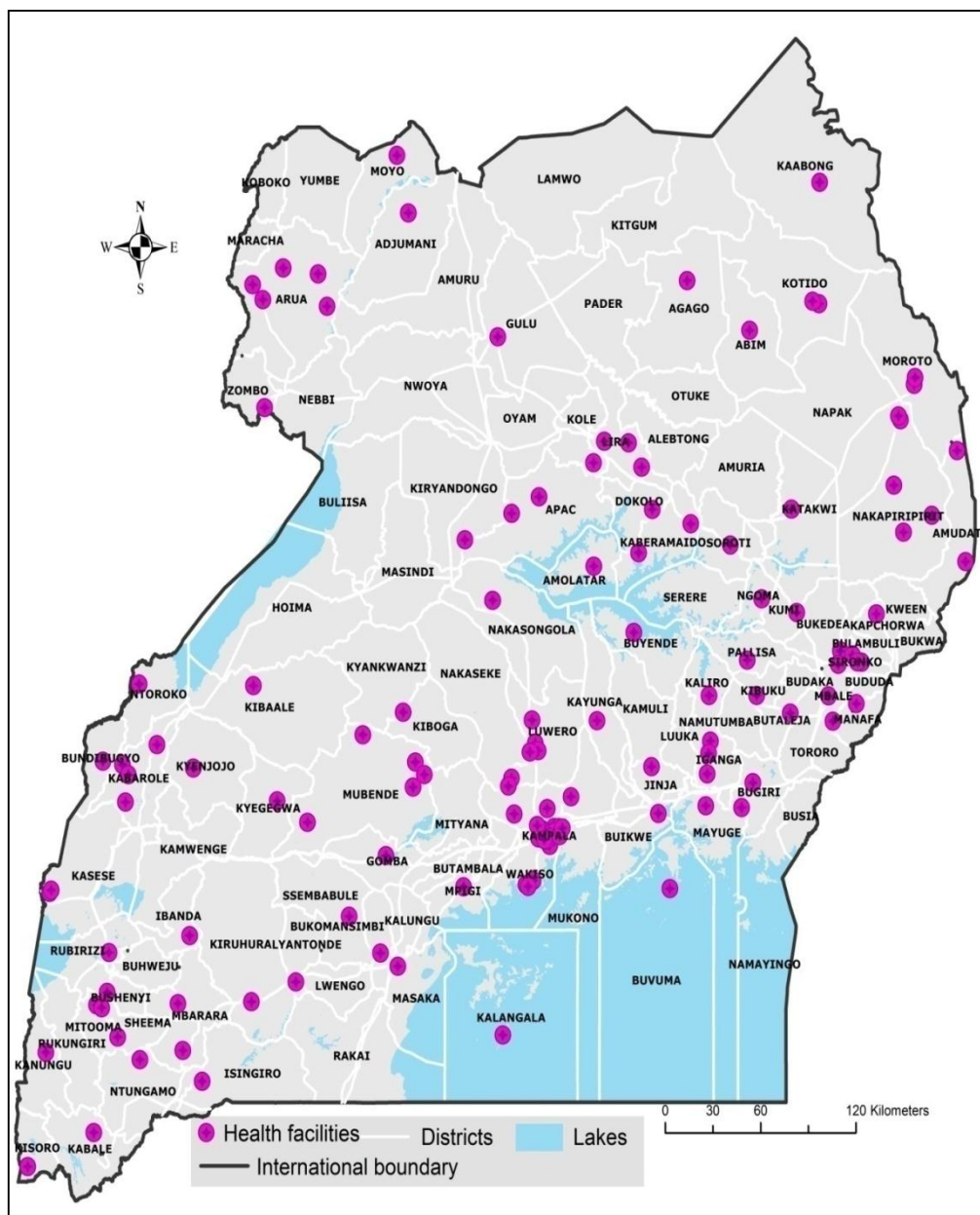
The sample design for Health institutions followed the same design used for the selection of Business establishments as shown in Table 3.

Table 1.3: Sample for Health Care Institutions

Employment Size	Total Health Units	Total Sampled	Provision for Non Response	Total Sample
1-4	5,300	50	15	65
5-9	1,369	26	8	34
10-19	820	16	5	20
20-49	314	6	2	8
>=50	129	2	1	3
Total	7,932	100	30	130

Source: UBOS COBE, 2011/2012

Figure 1.4: Distribution of Health institutions covered



1.3.3 Education Institutions

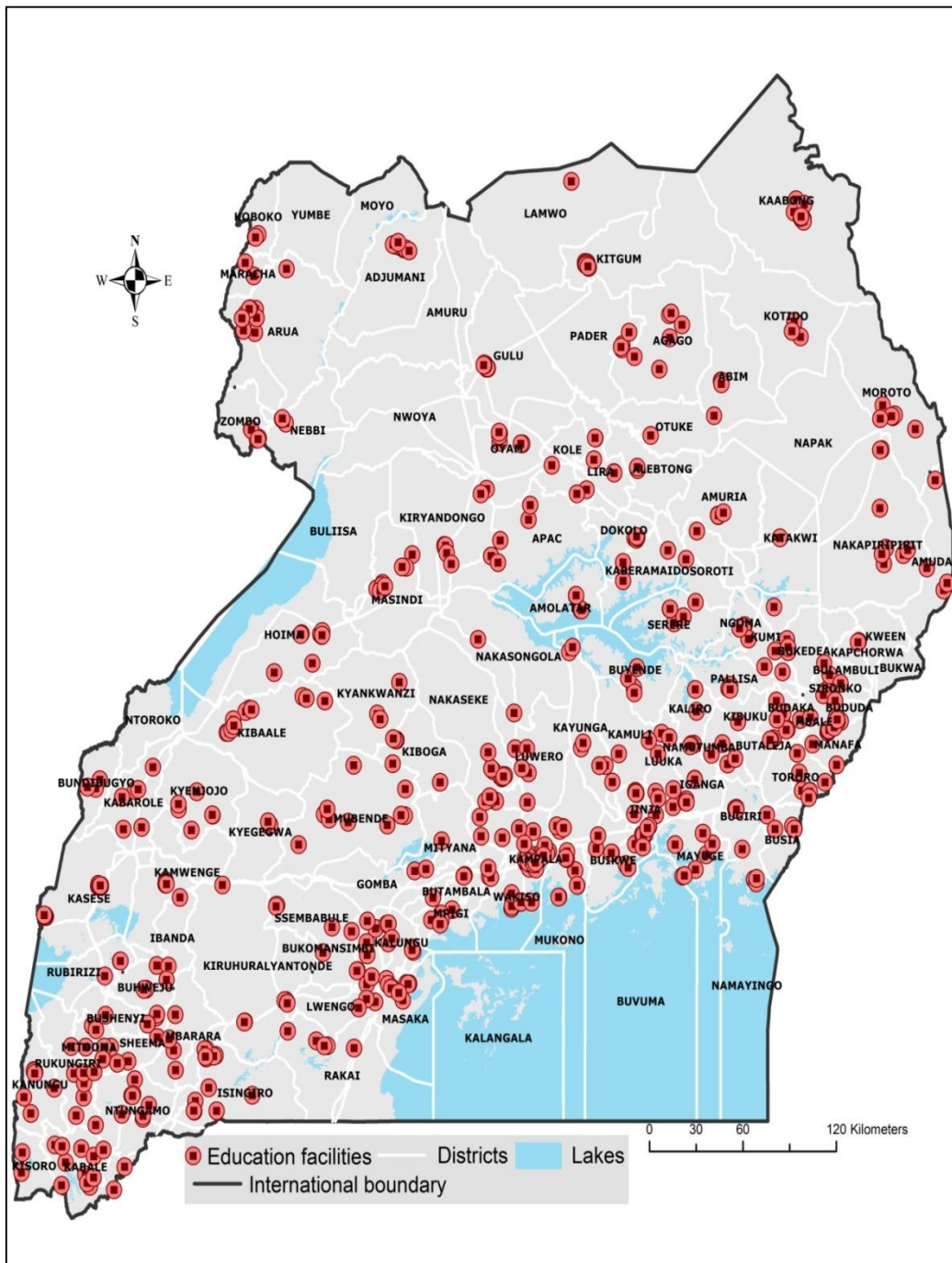
The survey used the Ministry of Education and Sports (MOES) list of educational institutions, 2012 as a sampling frame. The sample was further broken down into Pre-Primary schools, Primary schools, Secondary schools, Technical and Vocational institutions, Higher Education institutions and Other institutions. According to the census undertaken by the MOES, there were about 20,000 Primary and Secondary schools in the country. A sample of 637 schools was drawn. Of those, 508 were Primary while 92 were Secondary schools. In addition, a sample of 37 Pre-primary, Vocational and Higher Institutions was drawn from the Census of Business Establishment (COBE) register as summarised in Table 1.4.

Table 1.4: Primary & Secondary Schools

Education Sub sector	Total	Percent	Sample
Preprimary	1,273	5%	19
Primary Education	17,685	75%	508
Secondary Education	3,204	14%	92
Higher Institutions	79	0%	1
Technical & Vocational Institutions	919	4%	13
Other Institutions	391	2%	6
Total	23,551	100%	639

Source: Ministry of Education & Sports and COBE Register

Figure 1.5: Distribution of Educational Institutions



The total sample for the four sectors was, therefore, as shown in Table 1.5 below.

Table 1.5: Summary sample distribution

SECTOR	SAMPLE
Households	10,000
Enterprises	1,950
Education	639
Health	130
Total	12,719

1.3.4 Survey Instruments

In consultation with stakeholders, four questionnaires were designed for use in the 2012 URUE Survey. These were the Household Questionnaire, the Business questionnaire and the Health and Education Institutions questionnaires. UBOS however modified these questionnaires to reflect issues relevant to the Energy sector.

Other instruments of the Survey included the Household Listing Form, the Interviewers' Manual, the Sampling Frame, Enumeration Area Maps and GPS handsets.

The Household Survey instruments collected information on General personal and demographic characteristics of household members. Information was also collected on:

- Electricity use by household
- Solar Energy use in homes
- Biomass technology use
- Use of thermal generators
- Household expenditure on energy
- Other energy sources,
- Preferred energy source.

Education Questionnaire

- Institutional background
- Electricity use by institution
- Grid electricity access
- Solar use in schools
- Biomass technology use
- Use of thermal generators
- Expenditure on energy
- Other energy sources
- Preferred energy source

Health Questionnaire

- Institutional background
- Electricity use by institution
- Grid electricity access
- Solar use in the facilities
- Biomass technology use
- Use of thermal generators
- Expenditure on energy
- Other energy sources.

Business Establishments Questionnaire

- Commercial background
- Electricity use by institution
- Grid electricity access
- Solar use in establishments
- Biomass technology use
- Use of thermal generators
- Expenditure on energy
- Other energy sources
- Preferred energy source.

1.4 Survey organisation and Data collection

1.4.1 Organisation of the Survey

UBOS was the major implementer of the survey but did so in close collaboration with the MEMD. The collaboration took place in the following areas.

- i. Funding the whole survey
- ii. Identification of variables and preparation of the tabulation plan
- iii. Design of the Survey Instruments
- iv. Training of Field staff and Supervision of the field activities.

Two committees were formed to provide technical guidance in the implementation of the URUE 2012 survey. These included the Steering Committee (ST) which was chaired by the UBOS Deputy Executive Director, Statistical Production and Development (DED-SPD) and the Technical Working Committee (TWC) which was chaired by the UBOS Director for Business and Industry Statistics (DBIS). The TWC provided technical backstopping, including responsibility for questionnaire design, training and report writing.

1.4.2 Training of Staff

UBOS, while taking into account Gender, recruited and trained staff to serve as Supervisors, Field Editors, Male and Female Interviewers and Household Listers. They all participated in the main interviewer training held at the Silver Springs Hotel in June 2012. The Household listing staff were, however, trained during the month of March 2012 in Mosa Courts Apartments.

UBOS, with technical assistance from Government Ministries, conducted a two week training that included lectures, presentations, practical demonstrations and field practice in interviewing. During the training, special attention was paid to question interpretation and probing techniques, map reading and use of the Geographical Positioning System (GPS).

1.4.3 Questionnaire Pretesting and Piloting

Before the start of field work, the questionnaires were pretested to make sure that the questions were clear and could be understood by the respondents. Pretesting of the questionnaires was conducted as below.

The Listing questionnaire pretest was conducted in two Enumeration areas. The areas were Kiteredde and Kitanda Zones in Gombe Sub-county and Kyadondo County in Wakiso district. The Main questionnaire (Household, Business, Education and Health institutions) Pretest was conducted in the Kirinya, Kinawatakwa, Makindye, Kiwatule and Nansana areas of Kampala and Wakiso districts.

1.4.4 Community Mobilisation

Before and during the field work, a community mobilisation programme was implemented by a multi-disciplinary team of members from UBOS and the MEMD. The objective of the community mobilisation was to sensitise the respondents regarding the survey, including key topics in the questionnaire.

Before the field teams arrived in the districts, UBOS sent an advance letter to the district leadership (Chief Administrative Officers, Resident District Commissioner, District Police Commander and District Intelligence Security Officer) informing them about the survey and seeking their support. Together with the district coordinators, the teams went to the sub-counties in which the Enumeration Areas (EAs) were allocated. At the sub-county, local officials were engaged to conduct community mobilisation in the EAs. And in each EA, community mobilisation was undertaken a week before the data collection teams arrived.

1.4.5 Household Listing

Out of the 1,000 EAs sampled, a complete listing of households was conducted in 999 EAs for three months starting in April 2012. For this purpose 36 listing staff were identified from UBOS head office to carry out the household listing. Listing was not done in one EA in Kiboga district because it was located in a gazzeted forest area where there were no households.

1.4.6 Field Work

The URUE Field activities were implemented in two phases. The first phase was listing of all households in the sampled Eas. This was carried out between March and June 2013. Thereafter, ten households were selected from each EA for final interviewing in the second phase.

The second phase involved interviewing the selected Households, Business Establishments and Institutions. This was conducted between June 2012 to November 2012. A total of 80 interviewers were divided into 15 teams, each comprising of 1 Team Leader, 4 or 5 Team Members and a driver.

Before departure to the field, the coordinators and supervisors held regular briefings for the interviewers and drivers. During the briefing, key issues were discussed such as specific areas of allocation, code of conduct, allocation of vehicles and team work. Teams were then issued all the required materials, including GPS, bags, umbrellas, questionnaires and manuals.

At the district headquarters, the teams were required to hold an introductory meeting with the Chief Administrative Officer (CAO), Resident District Commissioner (RDC), District Internal Security Officer (DISO), District Police Commander (DPC), Chairperson Local Council V (LCV) and the Town Clerks (in cases of Municipalities). The district leadership then provided introductory letters to the Lower Local Government officials to ease the work of the teams and to guarantee their security while in the district.

The Chairperson LC1 or his designate was normally the guide for the interviewers and introduced the teams to the households and / or businesses and institutions in addition to making sure that interviewees collaborated with the interviewers.

1.4.7 Data Processing

A database was created using MS Access™ to provide an efficient data capture and processing system for information collected using the five questionnaires. These were the Listing, Household, Business Establishment, Education and Health institutions' questionnaires. The database was embedded with a number of checks so as to provide data completeness and accuracy and to enable ease of uploading to Stata³. A number of reports would then be generated to allow the user examine the entered data and discover errors, if any.

³ Stata is a statistical package for data analysis.

1.4.8 Response Rate

Table 1.6 shows the Response Rate for the survey. A total of 10000 households were sampled, out of which 9314 households were successfully interviewed, accounting for 93% response rate. Non-response mainly resulted from out migration and also non-coverage of the two EAs (located in gazetted forest areas of Kiboga and Kayunga districts). However, the business establishments had a 67 percent response rate, achieved from a total sample of 1950 business establishments. Education and Health institutions registered complete coverage (100 percent) arising from samples of 639 and 130 institutions respectively.

Table 1.6: Response Rate

Sector	Total Sample	Total responded	Percentage Response
Household	10,000	9,314	93.1
Business	1950	1,314	67.4
Education	639	639	100
Health	130	130	100

1.4.9 Oath of Secrecy

In order to ensure confidentiality and adherence to the UBOS Act, each enumerator was formally appointed and would thereafter swear an Oath of Secrecy. This was taken before the designate of the Chief Magistrate.

1.5 Challenges Encountered and Limitations of the Survey

While undertaking the exercise, the following challenges and limitations were encountered.

Key Challenges

- i) Some EAs were located in the Mountainous ranges that could only be accessed by walking uphill hence slowing down the speed at which work was completed. This was noted in some EAs in Mbale, Kisoro and Kapchorwa districts.
- ii) Inability to list one Enumeration Area in Kiboga district because the EA was found to be in a gazetted forest and therefore had no households.
- iii) Resistance by some area residents due to the land evictions that were ongoing across the country in spite of the sensitization on the objectives of the survey that had been carried out. This was noted in some EAs of Kamwenge, Kasese, Mayuge and Kayunga Districts.
- iv) A few respondents had a negative attitude towards the survey and other government programmes while others had a respondent fatigue.
- v) The Survey was conducted during the rainy season and as a result some households were missing because they were involved in farming activities outside the EAs and were not able

to return for the interview thus creating non-responses. The rains were also responsible for impassable roads such as in Amudat, Moroto and Kaabong Districts.

- vi) Poor weather conditions also created problems in picking signals of GPS readings.
- vii) Transport to islands was not friendly as lake water waves were terrifying. This was noted in Buvuma Islands where there is no transport by ship and interviewers had to use a speedboat instead, thus exposing their lives to risk.
- viii) The availed maps were at times not up-to-date because of the continuous creation of new administrative areas during which some EAs as at 2002 now fall under new sub-counties or parishes.
- ix) The maps also had features that were non-existent at the time of interview because they had either been destroyed or , in the case of roads, diverted in the course of development, hence making one unable to either locate the EAs or to ascertain the proper boundary of an administrative area.
- x) Some Business Establishments, especially in urban areas, kept on changing their addresses or actual business activity, making it difficult for them to be located.
- xi) Also, some Business Establishments could not be traced due to high business mortality rates.
- xii) Delays in acquiring information within establishments led to waste of time and, in some cases, interviewers departing with unsatisfactory information. This was mainly due to bureaucratic tendencies.

1.6 Limitations of the Survey

The sample size could not permit disaggregation of information to district and lower levels. Hence the report does not provide information to these levels.

CHAPTER TWO

CHARACTERISTICS OF HOUSEHOLDS, BUSINESSES & INSTITUTIONS

2.0 Introduction

This chapter presents the general findings regarding the demographic and socio-economic characteristics of the Selected Households, Business establishments and Educational and Health institutions.

2.1 Characteristics of Households and Head of Household

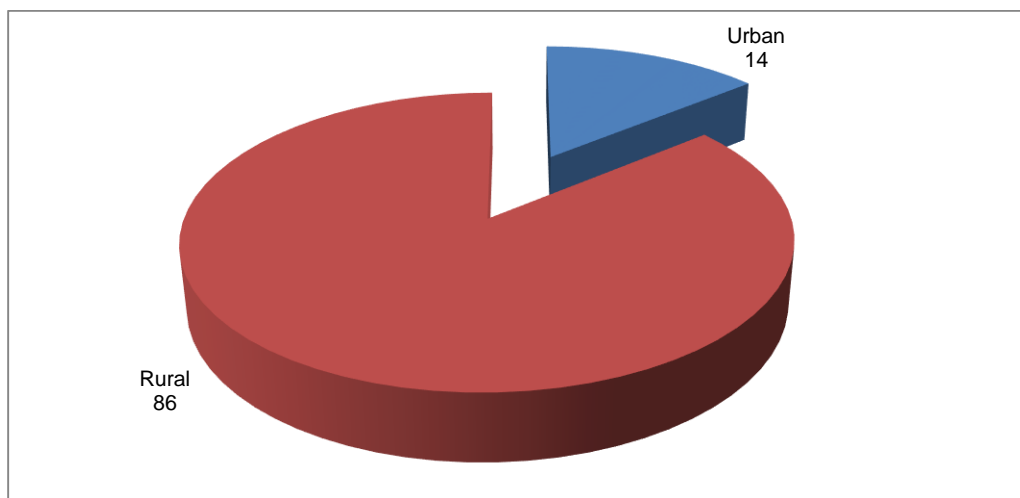
The Survey collected information on personal characteristics of Household members including information on sex, age, marital status, relationship to the household head and education. The section also collected data on characteristics of the dwellings, energy consuming equipment used and means of communication among households.

2.1.1 Number of Household by residence

The total number of Households surveyed was 9,314. Of these, 86 percent were located in Rural areas while 14.1 percent were in Urban areas, as shown in Figure 2.1 below.

86% of Households are in Rural areas

Figure 2.1: Percentage number of Households Survey by Residence



2.1.2 Average Household size

Household size refers to the number of usual members in a Household. Usual members were defined as those that had lived in the household for at least 6 months in the past 12 months. However, it included persons who might have spent less than 6 months during the last 12 months in the household but had joined the household with intention of living permanently or for an extended period of time.

Average Household Size is 5 persons per household

The average household size for the survey was 5 persons per household, a number which was consistent with the previous surveys. The results also indicated that the average household size was bigger in the Rural than in Urban areas.

51% of urban households were male headed. Eastern region had the highest number of male and female headed households with 52.4%.

2.1.3 Characteristics of Household Heads

The Heads of Households were defined as the ones who managed the incomes earned and expenses that were incurred by the household, and were considered by other members of the households as their head. The Household Head would either be male or female and was not necessarily the oldest person in the household. The findings showed that overall there were more male headed households, accounting for 69 percent of the Households as compared to females (31 percent). However regional comparison showed that the Northern had the highest number of female headed households, followed by Kampala (51.4 percent and 50.6 percent respectively). The data also showed that the Eastern region had the highest proportion of Male Headed Households (52.4 percent) and Northern region had the lowest (48.6 percent).

2.1.4 Distribution of Households Heads by Residence, Age and Region

Table 2.2 shows the reported distribution of age of household head by residence and region. The data showed that 73 percent of heads of households were less than 30 years old. Analysis within the two age groups showed that there were more urban residents that were heads of households compared to their rural counterparts within the age group of less than 30 years old. On the contrary, there were more heads of households in the rural areas who were more than 30 years old accounting for approximately 28 percent.

Regional comparison showed that the Eastern region had the highest percentage of Household heads of less than 30 years of age with Kampala having the lowest with only 8 percent. Further comparison was made for Household Heads of more than 30 years of age and the findings showed that Kampala had the lowest percentage for household heads. The Eastern region had the highest, accounting for 8 percent and 28 percent respectively.

Table 2.1: Distribution of Heads of Households by Residence, Age and Region

Residence	30 Years and below		31 Years and above		Total	
	Number	%	Number	%	Number	%
Uganda	6,800	73.0	2,514	27.0	9,314	100
Urban	1,204	73.4	437	26.6	1,641	100
Rural	5,596	72.9	2,077	27.1	7,673	100
Region						
Kampala	516	72.3	197	27.7	714	100
Central	1,598	73.2	585	26.8	2,183	100
Eastern	1,751	71.4	700	28.6	2,450	100
Northern	1,283	74.4	442	25.6	1,725	100
Western	1,652	73.7	591	26.3	2,242	100

2.1.5 Distribution of Household Heads by level of Education

Education is a key determinant of the lifestyle and status an individual enjoys in a society. Studies have consistently shown that educational attainment has a strong effect on the behaviour and attitude of individuals. In general, the higher the level of education an individual has attained, the more knowledgeable they are about the need and use of available facilities in their communities. During the survey, information was collected from household members aged 5 years and above on the highest education level attained.

Table 2.2 below shows that the majority of household heads in rural areas (58%) had attained education above secondary level while the majority of household heads in Urban (45%) had attained post primary/apprentice level of education. The Northern region had the highest percentage (33%) of household heads with no education.

Table 2.2: Distribution of Heads of Household by levels of Education and Residence (%)

Residence	No Education	Post Primary/Apprentice	Secondary+	Total
Urban	10.7	45.0	44.3	100.0
Rural	22.2	20.4	57.5	100.0
Region				
Kampala	9.8	55.1	35.1	100.0
Central	12.2	26.2	61.6	100.0
Eastern	19.3	22.0	58.7	100.0
Northern	32.8	18.8	48.4	100.0
Western	20.4	21.4	58.2	100.0

47% of HHs heads in rural areas were engaged Farming.

2.1.6 Main Economic activities of the Household head

In the survey, information was collected on economic activity undertaken in the Household sector. Table 2.3 shows that 47 percent of heads of households in rural areas were engaged in Crop Farming while 70 percent of heads of households in urban areas were engaged in the Services Sector.

Table 2.3: Distribution of main economic activities of heads of Household by residence (%)

Economic activity	Urban	Rural	Uganda
Crop Farming	14.4	47.2	42.6
Livestock Farming	6.8	21.4	19.4
Mining	0.2	0.5	0.5
Manufacturing	6.1	4.5	4.7
Services	70.2	25.0	31.3
Others	2.4	1.4	1.5
Total	100	100	100

2.1.7 Dwelling types

62% of main housing units were detached houses.

Housing characteristics reflect the household's socio-economic status in society. Good housing conditions are essential for the well being of mankind. Poor housing conditions are usually associated with poverty in general. In addition the condition of the structure could be a proxy indicator of the welfare status of the household.

The survey collected information related to the characteristics of dwellings, including room types occupied. The findings showed that nearly 61.5 percent of households resided in detached dwelling units followed by Grass thatched huts (26.4 percent).

Figure 2.2: Grass Thatched huts

77.9% of Grass thatched Households are in Northern Region



Regional differentials showed that 77.9 percent of households in the Northern Region reside in Grass thatched houses while detached dwelling units were the majority (74.7 percent) in Central region. The Tenement type of dwelling unit was noted to be highest in Kampala region (43.6 percent), as shown in Table 2.5 below.

Table 2.4: Percentage distribution of Dwelling types by Residence and Region

	Grass Thatched	Detached	Tenement	Others**	Total
Uganda	26.4	61.5	11.1	1.0	100.0
Residence					
Urban	2.7	58.6	36.4	2.3	100.0
Rural	31.5	62.1	5.8	0.6	100.0
Region					
Kampala	0.0	52.9	43.6	3.5	100.0
Central	8.5	74.7	15.7	1.1	100.0
Eastern	30.2	60.5	8.9	0.4	100.0
Northern	77.9	19.0	2.2	0.9	100.0
Western	8.6	85.0	5.7	0.7	100.0

** Includes: Flats, Uniports, garages and boys quarters

2.1.8 Main types of Equipment for lighting in dwelling units

The survey collected information on the type of energy consuming equipment that the households were using for lighting. Table 2.6 presents the distribution of households by type of lighting equipment used for

58.1% of households in rural areas used Tadooba paraffin for lighting

lighting. About 58 percent of households in rural areas used Tadooba paraffin for lighting. In the urban areas, only 35.1 percent of the households used Energy Saver Bulbs, with Kampala and the Central region having 40.6 percent and 21.7 percent of the households respectively using energy saver bulbs, as shown in Table 2.4.

Table 2.5: Percentage distribution of type of Equipment for lighting by location

Equipment in HH	Residence			Region				
	National	Urban	Rural	Kampala	Central	Eastern	Northern	Western
Lantern-Paraffin	14.5	20	13.3	15.8	18	10.6	13.3	15.8
Tadooba Paraffin	50.8	16.7	58.1	8.6	42.4	66	54	53.4
Torch with Batteries	4	1.9	4.4	0.9	4.2	4	5.5	3.5
Candle wax	1.9	6.3	0.9	8.9	2.1	0.9	1.4	0.8
Incandescent Bulbs	4.3	12.5	2.6	16	5.2	3.6	0.5	3.5
Fluorescent Tubes	1.3	3.6	0.8	4.7	1.5	0.9	0.3	1.2
CFLs (Energy Saver Bulbs)	16.4	35.1	12.5	40.6	21.7	11	5.5	18
Rechargeable lamp	1.3	1.9	1.2	2.2	2.1	1.4	0.3	1
Others	5.5	2	6.3	2.3	2.8	1.7	19.2	2.8
Total	100	100	100	100	100	100	100	100

2.1.9 Means of Communication for Households

The survey also collected information on means used for communication. It was observed that in the urban areas, 91.5 percent and 88.1 percent of households used and owned mobile phones respectively while 75 percent and 65 percent used and owned mobile phones in rural areas as shown in Table 2.1.6. The table further shows that 11 percent of households in Kampala region used the internet. Landline phones were the least owned in all regions.

88 % of Households owned Mobile Phones

Table 2.6: Distribution of use and ownership of means of Communication by residence (%)

Means of communication	Region					Residence	
	Kampala	Central	Eastern	Northern	Western	Urban	Rural
Use landline phones	8.1	2.40	3.4	3.1	1.1	5.1	2.4
Own landline phones	3.3	1.0	1.3	0.7	0.4	2.3	0.7
Use mobile phones	93.1	87.6	75.5	59.1	80.5	91.5	74.9
Own mobile phones	90.3	79.7	63.3	49.7	71.7	88.1	64.6
Use internet connection	11.3	2.9	2.9	1.8	1.2	7.3	2.0
Own internet connection	6.7	2.0	2.2	1.5	1.0	5.0	1.4

2.1.10 Summary of Household characteristics

60% of
Business
engaged in
the trade
Sector

The total number of households surveyed was 9,314 out of which 86 percent were located in rural areas and 14.1 percent in urban areas. The average household size was 5 persons. There were more male headed Households (51 percent) compared to female headed households (49 percent). The data showed that 73 percent of heads of Households were aged less than 30 years. Analysis of education level indicated that the majority of household heads in rural areas (58 percent) had attained an education level above secondary school while the majority of household heads in urban (45 percent) had attained post primary/apprentice level of education. The findings showed that 47.2 percent of the household heads in rural areas were engaged in crop farming while 70.2 percent of those in urban areas were engaged in the Business sector. Analysis of housing conditions indicates that, overall, nearly 61.5 percent of households reside in detached dwelling units followed by Grass thatched huts which accounted for nearly 26.4 percent. In rural areas 58.1 percent of households used Tadooba paraffin for lighting. In the urban areas, it was observed that 91.5 percent and 88.1 percent of households used and owned mobile phones while 75 percent and 65 percent used and owned mobile phones in rural areas.

2.2 Characteristics of Business Establishments

Information was collected from businesses on selected background characteristics and the analysis focused on the type of economic activity. The economic activities were classified according to the International Standard Industrial Classification (ISIC) Revision 4.

2.2.1 Economic Activity of Businesses

The findings showed that the majority of Businesses (60 percent) were engaged in the Trade sector, followed by Accommodation and Food services (14.0 percent). Business in Agriculture including Fishing accounted for only 2.0 percent as shown in Table 2.7 below.

Table 2.7: Distribution of businesses by type of economic activity and residence (%)

Industry	Urban	Rural	National
Agriculture	0.8	2.8	1.8
Trade	61.3	58.6	60.0
Accommodation & Food Services	10.9	17.4	14.0
Recreation & Personal	10.8	7.4	9.2
Education, Health & S	1.7	2.9	2.2
Real Estate & Business support services	4.1	1.7	2.9
Information & Communication	0.8	1.2	1.0
Transport & Storage	0.4	0.3	0.3
Others ⁴	2.6	2.8	2.7
Other Manufacturing	6.8	4.9	5.9
Total	100.0	100.0	100.0

⁴ Mining & Quarrying, Food processing, Utilities, Construction and Finance and Insurance

90% of Business establishments owned Mobile phones

2.2.2 Means of Communication for Businesses

Businesses were asked whether they used or owned any telephone landline, mobile phones and internet connections. The findings indicated that over 90.0 percent of the businesses in both rural and urban areas used mobile phones for communication. However over 70 percent of the businesses in both rural and urban regions had not used any internet. Just like other categories, the usage of landlines in Business was the lowest compared to that of mobile phone. Kampala recorded the highest usage of landlines among the regions, contributing 21.2 percent as shown in Table 2.8 below.

Table 2.8: Means of Communication for Businesses

	Use Landline Phones	Own Landline Phones	Use mobile Phones	Own mobile Phones	Use Internet Connection	Own Internet Connection
Residence						
Urban	13.9	12.1	92.7	84.4	16.4	12.7
Rural	6.5	5.2	93.2	85.7	6.7	5.8
Region						
Kampala	21.2	17.9	95.3	86	23.6	18.9
Central	4.9	4.4	91.9	88.5	5.4	4.1
Eastern	8.2	5.8	90.5	83.5	8.6	6.4
Northern	9.2	7.6	91.3	74.3	6.1	6.1
Western	5.3	5.3	94.1	83.9	9.2	8

2.2.3 Summary of Business Establishments

Businesses dealing in Agriculture, Education, Health, Social works and Food Processing in Rural areas contributed (74.3%), (63.3%) and (61.1%) respectively. Over 90% of the businesses in both rural and urban areas used the mobile phone for communication. Over 70% of the businesses considered by the survey had not used any internet connection.

2.3 Characteristics of Educational Institutions

Data was collected on the activities of educational institutions and means of communication. This section focused on the kind of education services provided by educational institutions such as Primary, Secondary, Technical and Higher education. It further looked at the different means of communication such as landline, mobile phones, use of internet and ownership of the communication gargets in these institutions.

2.3.1 Main Activities of Educational Institutions

The findings of the survey showed that 65.3% of the Primary Education Institutions were located in rural areas while 36.3% of the secondary institutions were in Urban areas. The Eastern region had more secondary schools contributing 38.5 percent. Out of the Educational Institutions covered in the Central region, only 2.8% were Technical as shown in Table 2.9 below.

65.3 % of Primary Schools are Rural based

Table: 2.9: Activities of Educational Institutions

	Primary	Secondary	Technical	Higher Education	Total
National	63.6	30.1	5.6	0.7	100.0
Residence					
Urban	57.1	36.3	5.7	0.9	100.0
Rural	65.3	28.5	5.5	0.7	100.0
Region					
Kampala	82.9	13.0	4.2	0.0	100.0
Central	63.5	32.6	2.8	1.1	100.0
Eastern	55.7	38.5	5.0	0.8	100.0
Northern	71.3	22.5	5.5	0.8	100.0
Western	56.9	33.4	9.0	0.7	100.0

2.3.2 Means of Communication for Education Institution

The survey also collected information on the status of means of communication in relation to the use and ownership of the communication equipment in the institutions. However, some institutions did not respond.

From the information obtained on Use, the findings showed that Mobile phones were the most used means of communication followed by Landlines while Internet was the least used. These are presented in Table 2.10. The findings were probably attributed to the many advantages of mobile phones over other means of Communication.

Table 2.10: Means of Communication in Education Institution

	Use landline phones	Own landline phones	Use mobile phones	Own mobile phones	Use internet connection	Own internet connection
Residence						
Urban	22.4	21.9	94.1	80.7	25.8	17.7
Rural	10.4	8.9	90.6	72.2	14.7	11.4
Region						
Kampala	44.9	44.9	100	94.2	43.2	27.4
Central	8.1	6.2	97.9	87.5	13.1	9.5
Eastern	14.9	13.1	87.5	72	20.3	16.5
Northern	11.6	10.7	85.2	55	13.6	12.3
Western	9.9	9.2	92	74.1	14.6	9.5

2.3.3 Summary of Educational Institutions

Over 80 percent of the education institutions surveyed used mobile phones as a means of communication. The usage of landlines by educational institutions remained low as was seen for the Business Establishments and Health institutions.

2.4 Characteristics of Health Institutions

Information about selected background characteristics focusing on the type of health institution, legal ownership, use of modern means of communication and average number of patients treated per month in the institutions was collected as part of the survey.

2.4.1 Main Activity of Health institutions

Table 2.11 below shows the distribution of Health institutions surveyed by type of main activity by residence and region. About 70 percent of hospitals were found in rural areas but 63.6 percent of medical and dental practices were found in urban areas. On the other hand, 76.9 percent of general clinics were found in rural areas and 63.6 percent of other health activities were also located in rural areas.

Table 2.11: Distribution of Health institution by type by Region and Residence (%)

	Hospital Activities	Medical and Dental practice	General clinic	Other human health activities
Residence				
Urban	27.7	37.5	76.9	63.6
Rural	72.3	62.5	23.1	36.4
Region				
Kampala	4.7	23.5	21.4	30.8
Central	18.6	11.8	57.1	38.5
Eastern	38.4	17.7	14.3	15.4
Northern	15.1	11.8	7.1	15.4
Western	23.3	35.3	0	0

2.4.2 Means of Communication for Health Institution

In rural areas, 92 percent of Health institutions used mobile phones to communicate and in urban areas the usage was 97.0 percent. Over 80 percent of the Health institutions in all the regions used mobile phones to communicate. The survey results indicate that over 60 percent of the Health institutions did not use any landline phones to communicate. Kampala had the highest number of Health institutions(33.9 percent) that used landline phones. Kampala also registered the highest number of Health institutions (46.6 percent)that use internet connection, as shown in Table 2.12 below.

Table 2.12: Percentage Distribution of Health Institution’s means of communication by location

	Use Landline Phones	Own Landline Phones	Use Mobile Phones	Own Mobile Phones	Use Internet Connection	Own Internet Connection
Residence						
Urban	27.1	26.1	97	75.6	37.7	32
Rural	12.9	9.6	92	69.9	16	13.9
Region						
Kampala	33.9	33.9	100	85.1	46.6	37.9
Central	13	13	100	89.2	15.5	14.2
Eastern	21	16.8	88.3	72.6	34.6	27.3
Northern	24	19.3	91.1	42.6	17.4	17.4
Western	3.7	0	90	62	8.9	8.9

2.4.3 Summary of Characteristics of Health Institutions

The survey findings indicated that 72.3 percent of hospitals were found in rural areas. While 63.6 percent of medical and dental practices were found in urban areas, 76.9 percent of general clinics were found in rural areas. The findings further revealed that 92 percent of Health institutions in rural areas used mobile phones to communicate. Over 80 percent of the health institution in all the regions used mobile phone to communicate. Regional comparison indicated that Kampala had the highest number of Health institutions that used landline phones contributing 33.9 percent.

CHAPTER THREE

SOURCES OF ENERGY

3.0 Introduction

This chapter presents the findings on the sources of energy used by Households, Businesses, Health institutions and Education institutions. The findings provided information on the extent of electrification in the country in the rural, urban, regional and at national level for Households, Businesses, Health institutions and Education institutions.

3.1 Sources of Energy accessed in the Households Sector

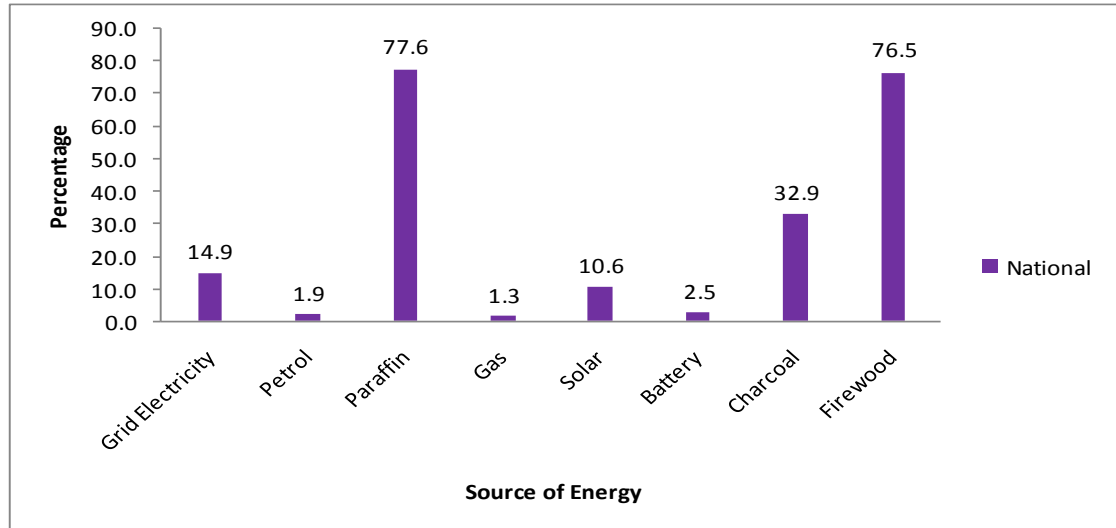
The survey analysed each energy source type independently in order to arrive at electrification levels per sector and location.

3.1.1 Sources of Energy accessed by the Households Sector at National Level

The findings show that the most common source of energy used Nationally by the households was Paraffin which accounted for 77.6 percent. This was closely followed by firewood which was used by 76.5 percent of the households in the country, as shown in Figure 3.1.

Figure 3.1: Distribution of Current Sources of Energy Used by Households at National level

Paraffin was the most common source of energy in the country used by households

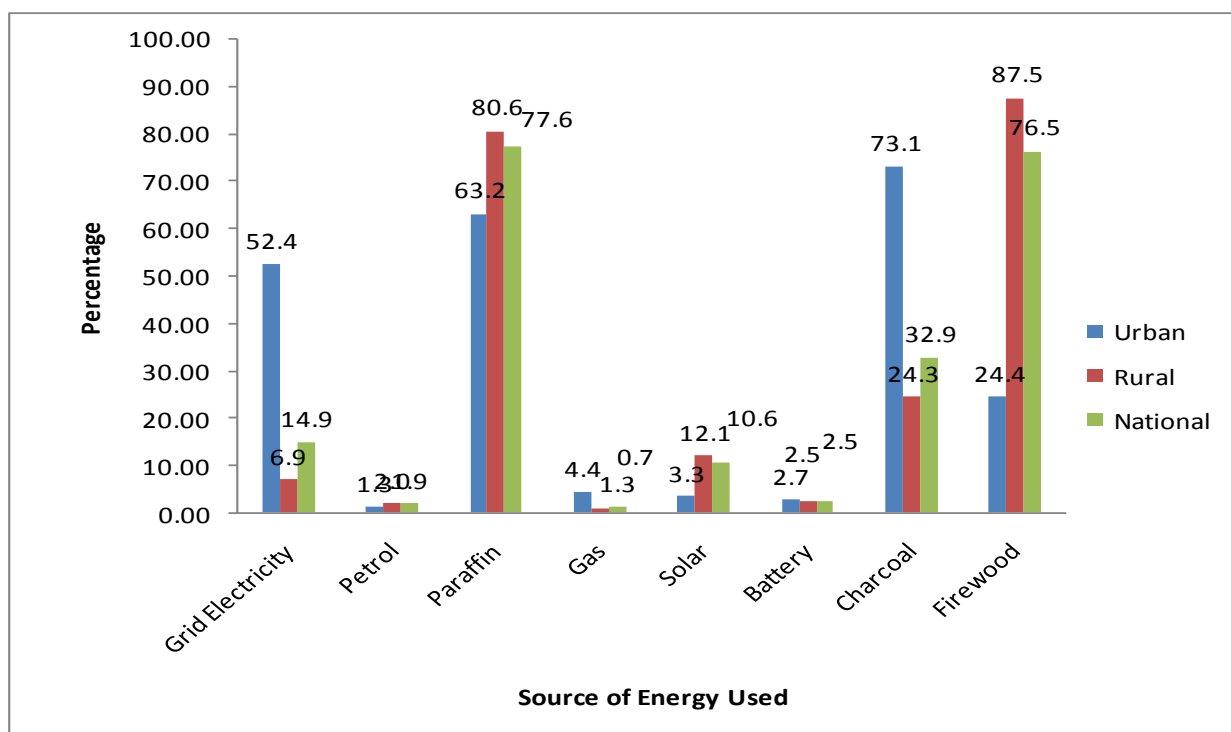


3.1.2 Current Sources of Energy Used by Households by Residence

Figure 4.3 shows that 87.5 percent of households in the rural areas reported using firewood as the most common source of energy. This was followed by paraffin at 80.6 percent while charcoal was used by 24.3 percent of the households in the rural areas. Charcoal was reported as the predominant source of energy by 73.1 percent of the urban households. This was closely followed by paraffin, used in 63.2 percent of the households, while firewood was used by only 24.4 percent of the urban households.

88% of households in the rural area used firewood

Figure 3.3: Distribution of Current Sources of Energy Used by Households by Residence.



3.1.3 Current Sources of Energy Used by Households by Region

Firewood was the most common source of energy in the Northern and Western regions. In the Northern region 90.4 percent of the households used firewood while in the Western region 86.4 percent of the households used the fuel. Households in the Central and Eastern regions reported using Paraffin as the most common energy source (77.2 percent and 88.4 percent respectively). Kampala was the exception, with 74.4 percent of the households in the region using charcoal as the most common source of energy. As shown in in Figure 3.1 Below.

About 74% of households in Kampala region used charcoal

Table 3.1: Distribution of Current Sources of Energy Used by Households by Region

Energy Source	Kampala	Central	Eastern	Northern	Western	National
Grid Electricity	65.1	19.4	11.6	1.8	8.3	14.9
Petrol	0.8	3.2	1.3	1.8	1.6	1.9
Paraffin	50.7	77.2	88.4	69.6	80.6	77.6
Gas	7.4	1.0	0.6	0.4	1.1	1.3
Solar	0.7	14.3	6.1	9.3	15.9	10.6
Battery	2.8	4.0	1.1	2.2	2.8	2.5
Charcoal	74.4	44.3	26.4	25.9	21.2	32.9
Firewood	8.9	70.7	82.0	90.4	86.4	76.5

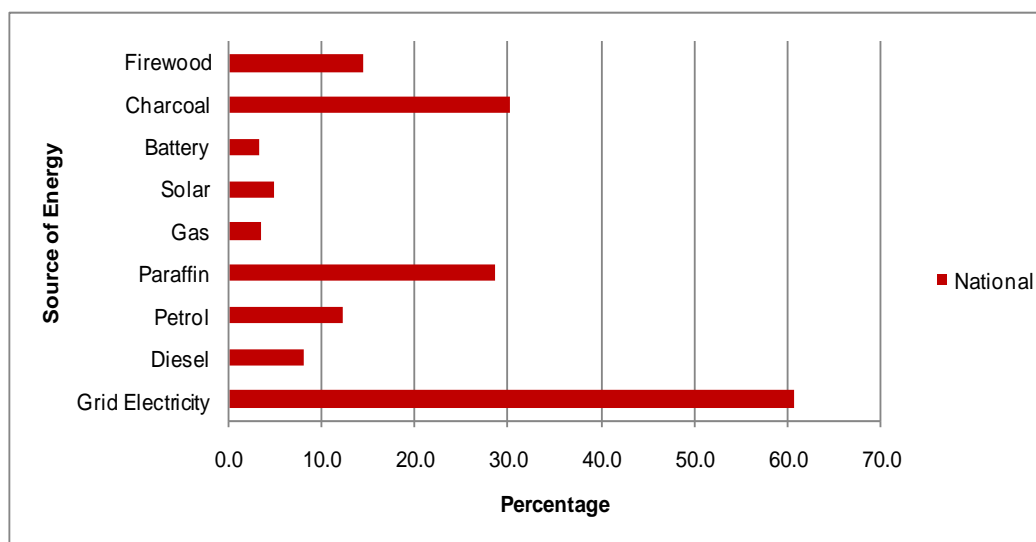
3.2 Sources of Energy Used by Businesses

3.2.1 Sources of Energy Used by Businesses at the National Level

Findings show that the most common source of energy used by Businesses at the national level was Grid Electricity (60.9 percent). This was closely followed by Charcoal and Paraffin (30.2 percent and 28.7 percent respectively), as shown in Figure 3.4 below.

61% of businesses in the country accessed Grid Electricity

Figure 3.4: Distribution of Current Sources of Energy Used by Businesses at National level



3.2.2 Sources of Energy Used by Businesses by Residence

The survey analysed energy sources independently in each location in the business sector to arrive at electrification and usage levels. The findings showed that Grid electricity was the most predominant source of energy for both urban and rural businesses. Table 3.2 shows that 73.1 percent and 48.3 percent of businesses in the urban and rural areas respectively used grid electricity as the most common source of energy.

Table 3.2: Distribution of Current Sources of Energy Used by Businesses by Residence

Energy Source	Urban	Rural	National
Grid Electricity	73.1	48.3	60.9
Diesel	9.3	6.5	8.0
Petrol	13.1	11.0	12.2
Paraffin	20.6	37.2	28.7
Gas	4.2	2.4	3.4
Solar	2.2	7.0	4.8
Battery	2.5	3.7	3.2
Charcoal	27.7	32.9	30.2
Firewood	7.7	21.4	14.3

3.2.3 Energy Sources Used by Business Establishments by Region

Businesses in the Central and Northern regions most predominantly used Grid Electricity (60.7 percent and 50.8 percent respectively), followed by Charcoal (37.3 percent).

The Eastern and Western regions had 42.7 percent and 50.5 percent of the businesses using Grid Electricity as the most common source of energy, followed by Paraffin at 39.2 percent. Grid electricity was the most common source of energy used by 81.8 percent of the businesses in the Kampala region. This was closely followed by charcoal, used in 24.3 percent of the businesses. Generally, Grid Electricity was reported as the most common source of energy used by businesses across the regions, as shown in Table 3.3.

82 % of Business in Kampala used Grid Electricity

Table3.3: Distribution of Current Sources of Energy Used by Businesses by Region

	Grid Electricity	Diesel	Petrol	Paraffin	Gas	Solar	Battery	Charcoal	Firewood
Kampala	81.8	13.0	16.5	13.1	4.5	0.8	3.2	24.3	5.3
Central	60.7	2.7	8.4	36.2	1.5	3.6	2.3	37.3	14.8
Eastern	42.7	5.4	9.6	39.2	3.7	6.8	1.8	31.0	27.1
Northern	50.8	16.3	20.1	22.3	1.2	15.7	7.7	30.6	20.2
Western	50.5	8.9	11.5	33.2	4.8	7.4	4.2	27.1	14.5
National	60.9	8.0	12.2	28.7	3.4	4.8	3.2	30.2	14.3

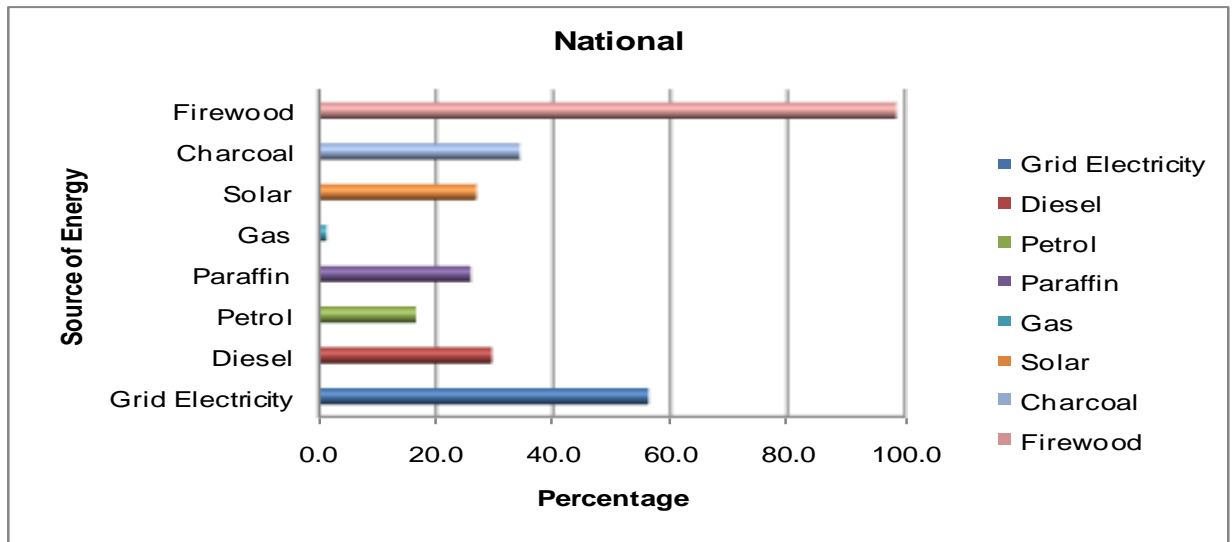
3.3 Sources of Energy Used by Education Institutions

3.3.1 Energy Sources Used by Education Institutions at the National Level

At the national level, the most common source of energy used in Education Institutions was Firewood. Figure 3.5 shows that 98.6 percent of the Educational institutions in the country used Firewood as the predominant source of energy, followed by Grid Electricity (56.3 percent).

99% of the education institutions in the country used firewood as a source of Energy

Figure 3.5: Distribution of Current Sources of Energy Used by Education Institutions at National level

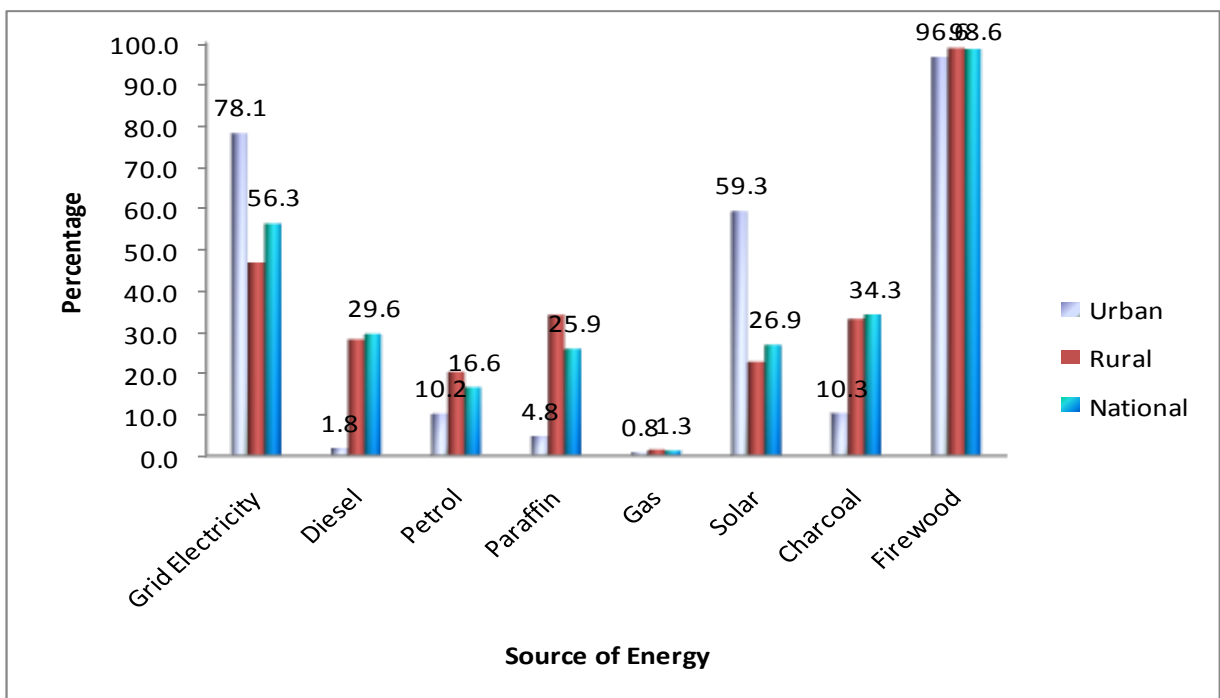


3.3.2 Sources of Energy Used by Education Institutions by Residence

Figure 3.5 shows that firewood was the most commonly used source of energy in the Education Institutions for the rural and urban areas, (98.8 percent and 96.6 percent respectively).

Firewood was the predominant source of energy used in both urban and rural Education Institutions

Figure 3.6: Distributions of Current Sources of Energy Used by Education Institutions by Residence



Education Institutions in all regions reported using firewood as the Predominant source of energy

3.3.3 Sources of Energy Used by Education Institutions by Region

Table 3.4 shows that the Education institutions in all regions reported using firewood as the predominant source of energy. The Central, Eastern and Northern regions respectively had 98.9 percent, 99.5 percent and 98.8 percent of their Education institutions using firewood as the most common source of energy, while Western region had 97.9 percent of the Education institutions using firewood as the predominant energy source. In Kampala region, 87.4 percent of the education institutions reported using firewood as their most common source of energy.

Table 3.4: Distribution of Current Sources of Energy Used by Education Institutions by Region

Energy Source	Kampala	Central	Eastern	Northern	Western	National
Grid Electricity	81.1	72.1	74.1	4.5	62.7	56.3
Diesel	36.6	30.8	68.5	1.4	9.8	29.6
Petrol	0.0	4.3	40.2	11.4	12.5	16.6
Paraffin	42.9	37.0	6.2	45.0	13.7	25.9
Gas	3.2	1.7	0.4	0.4	2.5	1.3
Solar	0.4	8.3	37.1	18.5	51.3	26.9
Charcoal	28.8	36.2	38.1	51.4	11.0	34.3
Firewood	87.4	98.9	99.5	98.8	97.9	98.6

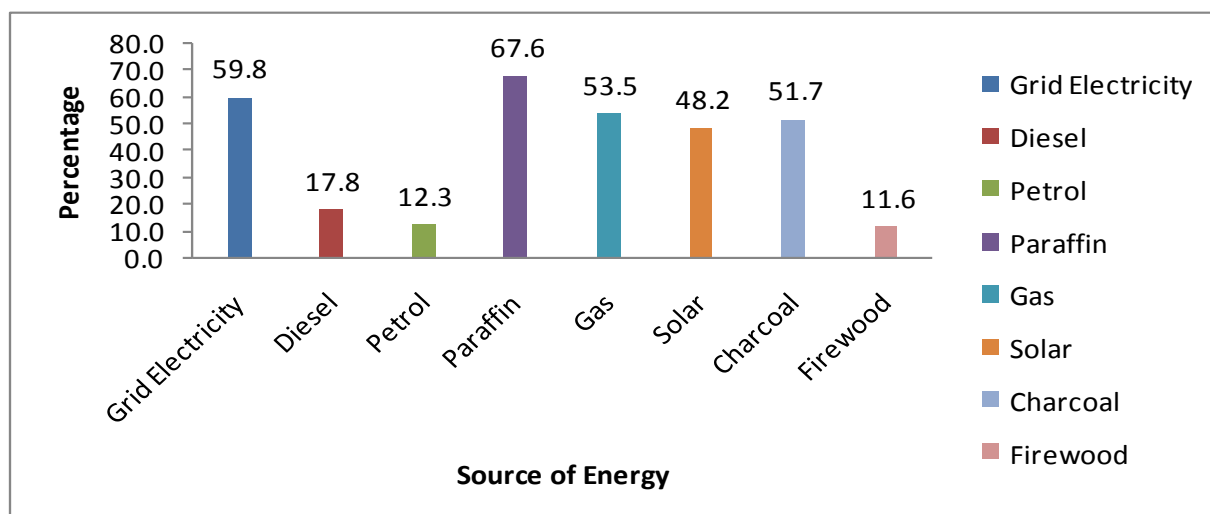
3.4 Current Sources of Energy used by Health institutions

68% of the health institutions in the country used paraffin as the predominant source of energy

3.4.1 Sources of Energy Used by Health institutions at National Level

According to the results in Figure 3.7, the most common source of energy at the national level in the Health institutions was paraffin (67.6 percent). This was followed by grid electricity, gas and charcoal at 59.8 percent, 53.5 percent and 51.7 percent, respectively.

Figure 3.7: Distribution of Current Sources of Energy Used by Health institutions at level



3.4.2 Sources of Energy Used by Health institutions by Residence

Table 3.5 shows that Gas was the most common source of energy used in the rural areas of Health institutions (74.3 percent). This was closely followed by Solar Energy and Paraffin used by 68.8 and 68.4 percent of the Health institutions respectively. Grid Electricity was the predominant source of energy in used by Health institutions in Urban areas (97.7 percent). This was followed by Paraffin and Charcoal (62.1 and 60.9 percent respectively).

Table 3.5: Distribution of Current Sources of Energy Used by Health institutions by Residence

Gas was the most common source of energy in rural health institutions

Energy Source	Urban	Rural	National
Grid Electricity	97.7	39.7	59.8
Diesel	31.0	10.7	17.8
Petrol	18.0	9.7	12.3
Paraffin	62.1	68.4	67.6
Gas	30.1	74.3	53.5
Solar	4.7	68.8	48.2
Charcoal	60.9	51.0	51.7
Firewood	0.5	20.1	11.6

3.4.3 Sources of Energy Used by Health institutions by Region

All health institutions in Kampala used grid electricity as the predominant source of energy

All (100 percent) of the Health institutions in Kampala reported using Grid Electricity as the most common energy source, as showed in Table 3.6. Health institutions in the Central and Eastern regions also reported Grid Electricity as the most common energy source used (89.3 percent and 91.1 percent respectively). The Northern and Western regions reported charcoal (89.7 percent) and Paraffin (81.2 percent) as the most common Energy sources.

Table 3.6: Distribution of Current Sources of Energy Used by Health institutions by Region

Type of Energy Source	Kampala	Central	Eastern	Northern	Western	National
Grid Electricity	100.0	89.3	91.1	49.9	2.8	59.8
Diesel	22.8	0.6	31.7	48.8	2.5	17.8
Petrol	2.6	5.5	29.8	42.2	0.6	12.3
Paraffin	95.5	50.7	64.2	11.0	81.2	67.6
Gas	24.6	70.2	61.8	83.9	48.3	53.5
Solar	0.0	42.0	64.5	86.9	66.5	48.2
Charcoal	70.7	51.8	7.0	89.7	48.6	51.7
Firewood	0.0	31.9	1.9	6.5	17.1	11.6

3.5 Summary of Findings

Findings from the survey revealed that the most common sources of energy used were Paraffin, Firewood, Charcoal, Grid Electricity, Gas and Solar. The extent of electrification of each energy source varies at Rural, Urban, Regional and National levels for the different sectors.

Paraffin was the most common source of energy in the country for Households and Health sectors, although less than half of the Businesses and Education Institutions nationwide used Paraffin.

While firewood was the predominant energy source among Education institutions and a large number of Households nationwide, less than 15 percent of the Business Establishment and Health institutions used Firewood.

Grid Electricity was used in only 14.9 percent of the households in the country. More than half of the Education and Health institutions nationwide used Grid Electricity. Businesses reported the highest percentage of using Grid Electricity (60.9 percent). Slightly more than a half of the Health institutions in the country reported using Charcoal, unlike the rest of the sectors (35 percent). Gas was also found to be commonly used in more than a half of the Health institutions, but less than 5 percent of the other sectors.

In the rural areas, firewood was the most common source of energy for over 80 percent of the households and almost 99 percent of the Education institutions. However, less than 25 percent of the Business Establishments and Health institutions used Firewood. Charcoal was used by 51 percent of the Health institutions, but less than 35 percent of the rest of the sectors. Grid Electricity was used in over 35 percent of the other sectors, but only about 7 percent in Households. Paraffin was used in over 80 percent of households and over 60 percent of Health institutions, but by less than 40 percent of Business Establishments and Education Institutions. Gas was used in over 70 percent of the Health institutions and only 5 percent of the other sectors. Similarly, Solar was used in over 65 percent of Health institutions but less than 25 percent of other sectors.

In the Urban areas, Firewood was used in over 95 percent of the Education Institutions but less than 25 percent of the rest of the sectors. Charcoal was used in over 60 percent of Households and Health institutions, but less than 30 percent of Business establishments and Education institutions. More than half of the households and over 70 percent of the other sectors used grid electricity. Paraffin was used by over 60 percent of Health institutions and households, but less than 25 percent of the Business Establishments and Education Institutions. Gas was the most common source of energy for 30 percent of the Health institutions, but less than 5 percent of the other sectors. Solar was used in more than a half of the Education institutions but less than 5 percent of the other sectors.

Across the regions, Firewood was used in over 70 percent of Households and Education institutions, except Kampala region. Charcoal was generally used in over 70 percent of Households and Health institutions in Kampala region and in less than half of the sectors in the other regions. Grid electricity was

used in all Health institutions and more than 60 percent of other sectors in Kampala region. Less than 20 percent of Households in all other regions used grid electricity. More than half of all Households and Health institutions in all regions used paraffin. Solar was used in less than 1 percent of all sectors in Kampala region, although it was used in more than a half of the Health institutions in all other regions. Gas was most commonly used by Households, Businesses and Health institutions in Kampala region but also in over 60 percent of Health institutions in other regions.

CHAPTER FOUR

GRID ELECTRICITY

4.0 Introduction

This chapter focuses on Grid Electricity for the Household, Business, Education and Health sectors. Grid Electricity refers to electricity delivered to consumers via either distribution networks that buy electricity directly from the Uganda Electricity Transmission Company Limited (UETCL) via the national grid or from Independent⁵ grid distribution networks operated under a distribution license⁶.

The chapter covers the level of Grid Electrification categorized by: location, type of grid (national or independent grid), metering status, category of consumers and consumer payment preferences.

In addition, the following are also covered under this chapter:

1. The sources of Electricity
2. The end uses for which electricity is demanded
3. The reliability of the electricity supply during the years 2010 and 2011.

4.1 Household Sector

4.1.1 Grid Electrification at National and Residence Levels

98.6% of Electrified Households are connected to the National Grid network

As indicated in Chapter 3, Grid Electrification level for the household sector at the national level was 14.9 percent. Of this, 98.6 percent were electrified through the national grid and 1.4 percent through independent grids. Electrification level through the independent grid was highest in the Northern⁷ region of the Country. Table 4.1 below gives results for the level of Electrification at National and Residence levels.

Table 4.1: Grid Electrification Levels for the Household sector at the National Level

Residence	National grid (%)	Independent grid (%)	Total
National	98.6	1.4	100
Urban	99	0.1	100
Rural	98	2	100
Region			
Kampala	100	0	100
Central	99.7	0.3	100
Eastern	98.6	1.4	100
Northern	72.6	27.4	100
Western	96.9	3.1	100

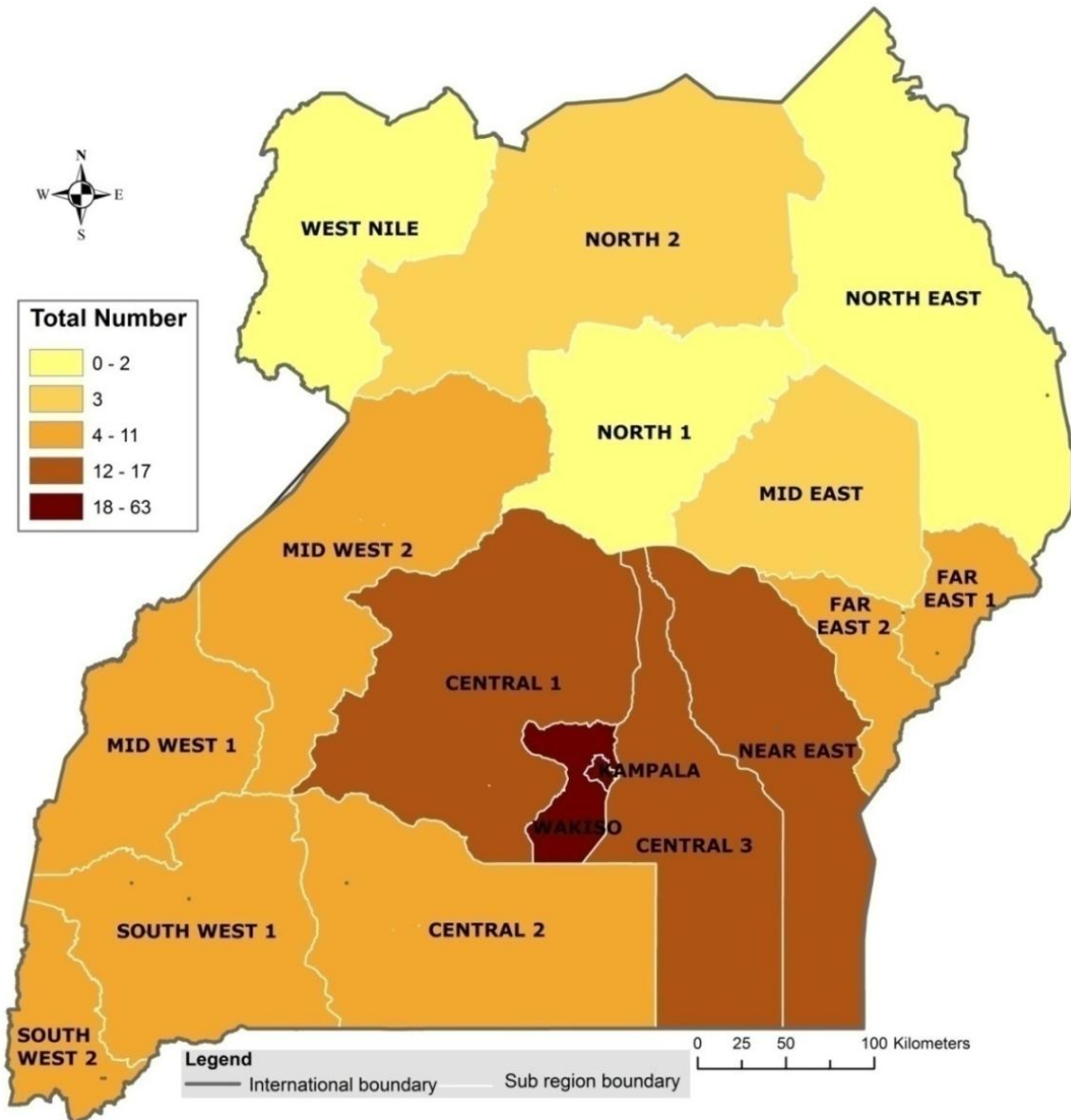
⁵ Independent Grid is also referred to as Off-grid

⁶ Distribution License as defined in the Electricity Act, 1999

⁷ Northern Region includes: North 1, North 2, North East and West Nile regions

Figure 4.1 shows the geographical distribution of Grid Electricity in Uganda. The figure shows that there is much concentration of Grid Electricity at the Household level within Kampala and Wakiso districts compared to other districts and regions.

Figure 4.1: Distribution of Grid Electricity by Strata at the Household Level



4.1.2 Metering Arrangement at National and Residence Levels

61.2% of Households in Kampala region share meters

Data was collected on metering arrangements for the households using grid electricity. Metering arrangement referred to the method by which electricity consumed is measured. The categories considered included: Own Meter, Shared Meter and No Meter. The survey findings indicated that at National level 49.9 percent had their own meters while 48.7 percent shared meters. Kampala region had the highest number of households sharing meters (61.2 percent). The results are as indicated in Table 4.2 below.

Table 4.2: Metering Arrangement at the National, Residence and Regional levels

Residence	Own meter(%)	Shared meters (%)	No meter (%)	Total
National	49.9	48.7	1.4	100
Urban	42.6	56.7	0.7	100
Rural	61.7	35.6	2.7	100
Region				
Kampala	38.6	61.2	0.2	100
Central	56.3	43.3	0.4	100
Eastern	54.7	41.1	4.2	100
Northern	64.2	33.2	2.6	100
Western	53.6	43.7	2.7	100

4.1.3 Selected End Uses met using Grid Electricity at National and Residence Levels

Households were asked to identify from a list of selected end uses the purposes for which they used Electricity. The findings indicated that at the National Level the most common end use was for lighting (23.1 percent). Table 4.3 below provides the results at National and Residence levels for the selected end uses.

Table 4.3: Selected End Uses met using Grid Electricity

Usage	Urban (%)	Rural (%)	National (%)
Lighting	22.0	24.9	23.1
Cooking	1.4	1.7	1.5
Ironing	15.6	13.8	15.0
Refrigeration	7.2	5.1	6.4
Washing(machine)	0.1	0.1	0.1
Cooking/Water heating	2.4	1.8	2.2
Air conditioning	0.4	0.6	0.5
Phone Charging	18.3	21.0	19.3
Radio	13.0	13.1	13.1
Television	16.6	15.9	16.3
Computer	2.8	2.1	2.5
Photocopy	0.1	0.0	0.1
Others(Specify)	0.1	0.0	0.1
Total	100	100	100

4.1.4 Interest in Grid Electricity at National and Residence Levels

The survey collected data on household interest in getting connected to the grid. This was for those households who did not have a connection yet. Results show that at the National level 90.1 percent of households have interest in grid connection. Table 4.4 below provides further results including at Residence and regional levels.

Table 4.4: Percentage distribution of Households Interested for Grid Electricity at National, Residence and Regional levels

Residence	Yes	No	Total
National	90.1	9.9	100
Urban	86.6	13.4	100
Rural	90.4	9.6	100
Region			
Kampala	83	17	100
Central	87.2	12.8	100
Eastern	92.1	7.9	100
Northern	89	11	100
Western	92.1	7.9	100

The Households that indicated a lack of interest in grid connectivity were required to give reasons why. Out of 9.9 percent of households in this category, 61.5 percent of them were not interested because they considered grid electricity to be expensive while 26 percent of these households were not interested

because they felt there was “No need” for a grid connection. Further results are as indicated in Table 4.5 below.

Table 4.5: Reasons for Lack of Interest in Grid Electricity at National and Residence Levels (%)

Reasons for lack of interest in Grid Electricity	Urban	Rural	National
No need	13.5	27.8	26.0
Too expensive	72.9	59.9	61.5
Not Reliable	5.6	7.6	7.4
Others	8.1	4.7	5.1
Total	100.0	100.0	100.0

4.1.6 Frequency of Payment of Electricity Bills

The survey asked households how frequently they paid their electricity bills. The findings indicated that at the National level, 92.7 percent of the households pay electricity bills on a monthly basis and 0.2 percent of households pay their electricity bills on an annual basis. Further results are as shown in Table 4.6 below. The main reason advanced for the preference of monthly payments of bills was the monthly salary earnings that was common among consumers.

Table 4.6: Frequency of Paying Electricity Bills (%)

Resident	Monthly	Every two months	Quarterly	Annual	On receipt of the bill	Others	Total
National	92.7	2.4	0.6	0.2	2.1	2	100
Urban	94.6	1.6	0.5	0.1	1.7	1.4	100
Rural	89.5	3.7	0.7	0.4	2.8	2.9	100
Region							
Kampala	95.5	1.1	0.1	0.2	2.4	0.5	100
Central	91.1	3.6	1	0.2	3.1	1.1	100
Eastern	95.2	1.4	0.5	0.4	0.4	2.1	100
Northern	91.3	3.8	3.1	0	0	1.9	100
Western	85.7	4.2	0.5	0	2	7.7	100

4.1.7 Load Shedding

Households were asked whether they had experienced any load shedding in the last two years. The survey results indicated that 92.9 percent of the households had experienced load shedding in the last two years. Over 90 percent of households in both rural and urban areas had experienced load shedding. Further results are as indicated in the Table 4.7 below.

Table 4.7: Load Shedding at National and Residence levels (%)

	Yes	No	Total
National	92.9	7.1	100
Urban	92.7	7.4	100
Rural	93.2	6.8	100
Region			
Kampala	93.7	6.2	100
Central	91.6	8.4	100
Eastern	91.6	6.3	100
Northern	67.8	32.2	100
Western	96.1	3.9	100

4.1.8 Effects of Load shedding

The survey asked households about the effects of load shedding. At the National Level, the findings indicated that load shedding resulted among others into the following:

- Machinery break down (43.4 percent)
- Spoilage of inputs (31.2 percent).
- High cost of raw materials (10.6 percent)

Higher storage costs as a result of load shedding were more pronounced in Kampala region (7.7 percent). More machines were broken down in the Western region (58.8 percent) due to load shedding. Northern region experienced the highest costs of refrigeration (41.1 percent) as compared to other regions, as shown in Table 4.8 below.

Table 4.8: Effects of load shedding (%)

Effects	Urban	Rural	Kampala	Central	Eastern	Northern	Western	National
Higher Storage Costs	4.6	1.2	7.7	0.0	1.7	0.0	3.9	3.3
Higher Costs of raw Materials	10.9	10.2	10.2	9.6	11.0	11.8	14.1	10.6
Higher refrigeration costs	6.2	6.8	5.0	5.9	7.7	41.1	3.8	6.5
Higher Transport Costs	0.0	2.7	0.0	0.8	1.4	11.8	2.0	1.1
Spoilage of inputs	32.7	28.8	36.2	30.9	39.2	0.0	11.8	31.2
Machinery breakdowns	41.0	47.3	36.9	50.5	33.9	23.6	58.8	43.4
Overtime	1.6	2.0	0.6	2.3	1.4	11.8	1.9	1.8
Increased labour costs	2.9	1.1	3.3	0.0	3.7	0.0	3.7	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

4.1.9 Alternative Sources of Energy

Households were asked whether they had used alternative sources of energy other than grid electricity. At the National level, the survey results indicated that 85.0 percent of the households used alternative

energy sources. In Rural areas 83.9 percent of the households had used alternative sources of energy compared to 85.6 percent in the Urban areas as shown in Table 4.9 below.

Table 4.9: Use of Alternative Sources of Energy Used at Household Level (%)

Resident	Yes	No	Total
National	84.9	15.1	100
Urban	85.6	14.4	100
Rural	83.9	16.1	100
Region			
Kampala	88.2	11.9	100
Central	86.6	13.4	100
Eastern	85.4	14.6	100
Northern	73	27.1	100
Western	74.3	25.7	100

4.1.10 Extent to which Alternative Energy Sources met Energy Requirement.

The findings indicated that 80.7 percent of the activities were not covered by the alternative energy sources. Generally, alternative sources of energy covered less than 50 percent of the activities of the households as shown in Table 4.1 below.

Table 4.4.11: Coverage of Activities by Alternative Energy Source (%)

Resident	Yes	No	Total
National	19.3	80.7	100
Urban	17.9	82.1	100
Rural	21.65	78.35	100
Region			
Kampala	12.4	87.7	100
Central	21.3	78.7	100
Eastern	20.8	79.2	100
Northern	32.9	67.1	100
Western	30.1	69.9	100

4.1.11 Percentage of Extent Activities Covered by Alternative Energy Source

Respondents were asked what percentage of activities were covered by alternative energy sources. The findings showed that 48.5 percent of the household reported that the alternative energy sources only covered between 1-25 percent of the household activities. Only 5 percent of alternative energy sources covered between 76-100 percent of the activities as shown in Table 4.10 below.

Table 4.10: Percentage of Extent activities covered by alternative energy source

Resident	Between 1-25	Between 26 - 50	Between 51-75	Between 76-100	Total
National	48.5	35.6	10.9	5	100
Urban	47.3	36.2	10.5	6	100
Rural	50.5	34.6	11.7	3.2	100
Regions					
Kampala	47.6	37	11.1	4.3	100
Central	51.3	33.9	10	4.8	100
Eastern	43.1	40	10.8	6.1	100
Northern	55.6	28.2	10.2	6	100
Western	52.7	29.1	12.6	5.6	100

4.1.12 Summary

The National electrification level for the Household sector was 14.9 percent. Of these, 98.6 percent were supplied with electricity via the national grid. Out of the total households using electricity, 48.9 had own meters. The most common end use for electricity was lighting (23.1 percent).

Out of the 76.1 percent non-electrified households, 90.1 percent had interest in a grid connection. The remaining 9.9 percent were not interested in a connection because they considered grid electricity to be expensive.

During a period of two years prior to the survey, 92.9 percent households had experienced load shedding which had, among its effects, Machinery breakdown, Spoilage of inputs and high cost of raw materials. At the national level, over 80 percent of households had alternative energy sources to grid electricity. However, results also indicated that 16 percent of electrified households in rural areas had no alternative source of energy.

The alternative energy sources were used to cover less than 20 percent household activities accounting for between 1-25 percent energy requirements for 48.5 percent of the households.

4.2 Business Sector

4.2.1 Grid Electrification at National and Residence Levels in the Business establishments

Table 4.11 indicates that the Grid Electrification level for the business sector at the national level was 61.4 percent. Of these Businesses, 97.1 percent were electrified through the national grid and 2.9 percent through independent grids. Electrification level through the independent grid was highest in the Northern region of the Country. Table 4.12 below gives results for the level of Electrification at National and Residence levels.

Table 4.11: Grid Electrification Levels at National, Residence and Regional levels in the Business establishments (%)

	Yes	No	Total
National	61.4	38.6	100
Residence			
Urban	73.5	26.5	100
Rural	48.6	51.3	100
Region			
Kampala	82.1	17.9	100
Central	61.1	38.9	100
Eastern	43.3	56.7	100
Northern	51.5	48.6	100
Western	50.9	49.1	100

Table 4.12: Percentage of Business Establishments connected to different Grid at National Levels

	National	Independent	Total
National	97.1	2.9	100
Residence			
Urban	98.5	1.6	100
Rural	95.0	5.0	100
Region			
Kampala	99.3	0.8	100
Central	99.3	0.7	100
Eastern	98.6	1.4	100
Northern	71.4	28.6	100
Western	95.5	4.5	100

4.2.2 Source of Independent Grid

For those using an independent grid, the survey sought to establish their source of supply and found that 52.7 percent of businesses on independent grid were supplied power by the West Nile Region Electricity Company (Wenreco), as shown in Table 4.13 below.

Table 4.13: Sources of Independent Grid by Residence (%)

	Wenreco	Kisiizi	Others	Total
National	52.7	15.3	32.0	100
Residence				
Urban	23.6	29.6	46.8	100
Rural	66.8	8.4	24.8	100

4.2.3 Metering Arrangement at National and Residence Levels

Data was collected on metering arrangement for the business institutions using grid electricity. Metering arrangement referred to the method by which electricity consumed is measured. The categories considered included: Own Meter, Shared Meter and No Meter. The survey findings indicated that at National level 51.2 percent had their own meters while 48.6 percent shared meters. Kampala Region had the highest number of business institutions sharing meters (51.5 percent). The results are as indicated in Table 4.14 below.

Table 4.14: Metering Arrangement at Nation, Residence and Regional levels (%)

	Own meter	Shared meter	No Meter	Total
National	51.2	48.6	0.2	100
Residence	49.3	50.5	0.3	100
Urban	54.9	45.0	0.1	100
Rural	49.7	49.9	0.4	100
Region				0
Kampala	48.5	51.5	0	100
Central	49.1	50.5	0.4	100
Eastern	69.4	30.6	0	100
Northern	55.0	45.0	0	100
Western	51.2	48.6	0.2	100

4.2.4 Tariff Category

There are four tariff billing categories under which grid electricity is classified. The categories are issued based on demand of the user. The categories include: Domestic supplied at 240 volts at low voltage single phase; Commercial supplied at 415 volts at low voltage three phase with a load not exceeding 100 amperes; Medium industrial supplied at 415 volts with a maximum demand of up to 500 KVA; and Large industrial supplied at 11,000 volts or 33,000 volts with maximum demand exceeding 500KVA but up to 10,000 KVA.

4.2.5 Tariff Category by Residence and Region

The survey also sought to find out in which category was the grid electricity bill the businesses had. The findings reveal that the majority of businesses countrywide were in the category of domestic and commercial bills with 51.8 and 46.4 percent respectively, as shown in Table 4.15 below.

Table 4.15: Tariff Category by Residence and Region (%)

	Domestic	Commercial	Medium Industrial	Large Industrial	Total
National	51.8	46.4	1.8	0.0	100.0
Residence					0.0
Urban	48.4	50.0	1.6	0.1	100.0
Rural	57.5	40.4	2.2	0.0	100.0
Region					
Kampala	52.5	46.0	1.4	0.0	100.0
Central	54.3	43.4	2.2	0.1	100.0
Eastern	48.7	50.6	0.8	0.0	100.0
Northern	43.1	53.8	3.1	0.0	100.0
Western	50.9	47.1	2.1	0.0	100.0

4.2.5 Frequency of Payment of Electricity Bills

The survey asked business institutions how frequently they paid their electricity bills. The findings indicated that at the National level, 91.2 percent of the business institutions pay electricity bills on a monthly basis and 0.8 percent of business institutions pay their electricity bills on an annual basis. Further results are as shown in Table 416 below.

Table 4.16: Preferred frequency of payment Tariff Category by Residence and Region (%)

Period	Weekly	Every 2 weeks	Monthly	Every 2 months	Quarterly	Annually	On receipt Bill	Others	Total
National	3	1.62	91.2	1.1	1.1	0.8	0.6	0.5	100
Residence									
Urban	2.9	2.1	91.5	1.1	0.7	0.8	0.5	0.4	100
Rural	3.3	0.9	91.1	1.0	1.6	0.9	0.4	0.8	100
Region									
Kampala	2.2	1.7	93.6	0.0	0.7	0.9	0.5	0.5	100
Central	2.3	0.1	92.0	1.3	1.1	1.7	1.5	0.0	100
Eastern	1.9	0.4	96.2	1.4	0.0	0.0	0.0	0.0	100
Northern	0.0	3.3	96.7	0.0	0.0	0.0	0.0	0.0	100
Western	8.2	4.9	78.2	3.2	3.2	0.0	0.0	2.2	100

4.2.6 Selected End Uses met using Grid Electricity at National and Residence Levels

Business Institutions were asked to identify from a list of selected end uses the purposes for which they used Electricity. The findings indicated that at the National Level the most common end use was for lighting purposes (29.7 percent). Table 4.17 below provides the results at National and Residence levels for the selected end uses.

Table 4.17: Selected End Uses met using Grid Electricity by the Business Sector (%)

Purpose	Urban	Rural	National
Lighting	29.6	29.9	29.7
Phone charging	16.3	18.5	17.1
Refrigeration	11.6	12.4	11.9
Television	8.6	10.2	9.2
Radio	8.3	9.0	8.6
Photocopy	4.9	3.7	4.4
Computer	4.3	2.2	3.5
Cooking/Water heating	3.8	2.5	3.3
Ironing	2.8	3.9	3.2
Air conditioning	2.2	1.7	2.0
Cooking	1.9	1.0	1.6
Hair dressing	1.7	1.4	1.6
Metal fabrication	1.4	1.3	1.3
Grinding mill	0.5	0.7	0.6
Tailoring	0.6	0.2	0.5
Others	1.6	1.6	1.6
Total	100.0	100.0	100.0

4.2.7 Average Payment for Grid

Businesses were asked how much their last payment for grid electricity was and the findings in Table 4.18 below show that nationally the majority of businesses on average paid between twenty and fifty thousand Uganda shillings. However, in rural areas, the majority on average paid up to ten thousand shillings.

Table 4.18: Tariff Category by Residence and Region in Uganda Shillings

		RANGE ('000)						
		1 -10	10 -20	20 - 50	50 -100	10 - 500	500 plus	Total
National		19.2	17.3	24.1	16.9	16.5	6.0	100
Residence								
	Urban	16.6	18.9	25.0	15.4	16.8	7.3	100
	Rural	23.3	15.4	22.1	19.1	15.9	4.1	100
Region								
	Kampala	13.4	16.5	24.7	19.2	18.2	8.1	100
	Central	21.5	22.4	28.2	13.7	12.2	2.0	100
	Eastern	23.8	10.5	18.9	16.6	22.4	7.9	100
	Northern	15.9	14.0	25.0	22.6	20.8	1.8	100
	Western	25.5	15.9	18.9	16.2	15.5	8.1	100

4.2.8 Load Shedding

Business institutions were asked whether they had experienced any load shedding in the last two years. The survey results indicated that 96.2 percent of the Business institutions had experienced load shedding in the last two years. Over 95 percent of households in both rural and urban areas experienced load shedding. Further results are as indicated in the Table 4.19 below.

Table 4.19: Load Shedding by Residence and Region

	Yes	No	Total
National	96.2	3.8	100
Residence			
Urban	95.8	4.2	100
Rural	96.8	3.3	100
Region			
Kampala	96.5	3.5	100
Central	94.3	5.8	100
Eastern	98.1	2.0	100
Northern	97.0	3.0	100
Western	97.4	2.6	100

4.2.9 Daily Hours of Electricity Needed by Businesses

On the duration of time business needs electricity daily, businesses were asked how many hours of electricity they needed for normal operation per day. Overall 41 percent of the business said they needed between 21 to 24 hours of electricity per day for normal operations, as shown in Table 4.20

Table 4.20: Hours of Electricity needed by Residence and Region

	1-5	6-10	11-15	16-20	21-24	Total
National	6.6	8.3	33.9	10.3	41.0	100
Residence						
Urban	5.4	8.8	35.4	11.7	38.6	100
Rural	8.2	7.2	30.9	8.4	45.4	100
Region						
Kampala	3.1	10.8	39.6	9.2	37.3	100
Central	6.0	3.8	31.6	10.6	48.0	100
Eastern	9.8	10.3	29.5	15.4	35.0	100
Northern	10.4	15.1	35.3	16.0	23.2	100
Western	12.4	6.9	27.4	6.8	46.6	100

4.2.10 Effects of Load Shedding by Residence

The survey also sought to establish the effects of load shedding on businesses and the findings were that the majority of businesses countrywide were affected though Idle production (labour) factors (21.8 percent) followed by Machinery breakdown (21.5 percent), as shown in Table 4.21 below.

Table 4.21: Effects of Load Shedding by Residence

Effects of Load shedding	Urban	Rural	National
High storage costs	7.7	5.7	7.1
Higher costs for raw materials	6.6	1.3	4.8
Higher refrigeration costs	9.3	12.3	10.3
Higher transport costs	1.6	3.3	2.1
Spoilage of inputs	18.3	17.1	17.9
Machinery breakdown	20.2	24.2	21.5
Idle production factors	22.3	20.8	21.8
Overtime	6.5	7.5	6.8
Increased labour costs	5.0	4.5	4.8
Inability to restart production	2.5	3.3	2.8
Total	100	100	100

4.2.13 Change in work pattern

The survey further sought to find out whether there was any change in the work times/shifts within the businesses due to load shedding. The findings in Table 4.24 show that 81.5 percent of businesses nationwide did not change the pattern of work time/shifts.

Table 4.22: Change in work/times within businesses by Residence and Region (%)

		Yes	No	Total
National		18.5	81.5	100
Residence				
	Urban	17.1	82.9	100
	Rural	21.0	79.0	100
Region				
	Kampala	11.7	88.3	100
	Central	21.8	78.3	100
	Eastern	20.0	80.0	100
	Northern	19.1	80.9	100
	Western	26.4	73.6	100

4.2.11 Alternative Energy Source

Business establishments were asked whether they had alternative sources of energy other than grid electricity. At the National level, the survey results indicated that 70.3 percent of the business institutions used alternative energy sources. In rural areas 27.9 percent of the business institutions used no alternative sources of energy, compared to 30.9 percent in urban areas. Other results are as shown in Table 4.9 below.

Table 4.23: Alternative Sources of Energy Used by Business Sectors (%)

		Yes	No	Total
National		70.3	29.7	100
Residence				
	Urban	69.1	30.9	100
	Rural	72.1	27.9	100
Region				
	Kampala	67.0	33.0	100
	Central	75.8	24.2	100
	Eastern	65.5	34.5	100
	Northern	71.8	28.2	100
	Western	70.4	29.7	100

4.2.12 Percentage of Activities Covered By Alternative Sources

The businesses were further asked if the alternative energy source covered all the required operation process. Table 4.23 below shows that 72.1 percent of the overall businesses that used alternative energy sources did not cover all the required operation processes.

Table 4.24: Coverage of Alternative Energy Sources by Residence and Region (%)

		Yes	No	Total
National		27.9	72.2	100
Residence				
	Urban	26.0	74.0	100
	Rural	30.0	70.0	100
Region				
	Kampala	25.6	74.4	100
	Central	25.6	74.4	100
	Eastern	26.6	73.4	100
	Northern	40.3	59.7	100
	Western	34.1	65.9	100

4.2.14 Interest in Grid Electricity at National and Residence Levels

The survey collected information on business institutions interested in grid connection. This was for those business institutions that were not connected yet. Results show that at the National level 78.2 percent of households have interest in grid connection. Table 4.25 below provides further results, including at Residence and regional levels.

Table 4.25: Interest in Grid electricity at National, Residence and Regional levels by Business sector (%)

		Yes	No	Total
National		78.2	21.8	100
Residence				
	Urban	64.1	35.9	100
	Rural	85.7	14.3	100
Region				
	Kampala	39.9	60.2	100
	Central	77.9	22.1	100
	Eastern	83.0	17.0	100
	Northern	85.8	14.3	100
	Western	91.2	8.8	100

The Business Institutions that indicated a lack of interest in grid connectivity were required to give reasons why. Out of 21.8 percent of Business establishments in this category, 36.5 percent were not interested because they considered grid electricity to be expensive, 52.2 percent of these Business establishments were not interested because they felt there was “No need” for a grid connection. Further results are as indicated in table 4.26 below.

Table 4.26: Reasons for No Interested in Grid electricity by Residence (%)

	No need	Too expensive	Not reliable	Others	Total
National	52.2	36.5	9.5	1.9	100
Residence					
Urban	56.0	31.2	11.0	1.8	100
Rural	46.4	44.4	7.1	2.2	100

4.2.15 Summary

The National electrification level for the business sector was 61.4 percent. Of these, 97.1 percent were provided with electricity via the national grid. Out of the total electrified business institutions, 51.2 used own meters. The most common end use for electricity was lighting at 29.7 percent. Out of the 38.6 percent non-electrified business institutions, 78.2 percent had interest in a grid connection. The remaining 21.8 percent were not interested in a connection because they considered grid electricity to be expensive.

Over 90 percent of electrified and non-electrified business institutions expressed preference to pay electricity bills on a monthly basis.

During a period of the two years prior to the survey, 96 percent business institutions had experienced load shedding among which were the following main effects: Idle Production Factor (Labour) and Machinery breakdown.

At the national level, over 70.3 percent of business institutions had alternative energy sources to grid electricity. However, the results also indicated that 27.9 percent of electrified business institutions in rural areas had no alternative source of energy. The alternative energy sources were used to cover less than 30 percent business institutions' activities.

4.3 Education Sector

4.3.2 Grid Electricity as Current Source of Energy

As indicated in Table 4.27, Grid Electrification level for the Education sector at the national level was 40.1 percent. Of this, 97.4 percent were supplied electric power through the national grid and 2.6 percent through independent grids. Electrification level through the independent grid was highest in the Northern region of the Country. Table 4.28 below gives results for the level of Electrification at National and Residence levels.

Table 4.27: Grid Electricity as Current Source of Energy for Education sector by Residence and Region (%)

	Yes	No	Total
National	40.1	59.9	100
Residence			
Urban	66.2	33.8	100
Rural	34.0	66.0	100
Region			
Kampala	72.7	27.3	100
Central	51.0	49.0	100
Eastern	43.2	56.8	100
Northern	15.1	84.9	100
Western	41.3	58.7	100

Table 4.28: Education Institution Access to Grid Electricity by Residence and Region (%)

	National	Independent	Total
National	97.4	2.6	100
Residence			
Urban	96.8	3.2	100
Rural	97.7	2.3	100
Region			
Kampala	100	0	100
Central	100	0	100
Eastern	100	0	100
Northern	82.2	17.8	100
Western	95.1	4.9	100

4.3.5 Source of Independent Grid Electricity by Residence and Region

The Education institutions that used Independent Grid were asked to specify their source. Table 4.29 shows that nationally, 44.79 percent of the Education institutions used Wenreco and 8.21 percent used Kisiizi as their source of independent grid. The survey findings also indicate that Wenreco was the main sources of the independent grid for the Northern region with Wenreco supplying to 84.50 percent of the Education Institutions.

Table 4.29: Sources of Independent Grid for Education Institution by Residence and Region (%)

	Wenreco	Kisiizi	Others	Total
National	44.8	8.21	47	100
Residence				
Urban	0	21.2	78.8	100
Rural	73.1	0	26.9	100
Region				
Northern	84.5	15.5	0	100
Western	0	0	100	100

4.3.6 Metering Arrangement by Residence and Region

Data was collected on the metering arrangement for the Education institutions using grid electricity. Metering arrangement referred to the method by which electricity consumed is measured. The categories considered included: Own Meter, Shared Meter and No Meter. The survey findings indicated that at National level 96.2 percent had their own meters while 3.5 percent shared meters. The results are as indicated in Table 4.30 below.

Table 4.30: Metering Arrangement at Nation, Residence and Regional levels for Education Sector (%)

	Own meter	Shared meter	No Meter	Total
National	96.2	3.5	0.3	100
Residence				
Urban	99.4	0.6	0	100
Rural	94.8	4.7	0.5	100
Region				
Kampala	100	0	0	100
Central	93.0	7.0	0	100
Eastern	97.5	1.3	1.3	100
Northern	97.4	2.6	0	100
Western	97.3	2.7	0	100

4.3.7 Tariff Category

There are four tariff billing categories under which grid electricity is classified. The categories are issued based on the demand of the user. The categories include: Domestic supplied at 240 volts at low voltage single phase; Commercial supplied at 415 volts at low voltage three phase with a load not exceeding 100 amperes; Medium industrial supplied at 415 volts with a maximum demand of up to 500 KVA; and Large

industrial supplied at 11,000 volts or 33,000 volts with maximum demand exceeding 500KVA but up to 10,000 KVA.

4.3.8 Tariff Category by Residence and Region

The survey sought to establish the category under which grid electricity bills were categorized for Education institutions. Table 4.31 shows that at the national level, the highest number of Education institutions was categorized under domestic billing category, 62.46 percent. The findings further show that the Eastern region had almost the same number of institutions categorized under domestic and commercial billing categories.

Table 4.31: Tariff Category by Residence and Region (%)

	Domestic	Commercial	Large Industrial	Total
National	62.4	37.2	0.31	100
Residence				
Urban	59.0	40.0	1	100
Rural	64.0	36.0	0	100
Region				
Kampala	65.1	34.9	0	100
Central	63.1	36.9	0	100
Eastern	50.0	50.0	0	100
Northern	71.6	28.4	0	100
Western	71.5	27.3	1.2	100

4.3.9 Frequency of Payment of Electricity Bills

The Survey sought to establish how often the Education institution pays for electricity. The institutions were required to specify whether payment frequency was weekly, every 2 weeks, monthly, every 2 months, quarterly, annually, on receipt of the bill or other specified frequency.

4.3.10 Frequency of Payment by Residence and Region

Table 4.32 below indicates that at the National level, most Education institutions had their electricity payments made on a monthly basis (83.1 percent) and 2.17 percent of them made their payments weekly.

83.1% of Education Institutions pay Monthly for their Electricity bill

Table 4.32: Frequency of Payment by Residence and Region (%)

Period	Residence			Region				
	Urban	Rural	National	Kampala	Central	Eastern	Northern	Western
Weekly	4.6	1.1	2.2	11.0	2.3	0.0	0.0	2.4
Every 2 weeks	4.5	1.7	2.5	0.0	0.0	0.0	11.3	7.0
Monthly	80.9	84.1	83.1	77.9	91.6	85.9	62.3	77.1
Every 2 months	2.0	2.9	2.6	0.0	1.9	3.0	11.3	1.1
Quarterly	6.5	5.3	5.7	11.1	1.0	6.7	12.5	6.7
Annually	1.5	0.7	0.9	0.0	0.8	0.0	2.7	1.9
On receipt Bill	0.0	2.5	1.7	0.0	1.3	4.5	0.0	0.0
Others	0.0	1.8	1.3	0.0	1.1	0.0	0.0	3.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

4.3.11 Selected End Uses met using Grid Electricity at National and Residence Levels

Electricity utilization in Education institutions is significant to this survey and information was collected on how the Education Institutions utilize their electricity. From Table 4.33 below, the survey findings reveal that nationally, on average, about a third of the institutions use electricity for lighting, 18.1 percent for phone charging, 14.18 percent for computer services and 0.10 percent (the least percentage) for washing clothes

83.1% of
Education
Institutions pay
Monthly for their
Electricity bill

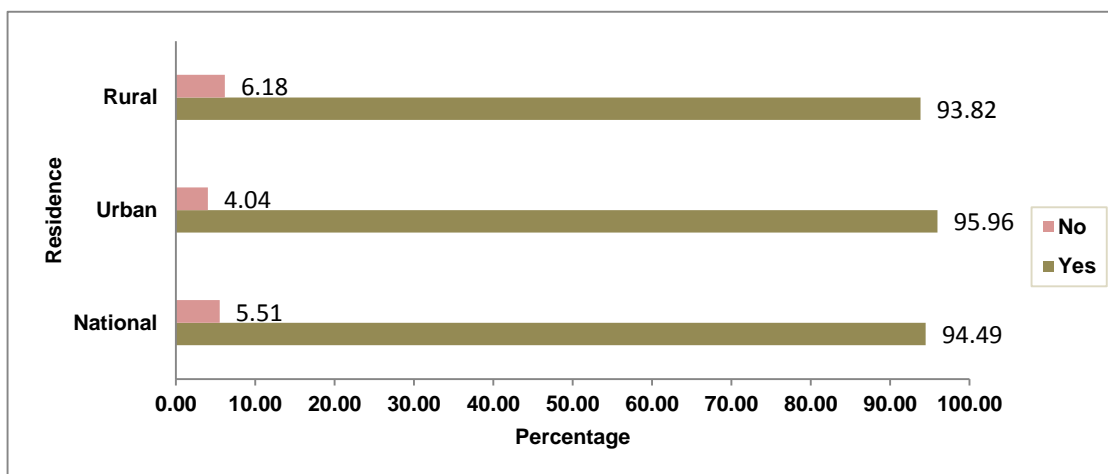
Table 4.33: Purposes of Electricity use by Residence (%)

Purpose of Electricity	Urban	Rural	National
Lighting	20.7	22.0	21.6
Cooking	0.7	0.3	0.4
Ironing	4.5	4.8	4.7
Refrigeration	7.5	4.5	5.5
Washing clothes	0	0.1	0.1
Cooking/Water heating	4.3	3.3	3.6
Air Conditioning	0.6	0.9	0.8
Phone Charging	18.1	18.1	18.1
Radio	7.9	10.0	9.3
Television	11.8	11.3	11.5
Computer	14.0	14.3	14.2
Photocopy	7.7	8.8	8.4
Others	2.1	1.5	1.7
Total	100	100	100

4.3.12 Load Shedding by Residence

The survey sought to find out whether the Education institution had experienced any load shedding during the two years prior to the survey. It is evident in Figure 4.2 that nine in every ten of the Education institutions reported that they had experienced load shedding during the past 2 years.

Figure 4.2: Load Shedding by Residence (%)



4.3.13 Daily Hours of Electricity Needed by Residence and Region

During the survey, Education Institutions were asked about the number of hours of electricity they would need for normal operations per day. From the findings, nationally, 72.11 percent of the Institutions reported that they would need at least 21 hours per day for normal operations, as shown in Table 4.34 below.

Table 4.34: Daily Hours of Electricity needed by Residence and Region (%)

	1-5	6-10	11-15	16-20	21-24	Total
National	1.0	3.9	12.3	10.7	72.1	100
Residence						
Urban	0.6	3.2	14.7	4.9	76.6	100
Rural	1.2	4.2	11.2	13.3	70.1	100
Region						
Kampala	0	8.7	25.3	4.3	61.7	100
Central	0	0.6	18.0	4.1	77.3	100
Eastern	3.0	4.1	4.5	19.7	68.8	100
Northern	2.6	13.9	4.0	13.4	66.2	100
Western	0	3.4	12.3	10.3	74.0	100

4.3.14 Effects of Load Shedding by Residence

The survey investigated the impact of load shedding on the Education institutions and established that nationally, Idle production factors (23.60 percent); Machinery breakdown (23.30 percent); Spoilage of

inputs (19.4 percent); and higher incubation costs (11.20 percent) were the major effects felt by the Institutions, as shown in Table 4.35 below.

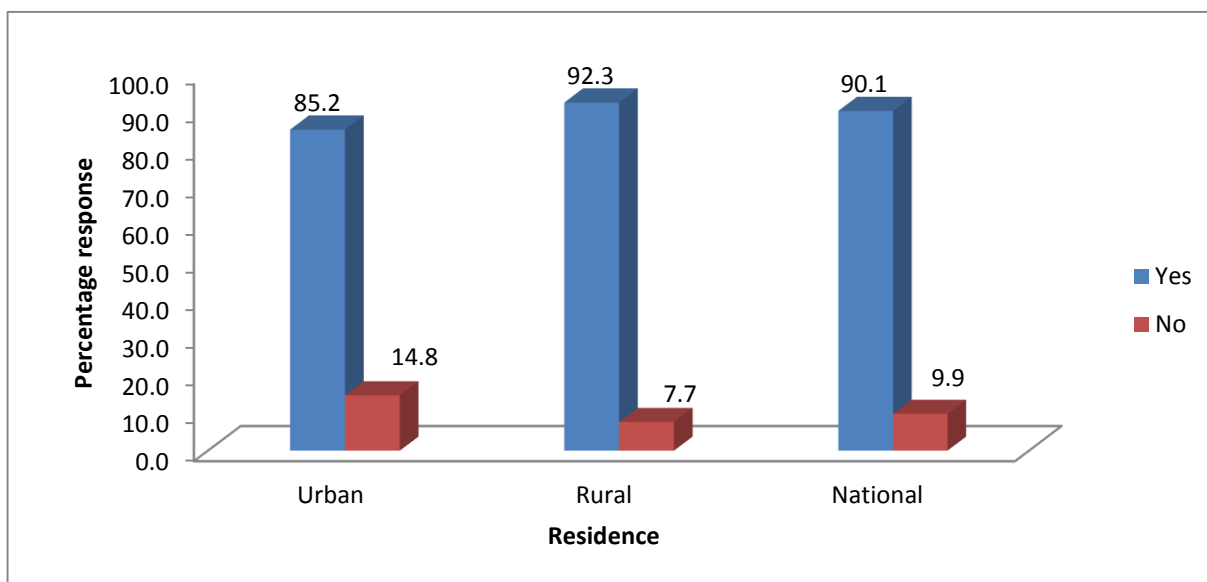
Table 4.35: Effect of Load Shedding by Residence (%)

Direct/Indirect effects	Urban	Rural	National
Idle production factors, e.g. labour	24.1	22.6	23.6
Machinery breakdowns	21.8	26.2	23.3
Spoilage of inputs (perishables)	19.8	18.5	19.4
Higher incubation costs	10.1	13.3	11.2
Higher storage costs	8.4	6.2	7.7
Overtime	7	8.2	7.4
Higher refrigeration costs	7.1	1.4	5.2
Higher transport costs	1.7	3.6	2.3
Total	100	100	100

4.3.15 Alternative Energy Source by Residence

The survey also collected information from Education Institutions on whether the institution had used any other alternative energy source apart from grid electricity. The findings revealed that nationally 90.1 percent of the institutions reported using other alternative energy sources, as shown in Figure 4.3 below.

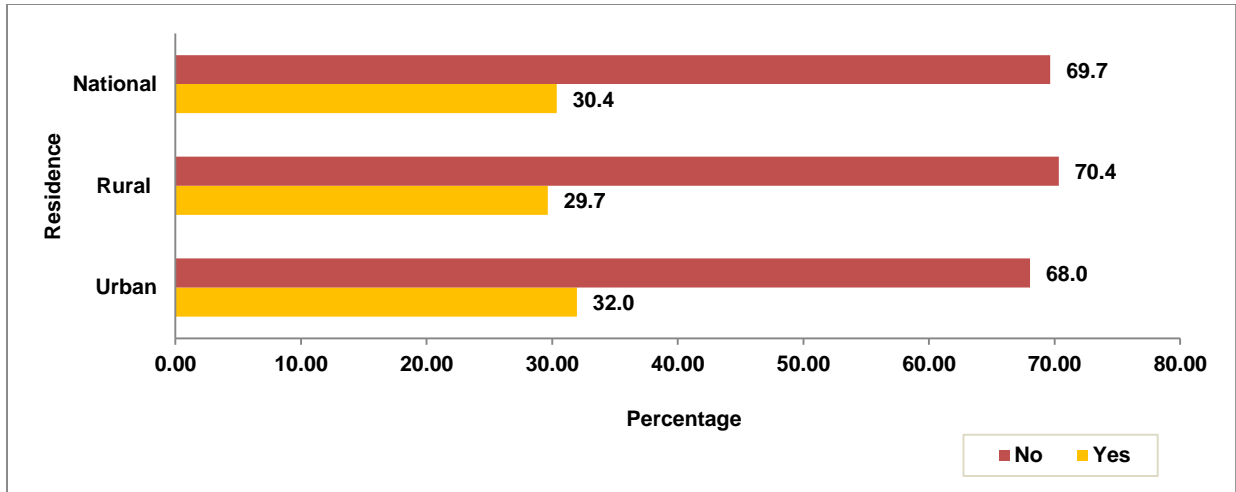
Figure 4.3: Alternative Energy Source by Residence (%)



4.3.16 Alternative Energy Source Coverage of activities by Residence

The survey sought to establish whether the alternative energy source covered all required activities. Figure 4.4 below shows that on average a third of the institutions reported at National level that the alternative energy sources covered all the required activities.

Figure 4.4: Alternative Energy Source Coverage of activities by Residence (%)



4.3.17 Percentage of activities covered by alternative energy sources in Education Institutions

The survey also categorised the percentage of activities covered by alternative sources of Energy used by the Educational institutions. The results showed that at the National level, the highest range of activities covered by alternative sources was between 26-50 percent with the lowest percentage of activities ranging between 76-100 percent and accounting for only 7.9 percent.

Analysis by residence also showed that in the Rural areas the highest percentage of activities covered between 26-50 percent while in the Urban areas the alternative energy sources was highest in the range between 1-25 percent of activities with 48.9 percent response.

Table 4.35. Percentage of activities covered by alternative sources (%)

Range	Urban	Rural	National
1-25	48.9	34.6	39.2
26-50	27.9	55.2	46.3
51-75	4.3	7.6	6.5
76-100	18.9	2.6	7.9

4.3.17 Interest in Grid Electricity by Residence and Region

This section focused on the Education institutions whose current source of energy was not Grid Electricity. They were asked whether they had any interest in Grid Electricity service. The survey findings in Table 4.36 below reveal that the majority of the Education institutions at National level had interest in grid electricity service (97.94) percent. The survey further reveals that all the Education institutions in Northern region expressed interest in the grid electricity service.

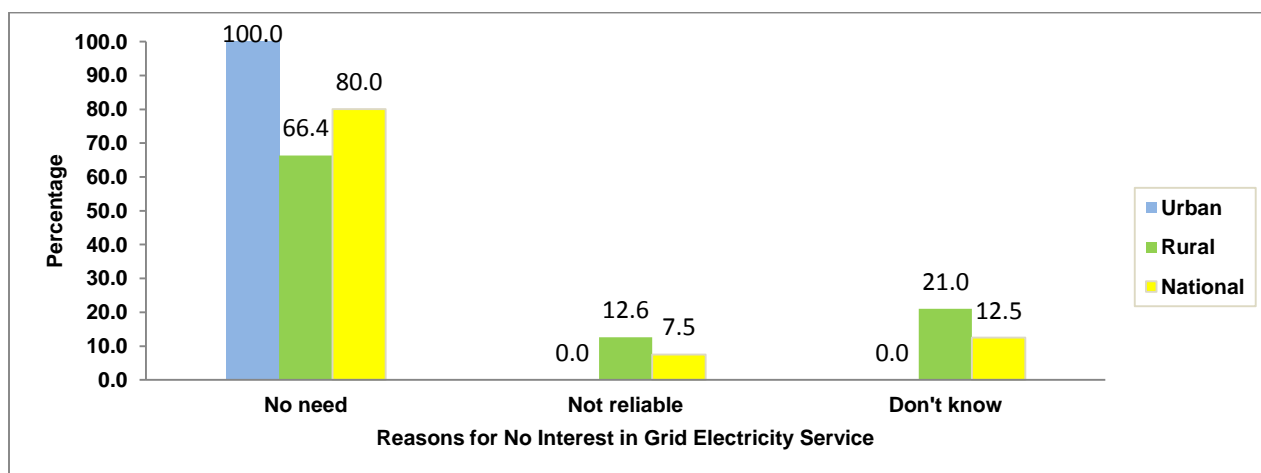
Table 4.36: Educational Institutions Interested in Grid Electricity by Residence and Region (%)

	Yes	No	Total
National	97.9	2.1	100
Residence			
Urban	96.8	3.2	100
Rural	98.1	1.9	100
Region			
Kampala	82.2	17.8	100
Central	94.9	5.1	100
Eastern	99.3	0.7	100
Northern	100	0.0	100
Western	97.9	2.1	100

4.3.18 Reasons for No interest in the Grid Electricity by Residence

The Education institutions were further asked why they would not be interested in Grid Electricity service given that it was not their current source of energy. From the survey findings presented in Figure 4.5 below, eight in every ten institutions at National level reported their main reason as having no need for grid electricity.

Figure 4.5: Reasons for no Interest in Grid Electricity by Residence (%)



4.3.19 Summary

The National electrification level for the Education sector was 40.1 percent. Of these, 97.4 percent were electrified via the national grid. Out of the total number of Education institutions with grid electricity, 96.2 used own meters. The most common end use for electricity was lighting (21.6 percent). Out of the 59.9 percent non-electrified Education institutions, 97.9 percent had interest in a grid connection. The

remaining 2.1 percent were not interested in any connection because they had no need for a grid connection.

Over 80 percent of electrified and non-electrified Education institutions expressed preference to pay electricity bills on a monthly basis.

During a period of two years prior to the survey, 94.5 percent of the Education institutions had experienced load shedding among which were the following main effects: Idle Production Factor (Labour), Machinery breakdown, Spoilage of Inputs, and Incubation costs.

At the national level, over 90.1 percent of Education institutions had alternative energy sources to grid electricity. Alternative energy sources were used to cover 30 percent Education institutions' activities. However, results also indicated that 7.6 percent of Education institutions in rural areas powered by grid electricity had no alternative source of energy.

4.4 Health Sector

This section covers the use of Grid electricity at health institution level. It answers questions on use and non-use of grid, source of grid, metering arrangements, etc. It also focuses on load shedding and its disadvantages.

4.4.1 Grid Electrification at National and Residence Levels

As indicated in Table 4.37, the Grid Electrification level for the Health sector at the national level was 60.8 percent. Of this, 96.7 percent were powered through the national grid and 3.4 percent through independent grids. Electrification level through the independent grid was highest in the Northern region of the Country. Table 4.38 below gives results for the level of Electrification at National and Residence levels.

Table 4.37: Distribution of use of Grid Electricity at National, Residence and Region Level (%)

	Yes %	No %	Total
National	60.8	39.2	100
Residence			
Urban	84.9	15.2	100
Rural	48.2	51.8	100
Region			
Kampala	100	0	100
Central	64.5	35.6	100
Eastern	69.2	30.8	100
Northern	39.7	60.3	100
Western	36.8	63.2	100

Results revealed that 61% of health institutions countrywide use grid

Table 4.38: Accessibility of Grid at National, Residence and Region levels (%)

	National Grid %	Independent Grid %	Total
National	96.7	3.4	100
Residence			
Urban	94.9	5.1	100
Rural	98.3	1.7	100
Region			
Kampala	100	0	100
Central	100	0	100
Eastern	100	0	100
Northern	68.7	31.4	100
Western	100	0	100

The results of use of grid were also categorised by type of Health institutions. Generally above 50 percent of all various Health institutions were using grid electricity. For more details see Table 4.39.

Table 4.39: Percentage Distribution of type of Health institutions by use of grid electricity (%)

Type of Health Institution	National Grid	Independent Grid	Total
Hospitals	61.6	38.4	100
Medical and Dental Practices	58.8	41.2	100
General Clinics	71.4	28.6	100
Other Health institutions	53.9	46.2	100

4.4.2 Selected End Uses met using Grid Electricity at National and Residence Levels

Health institutions were asked to identify the purposes from a list of selected end uses for which they used Electricity. The findings indicated that at the National Level the most common end use was for lighting purposes at 21.1 percent. Table 4.40 below provides the results at National and Residence levels for the selected end uses.

For both region and residence grid electricity was mainly used for lighting.

Table 4.40: Distribution of Energy use at National and by Residence (%)

Type of Energy Use	Urban	Rural	National
Lighting	20.9	21.3	21.1
Cooking	0.8	3.3	2.1
Ironing	10.6	4.8	7.6
Refrigeration	14	15.3	14.7
Washing	2	0.9	1.4
Cooking/Water heating	11.3	6.3	8.7
Air conditioning	4.3	4.4	4.4
Television	3	5.1	4.1
Computer	4.9	10.2	7.7
Photocopy	4.2	6.6	5.4
Radiology	14.1	14.4	14.3
Laboratory	7.2	1.8	4.4
Phone charging	0	0.7	0.4
Running medical equipment	0.7	0	0.3
Sterilizing	2	5.4	3.7
Total	100	100	100

4.4.3 Metering arrangement

Data was collected on metering arrangement for the Health institutions using grid electricity. Metering arrangement referred to the method by which electricity consumed is measured. The categories considered included: Own Meter, Shared Meter and No Meter. The survey findings indicated that at National level 85.5 percent had their own meters while 13.3 percent shared meters. Kampala Region had the highest number of Health institutions sharing meters (35.5 percent). The results are as indicated in Table 4.41 below.

Table 4.41: Metering arrangement at national, residence and regional level (%)

	Own metre (%)	Shared Metre (%)	No Metre (%)	Total
National	85.5	13.3	1.3	100
Residence				
Urban	78.4	19	2.6	100
Rural	92.1	8	0	100
Region				
Kampala	64.5	35.5	0	100
Central	92.5	7.5	0	100
Eastern	89.5	6.2	4.3	100
Northern	92.6	7.4	0	100
Western	89.5	10.5	0	100

Overall
98% of
health
institutions
were
interested

4.4.4 Interest in Grid Electricity at National and Residence Levels

The survey collected data on the interest of Health institutions in grid connection. This was for those Health institutions which did not have a connection yet. Results show that at the National level 98 percent of Health institutions have interest in grid connection. Table 4.42 below provides further results including at Residence and regional levels

Table 4.42: Interest in Grid electricity at National, Residence and Regional levels by Health Sector (%)

Location	Yes (%)	No (%)	Total
National	98	2	100
Residence			
Urban	80	20	100
Rural	100	0	100
Region			
Kampala	88.9	11.1	100
Central	100	0	100
Eastern	100	0	100
Northern	100	0	100
Western	100	0	100

4.4.5 Category of Consumers

58 % of
health
institutions
were
categorised
as domestic
consumers.

Electricity consumers are divided into classes or sectors (Domestic, Commercial, Medium Industrial and Large industrial consumers) based on the type and service they receive. However, medium and large industrial users were combined for this particular report. The classification of customers is determined by each utility and based on various criteria such as demand levels and rate schedules. Utility typically employs a number of tariffs. The alternative tariffs reflect consumers varying consumption levels and patterns and the associated impact on the utility costs of providing the service⁸. The findings revealed that 58.2 percent of the bills paid by Health institutions were categorized as Domestic. The same applied at Residence level. Results further show that at regional level, most of the Health institutions in Central region paid commercial as well as domestic bills (above 45 %). See Table 4.43 for further details.

⁸ Source : UMEME, tariff structure /website (www.umeme.co.ug)

Table 4.43: Category of grid electricity bill by National, Residence and Regional level (%)

	Domestic (%)	Commercial (%)	Medium Industrial (%)	Total
National	58.2	30.9	11.0	100
Residence				
Urban	59.8	29.7	10.5	100
Rural	56.6	32.0	11.4	100
Region				
Kampala	64.8	27.6	7.6	100
Central	46.8	45.3	7.9	100
Eastern	64.0	11.6	24.3	100
Northern	65.1	30.1	4.8	100
Western	53.8	46.2	0.0	100

4.4.6 Frequency of payment of electricity bills

The survey asked Health institutions how frequently they paid their electricity bills. The findings indicated that at the National level, 65.1 percent of the Health institutions pay electricity bills on a monthly basis. Further results are as shown in Table 4.44 below.

Table 4.44: Distribution of payments of electricity bills (%)

	Weekly	Every 2 weeks	Monthly	Quarterly	On receipt of the Bill	Others(Specify)	Total
National	0.8	2.4	65.1	29.2	1.2	1.3	100
Residence							
Urban	1.6	5.0	75.6	15.1	0.0	2.8	100
Rural	0.0	0.0	55.3	42.4	2.3	0.0	100
Region							
Kampala	4.0	12.6	74.7	8.8	0.0	0.0	100
Central	0.0	0.0	72.8	22.8	4.4	0.0	100
Eastern	0.0	0.0	49.8	45.9	0.0	4.3	100
Northern	0.0	0.0	64.3	35.8	0.0	0.0	100
Western	0.0	0.0	72.9	27.1	0.0	0.0	100

4.4.7 Load Shedding

Health institutions were asked whether they had experienced load shedding in the last two years. The survey results indicated that 90 percent of the Health institutions had experienced load shedding in the two years prior to the survey. Over 89 percent of household both in rural and urban experienced load shedding. Further results are as indicated in the Table 4.45 below.

Majority of health institutions preferred paying on a monthly basis (65 %).

Over 90% of all health institutions had experienced load shedding over the past 2 years.

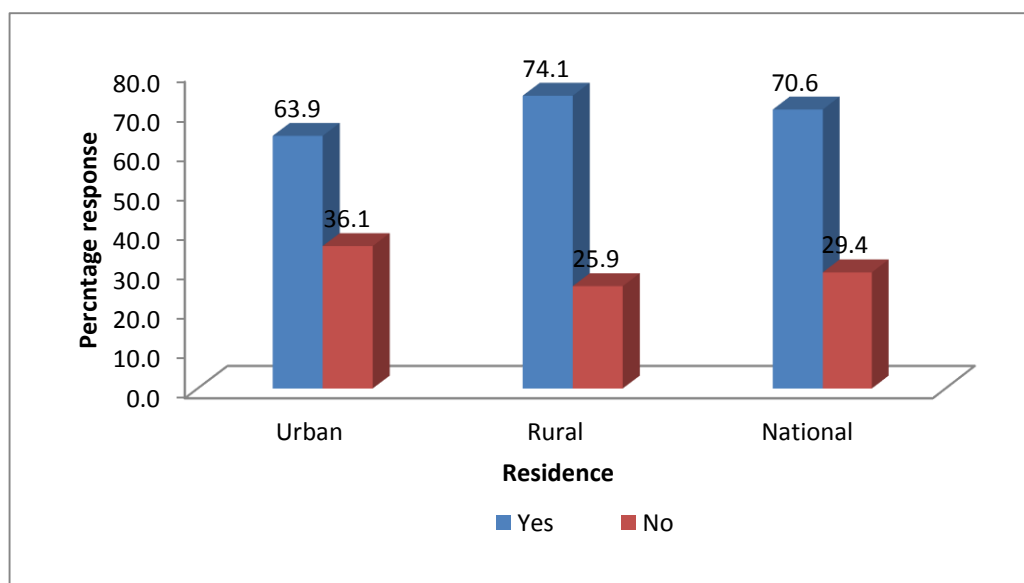
Table 4.45: Load Shedding by Residence and Region (%)

	Yes	No	Total
National	90.0	10.0	100
Residence			
Urban	95.9	4.1	100
Rural	89.1	10.9	100
Region			
Kampala	96.5	3.5	100
Central	88.8	11.2	100
Eastern	96.0	4.0	100
Northern	77.7	22.3	100
Western	100	0	100

4.4.9 Alternative Energy Source

Health institutions were asked whether they had used alternative sources of energy other than grid electricity. At the National level, the survey results indicated that 70.6 percent of the Health institutions had used alternative energy sources. In rural areas, the findings showed that 74.1 percent of the Health institutions used alternative sources of energy compared to 63.9 percent in urban areas as shown in Figure 4.6 below.

Figure 4.6: Percentage distribution of Health institutions that used Alternative sources of Energy.



4.4.10 Alternative Energy Sources coverage of activities at National and Residence levels in the Health institutions.

The survey sought information on what percentage of activities were covered by alternative energy sources. The findings revealed that 43.9 percent of Health institutions covered 26 to 50 percent of their activities at the National level, using alternative source.

At the residence level, 49.2 percent of the Health institutions in urban areas covered 1 to 25 percent of their activities, whereas by region Northern covered 1 to 25 percent of their activities using alternative sources. For detailed information see Table 4.47.

Table 4.47: Percentage of activities covered by alternative energy source

	(1 -25)	(26-50)	(51-75)	(76-100)	Total
National	42.1	43.9	9.5	4.6	100
Residence					
Urban	49.2	42.6	5.5	2.6	100
Rural	36	45	12.8	6.2	100
Region					
Kampala	37.8	62.2	0	0	100
Central	42.7	43.3	14.1	0	100
Eastern	38.8	41.1	10.3	9.8	100
Northern	65.2	22.9	0	11.9	100
Western	40.1	35.9	23.9	0	100

4.4.10 Summary

The National electrification level for the health sector was 60.8 percent. Of these, 96.7 percent were powered by electricity via the national grid. Out of the total electrified Health institutions, 85.5 used own meters. The most common end use for electricity was lighting (21.1 percent). Out of the 39.2 percent non-electrified Health institutions, 98 percent had interest in grid connectivity. Over 60 percent of the Health institutions powered by grid electricity and those not powered by grid electricity expressed preference to pay electricity bills on a monthly basis.

During a period of two years prior to the survey, 90 percent of the Health institutions had experienced load shedding. At the national level, over 90 percent of households had alternative energy sources to grid electricity. The alternative energy sources were used to cover between 1-25 percent of the energy requirements for 42.1 percent of the Health institutions.

CHAPTER FIVE

SOLAR POWER

5.0 Introduction

Solar Energy is a source of power which can generate both heat and electricity. It can be used for various applications ranging from solar drying, Cooking/water heating and provision of electricity for lighting and powering electrical equipment e.g. television and radiosets. Solar Electricity can be used as an alternative to Grid Electricity or in combination with Grid electricity. With the abundant sunshine available in the region, solar electricity is a realistic alternative in meeting the demand for household energy, both in rural and urban areas. The sale of solar electric systems also provides incomes for businessmen and technicians who install these systems.

This chapter covers the results of the survey on the usage of solar power in Uganda. The survey covered usage of Solar power in the Households, Business establishments, Education, institutions and Health institutions. The survey aimed at determining the extent of usage of solar power in the various sectors, the purpose for which it was used and the reliability of solar power systems.

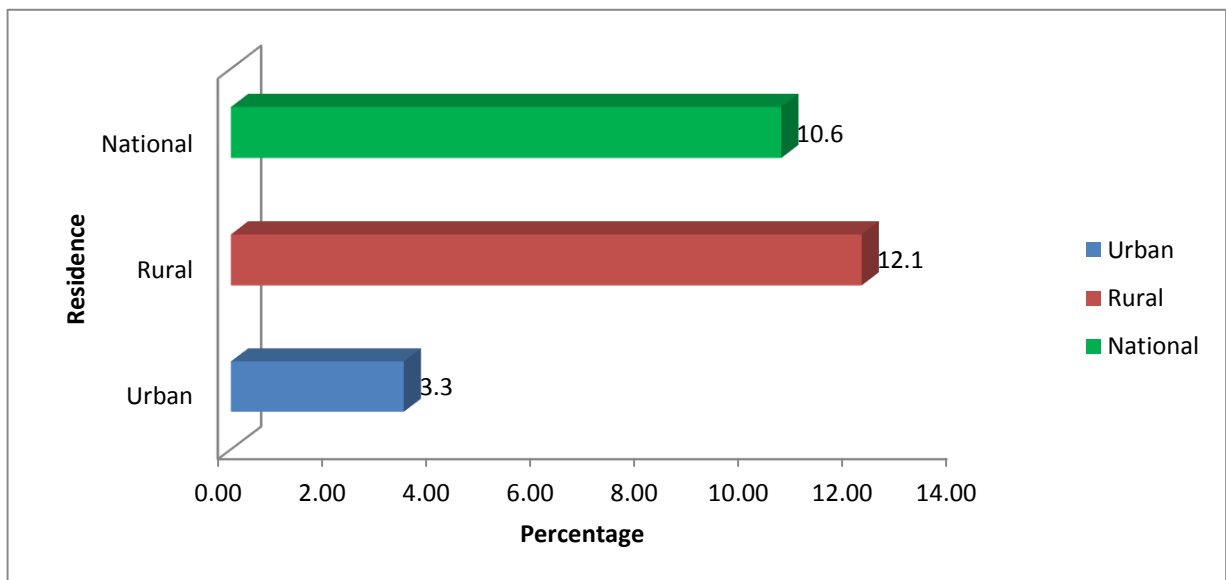
5.1 Usage of Solar Power in the Household Sector

5.1.1 Distribution of Households using Solar Power at the National and Residence Levels

Figure 5.1 below shows the proportion of households that used solar power categorized by residence. The findings showed that at national level 10.6 percent of the households used solar power. Findings at the residence level showed that 12.2 percent of the rural and 3.3 percent of urban households used Solar Power. The findings therefore indicate that Solar Power is predominantly used in the rural areas.

Figure 5.1: Percentage distribution of Households using Solar Energy at National and Residence levels.

10.6 % of Households used Solar Power



12.2 % of Rural Households used Solar Power

5.1.2 Usage of Solar Power in the Household Sector at Regional Levels

Figure 5.2 shows a regional distribution of solar power usage. The findings showed that within each region, 15.9 percent of the households used solar power in Western Uganda, 14.4 percent in Central region while only 0.7 percent in Kampala.

Figure 5.2: Percentage Distribution of Households using Solar Power at regional levels.

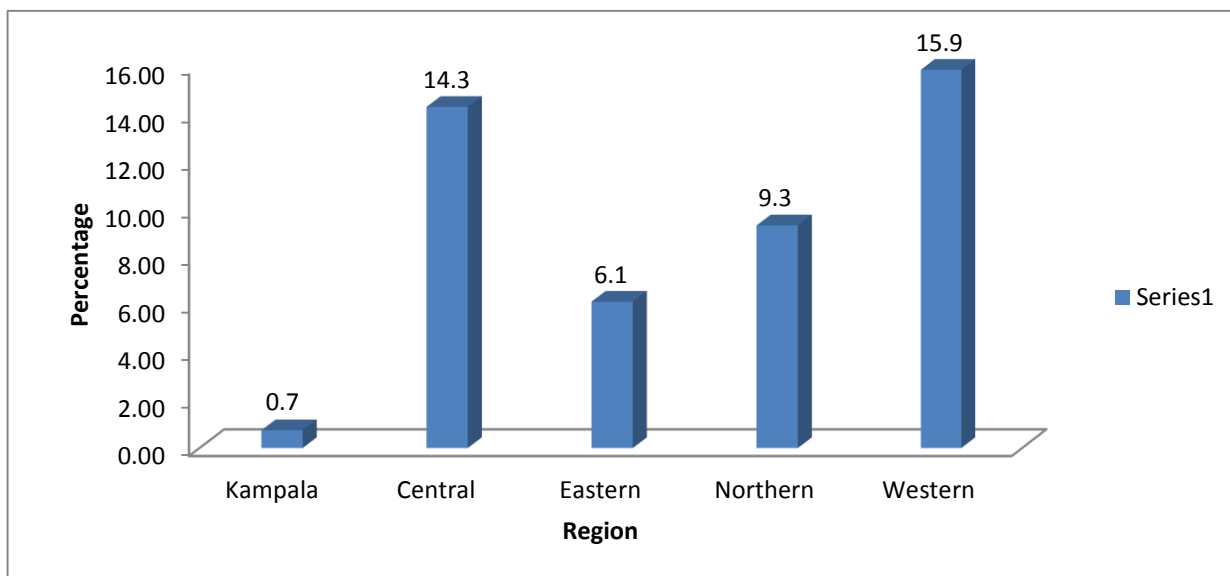
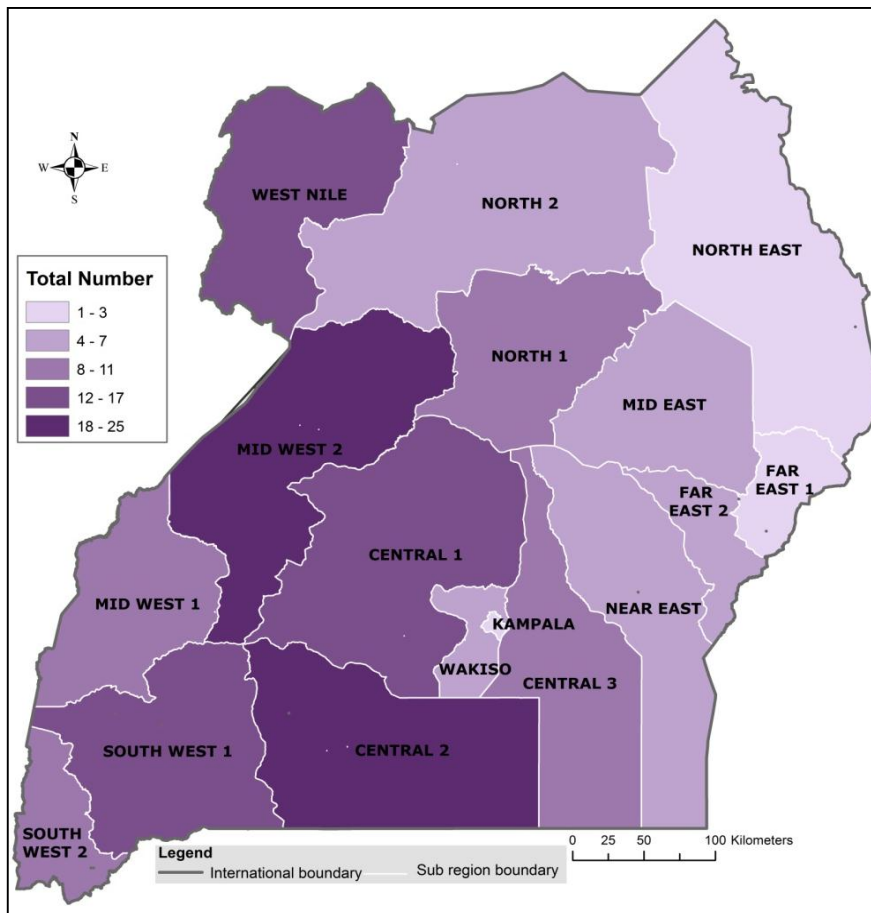


Figure 5.3: Distribution of Solar Power Usage by Strata

**15.9 % of
Households in
Western Region
Used Solar
Power**



5.1.3 Distribution by Purpose of Use of Solar Power at National and Residence Levels

42.9% of Solar Power is used for Lighting Purposes

The survey also collected information on the purpose for which Solar Power was used at National, Residence and Regional levels. At the national level, the findings showed that Solar Energy is used predominantly for Lighting (42.9 percent), Phone Charging (35.6 Percent) and for powering Radio and Television. The results also show that 42.8 percent of the Households in Rural areas use solar power for lighting, as shown in Table 5.1 below.

Table 5.1 Percentage distribution by Purpose of Use of Solar power at National and Residence levels

End Use	Urban	Rural	National
Lighting	44.8	42.8	42.9
Phone Charging	27.1	36.2	35.6
Radio	11.4	10.9	10.9
Television	14.9	8.7	9
Others	1.8	1.5	1.6
Total	100	100.1	100

5.1.4 Reliability of Solar Power Systems at Household level

The survey collected information from households on the reliability of Solar Power Systems in the last three months prior to the survey. The findings revealed that at the national level 90 percent of the households who used Solar Power found it to be reliable. By residence, all (100 percent) respondents in the rural and 99.9 percent respondents in the urban areas found solar power to be a reliable source of energy.

Table 5.2 Percentage distribution of Reliability of Solar Power in the Households by Rural- Urban

Solar Reliability	Urban	Rural	National
Reliable	99.86	100	90.0
Unreliable	0.14	0	10.0
Total	100	100	100.00

5.1.5 Summary of findings

The findings revealed that Solar Power is used by a tenth of the households in Uganda predominantly for lighting purposes and other purposes deemed low on energy consumption e.g. Phone Charging and for powering Radios and other electrical equipment. However, Solar Energy was not significantly meeting energy requirements for the high energy consuming end uses such as Cooking/Water Heating, Use of computers and photocopiers. The results also show that there is generally more use of solar power among the rural households compared to usage by urban households and that most users of solar power considered it a highly reliable source of energy.

5.2 Usage of Solar Power in the Business Sector

5.2.1 Distribution of Business establishments using Solar Power at the National and Residence Levels

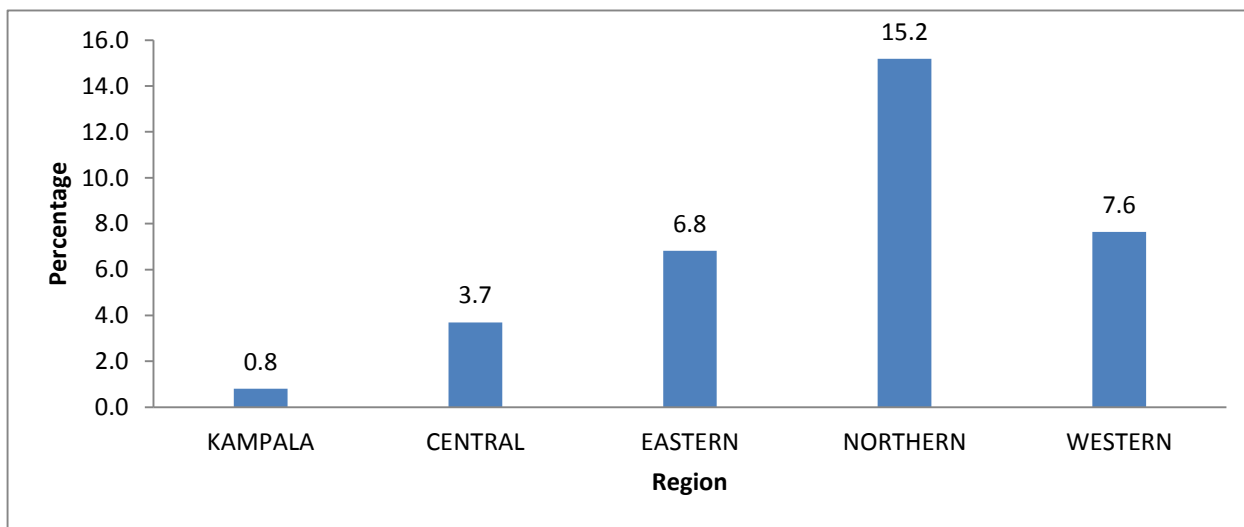
5 % of Business establishments used Solar Power

The survey collected information on the usage of solar power in the Business establishments. At the national level, 4.9 percent of the surveyed Business establishments were found to use solar power. At residence levels, 2.2 percent of the urban Business establishments and 7.1 percent of the Rural Business establishments also used solar power

5.2.2 Usage of Solar Power by the Business Sector at Regional Levels

The survey also analysed the findings independently in each of the five statistical regions. The findings showed that Northern region had the highest number of Business establishments that used Solar Power with 15.2 percent access while Kampala region had the lowest with only 1.0 percent as shown in Figure 5.4 below.

Figure 5.4: Percentage distribution of Business establishments using solar power at region levels



5.2.3 Distribution by Purpose of Use of Solar Power at National and Residence Levels

Highest end use activity was Lighting 47.1 % in business establishment

The survey investigated the purposes for which solar power was used by Business establishments. Survey results show that lighting and phone charging activities are the predominant purposes for which the establishments use the solar power. By location, 47.1 percent, 45.6 percent and 52.6 percent of the respondents at National, Rural and Urban Business establishment respectively used Solar power for Lighting. For Phone Charging purposes, 30.2 percent, 30.2 percent and 30.1 percent of the Business establishments at National, Rural and Urban locations respectively used Solar as energy source as seen in Table 5.3 below:

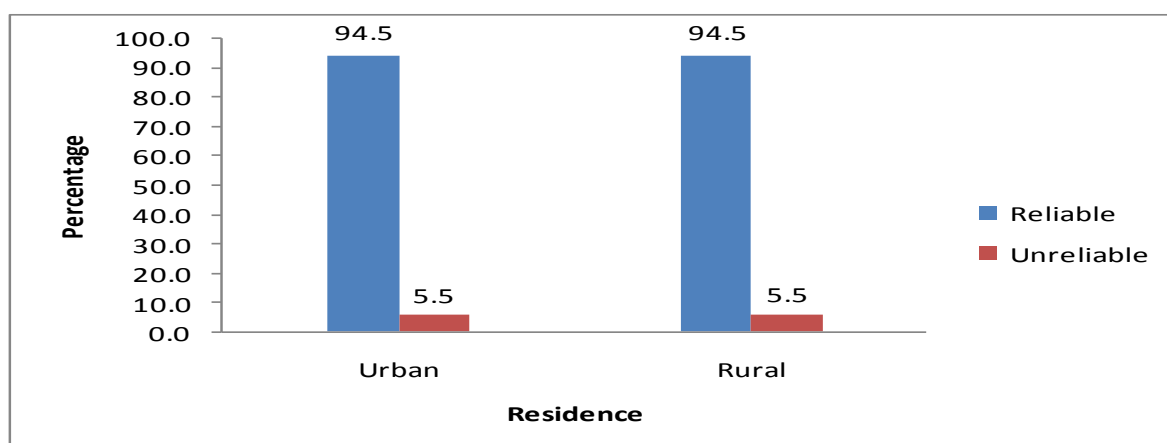
Table 5.3: Percentage distribution by Purpose of Use of Solar power at National and Residence levels

Uses of Solar	Urban	Rural	National
Lighting	52.60	45.60	47.10
Phone Charging	30.00	30.20	30.20
Radio	6.40	13.40	15.80
Television	11.00	2.80	4.50
Others	-	8.00	2.40
Total	100.00	100.00	100.00

5.2.4 Reliability of Solar Power Systems at Business Establishments

Respondents were asked to indicate the Solar Power Systems' performances and Reliability in their Business establishments during the last three months prior to the survey. The findings indicate that Solar Power Systems were very 94.5 percent reliable. Figure 5.5 below gives further details of the survey results.

Figure 5.5: Reliability Solar power performance in the last three months in urban Areas



5.2.5 Summary of findings

The findings revealed that Solar Power is an important Energy source and reliably used by Business establishments in both Rural and Urban locations. Evidently, the most use to which it is put is for Lighting and Phone Charging activities. Unlike among the Households, Business Establishments use Solar Power considerably for activities such as for Cooking/Water Heating and Radio plus Television.

5.3 Usage of Solar Power in the Education Sector

5.3.1 Distribution of Education Establishments using Solar Power at the National and Residence Levels

23.2 % of Schools used Solar Power

The survey collected information on use of Solar Power in the country by Education institutions. In total 23.2 percent of the covered establishments were found to use Solar Power. About 11 percent of the urban and 26 percent of the rural established education institutions used solar power.

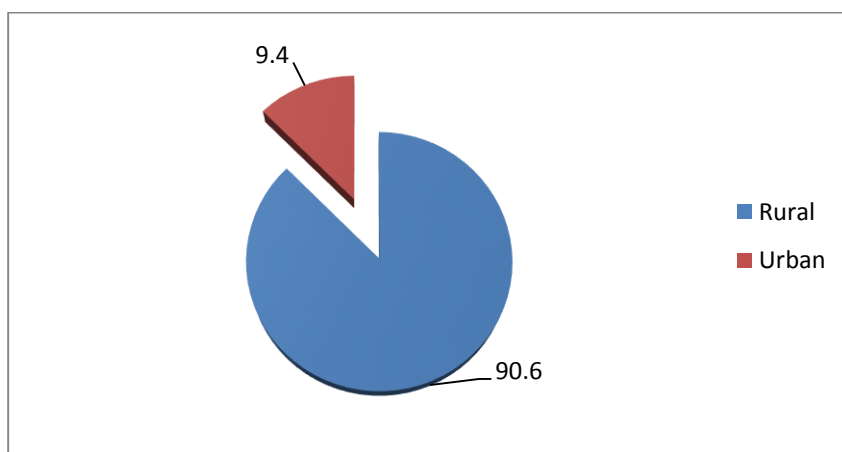
Figure 5.6: Students and Teachers in front of a Solar Power System Installed at a School



5.3.1 Distribution of Education Institutions using Solar Power by Location

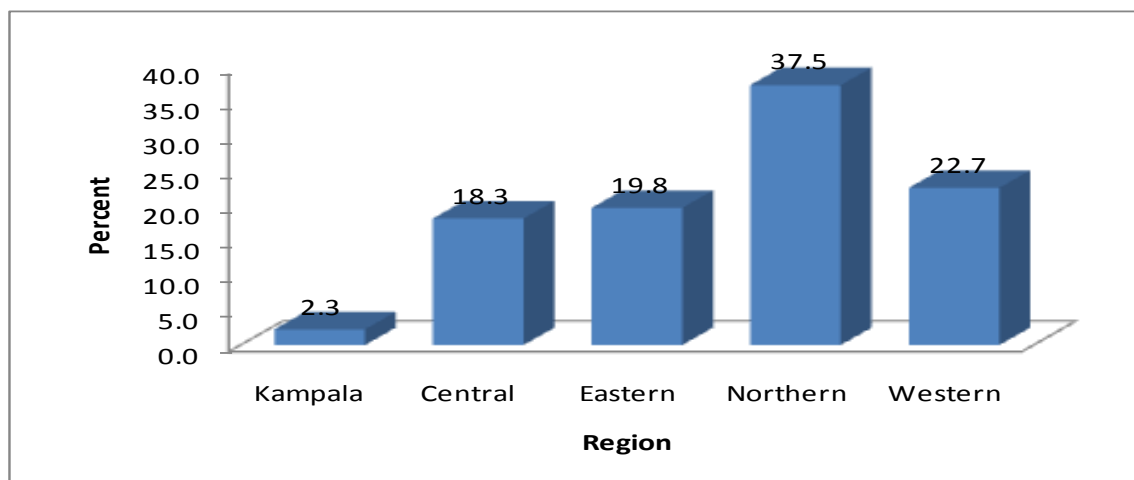
The survey collected information on Solar Power use in Education institutions both in Urban and Rural areas. The findings showed that of the schools that accessed solar power, 90.6 percent were Rural based, as shown in Figure 5.7 below.

Figure 5.7: Percentage distribution of solar power use in education institutions by location



However, the survey also analysed finding by regions independently and the findings showed Schools in the Northern Region used more solar power (37.5 percent) energy as shown in figure 5.8 below.

Figure 5.8: Percentage distribution of solar power use in education institutions by region



5.3.2 Distribution by Purpose of Use of Solar Power at National and Residence Levels

The survey investigated the purpose for which the Solar Power is used. The results showed that the predominant and significant purposes were for Lighting, Phone Charging and Computer related uses. The findings are that 43.4 percent, 43.4 percent and 43.6 percent of the Education Institutions at National, Rural and Urban locations respectively used the solar power for lighting purposes. Further results of the survey are as shown in Table 5.9 below.

Table 5.4: Percentage Distribution of Purpose of the Solar Power by Location

Use	Urban	Rural	Total
Lighting	43.6	43.4	43.4
Cooking/Water Heating	0.0	1.3	1.0
Phone Charging	25.1	21.2	22.0
Radio	0.0	3.5	2.8
Television	4.5	5.5	5.3
Computer	24.6	17.5	19.0
Photocopy	2.2	6.3	5.5
Others	0.0	1.3	1.0
Total	100	100	100

5.3.3 Reliability of Solar Power Systems in the Education Institutions

Respondents were asked to indicate the reliability of Solar Power Systems in their Educational Institutions in the last three months prior to the survey. The findings are that solar power is a very Reliable Energy source at 83 percent whereas 17 percent found it as Unreliable energy source.

5.3.4 Summary of findings

The findings revealed that Solar Power is used by 23.2 percent of the Education establishments in Uganda predominantly for lighting purposes, charging of phones and for Computer related uses. The results also show that there is generally more use of solar power among the rural schools compared to usage by urban schools and that most schools using solar power considered it a highly reliable source of energy.

5.4 Usage of Solar Power in the Health Sector

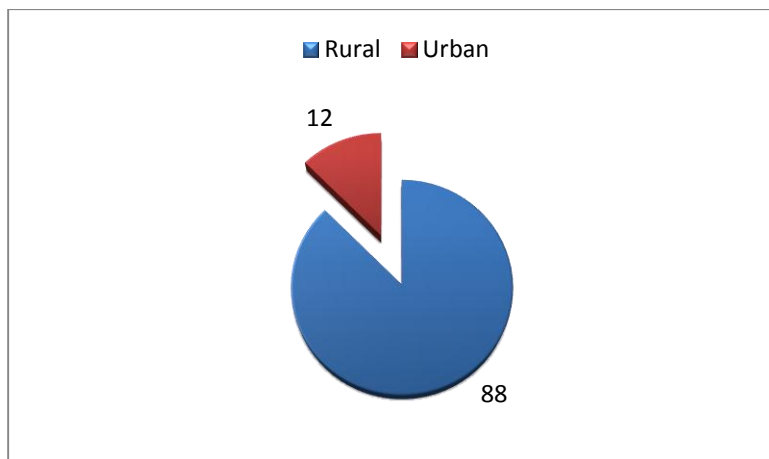
5.4.1 Distribution of Health institutions using Solar Power at the National and Residence Levels

This survey covered Health institutions on the usage of solar power. Findings showed that 50.9 percent of the total number of Health institutions covered used solar power. About 67 percent of the rural and 19 percent of the urban based Health institutions used solar power.

5.4.1 Distribution of Health institutions using Solar power by Location

The figure 5.9 below shows Health institutions that used Solar Power categorized by settlements as Rural, Urban and at National level. The findings reveal that of the institutions that used solar, 87.5 were rural based whereas 12.5 percent were urban based. The result, therefore, indicate that there is more use of Solar Power among the rural based institutions.

Figure 5.9: Percentage distribution of Health institutions using Solar Power.



At regional level, 74.2 of Northern based establishments used solar, 74.2 percent used Solar in Western Region, 61.9 percent used Solar in western Uganda, 54.4 percent used solar in Eastern Uganda whereas 50.2 percent Health institutions used solar in central Uganda. There was, however, limited use of solar power among Health institutions in Kampala region.

5.4.2 Distribution by Purpose of Use of Solar Power at National and Residence Levels

The survey also collected information on the use to which the solar power is put at National, Rural and Urban locations. Uses found predominant were for lighting and phone charging.

Findings show that 42.7 percent of the total Health institutions were found to be using solar for lighting purposes. By regional disaggregation, 45.1 percent of the rural based institutions and 32.4 percent of the urban based institutions used solar for lighting. Of the total institutions that used solar for lighting, 85.8 were rural based whereas only 14.2 percent were urban based, making solar mostly preferred among the rural than the urban based Health institutions.

For phone charging purposes, 26.6 percent of the total Health institutions were found to be using solar for phone charging purposes. Further analysis shows that 27.7 percent of the rural based institutions and 21.6 percent of the urban based institutions used solar for phone charging. Of the total number of institutions that used solar for phone charging, 84.8 were rural based whereas only 15.2 percent were urban based making solar mostly preferred among the rural than the urban based Health institutions.

5.4.3 Reliability of Solar Power Systems in the Health Sector

The survey collected information from the Health institutions on the reliability and performance of the solar power systems three months prior to survey. Findings revealed that at national level 77.9 percent of the Health institutions who used solar power reported that it was reliable whereas 22.1 percent reported that it was unreliable. By location of the respondents, 76.2 percent of the rural respondents found solar power reliable whereas 87.6 percent of the urban Health institutions found it reliable.

Table 5.5: Percentage distribution of Reliability of Solar Power Systems

Reliability of Solar	Urban	Rural	National
Reliable	87.6	76.2	77.9
Unreliable	12.4	23.8	22.1
Total	100	100	100

5.4.4 Summary of findings

The findings revealed that solar power is an important energy source that is predominantly used for purposes deemed low on energy consumption. Evidently, the most predominant use to which it is put is for lighting and phone charging whereas activities that consume higher energy such as cooking/water heating, computer and photocopying have not been significantly run using solar power. In general however, there is more use of solar power in the rural Health institutions and solar power systems are generally regarded to be highly reliable by Health institutions across the country.

CHAPTER SIX GENERATOR POWER

6.0 Introduction

This chapter reports the survey findings on the level of usage of power generated using generator sets owned by Households, Business establishments, Education and Health institutions. The generator power referred to here is strictly that generated for subsistence consumption and excludes power generated for sale to the national or independent grids. The chapter also covers the main purpose of use for generator power and the level of reliability of the Generator sets to supply power as required by users.

6.1 Usage of Generator Power at the Household Level

The survey collected information on generator power usage at the household level. The findings showed that 2.3 percent of households used generator power. Analysis within residences showed that rural based households used generator power more compared to urban households as shown in table 6.1 below

2.3% of
Households
used
generator
Power

Table 6.1: Percentage distribution by usage of generator power at National and Residence levels

	Urban	Rural	National
Yes	1.4	2.4	2.3
No	98.6	97.6	97.7
Total	100	100	100

6.1.1 Percentage Distribution of Households Using Generator Power at Regional Level

Comparison within regions showed that Central region had the highest percentage of households using generator power, accounting for 3.5 percent of the households while Kampala region registered the lowest proportion with 1.2 percent as shown in Table 6.2 below.

Table 6.2: Percentage distribution households using Generator power within regions

Use	Kampala	Central	Eastern	Northern	Western	National
Yes	1.2	3.5	1.5	2.1	2.3	2.3
No	98.8	96.5	98.5	97.9	97.7	97.7
Total	100	100	100	100	100	100

6.1.2 Distribution by Purpose of Use of Generator Power at National and Residence Levels

The survey also collected information on the purpose for which Generator Power was used at National, Residence and Regional levels. At the national level, the findings showed that Generator power is used predominantly for Lighting (27.3 percent), Television (24.5 percent) and Phone Charging (22.4 Percent) as shown in table 6.3 below.

Table 6.3: Distribution by Purpose of Use of Generator Power at National and Residence Levels (%)

Purpose	Urban	Rural	Kampala	Central	Eastern	Northern	Western	National
Lighting	28.0	27.3	25.8	27.0	32.7	26.4	26.0	27.3
Television	23.4	24.6	23.4	29.1	24.5	24.0	19.3	24.5
Phone charging	20.4	22.7	23.3	21.4	25.4	21.0	22.9	22.4
Radio	15.2	16.2	12.2	19.8	11.6	15.5	14.8	16.1
Computer	4.3	2.9	3.1	2.1	2.2	4.9	3.6	3.1
Cooking/Water heating	5.3	2.5	12.3	0.0	0.0	1.7	6.6	2.8
Salon	2.1	2.0	0.0	0.5	2.4	2.8	3.6	2.0
Photocopy	1.3	1.0	0.0	0.0	0.0	3.0	1.9	1.0
Ironing	0.0	0.5	0.0	0.0	1.2	0.0	0.9	0.4
Water pumping	0.0	0.2	0.0	0.0	0.0	0.0	0.6	0.2
Refrigeration	0.0	0.1	0.0	0.0	0.0	0.8	0.0	0.1
Grand Total	100	100	100	100	100	100	100	100

6.1.3 Reliability of Generator Power at the Household Level

The survey collected information from the households on the frequency of problems experienced from their generator power usage in the last three months. The survey findings revealed that at national level 73 percent of the households that used generator power reported that it was reliable.

Additionally, 83 percent of the households in the urban area revealed that generator power was reliable in the last three months.

Table 6.4: Percentage distribution of reliability of generator power in the households by rural-urban

Generator reliability	Urban	Rural	National
Reliable	82.98	72.14	73.33
Unreliable	17.02	27.86	26.67
Total	100.00	100.00	100.00

6.1.4 Summary of findings

The survey findings revealed that generator power usage was at 2.3 percent and is a very important source of energy for Households both in Rural and Urban areas.

It was established that generator power was more prominently used in rural areas at 2.4 percent compared to 1.4 percent in urban areas. The survey further revealed that a cross regions, Central region had the highest users accounting for 3.5 seconded by Kampala region with 2.3 percent.

Both at national and regional levels, generator power was mainly used for lighting, television, phone charging and radio. Nationally 73 percent households reported their generator power to be reliable and only 27 percent considered it unreliable.

6.2 Usage of Generator Power in the Business Sector

The survey collected information on generator power usage in the Business sector. The findings showed that 17.5 percent of Business establishments used generator power as shown in Figure 6.1. Analysis within residences showed that urban based businesses used generator power more compared to rural businesses. Further results are shown in Figure 6.2 below.

Figure 6.1: Percentage distribution of usage of generator power at National level by Businesses

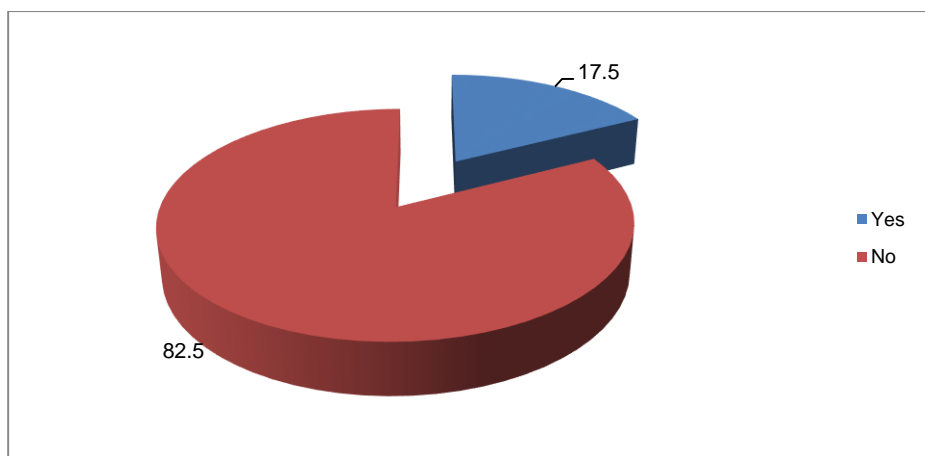
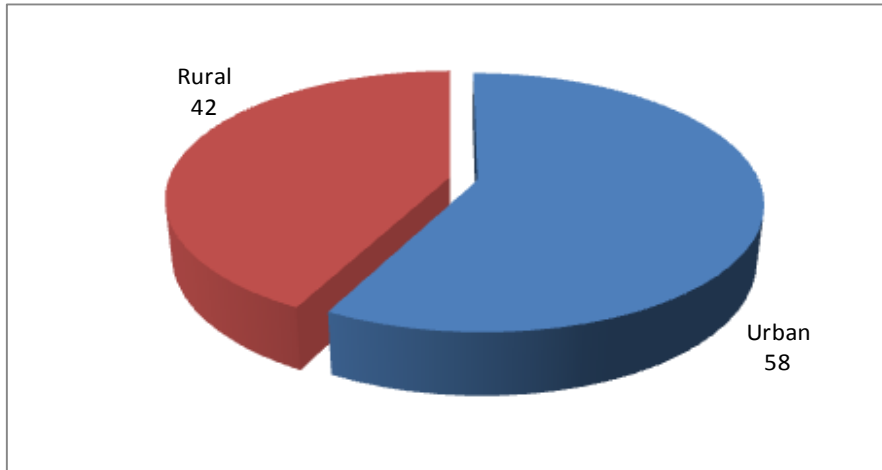


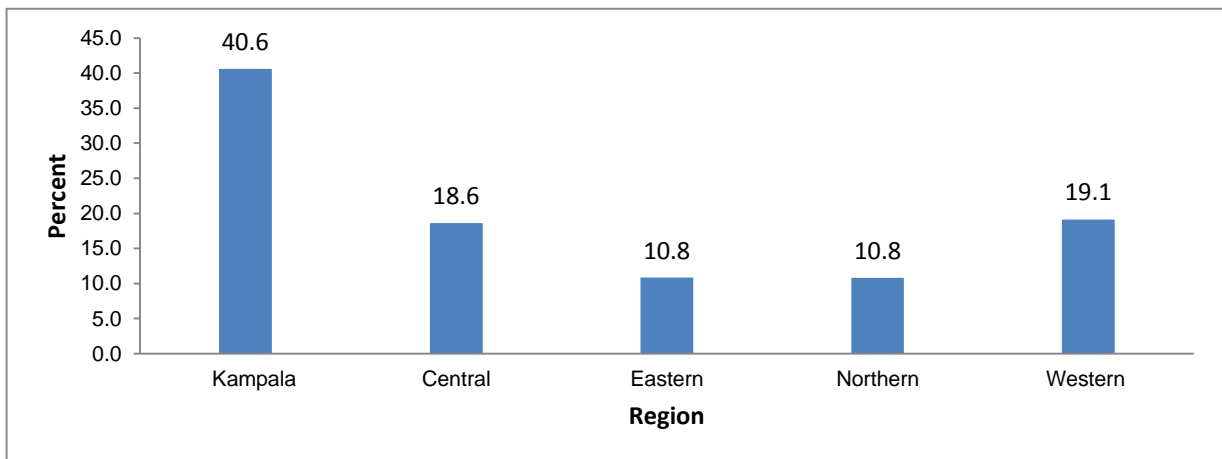
Figure 6.2: Percentage distribution by usage of generator power at Residence levels by Businesses



6.2.1 Percentage Distribution of Business Establishments Using Generator Power at Regional Level

Comparison within regions showed that Kampala region had the highest percentage of business establishments using generator power at 40.6 percent while Eastern and Northern regions registered the lowest proportion with 10.8 percent each as shown in Figure 6.3 below.

Figure 6.3: Percentage distribution of generator power use in business across regions



6.1.2 Distribution by Purpose of Use of Generator Power at National and Residence

The survey also collected information on the purpose for which Generator Power was used at National, Residence and Regional levels. At the national level, the findings showed that Generator power is used predominantly for Lighting (31.4 percent), Phone Charging (17.0 Percent, Computer related uses (14 percent) and Television (11.4 percent). Further results of the survey are as shown in tables 6.5 and 6.6 below.

Table 6.5: Percentage distribution of Generator Power Usage in Business Establishments at National by Residence

Purpose	Urban	Rural	National
Lighting	31.3	31.6	31.4
Phone charging	15.1	19.3	17.0
Computer	15.6	11.8	14.0
Television	8.9	14.6	11.4
Photocopy	8.3	5.0	6.9
Radio	5.6	8.2	6.7
Machinery operation	4.3	2.5	3.5
Cooking/Water heating	4.2	1.6	3.0
Saloon	1.9	1.9	1.9
Refrigeration	1.1	1.8	1.4
Production	1.2	0.6	0.9
Water pumping	0.8	0.6	0.7
Welding	0.8	0.0	0.5
Cooking	0.4	0.2	0.3
Washing	0.4	0.0	0.2
Air conditioning	0.1	0.3	0.2
Grand Total	100	100	100

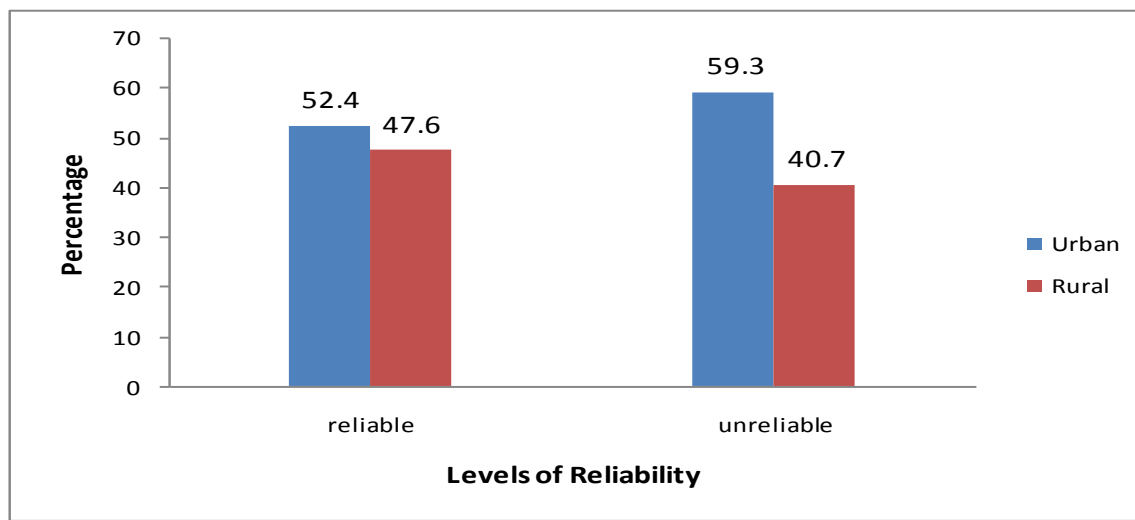
Table 6.6: Percentage distribution of Generator Power Usage in Business Establishments at National and Regions

Purpose	Kampala	Central	Eastern	Northern	Western	National
Lighting	30.0	36.4	35.0	31.8	28.0	31.4
Phone charging	14.9	16.4	20.5	21.0	18.2	17.0
Computer	16.9	11.9	13.7	12.3	11.6	14.0
Television	8.9	14.4	6.1	17.7	12.1	11.4
Photocopy	10.9	1.9	3.4	1.2	4.9	6.9
Radio	6.1	9.0	8.8	8.2	5.9	6.7
Machinery operation	3.1	3.3	2.2	1.2	6.8	3.5
Cooking/Water heating	3.2	1.4	2.1	3.7	3.9	3.0
Saloon	1.4	2.6	0.0	0.0	4.0	1.9
Refrigeration	1.0	0.0	3.8	0.0	2.9	1.4
Production	0.9	0.5	2.2	2.9	1.1	0.9
Water pumping	0.6	1.3	2.2	0.0	0.1	0.7
Welding	1.1	0.0	0.0	0.0	0.0	0.5
Cooking	0.6	0.0	0.0	0.0	0.4	0.3
Washing	0.6	0.0	0.0	0.0	0.0	0.2
Air conditioning	0.2	0.9	0.0	0.0	0.0	0.2
Grand Total	100	100	100	100	100	100

6.2.3 Reliability of Generator Power in Business Institutions

The survey collected information from the business establishments on the frequency of problems experienced from their generator power usage in the last three months. The survey findings revealed that at the residence level 52 percent of the business establishments in urban areas and 47.6 percent of rural business establishments that used generator power reported that it was reliable. Figure 6.4 below shows the survey findings on the reliability of generator power by residence.

Figure 6.4: Generator power performance in the last three months in urban (%)



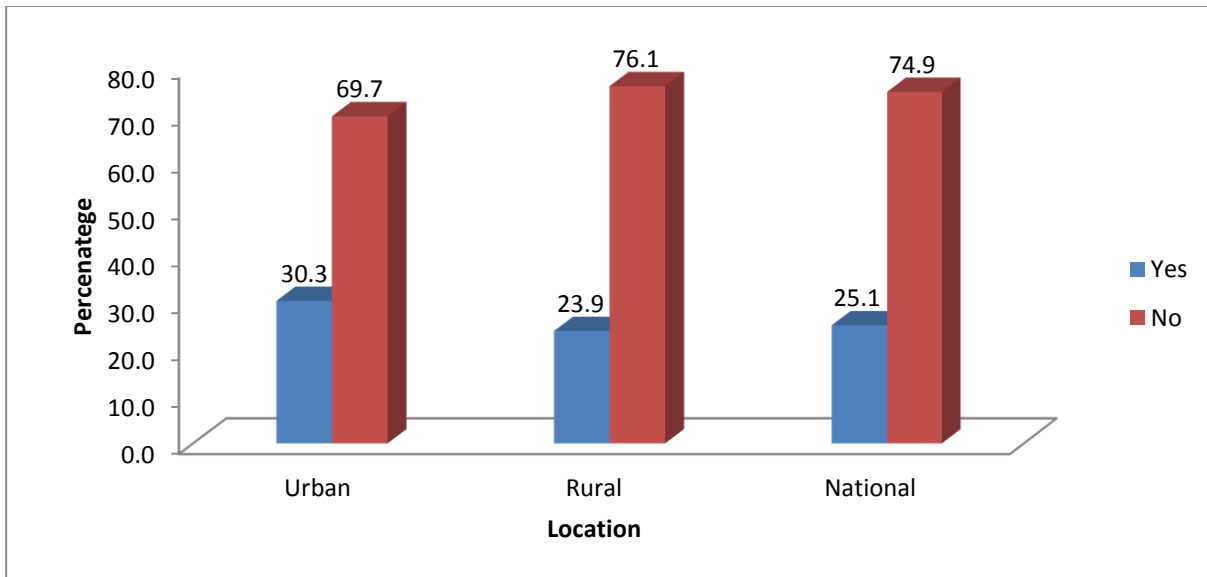
6.2.4 Summary of findings

The survey established that only 17.5 percent business establishments used generator power as an alternate source of energy. Generator power was more predominantly used in urban areas (58 percent) than in rural areas (42 percent). Kampala region had the largest share of businesses using generator power (40.6 percent) and the least were in Eastern and Northern regions with 10.8 percent each.

6.3 Usage of Generator Power in the Education Sector

The findings showed that 25.1 percent of Education Institutions used generator power. Analysis within residences showed that Urban based education institutions used generator power more compared to Rural based institutions. Further results are shown in Figure 6.5 below.

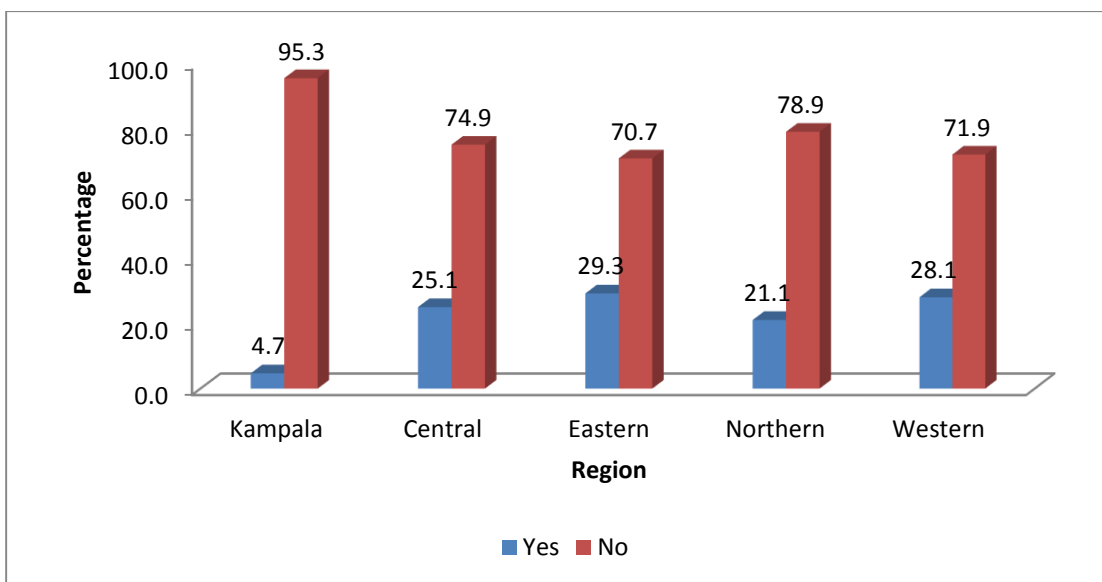
Figure 6.5: Percentage distribution of Education Institution using generator power by Residence



6.3.1 Percentage Distribution of Education Institutions Using Generator Power at Regional Level

Comparison within regions showed that Eastern region had the highest percentage of Education Institutions using generator power at 29.3 percent while Kampala region registered the lowest proportion with 4.7 percent as shown in Figure 6.6 below.

Figure 6.6: Percentage distribution of generator power use in education institutions by region



6.3.2 Distribution by Purpose of Use of Generator Power at National, Residence and Regional Levels

The survey also collected information on the purpose for which Generator Power was used at National, Residence and Regional levels. At the national level, the findings showed that Generator power is used predominantly for lighting (30.8 percent), Computer related uses (18.6 percent), and Phone Charging (16.6 Percent). Further results of the survey are as shown in Tables6.7below.

Table 6.7: Percentage distribution of generator power uses in education by region

Purposes	Urban	Rural	Kampala	Central	Eastern	Northern	Western	National
Lighting	31.6	30.5	29.2	28.1	33.2	30.6	31.2	30.8
Computer	16.2	19.3	29.2	15.5	18.6	18.3	21.5	18.6
Phone Charging	19.8	15.5	12.4	18.8	12.9	18.3	17.4	16.6
Television	13.4	13.5	29.2	11.0	15.6	13.5	12.6	13.4
Photocopy	8.1	11.6	0.0	13.3	9.6	11.3	9.3	10.7
Radio	8.8	5.7	0.0	8.3	5.1	5.2	7.1	6.4
Cooking/Water								
Heating	1.3	1.4	0.0	3.7	0.4	1.5	0.0	1.4
Typing	0.0	1.5	0.0	0.0	3.9	0.0	0.0	1.1
Grinding	0.9	0.1	0.0	0.8	0.0	0.6	0.0	0.3
Laboratory								
experiments	0.0	0.3	0.0	0.0	0.0	0.0	0.9	0.2
Refrigeration	0.0	0.3	0.0	0.0	0.8	0.0	0.0	0.2
Public address								
system	0.0	0.2	0.0	0.6	0.0	0.0	0.0	0.2
Water pumping	0.0	0.1	0.0	0.0	0.0	0.6	0.0	0.1
Grand Total	100	100	100	100	100	100	100	100

6.3.3 Reliability of Generator Power in Education Institutions

The survey collected information from the education institutions in regard to the frequency of problems experienced from their generator power usage in the last three months by residence. The survey findings revealed that at national level 65 percent of the education institutions who used generator power reported that it was reliable and only 35 percent reported that it was unreliable as shown in Table 6.8 below.

In the rural areas, 87 percent of the education institutions considered generator power to have been reliable compared to only 13 percent who indicated that their generator power was not reliable in the last three months.

Table 6.8: Percentage distribution of reliability of generator power in the education by rural- urban

	Urban	Rural	National
Reliable	13.8	86.9	64.6
Unreliable	86.2	13.1	35.4
Total	100.0	100.0	100.0

6.3.4 Summary of findings

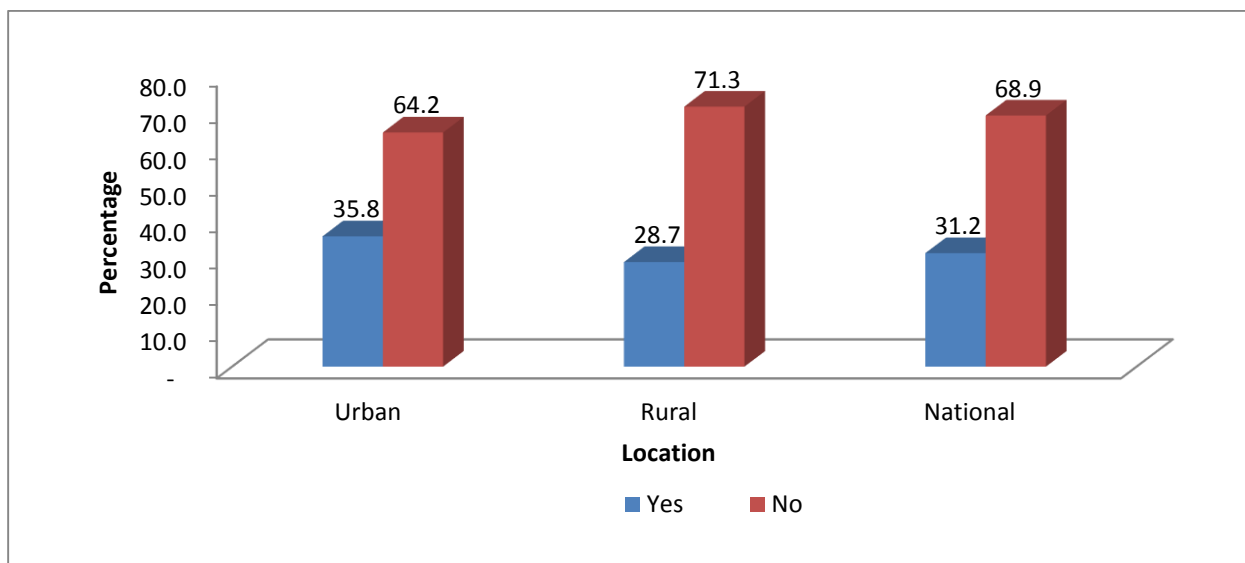
The survey findings revealed that approximately 36 percent of the education institutions used generator power and 64 percent of the education institutions had no generators.

Of the education institutions which had generator power, 69 percent were found in rural area and only 31 percent were in urban areas. Eastern region dominated with education institutions using generator power with 30.4 percent, followed by central region with 24.4 percent and the least being Kampala with only 1.3 percent.

6.4 Usage of Generator Power in the Health Sector

The survey collected information on generator power usage in the Health sector. The findings showed that 31.2 percent of Health institutions used generator power. Analysis within residences showed that Urban based Health institutions (35.8 percent) used generator power more compared to Rural based institutions (28.7 percent) as shown in Figure 6.7.

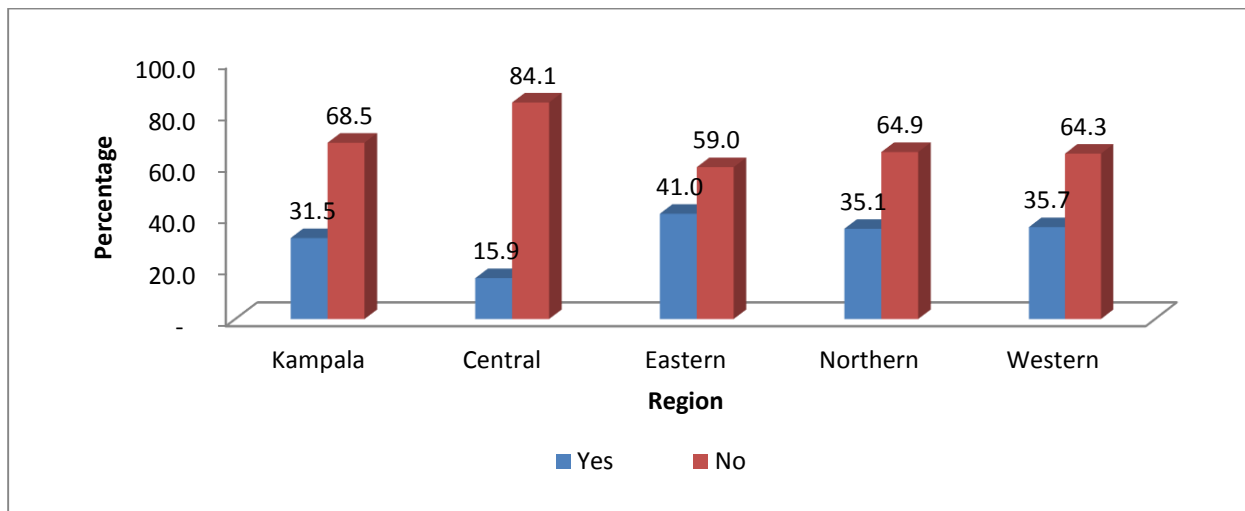
Figure 6.7: Generator power usage by Residence in Health institutions (%)



6.4.1 Percentage Distribution of Health institutions Using Generator Power at Regional Level

Comparison within regions showed that Eastern region had the highest percentage of Health institutions using generator power at 41.0 percent while Central region registered the lowest proportion with 15.9 percent as shown in Figure 6.8 below.

Figure 6.8: Percentage distribution of generator power use in Health institutions across regions



6.4.2 Distribution by Purpose of Use of Generator Power at National, Residence and Regional Levels

The survey also collected information on the purpose for which Generator Power was used at National, Residence and Regional levels. At the national level, the findings showed that Generator power is used predominantly for lighting (27.8 percent), Computer related uses (14.4 percent), and Cooking/Water Heating (12.9 Percent). Further results of the survey are as shown in Tables 6.10 below.

Table 6:10 Percentage distribution of generator power use in Health institutions

Energy Uses	Urban	Rural	National
Lighting	28.0	27.6	27.8
Computer	16.5	12.9	14.4
Cooking/Water heating	9.7	15.3	12.9
Phone charging	11.3	11.0	11.2
Theatre	10.4	5.5	7.7
Television	11.4	2.8	6.6
Photocopy	3.4	7.0	5.4
Refrigeration	3.2	6.3	5.0
Incubation	1.5	4.0	2.9
Radio	1.7	2.7	2.3
Water pumping	3.0	1.4	2.1
Washing	0.0	2.4	1.3
Dental equipment	0.0	1.0	0.6
TOTAL	100.0	100.0	100.0

6.4.3 Reliability of generator power in Health institutions

The survey collected information from the Health institutions in regard to the frequency of problems experienced from their generator power usage in the last three months by residence. The survey findings revealed that at national level 95 percent of the Health institutions who used generator power reported that it was reliable and only 5 percent reported that it was unreliable as shown in table 6.11 below.

In the rural areas, 95 percent of the Health institutions considered generator power to have been reliable compared to only 4 percent who indicated that their generator power was not reliable in the last three months.

Table 6:11 Percentage distribution of reliability of generator power in the Health institutions by rural- urban

	Urban	Rural	National
Reliable	94.3	95.9	94.8
Unreliable	5.7	4.1	5.2
Total	100.0	100.0	100.0

6.4.4 Summary of findings

During the survey, 31.2 percent of the Health institutions visited were found to have used generator power. The findings from the survey showed that generator power usage was more pronounced in Health institutions resident in rural areas (60.4 percent) compared to those in urban areas (39.6 percent).

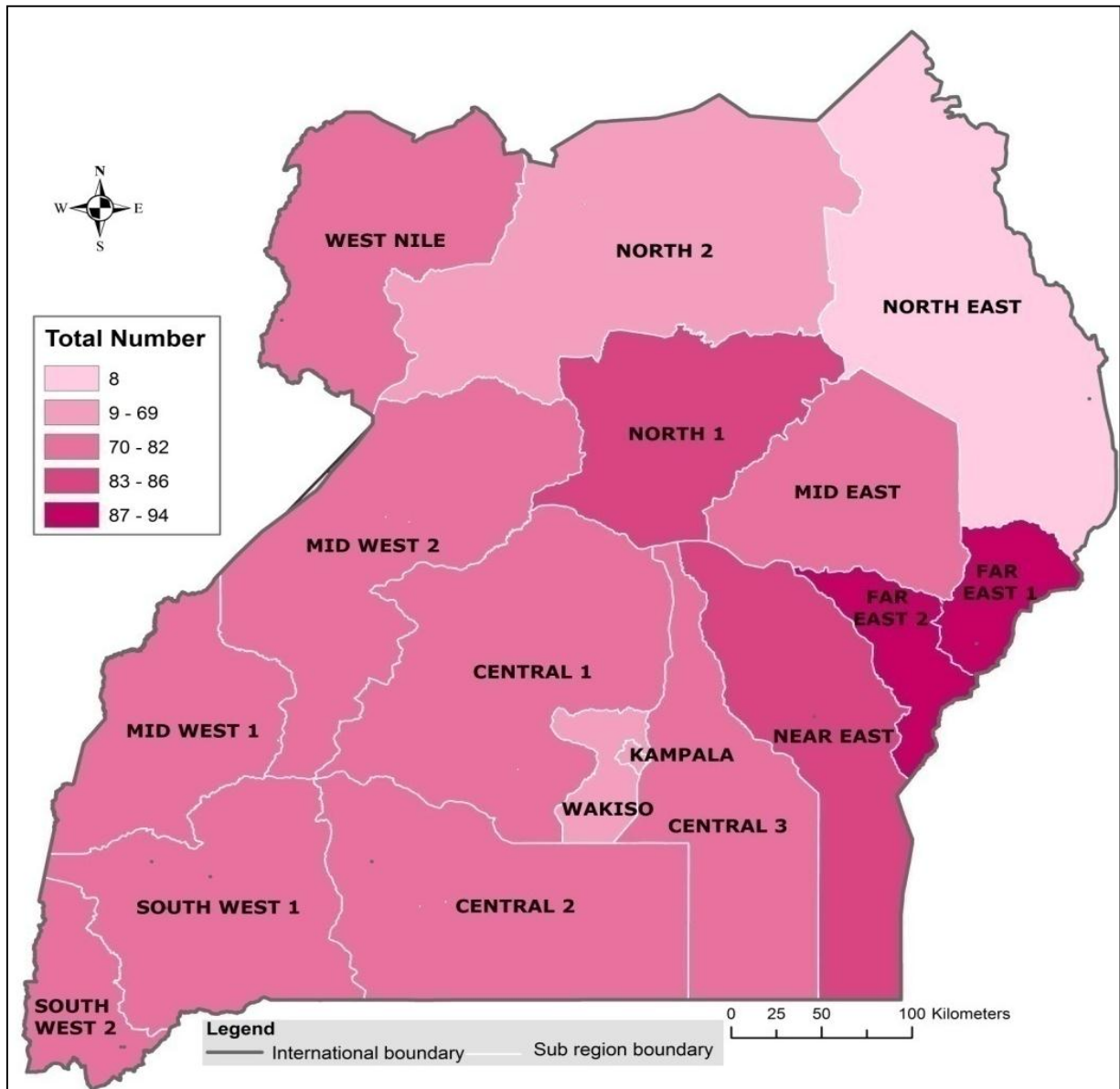
The Health institutions mainly used generator power for lighting. The study established that at the national level the majority of the Health institutions reported that generator power was reliable (95 percent).

CHAPTER SEVEN OTHER ENERGY SOURCES

7.0 Introduction

This chapter presents a summary analysis of the other energy sources used within the Household, Business Establishments, Education and Health sectors. The Energy sources analysed here were; Gas, Bagasse, Firewood, Paraffin, Charcoal and Others⁹.

Figure 7.1: Distribution of Paraffin Use for Cooking and Lighting by Strata



⁹Others include: Candle, Solar, Diesel, rechargeable lamps, Torches and Batteries

7.1 Distribution of Other Energy sources at the Household level

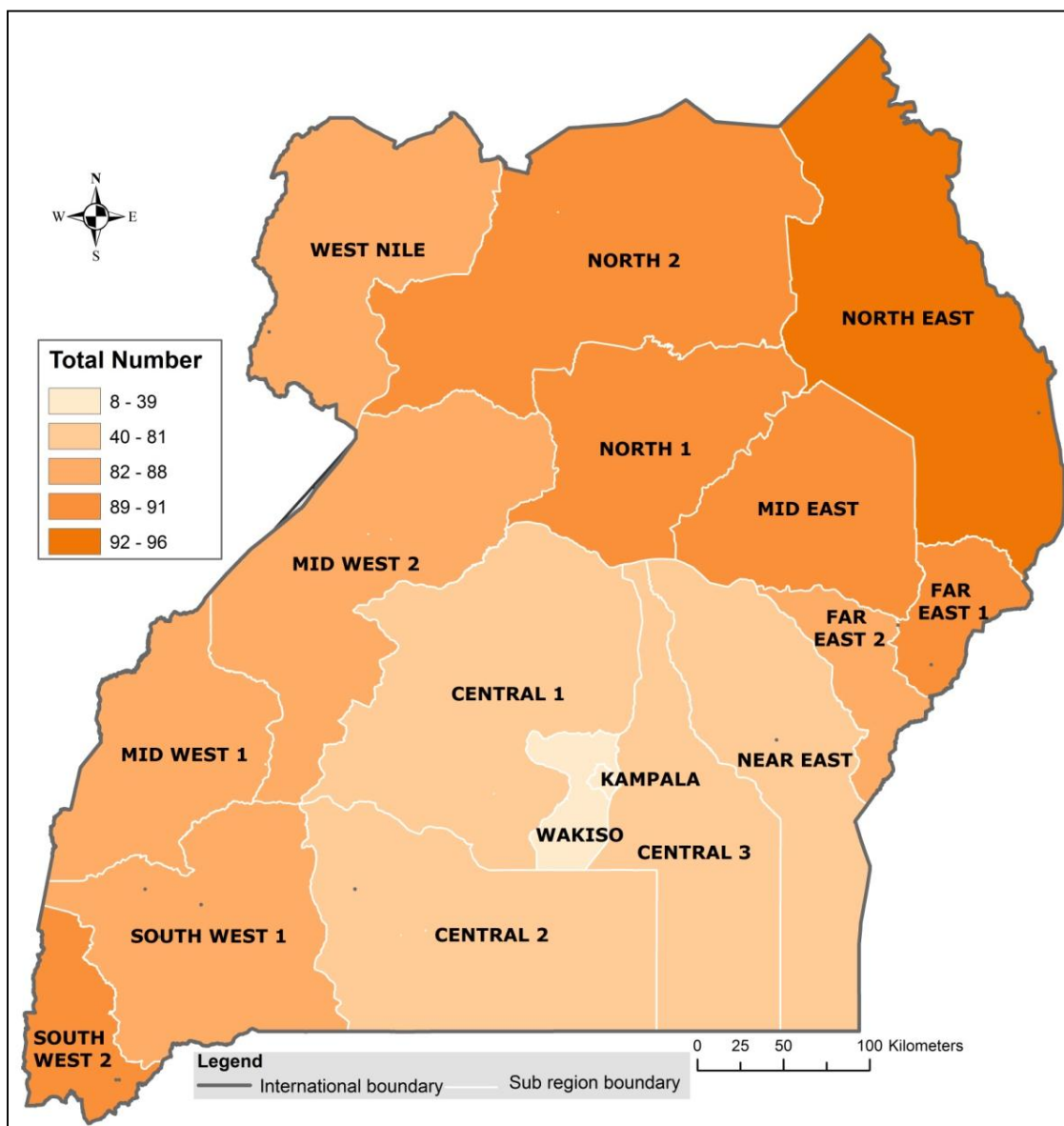
97.6 % of Households use paraffin as alternative source of energy

Table 7.1 shows the distribution of households that use the other sources of Energy in their households. The findings showed that 97.6 percent of the households use these sources of energy to run some of their operations.

Table 7.1: Percentage distribution of Other sources of Energy

	USE OTHER ENERGY	DO NOT USE OTHER ENERGY	
	SOURCE	SOURCE	TOTAL
National	97.6	2.4	100.0
Residence			
Urban	97.4	2.6	100.0
Rural	97.6	2.4	100.0
Region			
Kampala	95.9	4.1	100.0
Central	99.2	0.8	100.0
Eastern	99.5	0.6	100.0
Northern	99.6	0.4	100.0
Western	93.0	7.0	100.0

Figure 7.2: Distribution of Firewood Use by Strata



7.1.1 Distribution of types of Other sources of energy

Table 7.2 shows the distribution of Other energy sources at the household level. The findings show that Firewood was a major other source of energy used by households to meet their total energy requirements (44 percent) followed by paraffin (28.3 percent) and Charcoal (20.0 percent). However, the findings also show that households also used some other¹⁰ energy sources (7.2 percent) which included candles, torches, solar and rechargeable lamps.

¹⁰Others include: Candle, Solar, Diesel, rechargeable lamps, Torches and Batteries

Table 7.2: Percentage Distribution of Other sources of Energy at Household level by Residence

Energy source	Urban	Rural	National
Gas	2.4	0.2	0.6
Firewood	15.3	49.8	43.8
Charcoal	45.9	14.6	20
Paraffin	28.3	29.1	28.3
Others	8.2	6.2	7.2
Total	100	100	100

7.2 Distribution of Other Energy sources at the Business Establishments Level

Table 7.3 presents the distribution of businesses using other sources of energy to run some of their operations by residence and region. Overall 60 percent of the businesses use other energy sources to meet their total energy requirements. Analysis at the Rural and Urban areas showed that nearly 67 percent of the business in the rural areas used other energy sources to run some of their business as compared to 53 percent in urban areas.

Regional differentials show that the Central region had the highest proportion of business establishments using other sources of energy to meet their total energy requirements (73.5 percent) with Kampala having (46.2 percent).

Table 7.3: Percentage distribution of Other Energy Source by Residence and region at the Business Establishment Level

	USE OTHER ENERGY SOURCE	DO NOT USE OTHER ENERGY SOURCE	TOTAL
National	60.1	39.9	100
Urban	53.4	46.6	100
Rural	66.8	33.2	100
Regional			
Kampala	46.2	53.8	100
Central	73.5	26.5	100
Eastern	62.9	37.1	100
Northern	69.8	30.2	100
Western	51.9	48.1	100
National	60.1	39.9	100

7.2.1 Distribution of types of Other sources of energy used at the Business establishment Level

Distribution of other types of energy sources by residence showed that Charcoal was the highest Other source used and accounted for 32 percent followed by Paraffin with 22 percent. Bagasse was noted to be the least used (only 0.1 percent) and was mainly used by Rural based businesses.

Rural urban comparison show a similar trend with charcoal being the highest used other energy source accounting for 30 percent and 35 percent respectively.

Table 7.4: Percentage Distribution of Other Energy Source by Residence

OTHER ENERGY SOURCE	URBAN	RURAL	NATIONAL
Charcoal	35.0	29.6	31.9
Paraffin	18.7	24.8	22.2
Firewood	9.7	19.8	15.5
Others	25	19.2	21.5
Gas	6.1	2.5	4.0
Diesel	4.8	3.0	3.7
Solar	1.1	0.4	0.7
Grid electricity	0.0	0.4	0.3
Bagasse	0.0	0.2	0.1
Total	100	100	100

7.3 Distribution of Other Energy Sources at the Education Establishments

The findings show that overall 96.7 percent of Educational institutions used other sources of energy to meet their total energy requirement. Analysis by residence also showed that 94.8 percent of Urban Educational Institutions used the other energy sources to meet their energy demands. 97 percent of the Educational Institutions in Rural areas were found to be using the other energy sources as shown in table 7.5 below.

Table 7.5 Percentage distribution of Educational Institution using other energy sources

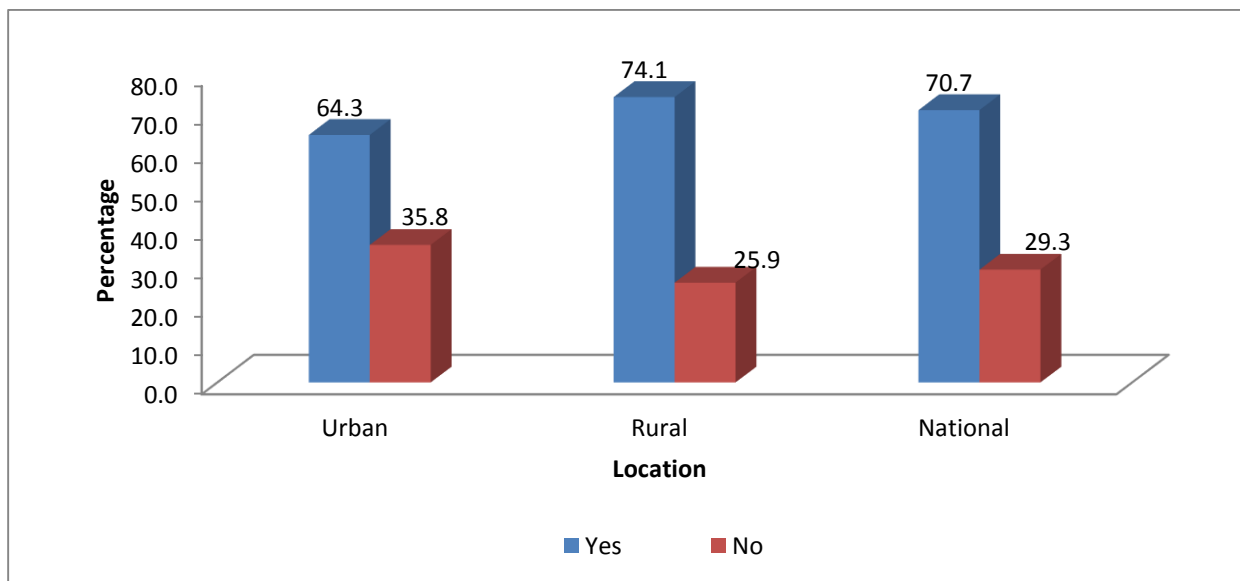
RESIDENCE	USE OTHER SOURCES	DON'T USE OTHER SOURCES	TOTAL
National	96.7	3.3	100.0
Urban	94.8	5.2	100.0
Rural	97.1	2.9	100.0
Region			
Kampala	100.0	0.0	100.0
Central	97.3	2.7	100.0
Eastern	97.5	2.6	100.0
Northern	98.1	1.9	100.0
Western	93.3	6.7	100.0

7.4 Distribution of Other Energy Sources in the Health Institutions

Figure 7.3 below shows the percentage distribution of other Energy sources used in Health Institutions. The findings show that nationally, 70.7 percent of the Health Institution use other energy sources to run

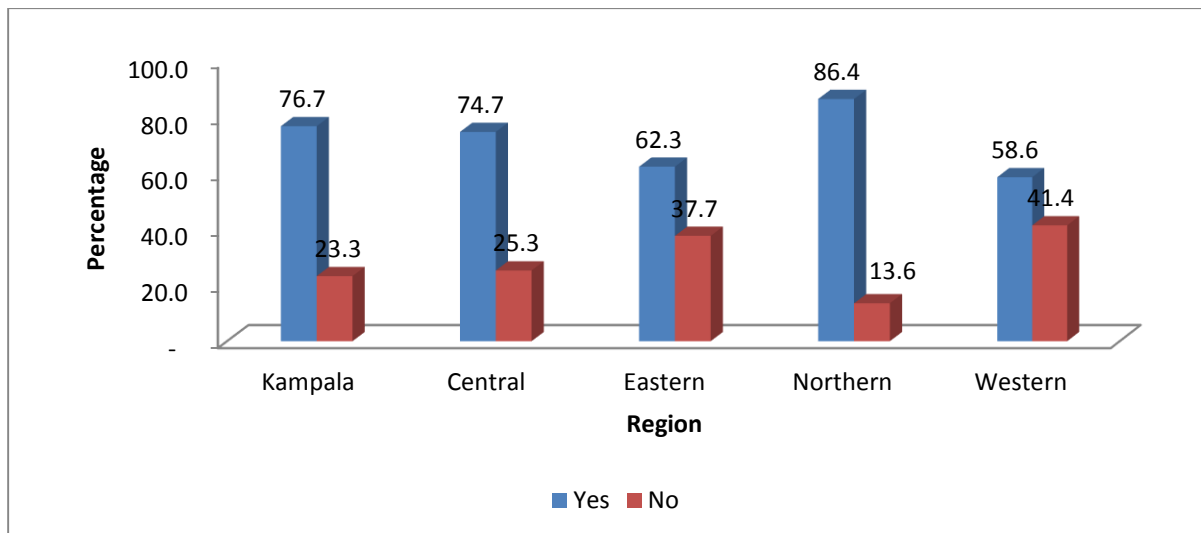
some of its operations. Analysis by residence show that 74.1 percent of Rural Health Institutions use other energy Sources as shown in Figure 7.3 below.

Figure7.3: Percentage distribution of Other Energy Sources in the Health Institutions by Residence and at the National level



Analysis within regions showed that Health Institutions in Northern Region had the highest percentage using Other energy sources to run some of their operations accounting for 86.4 percent as shown in Figure 7.4 below.

Figure 7.4: Percentage Distribution of Other energy sources by Region Used in the Health Institutions.



CHAPTER EIGHT

ENERGY EFFICIENCY

8.0 Introduction

The survey collected information on Energy efficiency. Energy efficiency is "using less energy to provide the same service". Energy efficiency has proved to be a cost-effective strategy for building economies without necessarily increasing energy consumption because it's a low cost way to save money, create jobs and mitigate effects of climate change.

The Government of Uganda has continued to fulfill its commitment to promoting energy efficiency in households, small and medium enterprises (SMEs), industries as well as social institutions by developing strategies and programs aimed at ensuring efficient and sustainable utilisation of energy such as development and dissemination of energy efficiency awareness information, energy audits in high energy consuming industries, training of energy managers and development of the standards and labeling programme for high energy consuming electrical appliances. The Ministry of Energy and Mineral Development also holds an annual energy week which is aimed at increasing awareness to the general public on various aspects of efficient utilisation of energy and the energy efficient technologies on the market. Figure 8.1 below shows the Minister for Energy and Mineral Development during the launch of the energy week 2012.



Figure 8.1: Minister of Energy Hon. Ms. Irene Muloni Launching Energy Week in 2012

This chapter presents the survey findings in regards to energy efficiency. Information was collected on energy efficiency trainings that had been carried out for the Households, Business, education and health sectors. Information on the extent of adoption of the energy saving measures and the challenges involved was also collected.

8.1 Energy efficiency at the Household level

8.1.1 Training Provided to Households

Nationally, only 9 % of Households received Training on energy efficiency

This section aims at showing whether households ever **received any training or advice** on energy efficiency. **At the National level**, findings showed that 9.0 percent of the households in Uganda received training and advice on energy efficiency.

The findings also showed that the Northern region had the highest number of respondents (16 percent) who had received training or advice on energy savings measures. This was followed by Kampala and the central region with 12.2 percent and 4.9 percent respectively as shown Table 8.1 below.

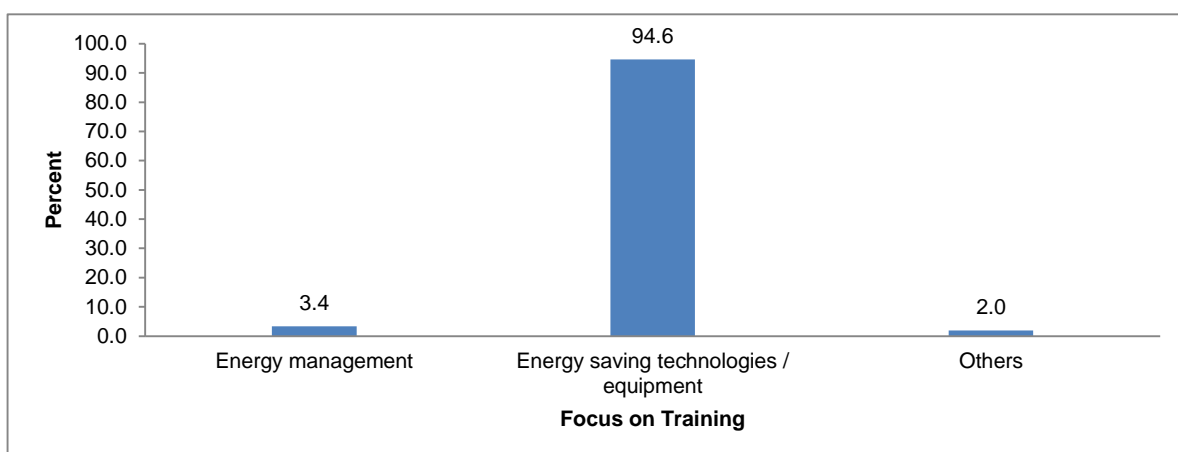
Table 8.1: Percentage distribution of training Provided to the Household by Residence and Region

Training or advice on energy efficiency.	Yes	No	Percent
National	9.0	91.0	100.0
Residence			
Urban	9.1	90.9	100.0
Rural	9.0	91.0	100.0
Regions			
Kampala	12.2	87.8	100.0
Central	4.9	95.1	100.0
Eastern	6.0	94.0	100.0
Northern	16.0	84.0	100.0
Western	9.8	90.2	100.0

8.1.2 Focus of Training

The main focus of training for the households was mainly on energy saving technologies/equipment as shown in Figure 8.2

Figure 8.2: Percentage distribution of Focus of Training at National level.



The trend on focus of training by both residence and region still remained on Energy saving technologies/equipment (see Table 8.2 below)

Table 8.2: Percentage Distribution of focus of Training by residence and Region

	Energy management	Energy saving technologies / equipment	Others	Percent
National	3.4	94.6	2.0	100.0
Residence				
Urban	5.1	93.5	1.4	100.0
Rural	3.0	94.9	2.1	100.0
Region				
Kampala	7.9	90.6	1.5	100.0
Central	0	100	0.0	100.0
Eastern	0	100	0.0	100.0
Northern	4.4	94.3	1.3	100.0
Western	4.6	90.3	5.1	100.0

8.1.3 Type of Trainer

Households were mainly trained by local private companies or consultants and this trend is seen throughout the regions as shown in Table 8.3.

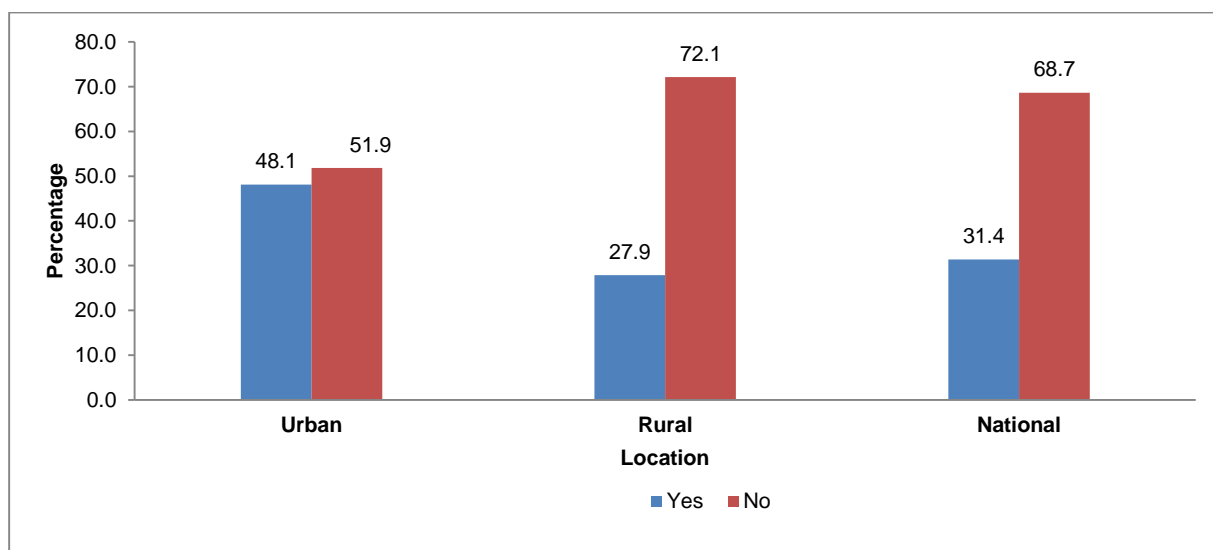
Table 8.3: Percentage Distribution of Type of Trainer by Residence and Region.

	Ministry of Energy and Mineral Development				Total
	Local private company/ consultant	Ministry of Energy and Mineral Development	Donor -funded Consultants	Others	
National	95.8	2.5	1.1	0.7	100.0
Residence					
Urban	92.0	6.1	0.0	2.0	100.0
Rural	96.6	1.7	1.4	0.4	100.0
Regions					
Kampala	86.9	9.7	0.0	3.5	100.0
Central	98.4	1.6	0.0	0.0	100.0
Eastern	100.0	0.0	0.0	0.0	100.0
Northern	97.6	0.4	1.1	0.9	100.0
Western	92.7	4.5	2.8	0.0	100.0

8.1.4 Energy Saving Measures Adopted

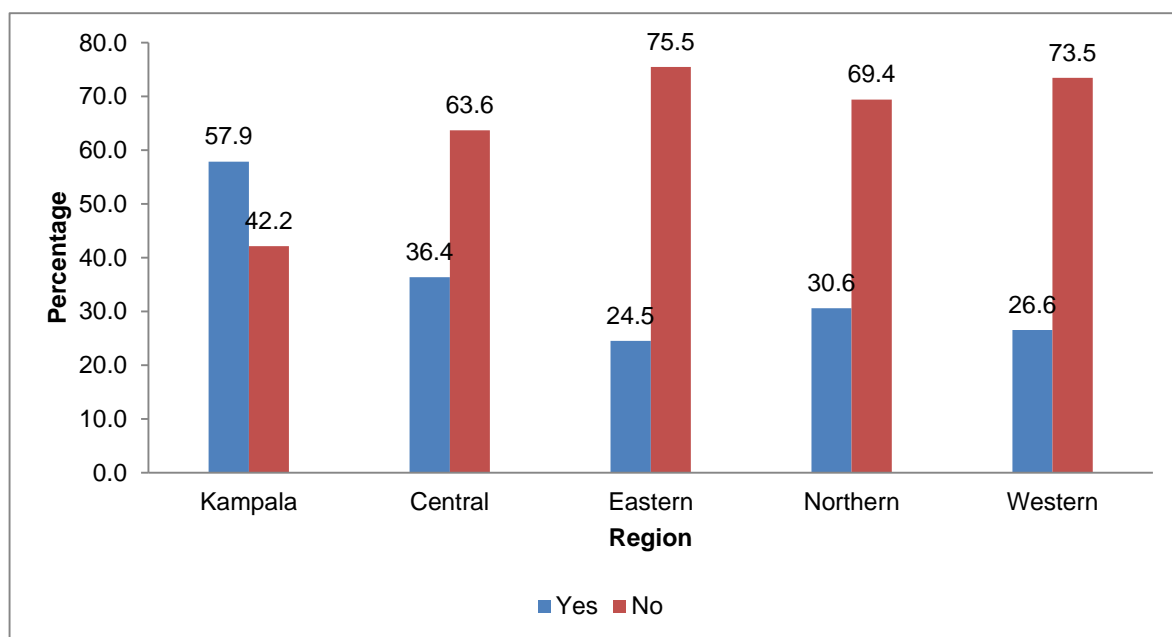
The survey further sought to establish whether households had taken up any energy saving measures regardless of whether they had received any prior training / advice or not. The findings revealed that in general 68.7 percent of the households surveyed had not adopted any energy saving measure. The urban population to some extent was adopting to energy saving measures (48 percent) as shown in Figure 8.3 below.

Figure 8.3: Proportion of Households adopting Energy Saving Measures by Residence (%).



Analysis by region showed that Kampala had the highest response to adopting energy saving measures as depicted by Figure 8.4 below.

Figure 8.4: Proportion of Households adopting Energy Saving Measures by Region (%)



8.1.5 Types of Energy Saving Measures Adopted

Households reported that the type of energy saving measure adopted was Installed energy saving equipment/technologies.

Table 8.4: Percentage Distribution Types of Energy Saving Measures adopted by Residence and Region

	Installed energy	Practice good	Other Measures	Total
National	90.2	5.2	4.6	100.0
Residence				
Urban	96.7	0.4	2.9	100.0
Rural	88.3	6.6	5.1	100.0
Region				
Kampala	97.8	0.0	2.2	100.0
Central	76.5	7.4	16.1	100.0
Eastern	100.0	0.0	0.0	100.0
Northern	86.7	11.7	1.6	100.0
Western	94.4	0.0	5.6	100.0

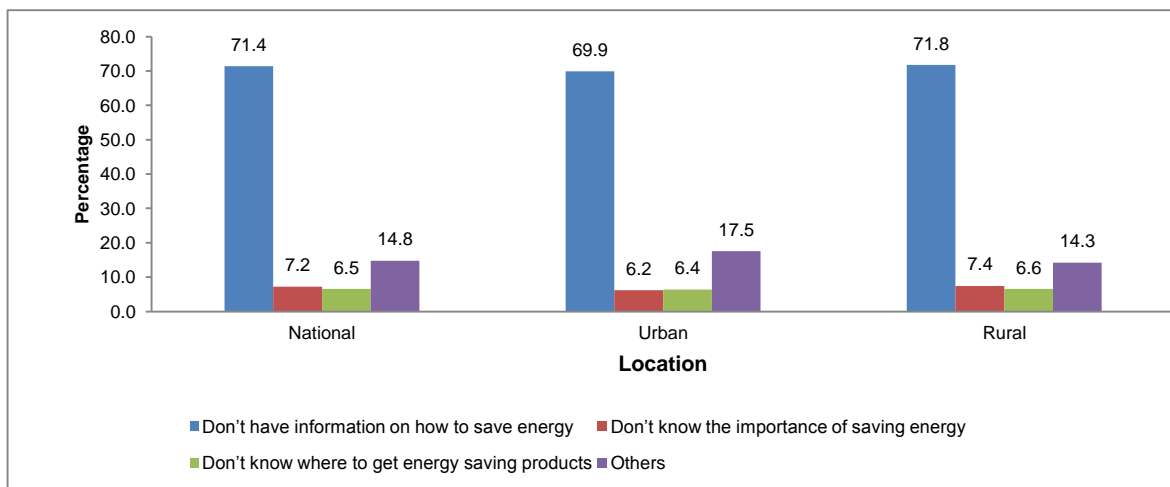
Figure 8.5 Energy Saving Stoves



8.1.6 Main Challenges in Adopting Energy Saving Measures

This section sought to find out the reasons as to why some households had not adopted energy saving measures. Nationwide 71.4 percent of households did not have information on how to save energy. This was the same trend at residence level as shown in Figure 8.6 below.

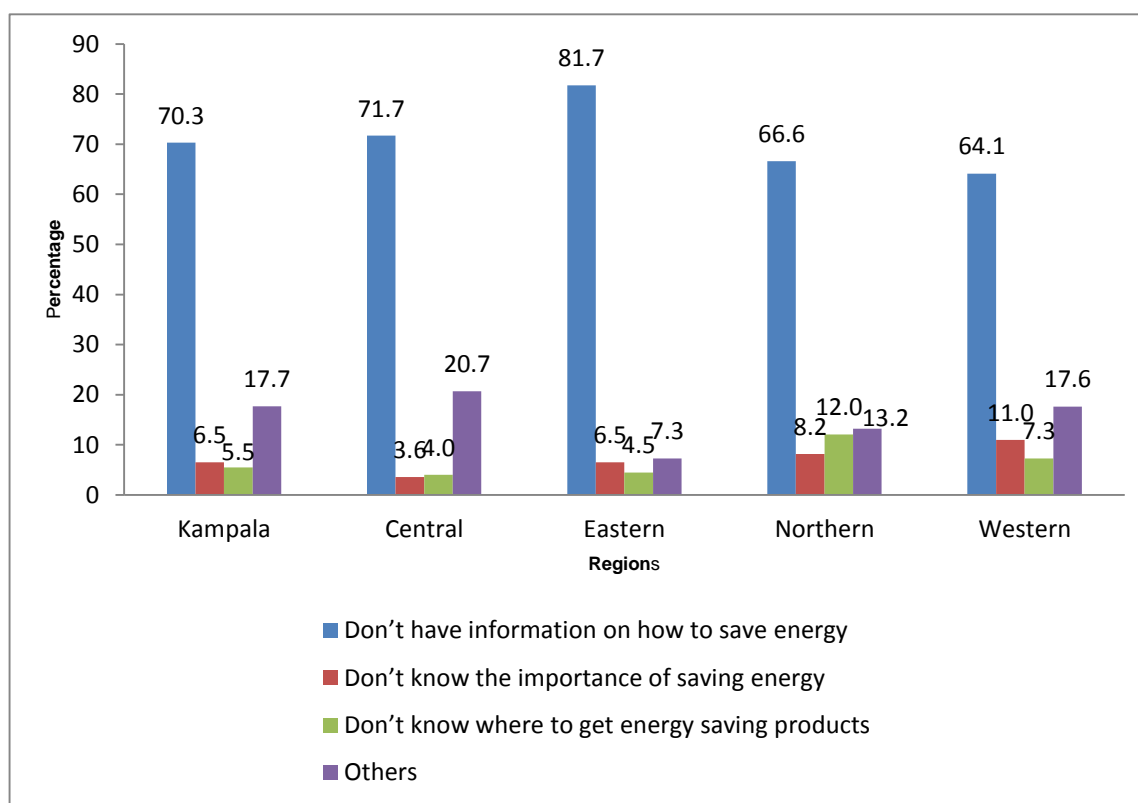
Figure 8.6: Percentage distribution of Main Challenges in Adopting Energy Saving Measures



71 % of Households lacked information on how to save energy

The main challenges within regions faced by the households in adopting the energy savings measures were mainly lack of information.

Figure 8.7: Percentage distribution of Main Challenges in Adopting Energy Saving Measures by Region (%).



8.1.7 Summary of Findings

In general, the survey revealed that nationally only 9.0 percent of the households had received training or advice on energy efficiency. Among those Households that had received some training or advice on energy saving measures, the focus was on Energy saving technologies/equipment. The training was mainly undertaken by local private companies or consultants. Lack of information on how to save energy was the main reason why households had not adopted energy saving measures.

8.2 Business Establishments

This section seeks to establish whether Entrepreneurs of businesses had ever received any training or advice on energy efficiency and if the businesses had adopted any energy saving measures.

8.2.1 Percentage Distribution of Training of Business Establishments

The survey findings revealed that nationally 12.3 percent of business establishments had received some training or advice on energy efficiency. At residence level, 12.7 percent of businesses in urban areas had received training while 11.8 percent of those located in rural areas had received training on energy

efficiency as shown in Table 8.5 below. The Table also reveals that there was poor advocacy on energy efficiency even at regional level.

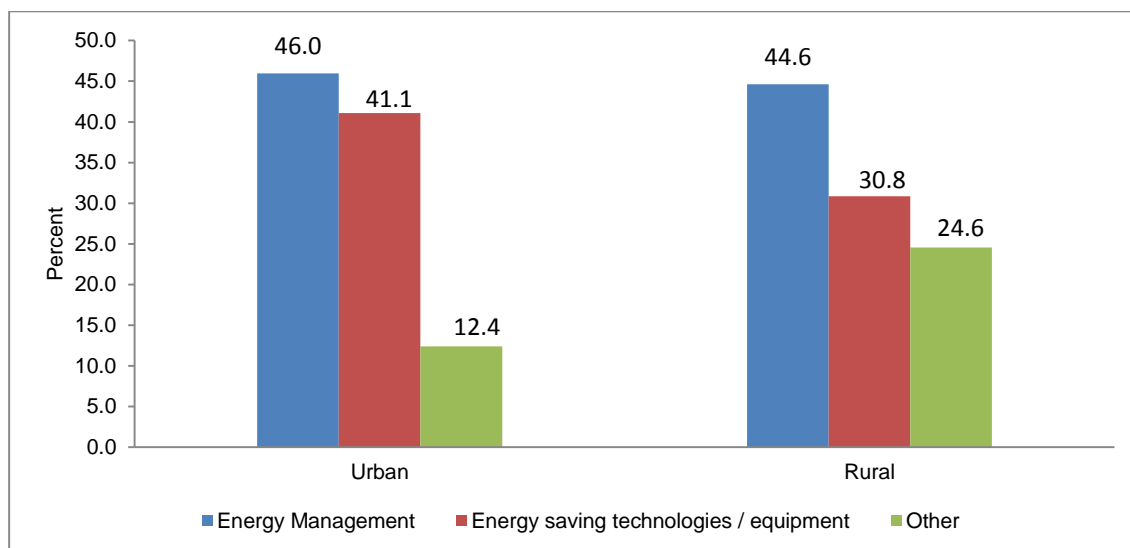
Table 8.5: Percentage Distribution of Training of Business Establishments by Residence and Region

		Yes	No	Total
National		12.3	87.8	100.0
Residence				
	Urban	12.7	87.3	100.0
	Rural	11.8	88.2	100.0
Region				
	Kampala	20.9	79.1	100.0
	Central	4.9	95.1	100.0
	Eastern	6.9	93.1	100.0
	Northern	21.4	78.6	100.0
	Western	12.8	87.2	100.0

8.2.2 Percentage Distribution of Focus of Training of Business Establishments

Focus of training received by most of the Business establishments was mainly on energy management (Figure 8.8).

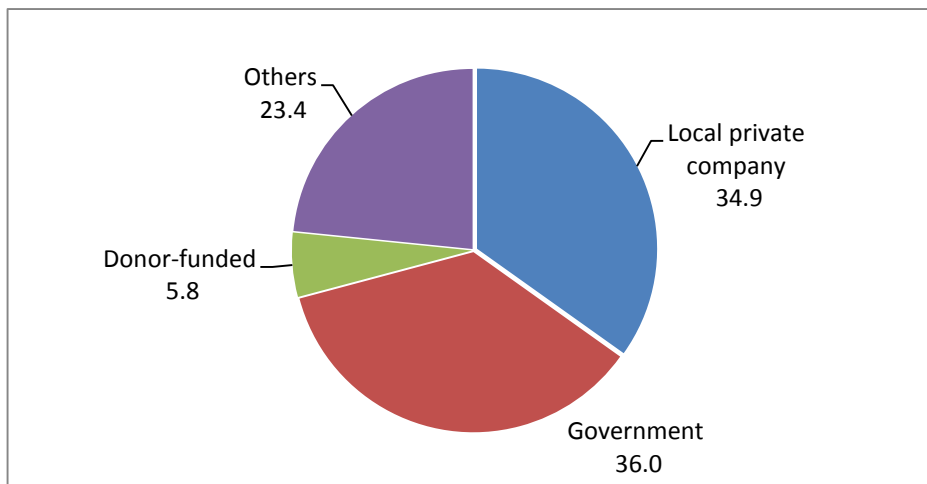
Figure 8.8: Percentage Distribution of Focus of Training by Residence



8.2.3 Percentage Distribution of Type of Trainer

The survey further revealed that 36 percent of the businesses had received energy efficiency training mainly through Government programmes, as illustrated in Figure 8.9 below.

Figure 8.9: Percentage Distributions by Type of Trainer



8.2.4 Percentage Distribution of whether Energy Saving Measures had been Adopted

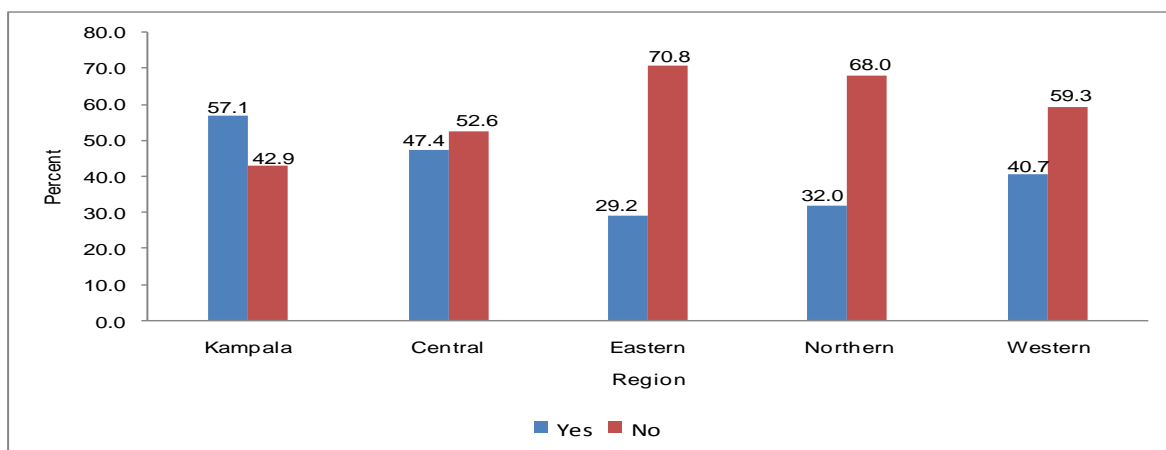
The survey further aimed to establish whether the energy saving measures that had been adopted by the business establishments regardless of whether they had received any prior energy efficiency training or advice. The survey findings revealed that at the national level, 44.7 percent of business establishments had adopted energy saving measures as shown in Table 8.6 below.

Table 8.6: Percentage Distribution of Businesses Adopting Energy Saving Measures by Residence

	Yes	No	Total
National	44.7	55.3	100.0
Residence			
Urban	50.7	49.3	100.0
Rural	38.7	61.3	100.0

Findings further revealed that at regional level, apart from Kampala where 57.1 percent of businesses had adopted energy saving measures, the other regions had higher percentages for not having adopted the measures (see Figure 8.10 below)

Figure 8.10: Percentage Distribution of Businesses Adopting Energy Saving Measures by Region



8.2.5 Percentage Distribution of Main Challenges for Adopting Energy Saving Measures.

This survey sought to find out why some businesses had not adopted energy saving measures. The major challenge for not having adopted energy saving measures was that businesses did not have information on the energy saving measures. This accounted for 64.4 percent of the business establishments nationwide. At residence level, 63.6 percent of businesses in urban areas and 65.6 percent of those in rural areas had not adopted energy saving measures due to lack of information on how to save energy as shown in Table 8.7 below.

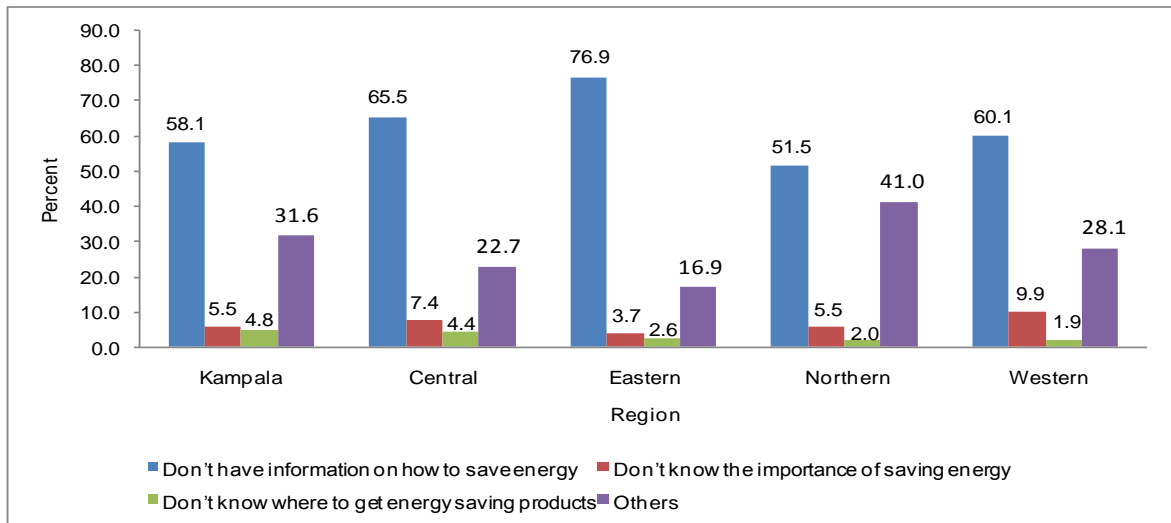
Table 8.7: Percentage Distribution of Main Challenges for Adopting Energy Saving Measures by Residence

Challenges	National	Urban	Rural
Don't have information on how to save energy	64.6	63.6	65.6
Don't know the importance of saving energy	6.6	6.3	6.9
Don't know where to get energy saving products	3.4	3.1	3.5
Others ¹¹	25.3	27.0	24.0
Total	100.0	100.0	100.0

The survey further revealed that even at regional level, the main challenge faced in adopting energy saving measures was ignorance on energy saving measures as illustrated in Figure 8.11 below.

¹¹Others Include: Initial costs expensive, Unfavorable weather, Poor quality of saving equipment like solar panels, energy saver bulbs, reluctance by heads of households etc

Figure 8.11: Percentage distribution of Main Challenges in Adopting Energy Saving Measures by Region



8.2.6 Summary of Findings

The survey revealed that overall, 87.8 percent of the business establishments in Uganda had neither received any training nor advice on energy efficiency measures. Establishments which had received some training or advice on energy saving measures mainly focused on Energy Management and Energy saving technologies/equipment both in rural and urban areas.

Training on energy saving measures was conducted mainly through government programmes and Local private companies. The main reason why businesses had not adopted energy saving measures was lack of information on how to save energy.

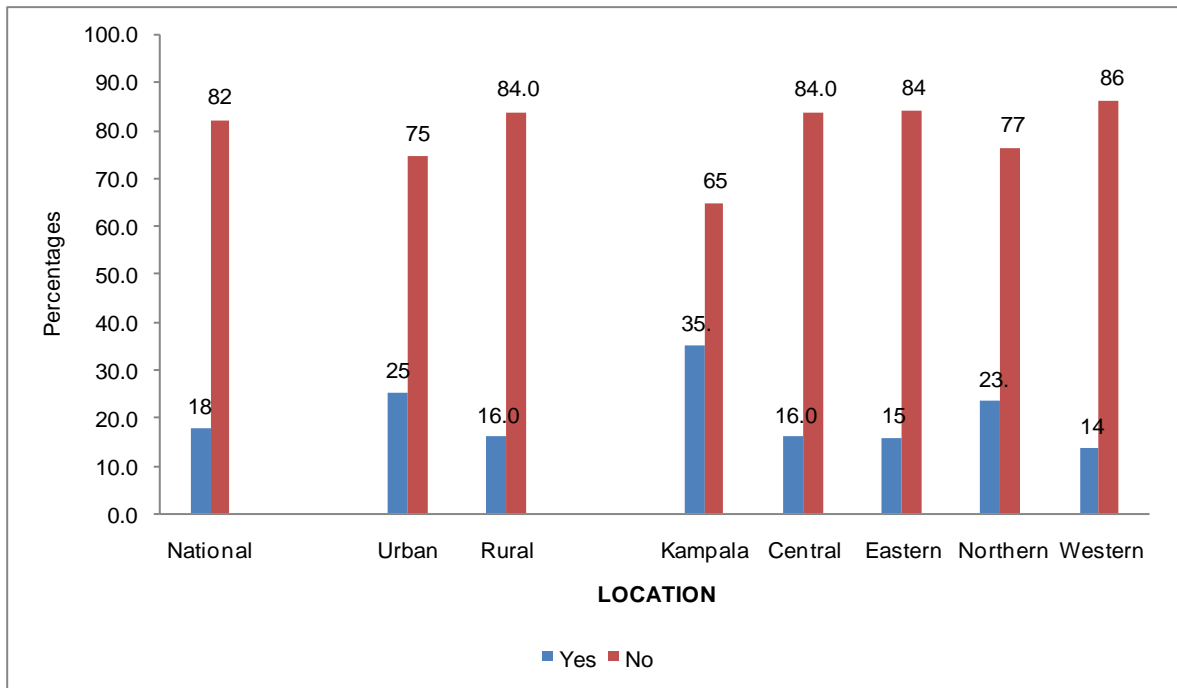
8.3 Educational Institutions

The survey also sought to establish whether educational institutions had received any training or advice on energy saving measures and what type of energy saving measures had been adopted.

8.3.1 Training of Educational Institutions

Findings show that at National level, 17.8 percent of the Education Institutions had received training or advice on energy efficiency. However, the same trend can be observed throughout all regions, as shown in Figure 8.12.

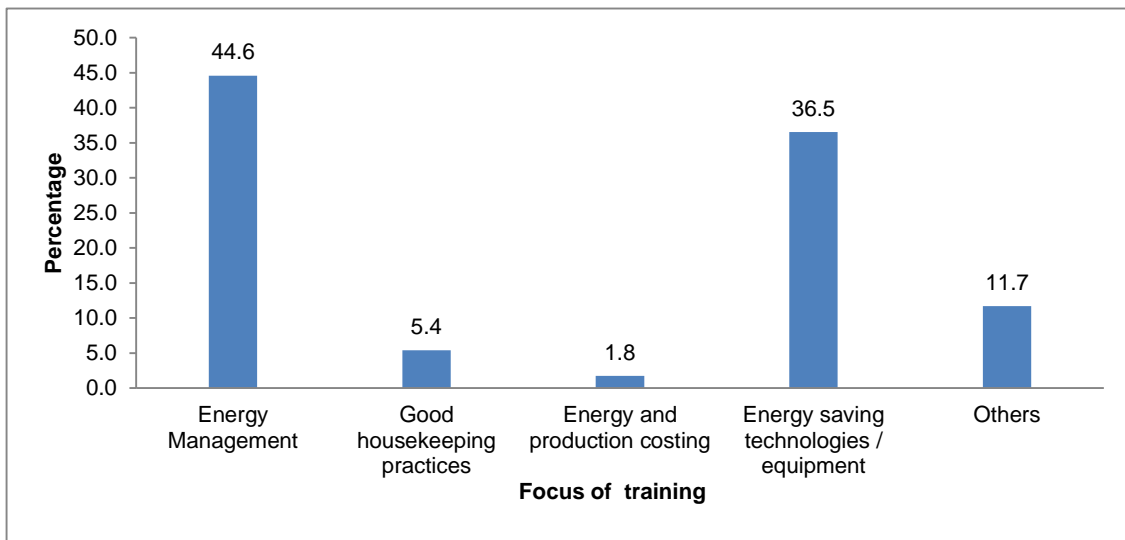
Figure 8.12: Percentage Distribution of Training of Educational Institutions by Residence and Region.



8.3.2 Focus of Training

The main focus of training in education institutions was on Energy management at 44.6 percent followed by energy saving techniques at 36.5 percent as shown in Figure 8.13 below.

Figure 8.13: Percentage distribution of Focus of Training by Residence and Region



At residence and regional level, the focus of training was also mainly on energy management, see Table 9.8 below.

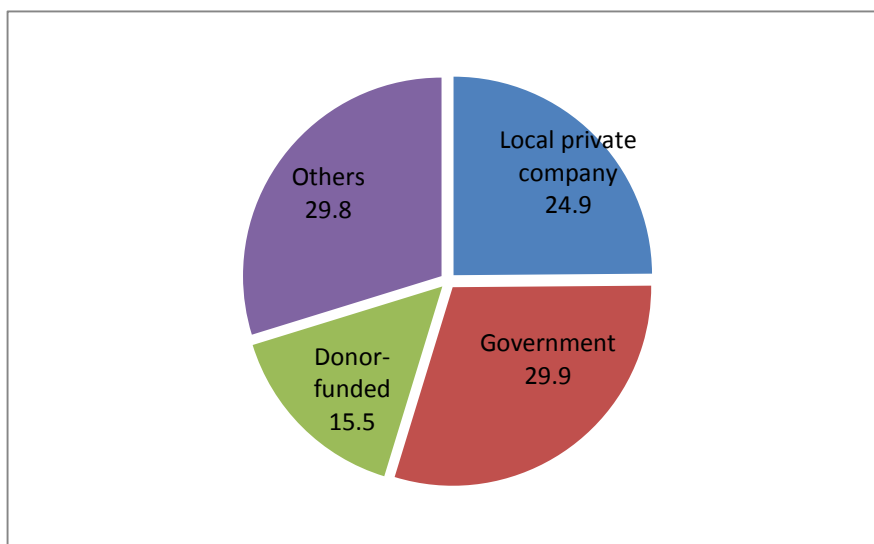
Table 8.8: Percentage Distribution of focus of Training by Residence and Region

	Energy Management	Good housekeeping practices	Energy and production costing	Energy saving technologies / equipment	Others	Total
National	44.6	5.4	1.8	36.5	11.7	100.0
Residence						
Urban	54.3	4.9	0.0	33.6	7.2	100.0
Rural	40.6	5.6	2.4	37.9	13.5	100.0
Regions						
Kampala	61.4	0.0	0.0	31.9	6.7	100.0
Central	28.7	10.5	4.5	19.0	37.4	100.0
Eastern	41.9	0.0	3.3	41.8	12.9	100.0
Northern	52.3	5.4	0.0	42.3	0.0	100.0
Western	47.1	8.6	0.0	44.3	0.0	100.0

8.3.3 Percentage Distribution of Type of Trainer

Education institutions were mainly trained by government followed by Others 12, as illustrated in Figure 8.14 below.

Figure 8.14: Percentage Distribution by Type of Trainer



8.3.4 Adoption of Energy savings measures

This section gives an insight into whether Educational Institutions had adopted any energy savings measures. The results in table 8.9 show that 46.8 percent of the educational institutions had adopted

¹²Others include: Uganda Manufacturers Association (UMA), Uganda Small Scale Industries Association (USSA), the Private Sector Foundation Uganda (PSFU), etc.

energy savings measures. The findings further indicated that there was of energy savings techniques a higher adoption in urban areas (60.1percent) compared to that of rural (43.8 percent). There was relatively less adoption of energy saving measures at regional level with Northern region having the least (36.5 percent).

Table 8.9: Percentage distribution of Adoption of Energy savings measures by Residence and region

		Yes	No	Percent
National		46.8	53.2	100
Residence				
	Urban	60.1	39.9	100
	Rural	43.8	56.2	100
Region				
	Kampala	67.8	32.2	100
	Central	51.5	48.5	100
	Eastern	47.2	52.8	100
	Northern	36.5	63.5	100
	Western	47.2	52.8	100

8.3.5 Summary of Education Institutions' Findings

At the National level, only 17.8 percent of education institutions had received training or advice on energy efficiency. The main focus of the training was on energy management followed by energy saving techniques and the training was done mainly by government institutions.

8.4 Health institutions

This section aims at providing some insights into the training of Health institutions on energy saving measures. The survey collected information on a number of issues related to the training of Health institutions, focus of training and type of trainer, among others.

8.4.1 Training provided to Health institutions.

Findings revealed that only 9.4 percent of Health institutions in Uganda received training or advice on energy efficiency, as shown in Table 8.10 below.

Table 8.10: Percentage Distribution of training of Health institutions by Residence

		Yes	No	Total
National		9.4	90.6	100.0
Residence				
	Urban	12.0	88.0	100.0
	Rural	8.1	91.9	100.0

8.4.2 Focus of Training.

Health institutions were asked if they had received any training or advice on energy efficiency and what was the focus of the training. The findings showed that Health institutions were found to have mainly received training on energy management at 55.7 percent followed by energy saving technologies at 44.3 percent as shown in Table 8.11 below.

Table 8.11: Percentage distribution of focus of training by residence

	Energy Management	Energy saving technologies/equipment	Total
National	55.7	44.3	100.0
Residence			
Urban	54.1	45.9	100.0
Rural	57.6	42.4	100.0

8.4.3 Type of Trainer.

Health institutions mainly received training from Government (33.8 percent) followed by Donor funded agencies at 30.6 percent. See Table 8.12 below.

Table 8.12: Percentage distribution of type of trainer by residence

	Local private company/consultant	Government	Donor-funded	Others specify	Total
National	26.7	33.8	30.6	6.8	100.0
Residence					
Urban	33.3	50.0	16.7	0.0	100.0
Rural	22.2	22.2	44.4	11.1	100.0

8.4.4 Adoption of Energy Saving Measures

The survey findings also revealed that 56 percent of Health institutions had adopted energy saving measures, as shown in Table 8.13 below at the National level. Analysis by residence showed that Urban based Health Institutions adopted more savings measures compared to Rural based Health Institutions with 51.0 percent

Table 8.13: Percentage distribution of whether energy saving measures were adopted by Residence.

	Yes	No	Total
National	56.0	44.0	100
Residence			
Urban	66.4	33.6	100.0
Rural	50.9	49.1	100.0

8.4.5 Types of Energy Saving Measures Adopted

Health institutions had mainly adopted the Installation of energy saving equipment/technologies as their energy saving measure as shown in Table 8.14 below.

Table 8.14: Percentage distribution of the kind of energy saving measures adopted

	Installed energy saving equipment/technologies	Practice preventive maintenance regularly	Schedule most production during off-peak hours	Monitor energy consumption	Practice good housekeeping	Total
National	90.5	4.6	0.8	1.8	2.3	100.0
Residence						
Urban	93.3	0.0	2.1	4.6	0.0	100.0
Rural	88.7	7.5	0.0	0.0	3.8	100.0

8.4.6 Distribution of Main Challenges for Adopting Energy Saving Measures

The findings showed that the main reasons as to why Health institutions had not adopted any energy saving measures was because there was lack of information on how to save energy (47.3) percent followed by Others¹³ at 34.4 percent. See Table 8.15.

Nearly 50% of health Institutions lacked Information about energy Savings

Table 8.15: Percentage distribution of main challenges for adopting energy saving measures by region

	Don't have information on how to save energy	Don't know the importance of saving energy	Don't know where to get energy saving products	Others	Total
National	47.3	9.4	8.9	34.4	100.0
Residence					
Urban	54.9	3.9	16.0	25.3	100.0
Rural	43.4	12.3	5.2	39.1	100.0

8.4.7 Summary of Health institutions Findings

In general, the survey revealed that 90.7 percent of Health institutions in Uganda had neither received any training nor advice on energy efficiency. Health institutions that had received some training on energy saving, the focus was on energy management and energy saving technologies. Training in energy saving measures was mainly conducted by Governments and Donor funded agencies. Lack of information on how to save energy was the main reason reported by Health institutions for not having adopted energy saving measures.

¹³ Others include: Initial cost is expensive, unfavorable weather, poor quality of savings equipment like solar panels, energy saver bulbs, reluctance by heads of households etc

CHAPTER NINE

INCOME AND EXPENDITURE

9.0 Introduction

This chapter presents findings on income and expenditure for Household, Business establishments, Education and Health institutions. The survey results are analysed and presented as a total average of all income earned from selected income sources and this include: Salary, sale of products, construction work, sale of retail goods, Service & commission income, Rental income, Financial & insurance services, Education service income, Medical service income, Dividends receivable, Agricultural products and from other sources of income.

The findings on the amount on expenditure on electricity used including other energy sources will also be presented at the National and at the regional level.

9.1 Household Income and Expenditure

9.1.1 Household Income.

This section covered the household income accrued from different economic activities. Table 9.1 shows that Urban based households on average earned UGX 450,000 per month as compared to Rural based households that earned on average UGX 216,700 per month. At the National level Households on average earned UGX250,000 per month from the various income sources.

Analysis by region shows that Households living in Kampala have a higher Income compared to other regions with Northern region having the lowest Income of UGX 150,850/=

Table 9.1 Distribution of Household Average Monthly Income by Residence (UGX)

Region	Urban	Rural	Total
Kampala	550,000	-	550,000
Central	360,000	263,400	280,000
Eastern	380,000	209,700	225,000
Northern	304,200	148,400	150,850
Western	470,000	250,000	269,200
Uganda	450,000	216,700	250,000

9.1.2 Household Expenditure on Electricity.

Table 9.2 shows the distribution of average household expenditure on Electricity used. The results showed that at the National level, the average amount spent by a Household on Electricity used was UGX 13,600/=. Analysis by Rural residence showed that Rural Households were able to pay up to UGX 10,000 while the Urban Households were able to pay up to UGX 30,000/=. Across regions, as indicated by table

9.2 below, Kampala based Households paid UGX 36,500 for their electricity bills more than households located in other regions with the lowest being households in Western Uganda paying only UGX 6,000/=.

Table 9.2 Distribution of Average Monthly Household Expenditure on Electricity

Region	Urban	Rural	Total
Kampala	36,500		36,500
Central	25,000	10,000	14,000
Eastern	35,000	16,000	18,000
Northern	32,000	12,000	13,000
Western	21,000	6,000	6,000
Total	30,000	10,000	13,600

9.2 Distribution of Expenditure on Electricity used in the Business Establishments.

9.2.1 Income in the Business establishments

Information on Income was also collected from the Business establishments. The findings show that the average income earned at the National level was UGX 475,000/=. Analysis by residence showed that the Rural based businesses earned more Income by UGX 483,400/= compared to their Urban based counterparts with only UGX 450,000/=. Analysis by region, showed that Business in Northern Region earned more income UGX 1,300,000/= than other regions as shown in table 9.2 below.

Table 9.3 Distribution of Average Monthly Income in the Business establishments (UGX)

Region	Urban	Rural	Total
Kampala	435,000	837,500	500,000
Central	333,400	475,000	420,000
Eastern	695,000	300,000	400,000
Northern	500,000	1,425,100	1,300,000
Western	600,000	589,350	589,350
National	450,000	483,400	475,000

9.2.2 Business establishments Expenditure on Electricity

Table 9.4 below shows the average distribution of expenditure on Electricity used in the Business establishments. The findings show that on average Business establishments were paying up to UGX 40,000/= per month on their electricity used at the National level. Analysis by Residence showed that Urban Business (UGX 50,000) were paying more than the Rural based Business (UGX 32,500).

Expenditure on Electricity at the Regional level showed that Kampala based businesses paid the highest amount (UGX 70,000) than all the other business located in the regions. Business establishments located

in Western Region, paid the lowest amount of UGX 30,000/= for their electricity consumed compared to other regions as shown in table 9.4 below.

Table 9.4 Distribution of Average Expenditure on Electricity in the Business Establishments (UGX)

REGION	URBAN	RURAL	TOTAL
Kampala	70,000	50,000	60,000
Central	35,000	35,000	35,000
Eastern	60,000	29,000	40,000
Northern	33,000	34,750	33,000
Western	25,000	30,000	30,000
Uganda	50,000	32,500	40,000

9.3 Income and Expenditure on Electricity in Education Institutions

9.3.1 Income in Education Institutions

The findings in table 9.5 below shows that overall, Education Institutions earned on average UGX 2,394,100 from the various income sources available in the Educational Institutions at the National level. Further analysis by residence showed the Urban based schools earned more income 5,471,200 than Rural based Schools with only 1,801,400 per month.

The results also showed that schools located in Eastern Region earned more income UGX 43,815,365 than schools located in other regions with Central region based schools registering the lowest income earned of UGX 2,500,000/= per month as shown in table 9.5 below.

Table 9.5 Distribution of average income earned in Education Institutions by Location (UGX)

Region	Urban	Rural	Total
Kampala	2,874,750	6,916,800	3,437,375
Central	2,500,000	2,000,000	2,000,000
Eastern	43,815,365	1,400,000	3,039,250
Northern	3,385,400	1,833,400	2,141,400
Western	5,816,700	2,000,000	2,476,500
Total	5,471,200	1,801,400	2,394,100

9.3.2 Education Institutions Expenditure on Electricity

Expenditure on Electricity in education institutions was found to be the same at both the National, Urban and Rural based educational Institutions paying UGX 100,000/= for their electricity consumed. The findings also found that Kampala based Educational Institutions paid more on their electricity expenses of

UGX 150,000/= compared to Educational institutions located in other regions with Central region based schools paying the lowest amount for their electricity bills as shown in table 9.6 below.

Table 9.6 Distribution of average monthly expenditure on Electricity bills in Educational Institutions (UGX)

Region	Urban	Rural	Total
Kampala	150,000		150,000
Central	90,000	115,900	107,600
Eastern	100,000	99,700	99,700
Northern	112,500	80,000	100,000
Western	110,000	67,200	100,000
Uganda	100,000	100,000	100,000

9.4 Income and Expenditure in the Health institutions.

9.4.1 Health institutions Income.

Table 9.7 below shows the distribution of Income earned by Health institutions. The results show that on average a Health Institution earned 625,000 per month at the National level. However, analysis by residence showed that Health institutions located in Urban areas (UGX 1,183,200) earned more than those located in Rural areas UGX 366,700.

Table 9.7 Distribution of Average Monthly Income earned in Health institutions

Region	Urban	Rural	Total
Kampala	700,000	-	700,000
Central	97,500	200,000	200,000
Eastern	12,083,400	750,000	1,183,200
Northern	7,100,000	625,000	625,000
Western	67,090,197	1,238,000	1,605,250
Uganda	1,183,200	366,700	625,000

9.4.2 Health institutions expenditure on Electricity

The survey collected information on expenditure on Electricity in the Health institutions. The findings showed that at the national level, Health institutions paid UGX 70,000 for their electricity expenses per month. The results also show that Health institutions located in Urban areas paid UGX 200,000 more than those located in Rural areas UGX 40,000 as shown in table 9.8 below.

Table 9.8 Distribution of average monthly expenditure on Electricity bills in Educational Institutions (UGX)

Region	Urban	Rural	Total
Kampala	150,000		150,000
Central	80,000	25,000	40,000
Eastern	600,000	300,000	300,000
Northern	250,000	20,000	20,000
Western	800,000	100,000	100,000
Uganda	200,000	40,000	70,000

9.5 Willingness to pay for Energy used.

The ERT 2012 survey collected information from the respondents who were interested in Grid Electricity and how much the respondents were willing to pay for the service.

9.5.1 Willingness to pay for Electricity consumed at Household level.

At the Household level, the results showed that at the National level, 54.5 percent of Households are able to pay for the energy used between Uganda shillings 1,000 and 10,000 UGX per month and this was the same at Residence level as shown in Table 9.9 below.

Table 9.9: Percentage distribution of amounts Households are Willing to pay for energy used monthly at the Household level by Residence per month.

Range of Amount Willing to Pay	Urban	Rural	National
1,000-10,000	59.4	54.0	54.5
11,000 -20,000	22.2	20.0	20.3
21,000-50,000	13.6	18.3	17.9
51,000-100,000	2.5	5.0	4.8
100,001 Plus	2.3	2.6	2.6
Total	100.0	100.0	100.0

9.5.2 Willingness to pay for Electricity used at Education Institutions.

Table 9.10 presents data on willingness to pay for Electricity consumed in Education Institutions. At the National level, the highest amount that the institutions were willing to pay was noted to be more than Uganda Shillings 100,000 per month for the energy used. However, the findings also showed that Urban Schools were able to pay 21,000 and 50,000 Uganda shillings while Rural Schools the highest number of respondents said they were able to pay.

The findings show that only 29.5 percent of Educational Institutions were willing to pay more than UGX 100,000/= for the electricity consumed at the National level. Analysis by residence show that 38.6 percent of Urban Educational Schools were willing to pay between UGX 21,000 and 50,000/=. However, the study also showed the highest proportion of that Rural based Schools were willing pay between UGX 21,000 to 50,000/= accounting for 29.2 percent of the Rural Based Educational Institutions as shown in Table 9.10.

Table 9.10: Percentage distribution of amounts Education Institutions are able to pay for energy used monthly at the Household level by Residence.

Range of Amount Willing to Pay	Urban	Rural	National
1,000-10,000	5.88	8.92	8.6
11,000 -20,000	12.13	10.9	11.03
21,000-50,000	38.57	29.2	30.18
51,000-100,000	10.49	21.88	20.69
100,001 Plus	32.94	29.1	29.5
Total	100	100	100

9.5.3 Willingness to pay for Energy at Business establishments

Information obtained from Business establishments at the national level showed that the highest proportion of establishments were willing to pay more than Uganda Shillings 100,000 accounting for 19.6%. At the residence level, the findings noted that Rural Business establishments were able to pay between UGX 21,000 and 50,000 while Urban based business were noted to be able to pay more than UGX100,001 for the energy used in their businesses as shown in table 9.11 below.

Table 9.11: Percentage distribution of amounts Business establishments are able to pay for energy used monthly at the Household level by Residence

Range of Amount Willing to Pay	Urban	Rural	National
1,000-10,000	24.6	40.6	35.8
11,000 -20,000	19.0	19.3	19.3
21,000-50,000	13.6	21.2	18.9
51,000-100,000	5.16	7.0	6.5
100,001 Plus	37.6	11.9	19.6
Total	100.0	100.0	100

9.5.4 Willingness to pay for Energy at Health institutions

The operations of Health institutions need a lot of energy to use and the findings showed that at the National level, the highest responses noted that they were willing to pay more than Uganda Shillings 100,000 accounting for 34.6 percent. At the residence level, the findings showed that in Rural Health institutions, the highest number of responses were that the Rural based Health institutions willing to pay between 21,000 to 50,000/= accounting for 38.7 percent whereas Urban based Health institutions said

they were willing to pay more than Uganda Shillings accounting for 62.2 percent as shown in Table 9.12 below.

Table 9.12: Percentage distribution of amounts Health institutions are able to pay for energy used monthly at the Household level by Residence

Range of Amount Willing to Pay	Urban	Rural	National
1,000-10,000	30.4	0.0	4.3
11,000 -20,000	0.0	4.9	4.2
21,000-50,000	7.35	38.7	34.2
51,000-100,000	0.0	26.5	22.7
100,001 Plus	62.2	30.0	34.6
Total	100	100	100

9.4.5. Summary of Income, Electricity and Willingness to pay in the Household, Business establishments, Education and Health Institutions at the National level.

The findings show that the average income earned at the Household level was at UGX 250,000/=, while in the Business establishments the average income was noted at UGX 475,000/=. However, in the education sector, the average Income earned was found to be UGX 2,394,000/= while Health Institutions earned 625,000/= monthly.

Expenditure on Electricity consumed was used to analyze ability to pay at the Household, Business establishments, Education and Health Institutions. The findings showed that at the National Level, Households were able to pay UGX 13,600/= monthly, while Business Establishments are able to pay up to UGX 40,000/=. The findings also show that Educational Institutions are able to pay up to UGX 100,000/= while Health Institutions are able to pay up to UGX 70,000/= on a monthly basis.

The survey also collected information from respondents who were Interested in Grid Electricity how much they would be willing to pay for the service. The findings showed that 54 percent of Households were willing to pay between 1,000 to 10,000/= Monthly for the energy consumed. The findings also show that the highest proportion of Business establishments were willing to pay between 1,000 to 10,000/= accounting for 35.8 percent of Business establishments. However, the highest proportion of business establishments in Education Institution were willing to pay between UGX 21,000 to 50,000/= Monthly for the energy consumed accounting for 30.2 percent of the respondents. The highest proportion of health Institution were willing to pay over UGX 100,000/= for the energy consumed per month accounting for 34.6 percent of the Health Institutions.

LIST OF REFERENCE

Ben Kiregyera, 1999; Sample Surveys with Special reference to Africa

Census of Business Establishments, 2010/11

Ministry of Health 2002; Energy for Rural Transformation Programme –Project Implementation Plan

UBOS, National Household Survey 2009/2010

Uganda Bureau of Statistics, 2011; Demographic and Health Survey

National Planning Authority (2010), National Development Plan 2010/11-2014/15

APPENDIX I: SAMPLING ERRORS

Household survey findings are usually based on a sample of households selected using appropriate sample designs. Estimates are affected by two types of errors; sampling and non sampling errors. Non-sampling errors result from wrong interpretation of results; mistakes in recording of responses, additional problems, improper recording of data etc. and are mainly committed during the implementation of the survey.

Sampling errors, on the hand, arise because observations are based on only one of the can be used to calculate any samples that could have been selected from the same population using the same design and expected size. They are a measure of variability between all possible samples. Sampling errors are usually measured using Standard Errors (SE). SE is the square root of the variance and can be used to calculate Confidence intervals (CI) for the various estimates. In addition, sometimes it is appropriate to measure the relative errors of some of the variables and the Coefficient of Variation (CV) is one such measure. The Coefficient of Variation is the quotient of the SE divided by the mean of the variable of interest.

The SE and CVs were computed using STATA software and they each take into account the multistage nature of the survey design. The results below indicate the SE and CVs computed for the selected variables in the report. The SEs and CVs are presented for the National and rural-Urban levels.

Table A1: Proportion of Households Accessing Current Energy types National Level

Energy Source	Number of Households	Proportion	Standard Error (SE)	Confidence Interval		CV
				Lower	Upper	
Grid Electricity	1,170	0.149	0.007	0.135	0.164	4.9
Diesel	34	0.005	0.002	0.001	0.008	34.9
Petrol	148	0.019	0.003	0.012	0.025	17.1
Paraffin	7,185	0.776	0.006	0.763	0.788	0.8
Gas	99	0.013	0.002	0.009	0.018	17.5
Solar	974	0.106	0.006	0.094	0.117	5.6
Battery	182	0.025	0.004	0.017	0.033	16.7
Charcoal	2,814	0.329	0.009	0.312	0.346	2.6
Firewood	7,359	0.765	0.009	0.747	0.782	1.2

Table A2: Proportion of Households Accessing Current Energy types at National Level

Energy Source	Residence	Number of Households	Proportion	Standard Error (SE)	Confidence Interval		CV
					Lower	Upper	
Grid	Urban	663	0.528	0.021	0.486	0.570	4.0
Electricity	Rural	507	0.069	0.006	0.058	0.080	8.4
	Urban	20	0.013	0.003	0.007	0.019	24.4
Petrol	Rural	128	0.020	0.004	0.013	0.028	19.1
	Urban	823	0.632	0.019	0.595	0.668	3.0
Paraffin	Rural	6,362	0.806	0.007	0.792	0.820	0.9
	Urban	49	0.044	0.012	0.020	0.068	27.7
Gas	Rural	50	0.007	0.001	0.005	0.008	14.7
	Urban	43	0.033	0.008	0.018	0.049	23.9
Solar	Rural	931	0.121	0.007	0.107	0.134	5.6
	Urban	31	0.027	0.006	0.015	0.039	22.9
Battery	Rural	151	0.025	0.005	0.015	0.035	19.9
	Urban	940	0.731	0.020	0.691	0.771	2.8
Charcoal	Rural	1,874	0.243	0.007	0.229	0.258	3.0
	Urban	354	0.244	0.020	0.205	0.283	8.1
Firewood	Rural	7,005	0.875	0.006	0.862	0.887	0.7

Table A3: Proportion of Businesses Accessing Current Energy types at National Level

Energy Source	Number of Observations	Proportion	Standard Error (SE)	Confidence Interval		CV
				Lower	Upper	
Grid Electricity	764	0.654	0.022	0.610	0.698	3.4
Diesel	111	0.076	0.010	0.057	0.095	12.6
Petrol	160	0.123	0.011	0.102	0.144	8.5
Paraffin	341	0.279	0.018	0.243	0.315	6.5
Gas	48	0.034	0.005	0.024	0.045	15.6
Solar	55	0.047	0.006	0.034	0.059	13.7
Battery	36	0.033	0.005	0.022	0.043	16.1
Charcoal	364	0.306	0.018	0.271	0.341	5.8
Firewood	209	0.147	0.013	0.121	0.173	8.9

Table A4: Proportion of Businesses Accessing Current Energy types by Residence

Energy Source	Residence	Number of Observations	Proportion	Standard Error (SE)	Confidence Interval (95%)		CV
					Lower	Upper	
Grid	Urban	462	0.802	0.023	0.756	0.849	2.9
Electricity	Rural	302	0.508	0.024	0.460	0.555	4.7
Diesel	Urban	69	0.084	0.016	0.053	0.115	18.6
	Rural	42	0.066	0.011	0.045	0.088	16.2
Petrol	Urban	88	0.130	0.016	0.098	0.163	12.6
	Rural	72	0.115	0.013	0.090	0.139	11.0
Paraffin	Urban	117	0.199	0.023	0.153	0.245	11.7
	Rural	224	0.359	0.021	0.317	0.401	5.9
Gas	Urban	27	0.040	0.008	0.024	0.055	20.2
	Rural	21	0.027	0.007	0.013	0.040	26.0
Solar	Urban	13	0.020	0.007	0.007	0.033	33.1
	Rural	42	0.071	0.011	0.049	0.093	15.5
Battery	Urban	16	0.025	0.007	0.012	0.038	26.8
	Rural	20	0.039	0.008	0.022	0.055	21.7
Charcoal	Urban	164	0.276	0.026	0.224	0.328	9.6
	Rural	200	0.335	0.022	0.292	0.378	6.5
Firewood	Urban	55	0.080	0.013	0.054	0.106	16.7
	Rural	154	0.217	0.017	0.183	0.251	8.0

Table A5: Proportion of Businesses Accessing Current Energy types at National Level

Energy Source	Number of Observations	Proportion	Standard Error (SE)	Confidence Interval	
				Lower	Upper
Grid Electricity	232	0.395	0.030	0.336	0.454
Diesel	59	0.084	0.013	0.058	0.110
Petrol	132	0.199	0.018	0.164	0.234
Paraffin	145	0.238	0.024	0.191	0.284
Gas	55	0.106	0.020	0.067	0.145
Solar	142	0.234	0.023	0.189	0.278
Battery	11	0.014	0.005	0.005	0.023
Charcoal	128	0.210	0.022	0.166	0.254
Firewood	609	0.969	0.009	0.952	0.986

Table A6: Proportion of Education Institutions Accessing Current Energy types by Residence

Energy Source	Residence	Number of Observations	Proportion	Standard Error (SE)	Confidence Interval		CV
					Lower	Upper	
Grid Electricity	Urban	86	0.65	0.06	0.54	0.77	8.7
	Rural	146	0.33	0.04	0.26	0.40	10.6
Diesel	Urban	13	0.09	0.03	0.03	0.14	32.7
	Rural	46	0.08	0.01	0.05	0.11	17.9
Petrol	Urban	34	0.25	0.04	0.17	0.33	15.8
	Rural	98	0.19	0.02	0.15	0.23	10.5
Paraffin	Urban	24	0.16	0.03	0.09	0.22	21.1
	Rural	121	0.26	0.03	0.20	0.31	10.8
Gas	Urban	7	0.05	0.02	0.01	0.10	44.6
	Rural	48	0.12	0.02	0.07	0.16	19.8
Solar	Urban	17	0.11	0.03	0.05	0.16	26.1
	Rural	125	0.26	0.03	0.21	0.32	10.0
Charcoal	Urban	39	0.29	0.05	0.20	0.39	15.8
	Rural	89	0.19	0.03	0.14	0.24	13.6
Firewood	Urban	123	0.95	0.02	0.92	0.99	1.9
	Rural	486	0.97	0.01	0.95	0.99	1.0

Table A7: Proportion of Health institutions Accessing Current Energy types at National Level

Energy Source	Number of Observations	Proportion	Standard Error (SE)	Confidence Interval		CV
				Lower	Upper	
Grid Electricity	80	0.574	0.051	0.472	0.677	9.0
Diesel	32	0.245	0.050	0.146	0.344	20.3
Petrol	20	0.130	0.044	0.041	0.218	34.3
Paraffin	67	0.529	0.057	0.415	0.644	10.9
Gas	37	0.256	0.048	0.160	0.352	18.8
Solar	67	0.531	0.056	0.420	0.641	10.5
Charcoal	58	0.489	0.053	0.384	0.594	10.8
Firewood	21	0.181	0.042	0.098	0.263	23.0

Table A8: 1Proportion of Health institutions Accessing Energy types by Residence

Energy Source	Residence	Number of Observations	Proportion	Standard Error (SE)	Confidence Interval		CV
					Lower	Upper	
Grid Electricity	Urban	38	0.844	0.076	0.692	0.996	9.06
	Rural	42	0.459	0.067	0.326	0.592	14.60
Diesel	Urban	11	0.237	0.085	0.068	0.405	35.77
	Rural	21	0.249	0.061	0.127	0.371	24.68
Petrol	Urban	8	0.102	0.063	-0.023	0.228	61.48
	Rural	12	0.141	0.057	0.028	0.254	40.33
Paraffin	Urban	20	0.564	0.101	0.364	0.765	17.88
	Rural	47	0.514	0.069	0.378	0.651	13.33
Gas	Urban	11	0.204	0.083	0.040	0.369	40.50
	Rural	26	0.278	0.056	0.168	0.389	20.01
Solar	Urban	10	0.185	0.069	0.049	0.321	37.06
	Rural	57	0.679	0.068	0.543	0.815	10.07
Charcoal	Urban	18	0.453	0.105	0.245	0.662	23.10
	Rural	40	0.504	0.059	0.386	0.622	11.73

APPENDIX II: PERSONS INVOLVED IN THE SURVEY

Persons involved in the Energy for Rural transformation Survey

Steering Committee

- | | | |
|----|---------------------------|--|
| 1. | Ben Paul Mugyereza | DED/SP&D - UBOS/ Chair |
| 2. | Imelda Atai Musana | DBIS - UBOS |
| 3. | James Muwonge | DSES – UBOS |
| 4. | Eng. Henry Bidasala Igaga | Ass. Commissioner/ComponentCoordinator, ERT II- MEMD |
| 5. | Emmanuel Buringuriza | ERT II Co-coordinator - MEMD |
| 6. | Peter Opio | ERT Coordinator - UBOS – Secretary |

Technical Working Committee

- | | | |
|-----|-------------------------|--|
| 1. | Imelda Atai Musana | DBIS - UBOS/ Chair |
| 2. | Peter Opio | PST- UBOS/ERT Survey Coordinator |
| 3. | JB Musoke | SST- UBOS/Budget Operations |
| 4. | Byron Twesigye | Senior Officer – UBOS/Field Operations |
| 5. | Hamiidu Katikajjiira | Officer - Field Operations - UBOS |
| 6. | Peter Ntale | Senior Officer - Survey Designs - UBOS |
| 7. | Bridget Nabagereka | Electrical Engineer - MEMD |
| 8. | Emmanuel Nsubuga | Energy Officer - MEMD |
| 9. | Paul Okudi | Statistician - UBOS/ Secretary |
| 10. | Edward Baleke Ssekulima | Energy Officer-MEMD |

Authors/Editors

- 1 Angella Ecweikin
- 2 Alfred Geresom Musamali
- 3 Charles Adriko
- 4 Chriss Wabwire
- 5 Diana Byanjeru
- 6 Dick. W Wadada
- 7 Angela Kiconco
- 8 Paul Okudi
- 9 Dan Wagidoso
- 10 William Anguyo
- 11 John B. Musoke
- 12 George Kawase
- 13 Bateesa Kenneth

- 14 Hamiidu Katikajiira
- 15 Godfrey Mwesigye
- 16 Israel Wandwasi
- 17 Livingstone Kyasikane
- 18 EmmanuelMugisha Kyaragaire
- 19 James Ambayo
- 20 Bob Okua
- 21 Peter Opio
- 22 Peter Mwayafu
- 22 Ssenono Vicent
- 23 Godfrey Senteza Kajubi
- 24 Winnie Nankya Mulindwa
- 25 Anne Karungi

Field Listers

Surname	Other names
Mabonga	Victoria
Matsiko	Alex
Mugisha	Robert
Naherya	Morine
Nantume	Josephine K
Nanyonjo	Faridah
Nyaketcho	Hellen
Ojanduru	Lillian
Okuyo	Kennedy
Opolot	Eric
Oteba	Moses
Abalo	Christine
Akumu Adupa	Marion
Alanyo	Emily
Anyango	Luckia
Aremwaki	Pamela
Binze	Robert
Chandiru	Patricia M
Chemonges	Andrew
Faida	Rebeccah
Kayanga	Gloria
Maseya	Vincent
Mbowa	Joseph
Mudega	Michael
Mukwaya	Benjamin
Nabukwasi	Florence
Nalukenge	Catherine
Andrew	Okiru
Nalukenge	Silvia
Nyirabashittsi	Judith
Omeke	Samuel
Otim Joel	Andrew
Oyella	Peninah
Ssemwanga	Hassan
Busingye	Wycliff
Waseka	Allan K

Field Staff

A) Field Team Supervisors

Asiimwe Julius
Bidasala Anthony
Duhimbaze Abel
Jawoko Tonny
Jurua Moses
Kaima Sharon
Khanakwa Lydia
Kikanja Joseph

Nabwire Esther Ruth
Nalwoga Sarah
Nansereko Judith
Nansubuga Margret
Steven Eonyu Ekadu
Tabingwa Barbra
Tino Florence

B) Field Team Interviewers

Abwola Ben Franklin
Akaturunda Mooreen
Akimu Ramathan
Akoli Hilda Eunice
Akoth Beatrice
Alowo Eunice Evelyn
Apeduno Ruth
Apio Christine
Asaba Doreen
Birungi Joy
Bugembe Jerry
Busuulwa Julius
Edirumira Edward Eric
Isomet Francis
Itwau Deborah Faith
Kamuli Lydia
Katali Christine
Kateme Diana
Kibuuka Ambrose
Kifuko Diana
Kiine Nancy
Kikanja Joseph
Kiwauka John Baptist
Kugonza Nicholas
Kwiyocwiny Patience
Kyeyago Viola
Makkeni Jackson Gray
Mangeni David Rogers
Mogal Lydia
Mubiru Kizito
Mugoya Samuel

Mukama Paul
Mutambo Anthony
Nabirye Martha
Nabyala Maureen
Najjemba Florence
Nakalembe Eseza Mary
Nakasi Sumaya
Nakiranda Angella
Nakubulwa Irene
Nalwanga Kate
Namaweje Annet
Nansereko Judith
Namusana Sandra R
Ndahiro Bernard
Niwagira Andrew
Nyinokwikirira Sharon
Nyiramahoro Esther
Odwera Emmanuel
Okello Lamton Lawrence
Okullo Patrick-Louis
Olukor George
Opio Paul
Osujjo Emmanuel Francis
Tino Florence
Turinawe Obadia
Tuwape Juliet
Wabwire Dick Moses
Wabwire Mugudya Dauda
Wafula Peter Lawrence
Wakooli David

APPENDIX IV: SURVEY INSTRUMENTS