Malawi Energy Regulatory Authority

National Statistical Office

MALAWI ENERGY SURVEY REPORT

2012

National Statistical Office
P.O. Box 333,
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Preface

The Malawi Growth and Development Strategy (MGDS II) recognises that a well – developed and efficient energy system is vital for socio-economic development. In this respect increasing generation, transmission and distribution of electricity and other energy sources will lead to improved service delivery and increased output in the economy.

Malawi continues to face a number of challenges in the energy sector including inadequate capacity to generate electricity and logistical bottlenecks in liquid and gas fuels supplies. Lack of reliable power is a key constraint to development in Malawi. Limited access to modern energy services contributes to low economic activity, lower quality of life and deters new investments across the country, in particular affecting key sectors of mining and manufacturing.

This report is based on the Energy Survey 2012 that was conducted by the National Statistical Office (NSO) in collaboration with Malawi Energy Regulatory Authority (MERA) and other relevant stakeholders such as the Ministry of Energy; Ministry of Finance, Ministry of Economic Planning and Development; and the Electricity Supply Corporation of Malawi Limited (ESCOM). The survey was conducted with technical and financial support from MERA supported by technical working group comprising of the above mentioned organizations. The survey was motivated by the Malawi Growth and Development Strategy (MGDS) which recognises the energy sector as being a priority among priority areas to poverty reduction in Malawi.

Government will, therefore, continue to emphasize on improving and expanding electricity generation, transmission and distribution systems. In addition, government will improve the supply chain of liquid and gas fuels to meet the increasing demand.

CHIEF EXECUTIVE OFFICER

Acknowledgements

The National Statistical Office (NSO) and the Malawi Energy Regulatory Authority (MERA) would like to express its appreciation for the support and co-operation provided by several institutions and the general public during the preparations, field activities and report preparation of the Energy Survey 2012.

Our gratitude also goes to members of the Technical Working Group (TWG) which comprised of officials from NSO, MERA, Ministry of Energy; Ministry of Finance, Ministry of Economic Planning and Development; and the Electricity Supply Coorporation of Malawi Limited (ESCOM) for their invaluable contributions towards the implementation of the Energy Survey 2012.

We also acknowledge all the respondents who accepted to be interviewed, for sparing their time and whose responses were very useful in forming the basis for the analysis and conclusions regarding energy issues in Malawi. We appreciate the cooperation that was exercised by various officials from electricity and petroleum institutions that supported the processes by providing the relevant information was requested. We also extended our sincere appreciation to the survey enumerators for their commitment and courage which they showed during the entire period of survey, their hard work made the survey a great success.

Finally, we wish to recognize the great efforts by the Team Leader and his team in ensuring that all the stages of the survey activities were coordinated and implemented successfully.

Mercy Kanyuka (Mrs)

COMMISSIONER OF STATISTICS

Summary of Findings

Residential Energy Survey

The Energy Survey 2012 was a nationally representative survey that covered all districts in Malawi except Likoma. The survey covered 6,048 households in 378 enumeration areas. Data collection was done by 11 mobile teams comprising 1 supervisor, 4 enumerators and a driver under close supervision of senior officers from NSO, MERA, Ministry of Finance, Mimistry of Economic Planning and Development and Ministry of Energy. Field workwork took place from April to June 2012.

The Residential Survey reveals that:

- About 13 percent of the households in Malawi have electricity.
- About 81 percent of households use firewood for cooking or heating water and about 15 percent of the households use charcoal. Use of electricity connected to ESCOM for cooking or heating water was reported at about 19 percent in urban households and one percent in rural households;
- Eighty percent of those households without electricity reported that they intend to have electricity. About 87 percent of these households without electricity but intending to have were in urban while 79 percent were in rural areas;
- About 46 percent of households without electricity require electricity for lighting;
- On the fuel sourced from filling stations, aAbout 41 percent of the households get petrol for their petrol-run motor vehicle, about 20 percent get diesel for their motor vehicles and about 20 percent get paraffin for their lamps;
- About 62 percent of households pay less than or equal to K2 000 per month;
- About 74 percent use incandescent bulbs (magolobo) while about 25 percent of the households use energy saver bulbs; and
- Forty eight percent of the households use LED lamp as main source of lighting and less than one percent use electricity from generator.

The Institutional Electricity Survey

The Institutional Electricity Survey 2012 covered the whole country with teams visiting all the districts in Malawi except Likoma and collecting data from instituions with electricity. Five teams comprising a team leadr and four enumerators were deployed to the institutional electricity survey.

The Institutional Survey reveals that:

- Ninety eight percent of the institutions use ESCOM as the main source of power;
- Forty eight percent of institutions reported to own standby power generation;
- The average monthly consumption costs of electricity by industry is about K269 000;
- Seventy five percent of the institutions interviewed in all industries use diesel powered generators;
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- About 76 percent of the respondents have standby power generators running on diesel while 23 per cent use petrol run generators;
- The average monthly expenditure on standby generation by industry is about K210 000;
- The average electricity own-generated by institutions is 55 kWh in an hour and the average installed capacity for standby power generation is about 232 kWA;
- The net quantity of electricity generated by standby power is about 352 kVAs;
- The maximum demand of electricity generated by standby power is about 236 kVAs;
- Thirty one percent of the institutions that generate own electricity have an energy meter;
- About 27 percent of the institutions interviewed reported to be planning to purchase an electricity generating plant in the next five years;

- The average expected capacity required by those institutions planning to purchase electricity generating plants is about 280 kVAs;
- About 79 percent of the interviewed institutions reported that persistent blackouts is the main problem encountered;
- As the first source of information on possible energy saving measures, 40 percent mentioned press, 27 percent mentioned television and/or radio and 10 percent mentioned friends; and
- Lighting is the main use of electricity at 84 percent.

The Petroleum Institutional Survey

The Petroleum Institutional Survey was conducted by a team of senior officers from NSO and MERA after the completion of the data collection for the other 2 surveys. The team visited oil marketing companies to collect the data for the period 2007 to 2012.

The Petroleum Institutional Survey reveals that:

- The highest volume of petrol and diesel imports between 2007 and 2012 were recorded in 2010 about 120 million and 220 million respectively;
- Between 2007 and 2012 paraffin and jet A1 imports were at their highest in 2008 where about 18 million litres and 1.4 million litres were imported respectively;
- The country had the highest level of ethanol production in 2011 at about 12 million litres up from about 9 million the previous year.
- The country had the highest level of ethanol sales in 2011 at over 12 million litres up from about 7 million the previous year;

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Acronomys

EA	Enumeration Area
ESCOM	Electricity Supply Corporation of Malawi Limited
kVA	kilo Voltage Ampere
kWh	kiloWatts per hour
LED	Light Emitting Diode
MERA	Malawi Energy Regulatory Authority
MGDS	Malawi Growth and Development Strategy
MW	MegaWatts
NSO	National Statistical Office
TWG	Technical Working Group

Chapter 1

INTRODUCTION

1.1 Country Profile

Malawi is located in sub-Saharan Africa with an estimated area of 118,480 square kilometres. The country is bordered to the north and northeast by Republic Tanzania; to the east, south and southwest by the People's Republic of Mozambique; and to the west by the Republic of Zambia. According to 2008 Population and Housing Census Malawi has a population of about 13.1 million people and with an annual growth rate of 2.8 percent. The majority of the people reside in the southern region at 44.8 percent; the central has 42.1 percent with the northern region contributing 13.1 percent of the whole population.

1.2 Background

This report is based on the Energy Survey 2012 that was conducted by the National Statistical Office (NSO) in collaboration with Malawi Energy Regulatory Authority (MERA) and other relevant stakeholders such as the Ministry of Energy; Ministry of Finance, Ministry of Economic Planning and Development; and the Electricity Supply Corporation of Malawi Limited (ESCOM). The survey was conducted with technical and financial support from MERA supported by technical working group comprising of the above mentioned organisations. The survey was motivated by the Malawi Growth and Development Strategy (MGDS) which recognises the energy sector as being a priority among priority areas to poverty reduction in Malawi.

This was a nation-wide survey implying that the survey results are expected to estimate national figures. However, the information can also be presented at district, city/town level.

Malawi is currently facing major power shortages due to inadequate power generation, transmission and distribution capacity. This has led to continued power outages resulting in power rationing and persistent blackouts. The current installed generation capacity stands at 287 MW against an estimated demand of over 300 MW. The growth in demand is mainly attributed to industrialization and increased prospects in the mining sector, increased residential connections as well as increased agricultural productivity through increased pump fed irrigation. On the supply side, no major system expansion projects to support the increasing demand have been undertaken in the recent times. The Department of Economic Planning & Development projected demand is expected to increase to around 600 MW by 2015 (Malawi Economic Report 2011).

The ever increasing demand is exerting tremendous pressure on the existing power infrastructure to the extent that most businesses and residential premises have resorted to putting up diesel generators and other forms of generation to hedge against the negative impacts of frequent power cuts. There is therefore an urgent need to ascertain the actual demand for electricity by current users in order to inform proper planning and implementation of power development projects to cover the generation gap. Invariably, there is need to improve and expand the transmission and distribution systems.

In fulfilment of its mandate as entrenched in the Energy Laws 2004 and Energy Regulations By- Laws of 2009 which provide for the registration of all forms of private generation, MERA wanted to contextualize the level of both public and private generation in form base load, standby generation, co-generation and other forms of generation in Malawi as well as its impact on the electricity supply industry in Malawi.

Further, the exercise will also generate a register of private electricity generation installations in the country and the associated generation capacity facilitating the inspection on the safe operation and compliance to power supply standards.

MERA wanted to ascertain the actual demand for petroleum products by current users in the country in order to inform proper planning and implementation of fuel storage facilities to cover the supply gap. The study was to contextualize the levels of imports and demand for petroleum products by both public and private institutions and the available and storage capacity and how that impacts the fuel supply situation in the country. Further, the exercise was to also generate a register of operators in the fuel supply business with the aim of facilitating the inspection on the safe operation and compliance to liquid fuel supply standards and inform proper planning and implementation of investment projects in the fuel industry.

1.3 Purpose of the Study

The study was conducted in order to provide a comprehensive data set to assist MERA to contextualise the level of both public and private generation in form of base load, standby generation, co-generation and other forms of generation in Malawi as well as its impact on the electricity supply industry in Malawi.

The energy survey serves a broad set of applications on policy issues including:

- Provision of information on the country's power requirements, the current level of suppressed demand and the willingness to pay for electricity; and
- Provision of information on the country's fuel requirements, the current level of suppressed demand and desirable storage capacity to meet the country's 30 days stock holding without replenishing.

1.3.1 Specific objectives for Electricity Study

The electricity study was undertaken:

a) To determine the level or magnitude of both public and private generation (base load, standby generation and co-generation) taking place in Malawi;

b) To segment the identified activities in accordance with ownership, capacity, purpose\ user type and hours of operation and type of generation;

c) To identify any existing arrangement between the private generators and their other licensed alternative suppliers, their influence or possible influence on pricing signals;

d) For thermal power generation, to collect and compile data on amount of fuel used and the associated costs on a weekly, monthly and annual basis and the corresponding amount of electricity generated from the same.

e) For renewable energy, to identify and collect data on institutions (public or private) that use renewable energy such as solar, wind or hybrid systems indicating the level of generation capacity and use and the associated costs.

f) To determine the main use categories for electricity in terms of Heavy Industry, Medium size enterprises, small scale enterprises, Agriculture production, Agro-processing, Manufacturing, service sector and domestic categories.

g) Under domestic category, to identify main uses of electricity in form of domestic cooking, water heating and air conditioning apart from lighting.

h) To determine levels of use and number of customers per city, per district, per region, urban areas combined and rural areas combined.

1.3.2 Specific objectives for Petroleum Products Study

The petroleum products study was undertaken:

i) To determine monthly and annual imports of the petroleum products comprising petrol, diesel and paraffin, LPG, Jet, Avgas for the last five years;

ii) To determine the level of sales from importers to wholesalers on individual Oil Marketing Company basis for the last five years;

iii) To determine monthly and annual fuel ethanol production and determine the level of sales to wholesalers on individual Oil Marketing Company basis for the last five years;

iv) To determine the level of fuel sales from wholesalers to retailers and all other bulk fuel purchasers including construction projects, manufacturing industries, Transportation industry, Mining industry, Power generators, and estates among others;

v) To determine the existing storage capacity both public and private (in use and idle) and periodic throughput of fuel products from retail service stations for the past five years and establish the desirable level of storage

capacity to meet the 30 days stock holding for the country without replenishing;

vi) To determine the private storage capacity for all other bulk fuel purchasers including manufacturers, contractors, large estates and others;

vii) To determine the main use categories and associated costs and volumes for petroleum products such as construction industry, Transportation, Mining, Agriculture production, Agro-processing, Manufacturing, service sector, Power generation and domestic;

viii) To identify the main uses of petroleum products e.g., transportation, power generation and others; and

ix) To determine levels of use and number of fuel users by categories per city, per district, per region, urban areas combined and rural areas combined on a monthly and annual basis for the last five years and project for the next three years.

1.4 Methodology and Approach to the Study

A multi-sectoral approach to data collection was designed in order to meet the objectives of the study. The survey was designed to collect information from households using a structured questionnaire and from institutions using or generating electricity and those dealing with petroleum products.

1.4.1 Residential Survey

The Energy Survey covered all districts in Malawi except Likoma. Within each district a total of 12 enumeration areas (EAs) were selected with a purposive sampling of half of the EAs selected at the Boma and the other half randomly selected in the areas outside the Boma. Within each selected EA, a total of 16 households were selected for interviews. A listing exercise within each EA was undertaken to determine the actual households to be interviewed. Urban areas of Blantyre City, Lilongwe City, Zomba City and Mzuzu City were selected as separate districts. For Blantyre City and Lilongwe City 15 Eas were selected while for Zomba City and Mzuzu City 12 Eas were selected like the other districts. It was expected that a total of 6,048 households be interviewed during this survey *(see Table 1 below)*.

Table 1: Sample distribution of households

District	Eas	Hholds
Chitipa	12	192
Karonga	12	192
Rumphi	12	192
Mzimba	12	192
Mzuzu City	12	192
NkhataBay	12	192
Nkhotakota	12	192
Kasungu	12	192
Ntchisi	12	192
Dowa	12	192
Salima	12	192
Lilongwe	12	192
Lilongwe City	15	240
Mchinji	12	192
Dedza	12	192
Ntcheu	12	192
Balaka	12	192
Machinga	12	192
Mangochi	12	192
Zomba	12	192
Zomba City	12	192
Chiradzulu	12	192
Blantyre	12	192
Blantyre City	15	240
Phalombe	12	192
Mulanje	12	192
Thyolo	12	192
Mwanza	12	192
Neno	12	192
Chikwawa	12	192
Nsanje	12	192
Total	**378**	**6048**

1.4.2 Institutional Survey

Unlike the sampling that was done in the Residential Survey, the institutions dealing with petroleum supply chain and electricity supply, attempts were made to cover all the institutions producing or using electricity and those dealing with petroleum products and reporting is at national level. It was not possible to predetermine the exact number of such institutions and mobile teams were provided information from the NSO Business Information Register to identify the institutions for the survey.

1.5 Research tools development

1.5.1 Survey Questionnaires

Three types of survey questionnaires were developed through a consultative process by all the stakeholders in the survey and these were:

- Residential Energy Consumption Questionnaire
- Institutional Electricity Questionnaire
- Institutional Petroleum Questionnaire

The questionnaires are given in Appendix I

1.5.2 Enumerators manual

An Enumerators manual was developed for use during training and field work. The manual facilitated the following aspects:

- defined concepts used in the survey,
- discussed how to approach and identify households
- how questions should be asked
- listing and selection of households in the selected enumeration areas

1.5.3 Listing form

In each selected enumeration areas, the team was first required to list all households in the area from which a sample of 16 households were selected. A listing form was designed to facilitate the listing of all households in the selected EA. A copy of the listing form is given in Appendix II. The procedure used in listing the households in the EAs is detailed in the Enumerators Manual.

1.5.4 Random selection

After completing the listing of households in an enumeration area, the team leader was required to select 16 households systematically for the household interviews. A table of random numbers was provided to facilitate selection of a random start.

1.5.5 Team identification and recruitment

A total of 78 enumerators and 16 team leaders were identified for training. These comprised NSO permanent staff and temporary employees pooled from the existing list of NSO temporary enumerators. The group was initially trained as enumerators and during the training team leaders were identified.

1.5.6 Team orientation and training

The field staff was trained at Masuku Lodge in Zomba City from 2nd to 6th April 2012. The training was conducted by senior officials from NSO, MERA, Ministry of Energy and Ministry of Economic Planning and Development.

The training involved going through each question in the questionnaire and people agreeing to how the questions were to be asked. It was also during training that each and every question in the questionnaire was translated into Chichewa. This was done to improve understanding of the questions by the enumerators. Mock interviews and role play were used extensively during training.

1.5.7 Printing of enumeration area maps and questionnaires

The residential questionnaire and the individual questionnaire were printed by the NSO Printing Section. Printing materials were purchased and used to print residential questionnaires and institutional questionnaires for the field work. Digital maps from the 2008 Malawi Population and Housing Census for the selected 378 enumeration areas were printed by the Cartographic Section of the NSO.

1.5.8 Sensitisation and Awareness Campaign

An awareness campaign was conducted before the launch and during the survey period through print and electronic media. A jingle was developed by Zodiak Broadcasting Corporation and aired by local radios. The main objective of the campaign was to make the public, particularly the respondents, aware of the exercise, its usefulness and requested for their cooperation.

1.6 Fieldwork organisation and Data Collection

Eleven teams comprising a team leader and 4 enumerators were formed and deployed to conduct the residential survey. Five teams comprising a team leader and 4 enumerators were deployed to conduct the institution electricity survey and a team of senior officers from NSO and MERA conducted the Institution Petroleum Survey.

The data collection teams were jointly supervised by the survey management team throughout the field work period.

1.7 Data coding and entry

It was decided to have a centralized data entry operation at NSO. Ten data entry clerks were mobilized to undertake this exercise at NSO. The data entry started three weeks after the data collection had started. To facilitate the data capture and cleaning, in-house programs were developed using CS-Pro software. The data was then exported to SPSS for analysis and tabulation.

In the final analysis data is made available in both SPSS and STATA to enable users who are familiar with such packages be able to do further and in depth analyses.

Chapter 2

SURVEY RESULTS

2 Presentation of Survey Results

The results of the Energy Survey 2012 are presented in this report in three sections. The first part presents the Residential Energy component survey results, the second part presents the Electricity Institution component results and the third part presents the Petroleum Institutions component results.

2.1 Residential Energy Survey

The Energy Survey collected information on household's characterictics, household expenditure and housing which include tenure, type of construction materials, availability of electricity and petroleum usage at household level. Those households with electricity we looked at source, monthly cost, usage, the size of other sources of electricity. For those without electricity data was collected on their intentions to have electricity and the main reasons for having it. As for those who were not intending to have electricity data was collected on the reasons why they did not intend to have electricity. Data was also collected on petroleum usage at household level that included type of equipment, average running costs, main source of fuel and whether they managed to get the required quantity.

Table 2: Percentage distribution of households by house tenure and area of residence

	Area of residence		
	Urban	**Rural**	**Total**
Total	**100.0**	**100.0**	**100.0**
Owned	38.0	84.6	78.3
Rented	51.2	6.4	12.5
Free	5.3	4.6	4.7
Provided by Employer	5.3	4.2	4.3
Being Purchased	0.2	0.2	0.2

Table 2 shows the percentage distribution of households by house tenure and area of residence. Overall, housing ownership stands at about 78 percent at national

level. In the rural areas about 85 percent of houses are owned by the residents as compared to 38 percent in the urban areas. Rented houses accounted for about 51 percent in the urban areas compared to about 6 percent in the rural areas. Less than one percent of households live in houses that are in process of being purchased.

Table 3: Percentage distribution of households by highest educational qualification of household head

	Male	Female	Total
Total	**100.0**	**100.0**	**100.0**
None	59.4	79.7	64.6
Primary School Leaving Certificate	14.4	9.7	13.2
Junior Certificate of Education	10.6	4.0	8.9
Malawi School Certificate of Education	11.2	4.1	9.4
Diploma	2.5	1.6	2.3
Degree	1.3	0.6	1.1
Post graduate	0.5	0.2	0.5

Table 3 shows the percentage distribution of households by highest educational qualification of household head. Households' heads having no education qualification account for about 65 percent of all households at national level. About 59 percent of male headed households have no education as compared to about 80 percent for female headed households. About 14 percent of male headed households have primary school education as compared to about 10 percent for female headed households. The least percentage of households is those headed by postgraduate qualification holders for both the male and female headed households at less than one percent in both cases.

Table 4: Percentage distribution of dwelling units with electricity by highest educational qualification of the head of household

	Percent
Total	**12.8**
None	3.7
Primary School Leaving Certificate	9.8
Junior Certificate of Education	21.1
Malawi School Certificate of Education	41.7
Diploma	82.3
Degree	95.7
Post graduate	92.9

Table 4 shows the percentage distribution of dwelling units with electricity and the highest qualification of the head of household in the dwelling unit. Overall, 13 percent of households in Malawi have electricity. Dwelling units with the head of household having degree have the highest ownership of electricity at about 96 percent followed by those having post graduate qualification at about 93 percent. The least percentage (4 percent) of households with electricity is headed by those who have no educational qualification.

Table 5: Percentage distribution of households with electricity by district

District	Percent
Total	**12.8**
Chitipa	10.9
Karonga	3.4
Rumphi	12.5
Nkhata Bay	9.8
Mzimba	11.5
Mzuzu City	41.7
Kasungu	12.0
Ntchisi	3.1
Dowa	6.3
Nkhotakota	7.3
Salima	0.5
Dedza	9.4
Ntcheu	2.6
Lilongwe Rural	4.3
Lilongwe City	53.8
Mchinji	3.1
Balaka	5.2
Mangochi	0.5
Machinga	10.9
Zomba Rural	5.2
Zomba City	47.9
Chiradzulu	2.6
Blantyre City	59.4
Blantyre Rural	10.4
Mwanza	23.0
Thyolo	9.4
Mulanje	3.6
Phalombe	0.5
Chikwawa	9.3
Nsanje.	6.8
Neno	3.1

Table 5 shows percentage distribution of households with electricity by district. About 13 percent of the households in Malawi have electricity. Over half of the households in Blantyre and Lilongwe cities have electricity. The lowest proportions of households with electricity are reported in Salima, Mangochi and Phalombe at less than one percent.

Table 6: Percentage distribution of persons aged 10 years and above by economic activity and place of residence

	Urban	Rural
Total	**100.0**	**100.0**
Wage/Salaried Employee	25.2	6.5
Self-Employed/Business	19.7	9.2
Mlimi (subsistence farmer)	5.6	43.6
Student	36.3	30.3
Non Paid Family Business	2.6	1.3
None	10.7	9.1

Table 6 presents percentage distribution of persons aged 10 years and above by economic activity and place of residence. The results show that about 36 percent and 30 percent of persons aged 10 years and above are students in urban and rural areas, respectively. About 44 percent of the persons aged 10 years and above are mlimi in rural areas as compared to about 6 percent in urban.

Table 7: shows percentage distribution of households by age of the household head

Age of head	Percent
Total	**100.0**
Less than 15 years	0.3
15 - 24 years	7.8
25 - 64 years	82.0
65+ years	9.9

Table 7 shows percentage distribution of households by age of the household head. It can be noted that 82 percent of household heads are aged between 25 and 64 years.

Table 8: Percentage distribution of respondents aged 10 years and above by economic activity and age group

Age of head (years)	Mlimi	Self employed	Wage/salaried employees	Non Paid Family Business	Student	None	Total
All	**39.7**	**11.0**	**9.6**	**1.6**	**29.2**	**9.0**	**100**
10 -15	4.3	0.3	0.2	;0.3	84.8	10.1	**100**
15 - 24	33.6	7.5	5.5	1.3	37.4	14.6	**100**
25 - 64	56.7	18.3	16.4	2.3	1.0	5.3	**100**
65+	71.3	6.9	5.5	0.8	0.1	15.4	**100**

Table 8 shows percentage distribution of respondents aged 10 years and above by selected age group and economic activity. Overall, about 40 percent of the respondents are *Mlimi* (subsistence farmer). About 29 percent are students while 11 percent are self employed. Of those aged 10 to 15 years, about 85 percent are students. Of those aged 65 years and over, about 71 percent are *Mlimi* (subsistence farmer).

Table 9: Percentage Distribution of households by average monthly electricity cost and place of residence

	Total	Urban	Rural
Total	**100.0**	**100.0**	**100.0**
Less than or equal to K2000	62.1	53.8	71.4
K2001-K4000	23.6	26.3	20.5
K4001-K6000	8.4	11.4	5.0
K6001-K8000	1.5	2.2	0.8
K8001 and above	4.5	6.3	2.4

Table 9 shows percentage distribution of households by average monthly cost of electricity and place of residence. Overall, about 62 percent of households pay less than or equal to K2, 000 per month. About 5 percent pay over K8, 000 per month. Across place of residence, more households in the rural area (71 percent) pay less than K2, 000 per month compared to those in the urban areas (54 percent).

Table 10: Percentage of households by average cost of purchasing energy source at place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Below K10000	36.6	30.8	32.1
K10001-K20000	14.0	15.3	15.0
K20001- K30000	2.7	12.0	9.8
K30001-K40000	0.0	9.4	7.2
K40001 -K50000	7.2	9.5	9.0
K50001 and above	39.4	23.0	26.9

Table 10 indicates percentage of households by average cost of purchasing energy source at place of residence. Overall, about 32 percent of households spent less than K10, 000 while 27 percent spent over K50, 000. About 37 percent of households in urban area spent less than K10, 000 as compared to 31 percent in the rural areas. About 39 percent of households in urban area spent over K50, 000 as compared to 23 percent in the rural areas.

Table 11: Percentage distribution of households by number of bulbs being used and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Less than 5 bulbs	40.7	54.6	47.1
5-10 bulbs	34.3	33.3	33.8
11-15 bulbs	14.8	9.6	12.4
16-20 bulbs	4.8	1.9	3.5
More than 20 bulbs	5.5	0.6	3.2

Table 11 shows the percentage distribution of households by number of bulbs and place of residence. Overall, about 47 percent of households have less than 5 bulbs. About 55 percent of households having less than 5 bulbs are in urban area as compared to 41 percent in the rural areas. About 6 percent of households having more than 20 bulbs are in urban area as compared to about one percent in the rural areas.

Table 12: Percentage distribution of households by main type of bulbs used in the household and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Incandescent Bulbs (Magolobo)	68.4	79.7	73.5
Energy Savers	29.4	18.6	24.5
Florescent Tubes	2.2	1.7	2.0

Table 12 shows the percentage distribution of households by main type of bulbs used in the household and place of residence. Overall, about 74 percent use incandescent bulbs (magolobo) while about 25 percent of the households use energy saver bulbs. About 80 percent of households in the rural areas use incandescent bulbs (magolobo) compared to about 68 percent in the urban area. About 29 percent of households in the urban areas use energy saver bulbs compared to about 19 percent in the rural area.

Table 13: Percentage distribution of households by type of electrical installer used and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Qualified Electrician	75.8	48.3	63.1
Unqualified Individual	4.8	27.9	15.5
Certified Company	2.6	11.7	6.8
Don't know	16.8	12.0	14.6

Table 13 shows percentage distribution of households by type of electrical installer used and place of residence. Overall, about 63 percent of households used qualified electricians for installation of electricity while 15 percent used unqualified individual. About 7 percent of the households used certified companies. In urban areas about 76 percent used qualified electrician as compared to 48 percent in the rural areas.

Table 14: Percentage distribution of households by main source of energy for lighting and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Light Emitting Diodes (LED) lamp	16.5	52.9	48.0
Paraffin Lamp	11.4	18.9	17.9
Electricity connected to ESCOM	50.5	4.7	10.8
Inverter	1.8	11.0	9.7
Candles	18.6	3.5	5.6
Solar for photo voltaic	0.7	1.5	1.4
Electricity from Generator	0.1	0.3	0.3
None	0.4	7.3	6.4

Table 14 indicates percentage distribution of households by main source of energy for lighting and place of residence. Overall, 48 percent of the households use LED lamp as main source of lighting and less than one percent use electricity from generator. About 53 percent of households in rural areas use LED for lighting as compared to 17 percent in urban areas. About 51 percent of households in urban areas use electricity connected to ESCOM for lighting as compared to 5 percent in rural areas.

Table 15: Percentage distribution of households by average monthly cost of lighting and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Less or equal to K1000	65.9	95.0	92.6
K1001-K2000	25.7	3.7	5.5
K2001-K3000	6.1	0.7	1.1
Above K3000	2.4	0.6	0.7

Table 15 shows percentage distribution of households by average monthly cost of lighting and place of residence. Overall, about 93 percent of households spent less or equal to K1, 000 per month while less than one percent spent above K3, 000. In the rural areas about 95 percent of the households spent less or equal to K1, 000 as compared to 66 percent in the urban areas. In the urban areas about 2 percent of

the households spent over K3, 000 as compared to less than one percent in the rural areas.

Table 16: Percentage distribution of households by main source of energy for cooking\heating water and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Firewood	26.8	89.8	80.8
Charcoal	54.0	8.7	15.2
Electricity connected to ESCOM	19.2	1.1	3.7
Petroleum Gas	0.0	0.1	0.1
Electricity from generator	0.0	0.1	0.1
Paraffin	0.0	0.0	0.0
Other	0.0	0.2	0.1

Table 16 shows the percentage distribution of households and their main source of energy for cooking or heating water and place of residence. Overall, about 81 percent of households use firewood for cooking or heating water. About 15 percent of the households use charcoal. The least used energy sources reported by households were gas and electricity from generators at less than one percent.

Households in rural indicated firewood as their main source of energy for cooking or heating at about 90 percent as compared to 27 percent in urban areas. Fifty four percent of urban households reported charcoal as their main source of energy for cooking or heating water while in rural areas at about 9 percent. Use of electricity connected to ESCOM for cooking or heating water was reported at about 19 percent in urban households and one percent in rural households.

Table 17: Percentage distribution of households by main means of heating and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Firewood	25.9	59.9	53.3
Charcoal (Mbaula)	58.2	37.7	41.7
Electric Heaters	14.6	1.0	3.7
Insulated roof	0.4	0.1	0.2
Solar Photo Thermal	0.0	0.2	0.2
Other	0.8	1.1	1.1

Table 17 shows the percentage distribution of households and their main means of heating and place of residence. Overall, about 53 percent of households use firewood for heating. About 42 percent of the households use charcoal. The least means of heating reported by households were insulated roof and solar photo thermal at less than one percent.

Households in rural areas indicated firewood as their main means of heating at about 60 percent as compared to about 26 percent in urban areas. About 58 percent of households in urban areas reported charcoal as their main means of heating while in rural areas it was reported at about 38 percent. Use of electric heaters for heating was reported at about 15 percent in urban areas and one percent in rural areas.

Table 18: Percentage distribution of households by main means of cooling and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Fan	95.4	92.2	94.2
Air Conditioners	4.6	5.9	5.1
Insulated roof	0.0	2.0	0.7

Table 18 shows the percentage distribution of households and their main means of cooling and place of residence. Overall, about 94 percent of households use fan for cooling while 5 percent use air conditioners. The least means of cooling reported by households was insulated roof at about less than one percent.

Households in rural areas reported fan as their main means of cooling at about 92 percent compared to 95 percent in urban areas. About 6 percent of households in rural areas reported air conditioners as their main means of cooling while in urban areas it was reported at about 5 percent.

Table 19: Percentage distribution of households without electricity but intending to have electricity by place of residence

	Urban	Rural	Total
Intending to have electricity	87.1	79.0	79.6

Table 19 shows the percentage distribution of households without electricity but intending to have electricity by place of residence. Overall, 80 percent of these households reported to intend to have electricity.

About 87 percent of households without electricity but intending to have were in urban while 79 percent were in rural areas.

Table 20: Percentage distribution of households without electricity but intending to have electricity by usage and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Lighting	44.4	45.9	45.7
Lighting and Cooking	47.4	37.5	38.3
Lighting and heating	3.3	1.7	1.8
Other business activities	5.0	15.0	14.1

Table 20 shows the percentage distribution of households without electricity but intending to have electricity by usage and place of residence. Overall, about 46 percent of households require electricity for lighting. About 38 percent of the households require it for lighting and cooking while about 2 percent require electricity for lighting and heating.

About 46 percent of households in rural areas require electricity for lighting. The households that require electricity for lighting in urban areas was reported at about 44 percent. In urban households the intention to use electricity for lighting and cooking was reported at about 47 percent as compared to rural areas at about 38 percent. The need of electricity for lighting and heating was reported at about 3 percent in urban and about 2 percent in rural areas.

Table 21: Percentage distribution of households without electricity but intending to have electricity by district

District	Percentage
Total	**79.6**
Chitipa	71.5
Karonga	73.0
Rumphi	75.6
Nkhata Bay	93.9
Mzimba	62.7
Mzuzu City	78.6
Kasungu	89.6
Ntchisi	74.9
Dowa	84.2
Nkhotakota	89.4
Salima	76.2
Dedza	85.7
Ntcheu	87.8
Lilongwe Rural	72.7
Lilongwe City	93.5
Mchinji	85.1
Balaka	73.5
Mangochi	69.5
Machinga	66.9
Zomba Rural	84.4
Zomba City	86.4
Chiradzulu	85.4
Blantyre City	90.3
Blantyre Rural	84.3
Mwanza	93.3
Thyolo	77.2
Mulanje	61.1
Phalombe	88.0
Chikwawa	83.9
Nsanje	57.8
Neno	91.9

Table 21 presents percentage distribution of households without electricity but intending to have electricity by district. Overall, about 80 percent of the households without electricity are intending to have electricity.

Over 90 percent of the households without electricity in Nkhatabay, Blantyre city, Mwanza and Neno are intending to have electricity. In all the remaining districts over half (50 percent) of the households without electricity are intending to have electricity.

Table 22: Percentage distribution of households without electricity but not intending to have electricity by reason and place of residence

	Urban	Rural	Total
Total	**100.0**	**100.0**	**100.0**
Cannot afford	64.2	77.5	76.8
Not available in the area	20.8	16.2	16.4
Complications to get connected	0.0	0.8	0.7
Other	13.1	2.8	3.3
No reason	1.9	2.8	2.7

Table 22 shows the percentage distribution of households without electricity but not intending to have electricity by reason and place of residence. Overall, about 77 percent of households reported that they cannot afford. About 16 percent reported that they cannot have electricity because it is not available in the area while about one percent indicated complications to get connected.

About 78 percent of households in rural areas reported that they cannot afford as compared to about 64 percent in urban areas. Less than one percent of households in rural and urban areas reported complications to get connected.

Table 23: Percentage distribution of households by ownership of equipment /appliances by period in urban area

	Daily	Weekly	Monthly	Rarely	Total
Total	**50.4**	**10.5**	**8.0**	**31.1**	**100**
Paraffin Lamp	45.2	3.4	6.2	45.2	**100**
Petro-run Motor Vehicle	71.1	14.4	6.2	8.3	**100**
Diesel-run Motor Vehicle	65.3	14.3	10.2	10.2	**100**
Gas Cooker/stove	14.3	21.4	7.1	57.2	**100**
Lawn Mower	0.0	0.0	0.0	100.0	**100**
Petro-run Generator	0.0	43.8	6.2	50.0	**100**
Diesel-run Generator	0.0	0.0	33.3	66.7	**100**
Motor Bike	77.8	11.1	0.0	11.1	**100**
Paraffin Refrigeration	50.0	0.0	0.0	50.0	**100**
Other items	28.6	14.3	14.2	42.9	**100**

Table 23 shows the percentage distribution of households by ownership of equipment /appliances and usage in urban. Overall, about 50 percent of households use equipment/appliances running on petroleum products on daily basis. About 31 percent of the households rarely use equipment/appliances running on petroleum products. About 11 percent of the households use equipment/appliances running on petroleum products as compared to 8 percent of the household running petroleum products on monthly basis.

Table 24: Percentage distribution of households by ownership of equipment /appliances by period in rural area

	Daily	Weekly	Monthly	Rarely	Total
Total	**51.2**	**5.9**	**4.4**	**38.5**	**100**
Paraffin lamp	53.2	4.4	4.1	38.3	100
Petro-run generator	9.8	25.5	7.8	56.9	100
Petro-run motor vehicle	35.6	24.4	6.7	33.3	100
Gas lighter	35.7	0.0	14.3	50.0	100
Motor Bike	42.9	7.1	11.9	38.1	100
Maize-mill	83.4	8.3	8.3	0.0	100
Paraffin Refrigeration	44.4	5.6	5.6	44.4	100
Diesel-run motor vehicle	52.6	21.1	0.0	26.3	100
Diesel-run Generator	27.2	36.4	0.0	36.4	100
Gas Cooker/stove	20.0	0.0	0.0	80.0	100
Engine Boat	50.0	25.0	0.0	25.0	100
Other items	36.4	27.2	0.0	36.4	100

Table 24 shows the percentage distribution of households by ownership of equipment /appliances and usage in rural. Overall, about 51 percent of households use equipment/appliances running on petroleum products on daily basis. About 39 percent of the households rarely use equipment/appliances running on petroleum products. About 6 percent of the households use equipment/appliances running on petroleum products as compared to 4 percent of the household running petroleum products on monthly basis.

Table 25: Percentage of average monthly running cost of major household appliances by households in the urban areas

	Less than K2000	K2001-K4000	K4001-K6000	K6001-K8000	K8001 & above	
Total	**71.8**	**11.2**	**3.7**	**2.9**	**10.4**	**100**
Diesel-run Generator	60.0	20.0	0.0	0.0	20.0	**100**
Diesel-run motor vehicle	25.0	22.9	6.3	8.3	37.5	**100**
Engine Boat	0.0	0.0	0.0	0.0	100.0	**100**
Gas Cooker/stove	83.3	0.0	16.7	0.0	0.0	**100**
Gas lighter	100.0	0.0	0.0	0.0	0.0	**100**
Lawn Mower	57.1	28.6	14.3	0.0	0.0	**100**
Maize-mill	50.0	0.0	0.0	25.0	25.0	**100**
Motor Bike	75.0	12.5	6.3	0.0	6.3	**100**
Other items	100.0	0.0	0.0	0.0	0.0	**100**
Paraffin Lamp	100.0	0.0	0.0	0.0	0.0	**100**
Paraffin Refrigeration	100.0	0.0	0.0	0.0	0.0	**100**
Petrol-run Generator	40.0	28.0	12.0	16.0	4.0	**100**
Petrol-run MV	30.1	30.1	8.7	4.9	26.2	**100**

Table 25 shows the average monthly running cost of major household appliances by households in urban areas. Overall, about 72 percent of households owning appliances spent less than K2, 000 per month. About 10 percent of the households spent more than K8, 001 per month.

Table 26: Percentage of average monthly running cost of major household appliances by households in the rural areas

	Less than K2000	K2001-K4000	K40001-K6000	K6001-K8000	K8001 & above	
Total	**91.9**	**2.8**	**1.3**	**1.0**	**3.1**	**100**
Diesel-run Generator	75.0	12.5	0.0	0.0	12.5	**100**
Diesel-run MV	26.9	0.0	3.9	7.7	61.5	**100**
Engine Boat	0.0	33.3	33.3	0.0	33.3	**100**
Gas Cooker/stove	60.0	0.0	20.0	0.0	20.0	**100**
Gas lighter	100.0	0.0	0.0	0.0	0.0	**100**
Lawn Mower	57.1	28.6	14.3	0.0	0.0	**100**
Maize-mill	33.3	33.3	0.0	8.3	25.0	**100**
Motor Bike	66.7	18.5	3.7	3.7	7.4	**100**
Paraffin Lamp	99.3	0.4	0.3	0.0	0.0	**100**
Paraffin Refrigeration	100.0	0.0	0.0	0.0	0.0	**100**
Petrol-run Generator	46.7	23.3	13.3	13.3	3.3	**100**
Petrol-run MV	22.0	26.0	10.0	10.0	32.0	**100**
Other items	88.9	0.0	0.0	0.0	11.1	**100**

Table 26 shows the average monthly running cost of major household appliances by households in rural areas. Overall, about 92 percent of households owning appliances spent less than K2, 000 per month. About 3 percent of the households spent more than K8, 001 per month.

Table 27: Percentage distribution of households by ownership of equipment /appliances and place of residence

	Urban	Rural	Total
Total	**15.7**	**84.3**	**100**
Diesel-run Generator	21.4	78.6	100
Diesel-run motor vehicle	72.1	27.9	100
Engine Boat	0.0	100.0	100
Gas Cooker/stove	73.7	26.3	100
Gas lighter	6.7	93.3	100
Lawn Mower	100.0	0.0	100
Maize-mill	20.0	80.0	100
Motor Bike	17.7	82.3	100
Other items	36.8	63.2	100
Paraffin Lamp	8.8	91.2	100
Paraffin Refrigeration	10.0	90.0	100
Petrol-run Generator	23.9	76.1	100
Petrol-run motor vehicle	68.3	31.7	100

Table 27 shows percentage distribution of households by ownership of equipment /appliances and place of residence. About 72 percent own diesel-run motor vehicles are in urban areas as compared to 28 percent. About 68 percent own petrol-run motor vehicles are in urban areas as compared to about 32 percent of households in rural areas. About 91 percent of households in rural areas own paraffin lamp while about 9 percent are in the urban areas.

Table 28: Percentage distribution of households by source of fuel by appliance/equipment used in the urban areas

	Filling station	Gas retailers	Informal markets	Total
Total	**100.0**	**100.0**	**100.0**	**100.0**
Petrol-run motor vehicle	40.9	0.0	1.4	25.1
Diesel-run motor vehicle	20.0	0.0	1.4	12.7
Paraffin Refrigeration	0.4	0.0	0.7	0.5
Gas Cooker/stove	0.4	92.3	0.7	3.6
Maize-mill	1.3	0.0	0.0	0.8
Motor Bike	3.9	0.0	0.0	2.3
Gas lighter	0.0	7.7	0.0	0.3
Diesel-run Generator	1.3	0.0	0.0	0.8
Lawn Mower	3.0	0.0	0.0	1.8
Paraffin Lamp	19.6	0.0	94.4	46.3
Petrol-run generator	7.0	0.0	0.0	4.1
Other items	2.2	0.0	1.4	1.8

Table 28 shows percentage distribution of households by source of fuel by appliance/equipment used in the urban areas. On fuel sourced from filling stations, about 41 percent of the households get petrol for their petrol-run motor vehicle, about 20 percent get diesel for their motor vehicles and about 20 percent get paraffin for their lamps. From gas retailers, about 92 percent of the households get gas for their cookers/stoves. From informal markets, about 94 percent get paraffin for their lamps.

Table 29: percentage distribution of households by source of fuel by appliance/equipment used in the rural area

	Filling station	Gas retailers	Informal markets	Total
Total	**100.0**	**100.0**	**100.0**	**100.0**
Paraffin Lamp	69.4	38.5	93.5	88.9
Gas Cooker/stove	0.3	30.8	0.0	0.2
Petrol-run Generator	7.1	7.7	1.4	2.5
Petro-run motor vehicle	9.2	0.0	0.6	2.2
Gas lighter	0.8	7.7	0.6	0.7
Motor Bike	4.7	0.0	1.5	2.0
Diesel-run motor vehicle	3.7	0.0	0.3	0.9
Diesel-run Generator	1.6	0.0	0.3	0.5
Paraffin Refrigeration	0.5	0.0	1.0	0.9
Maize-mill	1.3	0.0	0.4	0.5
Engine Boat	0.8	0.0	0.1	0.2
Other items	0.8	15.4	0.4	0.5

Table 29 shows percentage distribution of households by source of fuel by appliance/equipment used in the rural areas. On fuel sourced from filling stations, about 69 percent of the households get paraffin for their lamps, about 9 percent get petrol for their motor vehicles and about 7 percent get petrol for their generators. From gas retailers, about 39 percent of the households get paraffin for their lamps, about 31 percent get gas for their cookers/stoves and about 8 percent get petrol for generators and 8 percent get gas for their lighters. From informal markets, about 94 percent get paraffin for their lamps, about 2 percent get petrol for their motorbikes, about one percent get petrol for their generators and one percent get paraffin for their refrigerators.

2.2 Electricity Institutional Results

The electricity institution survey collected data on background characterictics of institutions and electricity users. Under background characterictics of institutions data was collected on industrial classification, availability and main use of electricity, if the institution had own generation type of generation, primary source of generation and related cost and how much electricity was own generated.

On electricity users data was collected on use of electricity, monthly consumption levels, monthly costs, problems encountered by institutions and how they dealt with the problem.

Table 30: Distribution of institutions by industrial classification

	Number	Percent
TOTAL	**1 066**	**100.0**
Public Services	440	41.3
Hotels, Lodges and Restaurants	141	13.2
Manufacturing	100	9.4
Agriculture	82	7.7
Financial Institutions (Banking, Insurance	78	7.3
Distribution (Wholesale and Retail)	74	6.9
Transport and Communications	60	5.6
Agro-Processing	51	4.8
Construction	22	2.1
Electricity and Water	14	1.3
Mining and Quarrying	4	0.4

Table 30 above shows the distribution of interviewed institutions by their industrial classification. Overall, there were a total of 1,066 institutions that were interviewed. Of these, the highest proportion of interviewed institutions was from the public service representing about 41 percent. This was followed by hotels, lodges and restaurants recording about 13 percent. The least number of institutions interviewed was in the mining and quarrying sector accounting for less than 1 percent.

Table 31: Number of employees by industry

	Male	%	Female	%	All	%
TOTAL	**85 371**	**53.0**	**75 570**	**47.0**	**160 941**	**100.0**
Public Services	37 325	52.0	34 460	48.0	71 785	**44.6**
Construction	14 065	55.9	11 090	44.1	25 155	**15.6**
Agriculture	8 623	40.8	12 525	59.2	21 148	**13.1**
Transport and Communications	3 648	23.4	11 961	76.6	15 609	**9.7**
Manufacturing	7 940	86.0	1 292	14.0	9 232	**5.7**
Agro-Processing	5 531	88.4	729	11.6	6 260	**3.9**
Hotels, Lodges and Restaurants	3 060	68.4	1 415	31.6	4 475	**2.8**
Financial Institutions (Banking, Insurance	2 539	62.7	1 511	37.3	4 050	**2.5**
Distribution (Wholesale and Retail)	1 612	83.4	322	16.6	1 934	**1.2**
Electricity and Water	691	74.9	232	25.1	923	**0.6**
Mining and Quarrying	337	91.1	33	8.9	370	**0.2**

Table 31 above shows the distribution of employees in the interviewed institutions by sex and sector. As may be noted above, the highest proportion of employees was recorded in the public service (45 percent) followed by those recorded in the construction industry at 16 percent. Mining and quarrying, and electricity and water recorded the least proportion of employees (less than one percent each).

Overall, the share of male employees is 53 percent with the remaining 47 percent being females. Of the employees in the public service, 52 percent are male while the remaining 48 percent are females. The highest share of male employees was recorded in the mining and quarrying sector registering 91 percent while the least share of male employees was registered in transport and communication registering 23 percent. On the other hand, the highest share of female employees was recorded in the transport and communication sector registering 77 percent.

Table 32: Employment projections over the next two years by industry

	Decline	%	Remain the same	%	Increase	%	Don't know	%	Total
Public Services	47	10.7	100	22.7	270	61.4	23	5.2	440
Hotels, Lodges and Restaurant	17	12.1	43	30.5	78	55.3	3	2.1	141
Manufacturing	12	12.0	35	35.0	42	42.0	11	11.0	100
Agriculture	14	17.1	20	24.4	41	50.0	7	8.5	82
Financial Institution	6	7.7	19	24.4	48	61.5	5	6.4	78
Distribution (Wholesale)	10	13.5	29	39.2	28	37.8	7	9.5	74
Transport and Communication	13	21.7	13	21.7	31	51.7	3	5.0	60
Agro-Processing	4	8.0	24	48.0	20	40.0	2	4.0	50
Construction	0	0.0	4	18.2	15	68.2	3	13.6	22
Electricity and Water	2	14.3	2	14.3	9	64.3	1	7.1	14
Mining and Quarrying	0	0.0	2	50.0	2	50.0	0	0.0	4
Total	**125**	**11.7**	**291**	**27.3**	**584**	**54.8**	**65**	**6.1**	**1 065**

Table 32 above shows the employment projections for the industrial groups. Overall, about 55 percent of the interviewed institutions expected an increase in the number of employees over the next two years. The highest number of institutions that reported expecting an increase in the number of employees was in the construction sector at 68 percent followed by those in the electricity and water at 64 percent. Institutions in the transport and communication and agriculture sectors reported expecting a decline in the number of employees

About 61 percent of public institutions expected an increase in the number of employees in the next two years. About 23 percent expressed that there would be no change. In construction industry about 68 percent of the institutions indicated that the employment would increase.

Table 33: Main source of electricity for institutions

	Number	Percent
ESCOM	1 043	98.1
Own-generated	20	1.9
Total	**1 063**	**100.0**

Table 33 presents results on the main source of electricity for the institutions that reported to have electricity. Majority of the institutions indicated ESCOM as the main source of electricity at 98 per cent while 2 per cent reported to generate own electricity.

Table 34: Proportion of institutions having standby power supply by industrial classification

	Percent
Total	**47.7**
Mining and Quarrying	75.0
Financial Institutions (Banking, Insurance	71.8
Distribution (Wholesale and Retail)	63.5
Hotels, Lodges and Restaurants	62.0
Transport and Communications	58.3
Agriculture	48.1
Public Services	40.0
Construction	36.4
Electricity and Water	35.7
Manufacturing	35.4
Agro-Processing	30.0

Table 34 shows the proportion of institutions with standby power supply by their industrial classification. Overall, 48 percent of institutions reported to own standby power generation. The results further indicate that in the mining and quarrying industry 75 percent of institutions own standby power supply followed by the Financial Institutions at about 72 percent. The Agro-processing industry reported the lowest (30 percent) ownership of standby power supply. These results are depicted in Figure 1.

Figure 1: Proportion of institutions owning standby power supply by industry

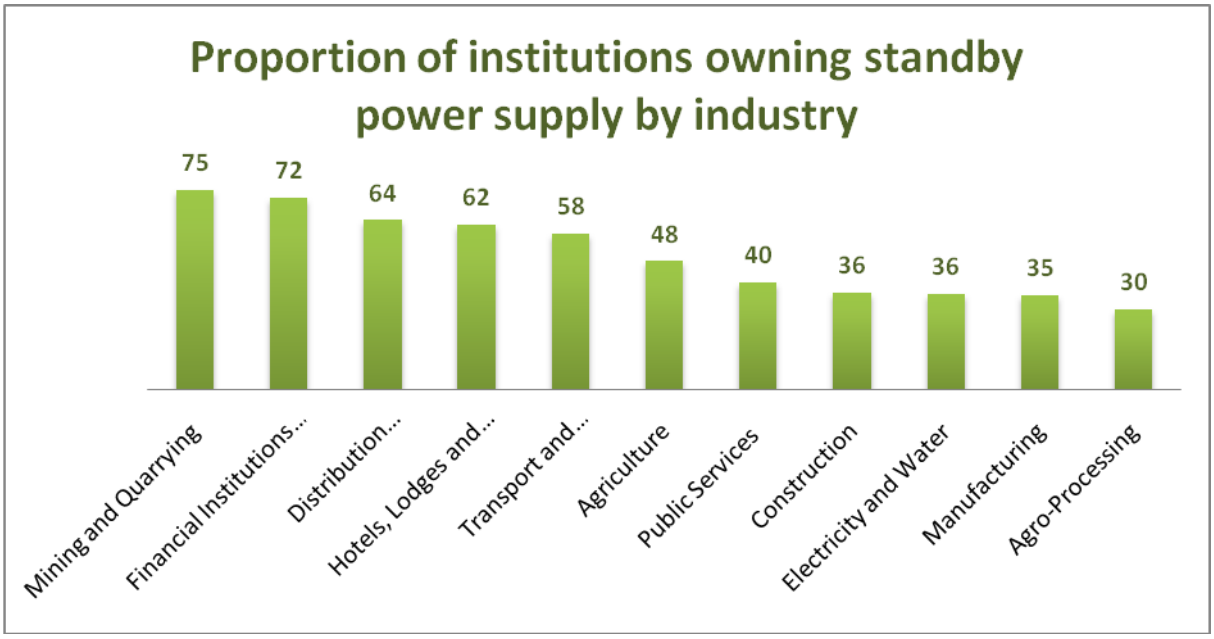

Table 35: Type of electricity generation by institutions reporting to own standby power generation by industry

	Diesel Generator	Petrol Generator	Solar	Biomass	Other	ALL
Total	**74.7**	**23.5**	**0.8**	**0.2**	**0.8**	**100**
Manufacturing	94.4	2.8	0.0	2.8	0.0	100
Agro-Processing	87.5	12.5	0.0	0.0	0.0	100
Transport and Communications	85.7	11.4	0.0	0.0	2.9	100
Agriculture	82.5	17.5	0.0	0.0	0.0	100
Financial Institutions (Banking, Insurance	82.1	16.1	0.0	0.0	1.8	100
Electricity and Water	80.0	20.0	0.0	0.0	0.0	100
Construction	75.0	25.0	0.0	0.0	0.0	100
Public Services	71.5	26.8	1.7	0.0	0.0	100
Distribution (Wholesale and Retail)	68.1	27.7	0.0	0.0	4.3	100
Mining and Quarrying	66.7	33.3	0.0	0.0	0.0	100
Hotels, Lodges and Restaurants	61.8	37.1	1.1	0.0	0.0	100

Table 35 shows type of electricity generation by institutions that reported to own standby power supply. The table indicates that a significant proportion (75 percent) of the institutions in all industries use diesel powered generators. This is followed by petrol generation reported by 24 percent of the institutions. Biomass electricity

generation is the least reported at less than one percent. Across industries, institutions in the manufacturing sector reported the highest proportion (94 percent) using diesel generation followed by agro-processing at 88 percent.

Table 36: Percentage distribution of institutions with standby power supply by source of fuel used and units of measurement

	Diesel	Petrol	Bagasse	Solar	Total
Total	**75.7**	**23.3**	**0.2**	**0.8**	**100**
Litres	76.4	23.6	0.0	0.0	100
Tonnes	0.0	0.0	100.0	0.0	100
Solar	0.0	0.0	0.0	100.0	100

Table 36 shows the distribution of institutions with standby power supply by type of fuel and unit of measurement. The survey results show that about 76 percent of the respondents have standby power generators running on diesel while 23 per cent use petrol run generators. Only 0.8 per cent and 0.2 per cent of surveyed institutions generate own standby power using solar and bagasse, respectively.

Table 37: Average monthly expenditure on standby electricity generation by industry

	Average (MK)
Total	**210 838**
Construction	1 513 457
Financial Institutions (Banking, Insurance)	372 091
Electricity and Water	269 816
Agro-Processing	266 363
Manufacturing	256 360
Public Services	191 221
Agriculture	147 987
Hotels, Lodges and Restaurants	145 941
Mining and Quarrying	127 346
Transport and Communications	112 490
Distribution (Wholesale and Retail)	68 811

Table 37 indicates that of the interviewed institutions, the average monthly expenditure on standby generation is about K210, 000. Across industries, construction industry has the highest monthly average expenditure (MK1.5 million) on standby electricity generation. The second are financial institutions (Banking, Insurance etc) followed by electricity and water and agro-processing industries. Distribution (Wholesale and Retail) registered the lowest average monthly expenditure of MK69, 000 on standby generations.

Table 38: Reasons for generating own electricity

	Percent
Standby (When there is blackout)	85.0
Base load (Continuous use)	13.6
Co-generation (Supplementary to regular supply)	1.4
Total	**100.0**

Table 38 shows that 85 percent of the institutions reported that they generate their own electricity when there is black out (standby). About 14 percent of the industries generate own electricity as base load (continuous use). About one percent of the industries in the survey use co-generation.

Table 39: Average electricity own-generated by institutions

	kWh
Total	**55.0**
Agro-Processing	438.1
Transport and Communications	169.4
Manufacturing	101.0
Mining and Quarrying	54.2
Distribution (Wholesale and Retail)	33.2
Agriculture	27.0
Public Services	23.7
Hotels, Lodges and Restaurants	20.7
Electricity and Water	18.6
Financial Institutions (Banking, Insurance)	4.7
Construction	1.1

Institutions in the survey were asked on the average hourly amount of electricity they generating. Overall, the average electricity own-generated by institutions is 55 kWh. Across sectors, agro-processing produces the highest (438 kWh). This is followed by those institutions in the transport and communication sector producing 169 kWh. Institutions in the construction sector produce the lowest electricity of about one kWh.

Table 40: Average installed capacity for standby power generation

	kVA
Total	**232.8**
Mining and Quarrying	2 532.9
Construction	1 103.7
Manufacturing	593.1
Agro-Processing	215.0
Hotels, Lodges and Restaurants	210.3
Financial Institutions (Banking, Insurance)	201.6
Public Services	192.2
Electricity and Water	148.9
Distribution (Wholesale and Retail)	106.7
Transport and Communications	105.1
Agriculture	88.2

The survey further inquired the total installed capacity for those institutions reporting to have a standby power supply. Table 40 shows that overall, the average installed capacity for standby power generation is about 230 kVAs. Across industries, mining and quarrying have the highest installed capacity at 2, 533 kVAs followed by construction sector at 1, 104 kVAs. The lowest installed capacity for standby power generation is in the agriculture sector at about 88 kVAs.

Table 41: Net quantity of electricity generated

Sector	Mean (net_kVa)	Sum(net_kVa)
Total	**352.2**	**180 653.7**
Hotels, Lodges and Restaurants	824.0	74 156.3
Public Services	247.2	44 246.3
Transport and Communications	792.9	27 752.1
Manufacturing	427.9	15 405.1
Financial Institutions (Banking, Insurance	118.0	6 610.2
Distribution (Wholesale and Retail)	85.9	3 953.5
Agro-processing	177.4	2 661.0
Agriculture	62.8	2 511.4
Construction	229.5	18 36.3
Mining and Quarrying	420.0	1 260.0
Electricity and Water	52.3	261.5

The survey asked institutions that have standby power supply to indicate the net quantity of electricity they generate. Overall, the net quantity of electricity generated is about 352 kVAs. The highest net quantity of electricity generated is reported in the hotels, lodges and restaurants sector at 824 kVAs followed by transport and communications sector at 793 kVAs. The lowest net quantity has been reported by institutions in the electricity and water sector (52 kVAs).

Table 42: Maximum demand of electricity

Sector	Mean (net_kva)	Sum(net_kva)
Total	**236.1**	**94 914.7**
Hotels, lodges and Restaurants)	468.8	33 286.2
Public Services	168.4	24 922.2
Manufacturing	513.3	15 397.8
Financial Institutions (Banking, Insurance	163.7	6 877.0
Agro-processing	210.8	2 951.7
Agriculture	79.8	2 711.6
Transport and Communications	80.0	2 479.8
Distribution (Wholesale and Retail)	124.0	2 355.0
Construction	286.6	1 719.5
Mining and Quarrying	800.0	1 600.0
Electricity and Water	122.8	614.0

Apart from the installed capacity and net quantity of electricity generated, the institutions with standby power supply were asked on the maximum demand of electricity for their institution. Overall, the maximum demand is about 236 kVAs. Across sectors, the highest demand is reported in the mining and quarrying sector at 800 kVAs followed by manufacturing at about 513 kVAs. Institutions in the agriculture sector and those in the transport and communications sector have reported the lowest maximum demand of electricity at about 80 kVAs.

Table 43: Proportion of institutions generating own electricity and whether they have an energy meter

	Percent
Total	**30.9**
Agro-Processing	53.3
Transport and Communications	37.1
Financial Institutions (Banking, Insurance	35.1
Public Services	34.4
Mining and Quarrying	33.3
Manufacturing	33.3
Hotels, Lodges and Restaurants	27.8
Agriculture	25.0
Electricity and Water	20.0
Distribution (Wholesale and Retail)	15.2
Construction	0.0

Table 43 shows that overall, 31 percent of the institutions that generate own electricity have an energy meter. Slightly over half (53 percent) of institutions surveyed in agro-processing have energy meters. Slightly over one third of the respondents in Transport and Communications (37 percent), Financial Institutions (35 percent), Public Services (34 percent), Mining and Quarrying (33 percent) and Manufacturing institutions (33 percent) have energy meters. No institution in the construction industry reported to have an energy meter.

Table 44: Number of hours per day electricity generating machine is run

Total	**5.8**
Mining and Quarrying	13.0
Manufacturing	10.4
Public Services	6.7
Agro-Processing	6.1
Agriculture	6.0
Financial Institutions (Banking, Insurance)	5.5
Transport and Communications	5.4
Construction	4.3
Electricity and Water	4.0
Hotels, Lodges and Restaurants	3.7
Distribution (Wholesale and Retail)	2.5

Table 44 shows the number of hours that an electricity generating machine run in a day. Overall, electricity generating machines run for about 6 hours in a day. However, machines in the mining and quarrying sector run for the highest number of hours in a day (13 hours) followed by those in the manufacturing sector running for about 10 hours. The power generating machines in the distribution sector run for the shortest time in a day at about 3 hours.

Table 45: Proportion of institutions planning to purchase electricity generating plants in the next 5 years

	Percent
Total	**26.7**
Mining and Quarrying	100.0
Agro-Processing	53.3
Hotels, Lodges and Restaurants	36.4
Public Services	31.1
Agriculture	20.5
Electricity and Water	20.0
Transport and Communications	20.0
Manufacturing	19.4
Financial Institutions (Banking, Insurance)	14.5
Construction	14.3
Distribution (Wholesale and Retail)	11.1

Table 45 shows that about 27 percent of the institutions interviewed reported to be planning to purchase an electricity generating plant in the next five years. All the interviewed institutions in the mining and quarrying sector reported to be planning to purchase electricity generating plants in the next five years. This is followed by those institutions in the agro-processing sector as reported by 53 percent of institutions in this sector. In the hotels, lodges and restaurants 36 percent reported to be planning to purchase electricity generating plants. The least group of institutions planning to purchase electricity generating plants in the next five years was recorded in the distribution sector (11 percent).

Table 46: Expected capacity of standby power generation to be purchased

Sector	Mean (Expected kVA)	Sum (Expected kVA)
Total	**278.8**	**30 383.5**
Hotels, lodges and Restaurants	426.0	12 353.5
Public Services	155.1	7 134.3
Agro-processing	474.1	3 319.0
Mining and Quarrying	1 760.0	1 760.0
Manufacturing	415.0	1 660.0
Agriculture	221.1	1 326.7
Transport and Communications	180.3	1 262.0
Financial Institutions (Banking, Insurance	165.5	993.0
Distribution (Wholesale and Retail)	237.5	475.0
Construction	100.0	100.0
Electricity and Water	0.0	0.0

Table 46 above shows the total capacity required by those institutions planning to purchase electricity generating plant. Overall, the expected power to be purchased is about 280 kVAs. Across sectors, the highest plans to purchase additional power is reported in the mining and quarrying sector at 1,760 kVAs followed by Agro-processing at about 474 kVAs. Institutions in the Electricity and Water sector have reported to have no plans to purchase power.

Table 47: Average monthly electricity consumption cost by industry

Sector	Mean Cost MK)
Total	**269 260**
Public Services	170 110
Electricity and Water	1 393 220
Mining and Quarrying	1 482 030
Agro-processing	271 790
Hotels, lodges and Restaurants)	227 250
Agriculture	237 840
Manufacturing	688 300
Financial Institutions (Banking, Insurance	279 090
Distribution (Wholesale and Retail)	155 530
Transport and Communications	119 250
Construction	542 510

Table 47 shows the average monthly electricity consumption costs by industry. Overall, the average monthly consumption cost of electricity is about K269, 000. The highest average monthly consumption cost of electricity was reported in the mining and quarrying sector recorded at about K1.5 million. This was followed by the electricity and water sector recording about K1.4 million. The least average monthly consumption cost was reported in the transport and communications sector recording about K119, 000.

Table 48: Main problem encountered by institutions in relation to electricity supply

	Percent
Persistent blackout	78.5
Marginal blackout	11.8
Inconsistent billing	3.0
Expensive	1.9
Negligible problem	1.2
Other	3.7
Total	**100.0**

Table 48 shows about 79 percent of the interviewed institutions reported that persistent blackouts are the main problem encountered. About 12 percent reported marginal blackouts as their main problem. About 3 percent of the

interviewed institutions reported inconsistent billing as their main problem. This is followed by 2 percent of the institutions that reported that electricity is expensive.

Table 49: institutions reporting type of problems faced with electricity and whether initiatives have been taken to discuss the problem

	Percent
All	**49.8**
Persistent blackout	49.5
Marginal blackout	29.3
Inconsistent billing	61.3
Expensive	70.0
Negligible problem	83.3
Other	92.3

Table 49 shows that overall about 50 percent of the institutions took an initiative to discuss the problem with supplier. Of those who reported persistent blackout as their main challenge with the electricity supplier, about 50 percent made initiatives to discuss the problem with the supplier. Likewise, 61 percent of those that reported inconsistent billing also took the initiative to discuss the problem with the supplier. Amongst those that encountered marginal blackouts 70 percent did not take any initiative to discuss the problem.

Table 50: Outcome of discussion regarding the reported problem

	Percent
Total	**100.0**
Promised to solve the problem	48.5
Nothing was done	28.1
Problem solved	16.9
Failed to agree	3.7
Other	2.8

Table 50 shows that of those who reported to have taken an initiative to discuss the problems they were encountering, about 49 percent reported that the utility supplier promised to solve the problem. This was followed by 28 percent that

reported that nothing was done. About 17 percent reported that the problem was solved whilst 4 percent reported that they failed to agree.

Figure 2: Suggestions to overcome problems encountered

Figure 2 shows that about 25 percent did not provide any suggestion to overcome problems encountered. About 15 percent was of the opinion of generating own electricity while about 14 percent suggested that the utility provider should have well trained staff who can attend to such problems. About 9 percent remained optimistic that the situation will gradually improve.

Table 51: Average number of days taken to solve the problem with electricity provider

	Average number of days
Total	**86**
Inconsistent billing	183
Negligible problem	107
Persistent blackout	97
Marginal blackout	42
Other	3

From table 51, the average number of days taken to solve the problem with the electricity provider is about 86. Across problems, the longest period taken to solve the problem was registered in the inconsistent billing recording about 183 days. Negligible problem recorded the second highest averaging 107 days. Other problems recorded the lowest registering 3 days.

Table 52: Reasons for not discussing the problems with the utility provider

	Percent
Don't know who to meet	29.7
Gave up and now want to have standby generator	29.2
The institution generates own electricity	25.8
Planning to meet the provider	15.4
Total	**100.0**

Table 52 shows the institutions reasons for not discussing their problems with the electricity utility provider. It can be noted that the highest proportion (30 percent) of the interviewed institutions reported that they did not know who to meet. This was followed by those who gave up and now want to have standby generators representing about 29 percent. The least number of institutions were those planning to meet the provider representing about 15 percent.

Table 53: Percentage distribution of institutions reporting on levels of electricity consumption over the past 5 years

	Increased	Not changed	Decreased	Don't know	Total
Total	**69.9**	**21.4**	**7.0**	**1.6**	**100**
Agriculture	64.6	27.8	6.3	1.3	100
Mining and Quarrying	75.0	0.0	0.0	25.0	100
Manufacturing	75.8	10.1	11.1	3.0	100
Agro-Processing	71.4	20.4	6.1	2.0	100
Electricity and Water	85.7	7.1	7.1	0.0	100
Construction	45.5	45.5	9.1	0.0	100
Distribution (Wholesale and Retail)	68.9	16.2	10.8	4.1	100
Hotels, Lodges and Re	71.1	17.0	10.4	1.5	100
Transport and Communication	66.7	25.0	8.3	0.0	100
Financial Institution	59.7	32.5	5.2	2.6	100
Public Services	72.2	22.2	4.7	0.9	100

The institutions were asked whether their electricity consumption has increased or decreased in the last five years. Table 53 shows that about 70 percent of the institutions reported increased consumption, 21 percent reported that there has been no change, 7 percent reported decreased consumption and about 2 percent did not know. About 86 percent of institutions in the electricity and water sector reported increased consumption while 46 percent of institutions in the construction sector reported increased consumption.

Table 54: Energy saving measures as reported by institutions

	First measure	Second Measure	Third Measure
Using of energy efficient equipment	65.1	5.3	10.5
Switch off the equipment	19.9	49.7	10.7
Switching off the lights in vacant room	10.4	28.7	58.5
Right choice of equipment capacity	1.6	9.5	8.4
Do not overheat and air the rooms correctly	1.5	6.0	5.2
Other	1.6	0.9	6.7
Total	**100.0**	**100.0**	**100.0**

The institutions were asked to identify three electricity saving measures which could help to reduce electricity consumption of their institutions most effectively.

Table 54 shows that as the first measure, 65 percent mentioned using of energy efficient equipment, 20 percent switching off equipment, 10 percent switching of the lights in vacant room and about 2 percent each mentioned right choice of equipment and not overheating and air the rooms correctly. As a second measure, 5 percent mentioned use of energy efficient equipment, 50 percent switching off equipment, 29 percent switching of the lights in vacant room, about 10 percent mentioned right choice of equipment and 6 percent mentioned overheating and air the rooms correctly. As the third measure, 11 percent mentioned using of energy efficient equipment, 11 percent switching off equipment, 59 percent switching of the lights in vacant room, 8 percent mentioned right choice of equipment and 5 percent mentioned not overheating and air the rooms correctly.

Table 55: Sources of information on energy saving measures

	First source	Second source	Third source	Forth source
Press	40.3	13.7	8.3	2.5
TV and/or radio	26.7	53.9	10.7	2.5
Friends	10.3	14.6	42.8	5.6
Do not look for such information	9.0	0.7	0.2	7.1
Internet	3.6	8.2	11.3	34.9
Corporate world	2.7	2.2	9.4	38.9
Special Consulting centres	2.0	4.2	12.4	0.5
Other	5.5	2.6	5.0	8.1
Total	**100.0**	**100.0**	**100.0**	**100.0**

Institutions were asked to indicate their four sources of information regarding energy saving measures.

Table 55 shows that, as a first source, 40 percent mentioned press, 27 percent mentioned TV and/or radio, 10 percent mentioned friends. As a second source, 54 percent mentioned TV and/or radio, 15 percent mentioned friends, and 14 percent mentioned press. As a third source, 43 percent mentioned friends, 12 percent mentioned special consulting centres and 11 percent mentioned internet. As a fourth source, 39 percent mentioned corporate world, 35 percent mentioned internet, and 8 percent mentioned other sources.

Table 56: Use of electricity in institutions by industry

	Lighting	Cooking	Production	Office Equipment	Heating	Cooling	Total
Total	**83.6**	**3.0**	**5.1**	**6.4**	**0.3**	**0.8**	**100**
Public Services	86.8	2.5	1.8	7.1	0.5	0.7	100
Construction	86.4	9.1	0.0	4.5	0.0	0.0	100
Hotels, Lodges and Restaurants	85.1	9.2	0.0	0.7	0.0	2.8	100
Transport and Communications	85.0	0.0	3.3	11.7	0.0	0.0	100
Distribution (Wholesale and Retail)	83.8	1.4	4.1	9.5	0.0	1.4	100
Agriculture	80.2	2.5	12.3	3.7	0.0	1.2	100
Manufacturing	79.0	0.0	18.0	3.0	0.0	0.0	100
Electricity and Water	78.6	0.0	14.3	0.0	7.1	0.0	100
Agro-Processing	78.4	2.0	19.6	0.0	0.0	0.0	100
Financial Institutions (Banking, Insurance	75.6	2.6	0.0	19.2	0.0	0.0	100
Mining and Quarrying	75.0	0.0	25.0	0.0	0.0	0.0	100

Table 56 shows the main use of electricity in institutions across the industries. Overall, lighting is the main use of electricity (84 percent). In public service institutions electricity is mainly used for lighting at about 87 percent while about 3 percent is used for cooking. However, hotels (9 percent) and construction (9 percent) industries also use a bigger proportion of electricity for cooking in addition to lighting. Mining on the other hand appears to be greatest user of electricity for production.

2.3 Petroleum Institutional Results

The petroleum institution survey collected data on the following petroleum products: petrol, diesel, paraffin, jet A1, avgas, and liquefied petroleum gas and ethanol. For importation data was collected on volume, value, port of entry for six years (2007-2012). On sales, data was collected on various petroleum products, volumes and values from known oil marketing companies.

However, there were some challenges to get this types information from the companies and ended up using data which companies provided to MERA. The companies were unwilling to provide this information due to the historical data required.

Figure 3: Petrol importation

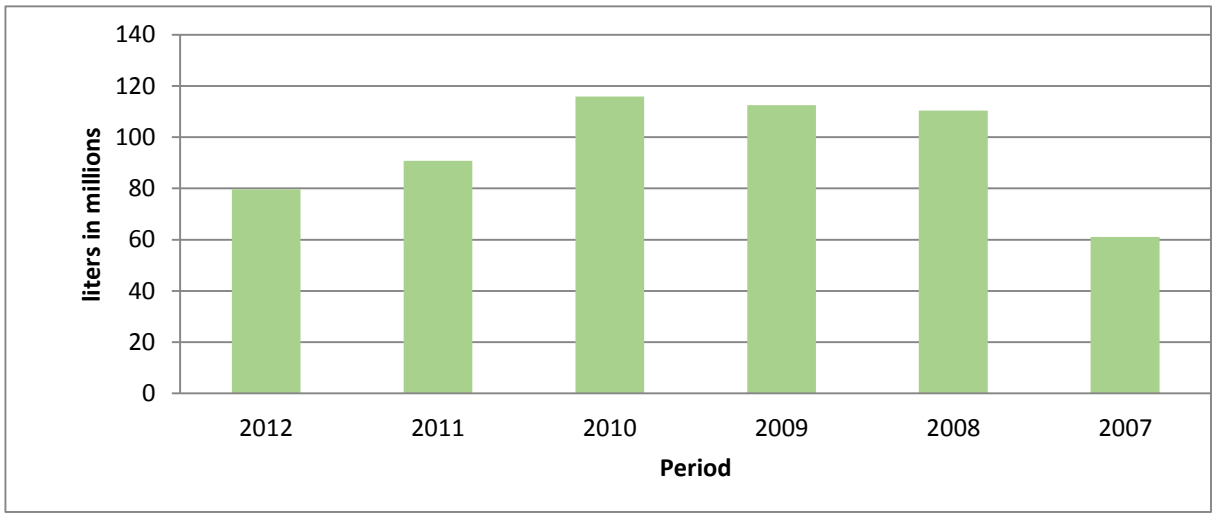

Figure 3 shows the volumes of petrol importation from 2007 to 2012. The country, through the oil importation companies had the highest level of petrol imports in 2010 in which close to 120 million were imported. The trend has meanwhile been declining from 2011 in which 90 million litres were imported to about 80 million litres imported in 2012.

Figure 4: Diesel importation

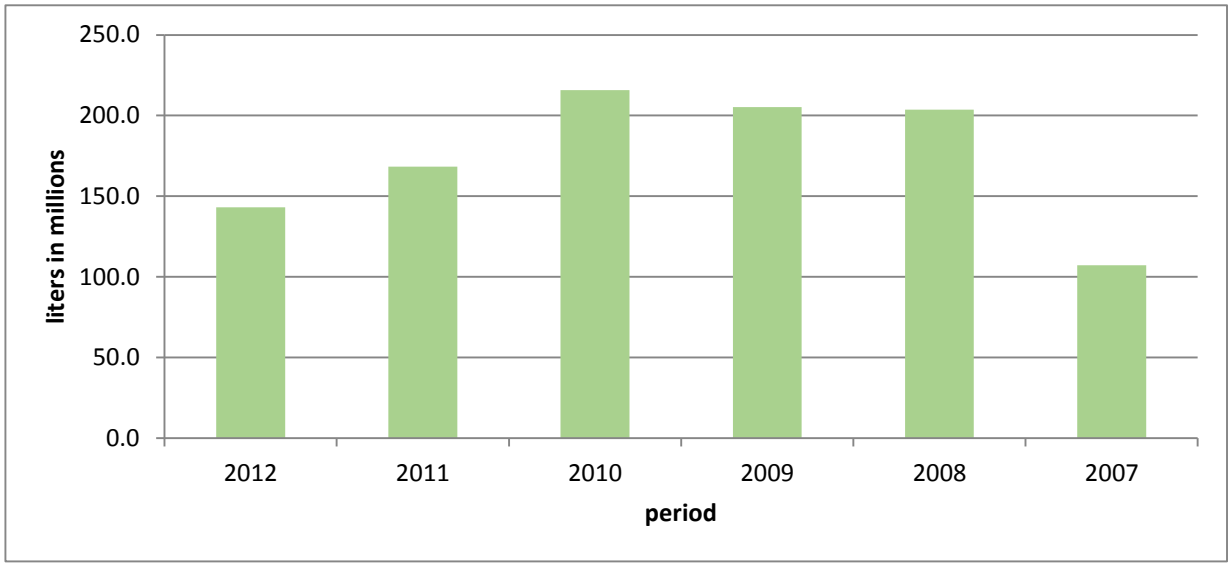

Figure 4 shows the volumes of diesel importation from 2007 to 2012. The country had the highest level of diesel importation in 2010 in which close to 220 million litres were imported. Over the years, diesel importation has been on the decline. In

2011 close to 165 milli0n litres were imported as compared to about 145 million litres imported in 2012. Prior to this, diesel importation had risen from about 110 million litres in 2007 to about 200 million in 2009.

Figure 5: Paraffin importation

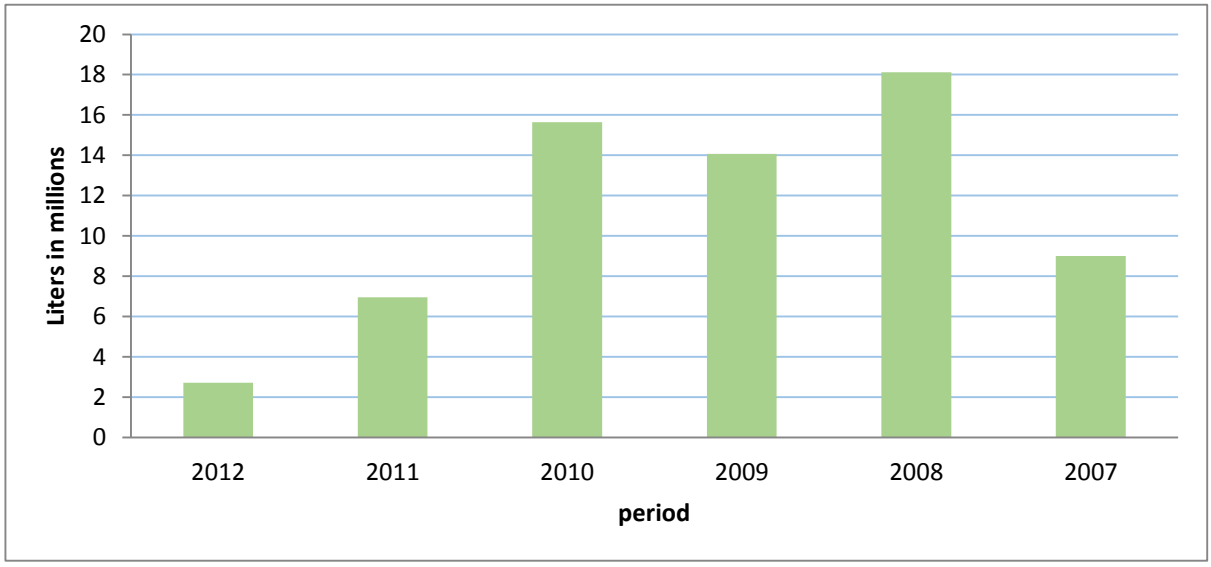

Figure 5 shows the volumes of paraffin importation from 2007 to 2012. Paraffin imports were at their highest level in 2008 in which about 18 million litres were imported. The importation has meanwhile been dropping from 2011 to 2012 where imports stood at about 7 million and close to 3 million litres respectively.

Figure 6: Jet A1 fuel importation

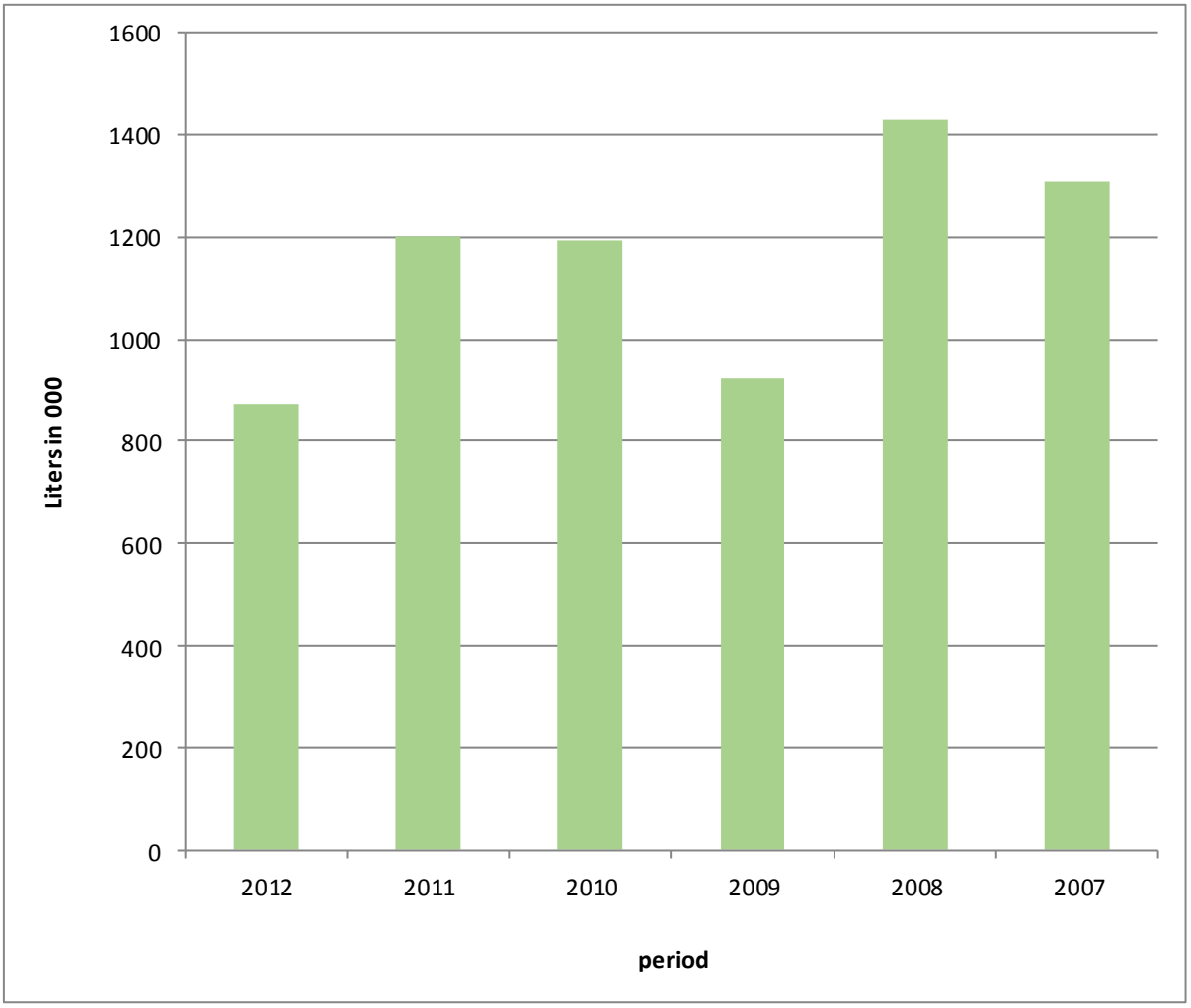

Figure 6 shows the volumes of Jet A1 fuel importation from 2007 to 2012. The country had the highest level of jet A1 importation in 2008 in which close to 1.4 million litres were imported. Over the years, diesel importation has been on the decline. In 2011 close to 1.2 million litres were imported as compared to about 850,000 litres imported in 2012. Prior to this, Jet A1 importation had risen from about 1.3 million litres in 2007 to slightly above 1.4 million litres in 2009.

Figure 7: Aviation gas importation

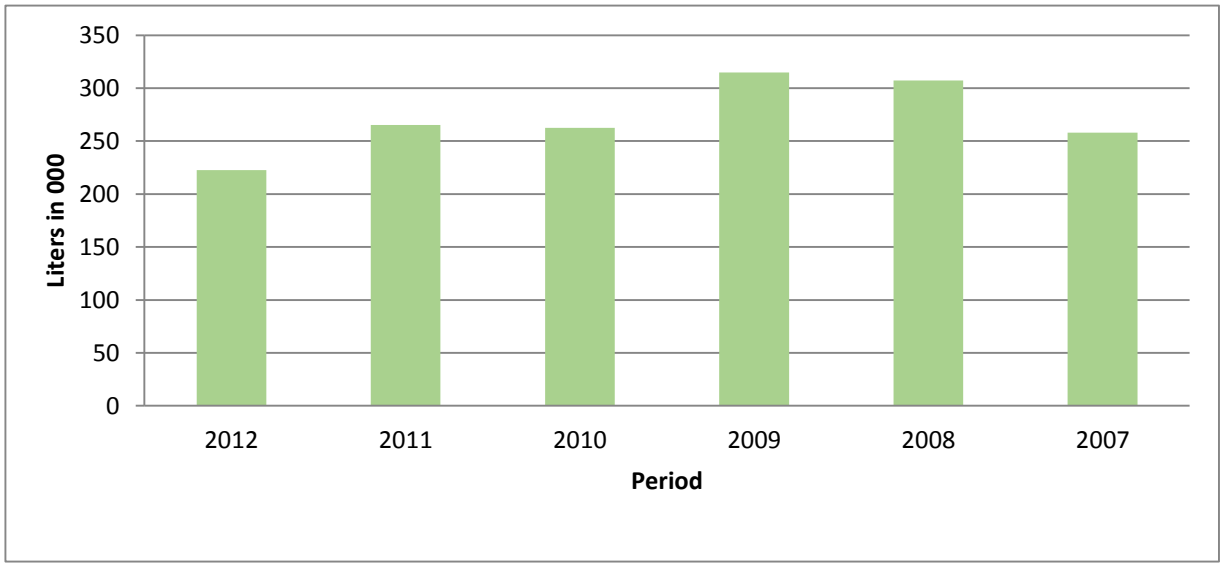

Figure 7 shows the volumes of aviation gas importation from 2007 to 2012. The country had the highest level of aviation gas in 2009 in which close to 310,000 litres were imported. Between 2011 and 2012 the country imported about 260,000 litres and about 220,000 litres respectively. From 2007 aviation gas importation had been rising until 2009 when the decline started.

Figure 8: Liquidified gas importation

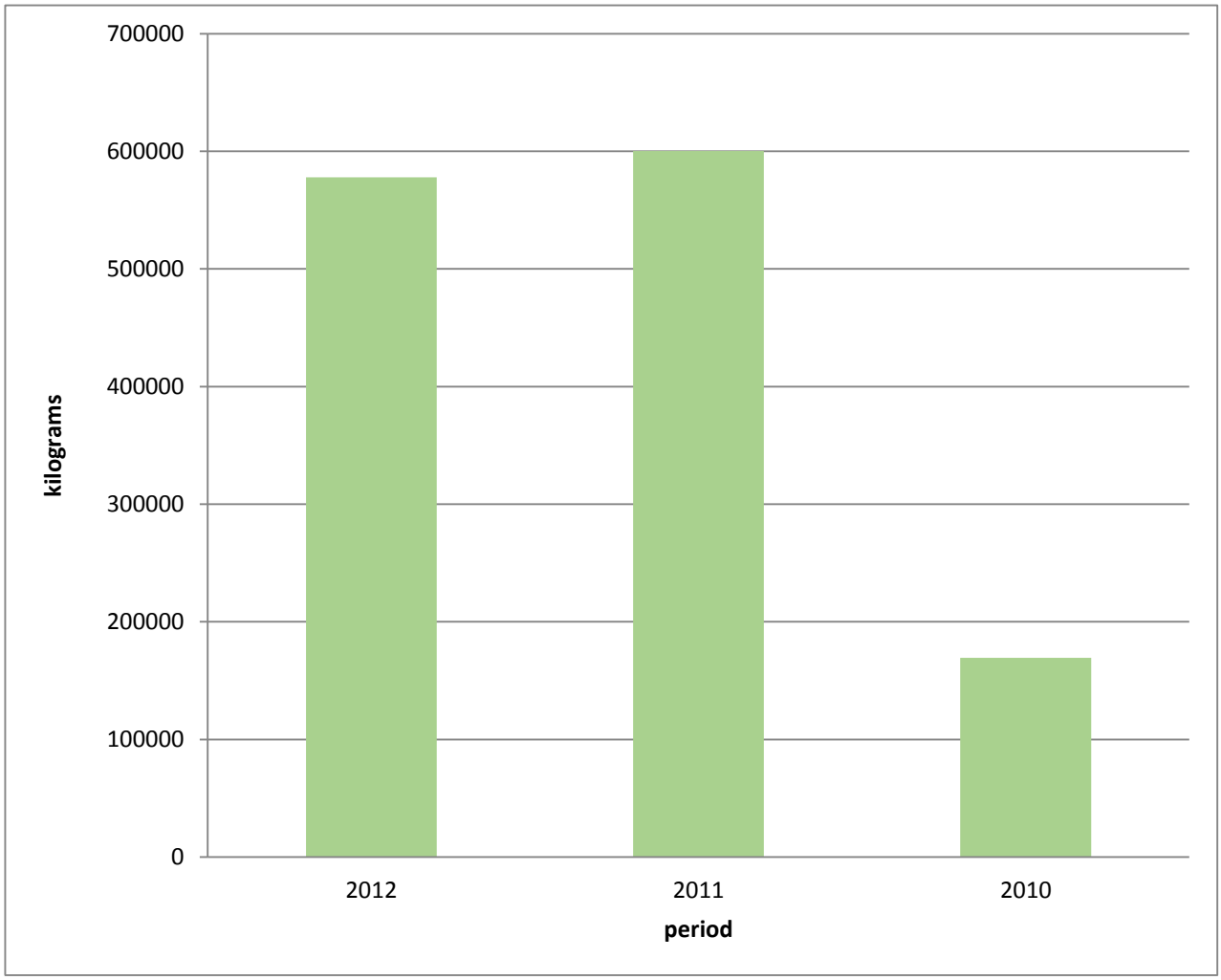

Figure 8 shows the weights of Liquidified gas importation from 2010 to 2012. The country had the highest level of Liquidified gas importation in 2011 in which close to 600,000 kilograms of gas were imported. The period 2010 had the lowest levels of importation with about 150,000 kilograms being imported.

Table 57: Fuel storage capacity

	Fuel storage capacity in use (litres)					
	2012	2011	2010	2009	2008	2007
Petrol	5 380 000	5 380 000	5 848 000	5 848 000	5 848 000	5 848 000
Diesel	8 983 000	8 983 000	7 739 000	7 739 000	7 739 000	7 739 000
Paraffin	645 000	645 000	1 023 000	1 023 000	1 023 000	1 023 000
Jet A1						
Ethanol						
Avgas						

Table 57 shows the combined storage capacity in use of various fuels. The combined fuel capacity for petrol has been constant at 5,848,000 litres from 2007 to date.The combined diesel storage capacity stands at 8,983,000 litres from 7,739 000 litres in 2010. The combined capacity for paraffin storage has been reduced from the initial 1,023,000 litres in 2010 to 645,000 litres in 2011 and onwards.

Figure 9: Ethanol production

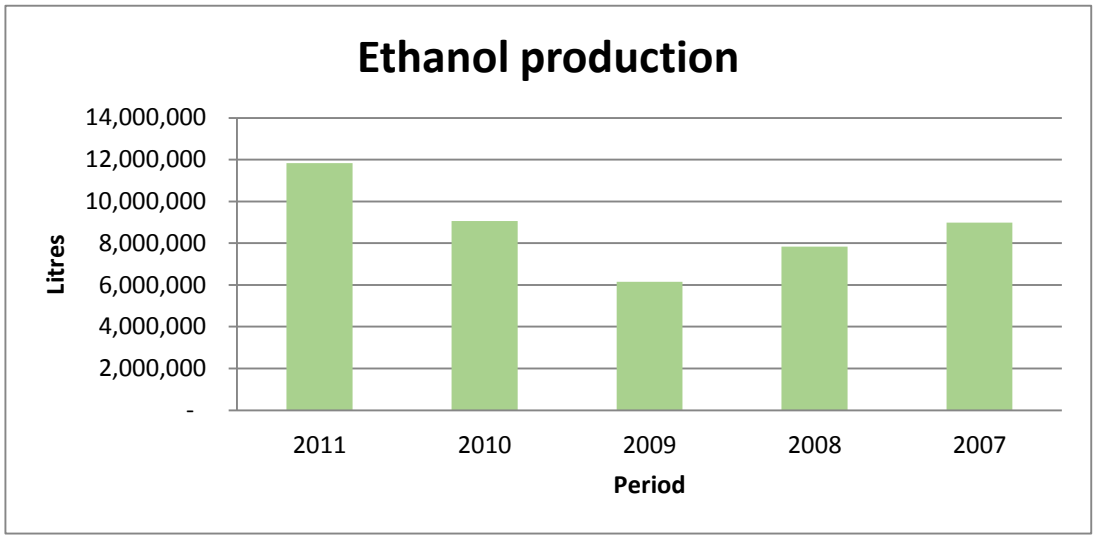

Figure 9 shows the volumes of ethanol produced at Nchalo and Dwangwa 2007 to 2012. The country had the highest level of ethanol production in 2012 at about 12 million litres up from about 9 million the previous year. Overall the lowest production was experienced in 2009.

Figure 10: Ethanol sales

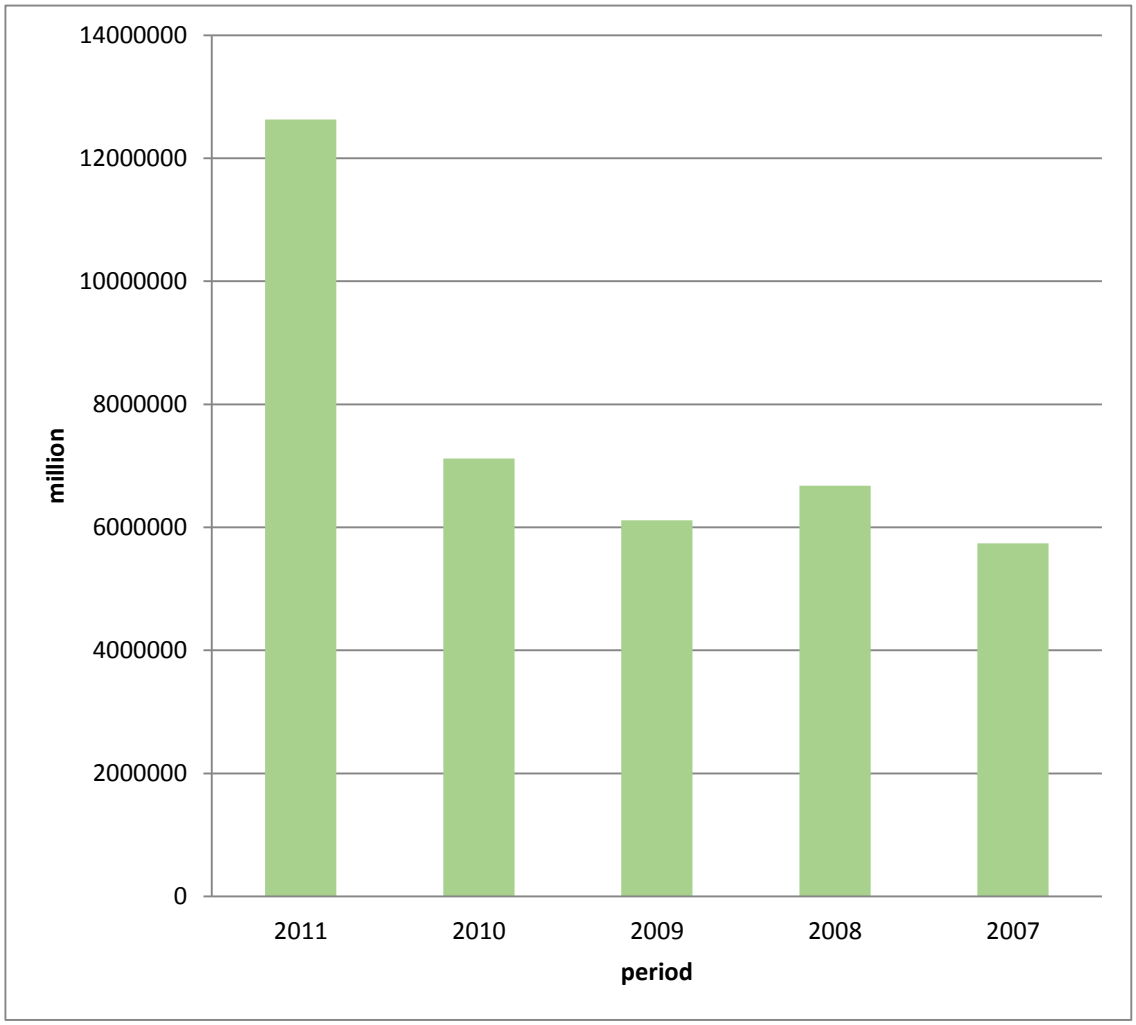

Figure 10 shows the volumes of ethanol sales to oil marketing companies from 2007 to 2012. The country had the highest level of ethanol sales in 2012 at over 12 million litres up from about 7 million the previous year. Overall ethanol sales have been increasing over the years from 2007.