HOUSEHOLD ENERGY USE AND SUPPLY SURVEY OF DIKGALE SUBDISTRICT OF POLOKWANE, LIMPOPO

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Abbreviations

CFLs	
FBE	Free basic electricity
HDSS	Health and Demographic Surveillance Site
kWh	kilo watt per hour
PM	Polokwane Municipality
SALGA	South African Local Government Association
SACN	South African Cities Network
SANEDI	South African National Energy Development Institute
SEA	Sustainable Energy Africa
StatsSA	Statistics South Africa
UL	University of Limpopo

Executive summary

"If you do not measure results, you cannot tell success from failure" (Osbrone and Gaebler)

Introduction

Polokwane Municipality (PM), as part of its mandate of service delivery to its residents, has embarked on a process of developing an integrated household energy delivery service strategy. To ensure that the energy service delivery is efficient and conforms to residents' expectations and that the available service is fully utilised, PM needs to solicit feedback from the residents on its service delivery levels for review and planning purposes. In this regard, PM in conjunction with Sustainable Energy Africa (SEA) commissioned the University of Limpopo (UL) to conduct an energy supply and usage survey in one of the sub-districts of Polokwane Municipality for the year 2015. Funded by Bread for the World (Brot), the Survey aims to (1) gain insights into household energy supply and usage gaps amongst the vulnerable residents; (2) identify the energy needs of the residents' and small businesses; and (3) determine the coverage of energy subsidies among the vulnerable households. The Survey is a baseline study that will feed into future research. Additionally, the results of this survey will feed into the proposed PM integrated household energy service strategy which, in turn, will feed into the National Integrated Household Energy Services Strategy.

Methods

The main method of the study followed five agreed upon stages, viz: (1) Pre-start strategic planning; (2) Design of research tools; (3) Study primary research – field work and data capturing; (4) Data analysis and compilation of report and; (5) Report finalisation (Presentation of findings). The pre-start strategic planning involved formulation of deliverables, terms of reference, interview scheduling and signing of contractual agreements with enumerators.

This was followed by the design of the questionnaire. After extensive consultations, a questionnaire was designed for the survey. The questionnaire was created by modifying the ones that had been used by SEA in other Surveys (Johannesburg and Cape Town) to allow for comparability studies in the future as well as accommodating further questions that may be specific to Polokwane. The study used a survey approach that used a structured questionnaire to enquire into residents' profiles, household energy use patterns, household appliances, household energy choices, health and safety in household energy use, energy affordability, small business energy needs and mode of transport used.

Dikgale, a sub-district of PM consisting of 15 villages, was chosen to be surveyed as it is representative of the vulnerable communities of Polokwane as well as because of its accessibility from UL. Stratified random sampling was employed in this survey, with the village used as a strata. A total of 388 households out of the 400 originally targeted were interviewed between 24 November and 8 December 2015, inclusive, by five enumerators that were trained prior to the Survey. Note that the sample size was chosen because literature (See Israel, G.D; University of Florida)[1] has shown that a minimum sample size of 330 will be required to give results within a precision of 3% and a confidence level of 95%. Thus, a sample of 400 was chosen so as to maximise on the information collected within the constraints while at the same time retaining high levels of accuracy and confidence in the results. Tablets were used to capture information directly into a database administered independently online. The collected data provided sufficient information to give insight into the energy supply and use patterns among some of the vulnerable communities of Polokwane.

Highlights of the findings

A household in Dikgale was found to have, on average, five members (three adults and two children) with most households headed by a pensioner (41%). Only 21% of the

[1] Based on publications by: Glenn D. Israel, associate professor, Department of Agricultural Education and Communication, and extension specialist, Program Evaluation and Organizational Development, Institute of Food and Agricultural Sciences (IFAS), University of Florida, Gainesville 32611.

household heads have permanent jobs with another 13% temporarily employed. The majority (92.2%) of households has an income of less than R3200. At least 73% of the households receives a government grant in one form or another. Most (56%) of the households rely on government grants alone for their income while only 27% of the households rely on wages alone as the source of income revealing high levels of vulnerability within the community. The average income per household is R1987 per month.

The first household was electrified in 1994 and the rate of electrification has since increased to 98% at the time of the survey. Households earning less than R3500 are eligible for free basic energy (FBE), a government subsidy of 50kWh per month. With more than 92% of the households earning less than or equal to R3200 per month it is a surprise that the Survey revealed that only 22% of the households are receiving FBE. Thus about 70% of the households are eligible for FBE but do not access it.

The proportion of households using electricity for lighting, cooking and water heating is 97%, 63% and 71%, respectively. In spite of the high level of electricity biofuels (wood, dung, paraffin and coal) are still being used as sources of energy. Some (26%) of the households alternate between wood and electricity for cooking while at least 7% cook with wood or other biofuels despite having electricity. Almost 30% of the households are still using biofuels for water heating while about 13% use it for heating the house. This is because about 36% of the households run out of electricity due to mostly lack of money (64% of the time). Those who run out of electricity resort to cooking with dung or wood (44%), or cooking with paraffin or gas (17%) or borrow money (22%) to buy more electricity.

Each household spends, on average, R133 per month on household energy against an average monthly household income of R1987.00. This translate to an energy burden of 7% which is below the threshold of 10% beyond which a household is described as energy poor. This conventional definition of poverty is compromised given that the population under study is characterised with high levels of poverty with most of the income coming from government grants but yet is not categorised as energy poor.

Conclusions and recommendations

There has been an enormous positive impact through the electrification process with electricity coverage very high at 98%, which is above both the provincial and the national coverage at 93.5% and 91.1%, respectively. The challenge that is there now is that of affordability as some households now and again resort to biofuels, such as wood, which are harmful to health and the environment. The 70% of households who are eligible, but have no access to the national social grant (Free Basic Electricity (FBE)), need to be taken on board. There is a need for awareness programmes in order to develop greater levels of awareness and take up of existing social grants relating to energy and knowledge of tariffs (though this is quite good). Clarification of the free basic unit amount, and an increase in the FBE units from 50kWh to between 100kWh and 150kWh (in light of the R133 spent on energy per month per household) may go a long way in alleviating energy poverty in the area in the face of electricity price increases that have been experienced and are set to continue into the future.

The findings challenge the conventional measure of energy poverty which indicates energy poverty when over 10% of income is spent on meeting energy needs of a household. At around 10% of income, households in the survey appeared to turn to 'free' energy services from the environment to meet their energy needs. Thus the household suffers 'energy poverty' not in direct cost terms, but through the indirect costs of indoor air pollution, environmental degradation and time costs and physical impact and dangers of fuel collecting in the *veld*. Further studies may want to look at the different levels of service available from the energy inputs into a household to help explain energy switching and the extent of energy poverty in the area.

Patterns of energy use suggest a need to find reliable and cheap alternative energy sources for cooking, lighting and water heating that would make a difference in the area without compromising the health of the residents as well as the environment. Introduction of alternatives must take into account acceptability and take up. This includes technology efficiency and speed, affordability – capital and operating - storage,

end product acceptability, health and safety. These aspects must be demonstrated and trust in new technology developed.

Chapter 1. Introduction

There is a well-established link between household access to energy and poverty alleviation. There is also a strong link between household poverty and vulnerability to climate change impacts. In turn, household dependence on fire wood can impact negatively on ecological resilience of an area to climate change. Increasingly there is also an understanding that an integrated approach to energy services, rather than just supplying electricity, is an important poverty and services approach in the country.

This Polokwane Municipality based project is a component of a larger project that includes a similar process within the City of Cape Town, as well as a broader household energy research towards making input into the National Integrated Household Energy Services strategy under development within Department of Energy and the South African National Energy Development Institute (SANEDI), learnings will also be shared within the broader SEA-SALGA-SACN urban energy network.

The Municipality of Polokwane is looking at the development of a municipal integrated household energy services strategy that will enable it to meet its service delivery mandate to its residents. In order to map the way forward decisions need to be informed knowledge of by the current supply and usage of energy within the municipality. Thus a survey pilot project, funded by Bread for the World (Brot), was mooted to gain insight into current energy use and supply gaps within the municipality of Polokwane and is to be implemented in the Dikgale sub-district of Polokwane.

Dikgale was chosen for the survey as it is representative of most of the developing sub-districts of Polokwane in terms of infrastructure and development. On-going research suggests that the area is lagging behind in terms of electrification (30% of the households in this area are unelectrified) compared to other areas in the municipality. This is mainly

an Eskom supplied area and Eskom's power capacity in this area is low. The municipality has been called in to assist with filling the electrification backlog.

In addition, Dikgale is an established Health and Demographic Surveillance Site (HDSS) run by the University of Limpopo (UL) where Census data are collected annually since 1994. Thus the University has an existing relationship with the communities here including the political leaders in this area. Getting a buy-in into the energy research from the communities was not difficult compared to when the research was to be done in a new area.

The Dikgale HDSS, with a population of approximately 36 000 residents, is placed in Capricorn District of Limpopo Province. The site used to have 8 villages with a population of approximately 8 000 under surveillance, which was increased to 15 villages of about 36 000 persons under surveillance in the period 2010-2011. The location of the DHSS in the maps of South Africa and Limpopo Province is shown in Figure 1.1. The Dikgale DHSS site is found about 40 kilometres north east of the urban area of Polokwane, the capital city of Limpopo. The population is predominantly composed of the Pedi ethnic group and is all-African. The population live in dwellings that range from shacks (slums), mud houses, to brick houses. The majority of the populace is economically disadvantaged in an area characterised by high unemployment rates, poor road infrastructure and poor service delivery. Recent research suggests that the rate of electrification stand at 30%, a gap that Polokwane Municipality (PM) will be looking at closing.

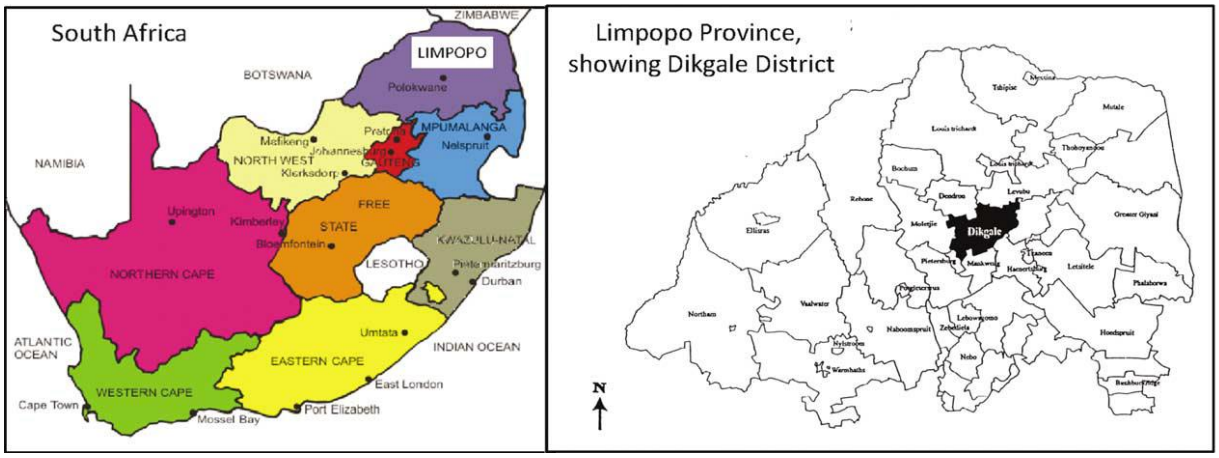


Figure 1.1 The maps of South Africa and Limpopo Province showing the location of Dikgale DHSS (Source: Kanjala, Alberts, Byass et al. (2010)).

The 15 villages involved in this survey are Mantheding, Maselaphaleng, Madinga, Ntsima, Maphoto, Ga-Tjale, Sefateng, Moduane, Moshate, Morobala, Titibe, Ga-Makgopo, Solomondale, Sebayeng and Nchichane.

The survey is a baseline study aimed at:

1. developing a detailed understanding of household energy use and household energy service "gaps" amongst the most vulnerable households in the Polokwane municipal area;
2. strengthening household awareness around energy issues, energy safety and efficient use of energy;
3. identifying energy needs of small businesses;
4. determining if energy subsidies are reaching poor households, or other areas of problem relating to the current electricity service provision.

This report presents the results of the survey. The report will take the following structure:

1. Chapter 2 of the report gives a description of the methodology of the survey and sample profile.

2. Chapter 3 gives the results on the characteristics of the Dikgale households.
3. Chapter 4 presents the results and discussions of the sources of energy for lighting, cooking, heating the house and water boiling.
4. Chapter 5 further discusses the findings and makes some concluding remarks.

Chapter 2. Survey Methodology and sample profile

The approach for the entire study as agreed after consultation with SEA and PM can be summarised under the following 7 stages:

Stage 1: Pre-survey strategic planning

Stage 2: Design of research tool/questionnaire

Stage 3: Survey – field work and data capturing

Stage 4: Data Analysis and Compilation of Report

Stage 5: Report Finalisation (Presentation of new findings)

This section briefly discusses the stages up to and including stage 3.

2.1 Pre-start strategic planning

The pre-start planning stage comprised mainly of liaison between UL, SEA and PM. The other activities undertaken under the planning phase included the following:

- Discussion on project deliverables, methodologies and time frames
- Budgeting
- Logistic planning

2.2 Design of research tool

A questionnaire was designed based on the questionnaire used in the Cape Town and Johannesburg domestic energy use Surveys of 2015 with the objective of building up a capable data across the country. Other questions were also formulated based on the literature and in line with general practices by organisations offering similar services.

The final questionnaire had three sections which are in line with the objectives of the survey. They cover the following areas:-

- Section A-House and people.
- Section B- Home energy.
- Section C- Home appliances.
- Section D- Energy choices, usage patterns and awareness.

- Section E- Health and safety in energy use.
- Section F- Affordability.
- Section G- Energy for business/income generation.
- Section H- Transport

The advantages of this questionnaire were that:

i. It was modified from a questionnaire previously used in a large study.
ii. There was no need for pre-testing and validating the questionnaire.

2.3 Enumerator recruitment and training

Enumerators were recruited from a pool of experienced personnel availed by Dikgale HDSS of UL. A course was conducted to familiarise them with the questionnaire and energy sector. The course was conducted in November 2015 at the Peter Mokaba Stadium in Polokwane.

2.4 Sampling strategy and sample size

The sample to be used was drawn using stratified random sampling. Stratified random sampling is a probability sampling technique wherein the researcher divides the entire population into different subgroups or strata, then randomly selects the final subjects proportionally from the different strata. The strata in this case are the villages and subjects were selected proportionally to the size of the population in the village.

The sample size was determined using the acclaimed formula by Cochran (1963) that is used to find a representative sample for proportions for a large population. The formula is defined by:

$$n_0 = \frac{Z^2 pq}{e^2}$$

where n_0 is the sample size, Z is the abscissa of the normal curve that cuts off an area α at the tails ($1-\alpha$ equals the desired confidence level, usually 95%), e is the desired level

of precision, p is the estimated proportion of an attribute that is present in the population, and q is $1-p$. The value for Z is found in statistical tables which contain the area under the normal curve. A 95% confidence level $(Z=1.96)$ and precision of 5% $(e=0.05)$ is required for this study. Since 30% of the households in the area were estimated to have no electricity it was agreed to use $p=0.30$. Thus the sample size for this large population was calculated using the general formula as: $n_0 = \frac{(1.96^2)(0.3)(0.7)}{0.05^2} = 323$households.

A statistics survey has an average response rate of about 81.8% (Carley-Baxter et al., 2009). It was decided to mitigate for the non-response with a factor of 25% (slightly above the expected non-response of 20%). Thus a sample size of between 323 and $403\,(1.25\times 322)$ is acceptable[2]. The two biggest villages (Sebayeng and Solomondale) were not considered for this study as they are, according to experts of the area, relatively better off than the other villages. A rule of thumb in sample size determination is that 30 observations per category will enable data analysis and if a sample is less than 30 then select the whole population. These rules were applied until a sample of size 399 was determined. Table 1 shows the number of households from which the sample was taken, the 5% sample and the final sample size by village. Note that the proportion of targeted sample is not the same as in the population so weighting will be considered in the analysis.

Table 2-1 The number of households from which the sample was taken

	No. of households		**5% sample**	**Final sample**	
Village	***Frequency***	***Percent***	***Frequency***	***Frequency***	***Percent***
Ga-Makgopo	673	10%	40	40	10%
Ga-Tjale	62	1%	4	5	1%

[2] See also publications by: Glenn D. Israel, associate professor, Department of Agricultural Education and Communication, and extension specialist, Program Evaluation and Organizational Development, Institute of Food and Agricultural Sciences (IFAS), University of Florida, Gainesville 32611.

Madiga	576	8%	35	35	9%
Mantheding	511	7%	31	35	9%
Maphoto	36	1%	2	5	1%
Maselaphaleng	14	0%	1	14	4%
Moduane	137	2%	8	12	3%
Morobala	768	11%	46	46	12%
Moshate	887	13%	53	53	13%
Nchichane	331	5%	20	36	9%
Ntsima	36	1%	2	5	1%
Sebayeng	1157	17%	69	69	17%
Sefateng	113	2%	7	10	3%
Solomondale	1055	15%		0	0%
Titibe	497	7%	30	34	9%
Total	**6853**	**100%**	**348**	**399**	**100%**

Taking into consideration the time required to complete a single interview, and the number of days available for UL to conduct the survey, a decision was made to target a sample of 399 respondents for the survey. Participants for the survey were randomly drawn from an SQL database using stratified random sampling.

2.5 The Survey

The Survey was conducted during the days starting 24th November and ending on 8th December 2015. A total of 388 households of the targeted households were interviewed using only the one-on-one representing a 97.2% response rate. This response rate is acceptable given an average response rate of about 81.8% (Carley-Baxter et al., 2009) for statistical survey.

Tablets were used to collect the data with information immediately captured in the database. A stata table with the data was generated for analysis. This package was used to create frequency tables and cross-tabulations. The tables were then formatted in excel and graphs were also done using excel spreadsheet. Findings are presented in Chapter 3.

Chapter 3. Data analysis

This chapter presents the analysis of the data by each section of the survey. The section below shows the current status of Dikgale households' characteristics and energy use patterns. Furthermore, this section gives important insight to the municipality as it provides the municipality with the perceptions of the households. This is important as this will guide the municipality to develop strategies that will address people's needs and gives the opportunity to the municipality to see where greater awareness is required with regards to energy use and services.

3.1 Household characteristics

The majority (54.2%) are of the productive age group (16-65 years) and 8% are of pensionable age. The remainder (37.5%) are children under the age of 16 years. Table 3.1 shows the distribution of the population by age group for the sampled households.

Table 3-1 Distribution of population by age group

Age group	Frequency	%
0-1	74	3.7%
2-15	681	33.8%
16-65	1,093	54.2%
66+	167	8.3%
Total	2,015	100.0%

There are about 5 (2015/388=5.2) persons in each household as shown in Figure 3.1, with 3 adults and 2 children. The Dikgale household size is greater than the national household size at 3.6 and the Limpopo average at 3.8 as of 2011. This may be explained by the fact that the population of Dikgale is ageing with the proportion living beyond 65 years at 8% double that at national level (4%) hence an extra adult, on the average, in each household compared to national and Limpopo.

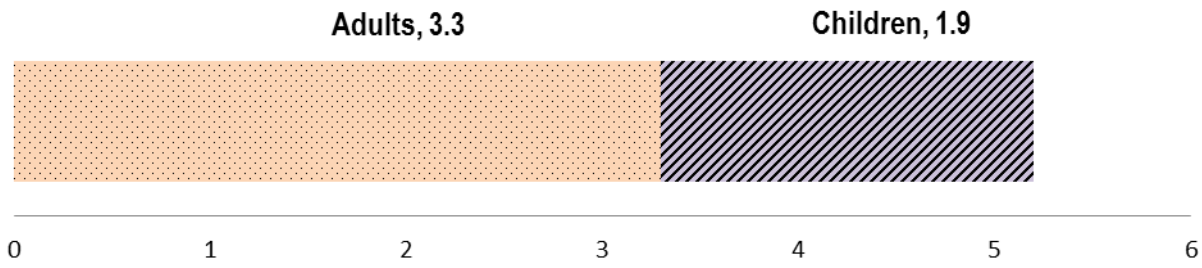


Figure 3.1 The average household size in Dikgale

The majority (66%) of the populace of household heads is not economically active and this is an ageing population with about 42% of the household heads being pensioners while 24% are unemployed (see Figure 3.2). Only 21% are fully employed on a permanent basis while another 13% are employed on a part-time basis. A small proportion (1%) of the households is headed by students or scholars. A higher proportion of these households are headed by females (57%) compared to males (43%).

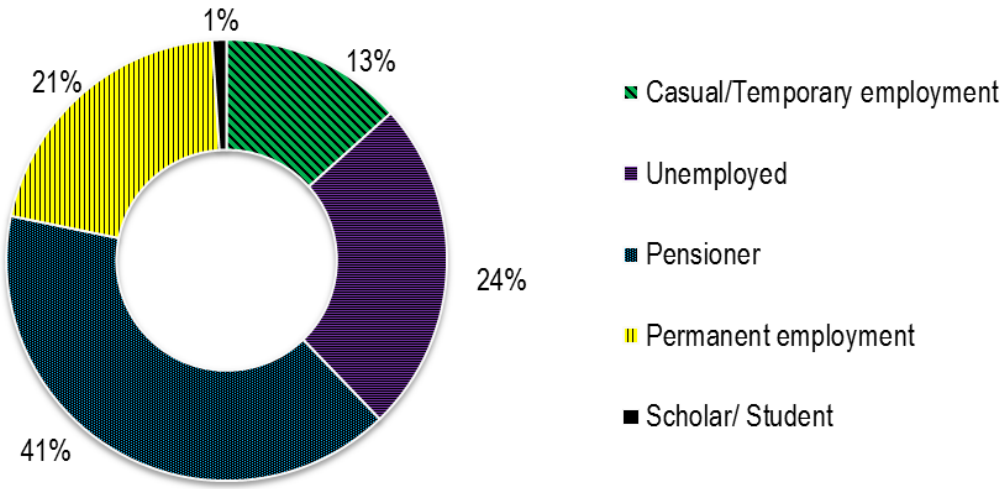


Figure 3.2 The employment status of household heads in Dikgale, 2015

The sources of income for the households are shown in Figure 3.3. It is a reflection of the employment status of the household heads as most of the income is coming from grants. At least 55.3% of the households' income is in the form of pensioner grants or/and child grants while only 27.4% is from wages only. More than 70% of the households are

reliant on government grants in one way or another. This is not surprising given that the population is ageing and only 21% of the populace have permanent employment.

It shows that there is a huge social burden for the productive population in Dikgale as only a few have to meet the health and social needs of the ageing population and the young ones.

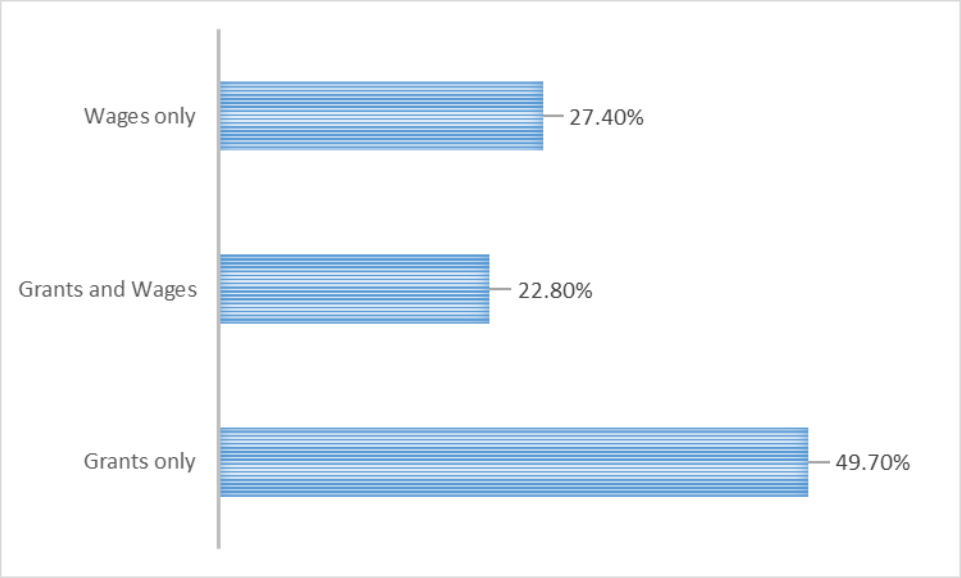


Figure 3.3 Sources of income in Dikgale

The distribution of monthly household income for the Dikgale sample is shown in Figure 3.4a. On average, each household has a monthly income of R1 987.00. The majority (88%) of the households earn between R800 and R3200 while 7% earn more than R3 200 per month. The average monthly income for Dikgale at R1 987.00 is below the national average for Africans at R5 051.08 and the one for Limpopo Province which is R4 737.00 according to the 2011 Census. This is acceptable since Limpopo has the lowest average household income in South Africa and Dikgale is an impoverished sub-district in Limpopo and one would not expect it to exceed the Provincial average. Figure 3.4b illustrates the severity of poverty levels in the areas 92% of the households earn below R3200 per month, indicating that 92% of the households are indigent.

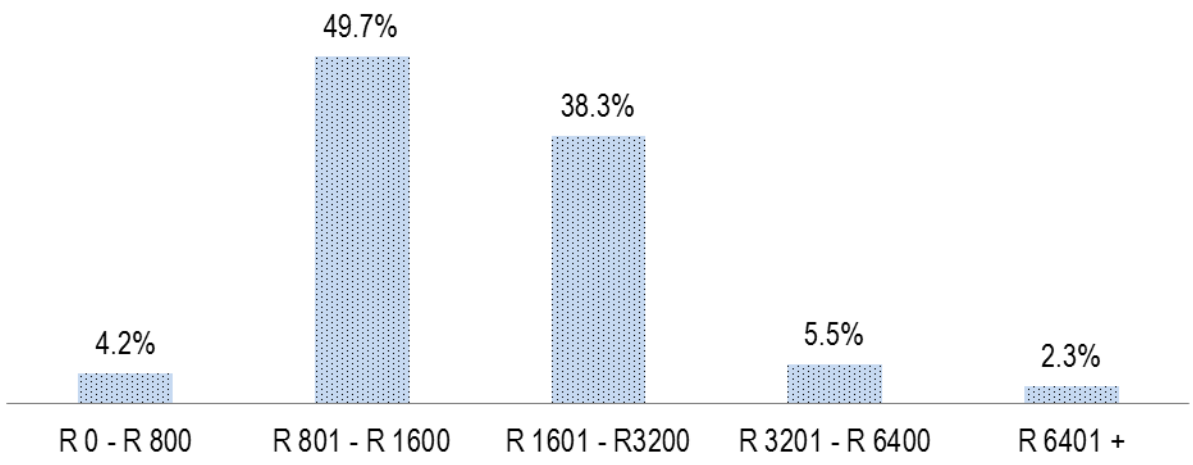


Figure 3.4a Distribution of household income for Dikgale

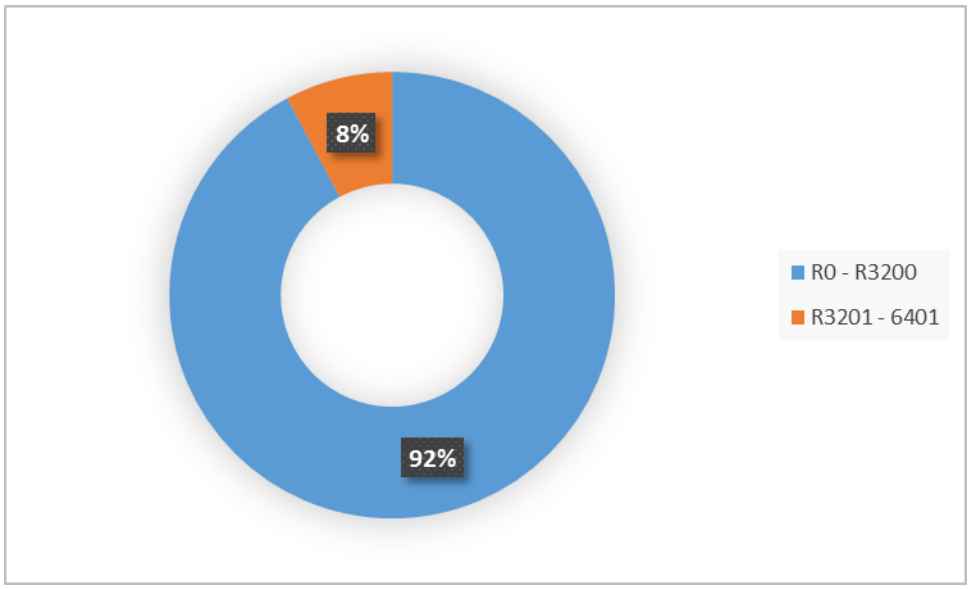


Figure 3.4b Distribution of household income for Dikgale

There are some households who try to supplement their income by keeping livestock. Almost a third (31%) of the households indicated that they kept livestock to supplement their income. Poultry and ducks, cattle and goats are common with 19%, 13% and 10% of the households keeping these, respectively. The proportion of households keeping donkeys and sheep are low and equal at 3%.

The areas sampled are characterised by 95.9% free-standing individual houses, 3.6% semi-detached houses or apartments while shacks and huts constitute only a small proportion (0.5%). Almost all the houses are fully owned (99%) with only 1% renting. A huge portion (87%) of the households does not have a ceiling.

3.2 Household Energy use patterns

3.2.1 Rate of electrification

The majority (98%) of the respondents indicated that their households are electrified. This is higher than the national and Limpopo levels of electrification at 91.1% and 93.5% respectively, according to the Community Survey 2016. Of the 2% houses not electrified the majority (75%) were new stands still to be connected. The first house in the area was connected in 1994 soon after freedom. Table 3.2 shows the distribution of time since connection of the households in the area. The majority of the houses (70%) have been electrified for less than 10 years. This may have a bearing on the energy use patterns as households adjust to having electricity.

Table 3-2 Distribution of households since time connected to electricity grid

Time since connected (years)	Frequency	Relative Frequency	Cumulative Frequency
0-4	64	16.8%	16.8%
5-9	202	53.2%	70.0%
10-14	15	3.9%	73.9%
15-19	22	5.8%	79.7%
20+	77	20.3%	100.0%

There is no serious problem with illegal connections as only 2% indicated that they have an illegal connection to neighbours. Those who have allowed illegal connections indicated that they do this as an opportunity to make money but they also complain that there is an additional problem of electricity tripping.

3.2.2 Free basic electricity (FBE)

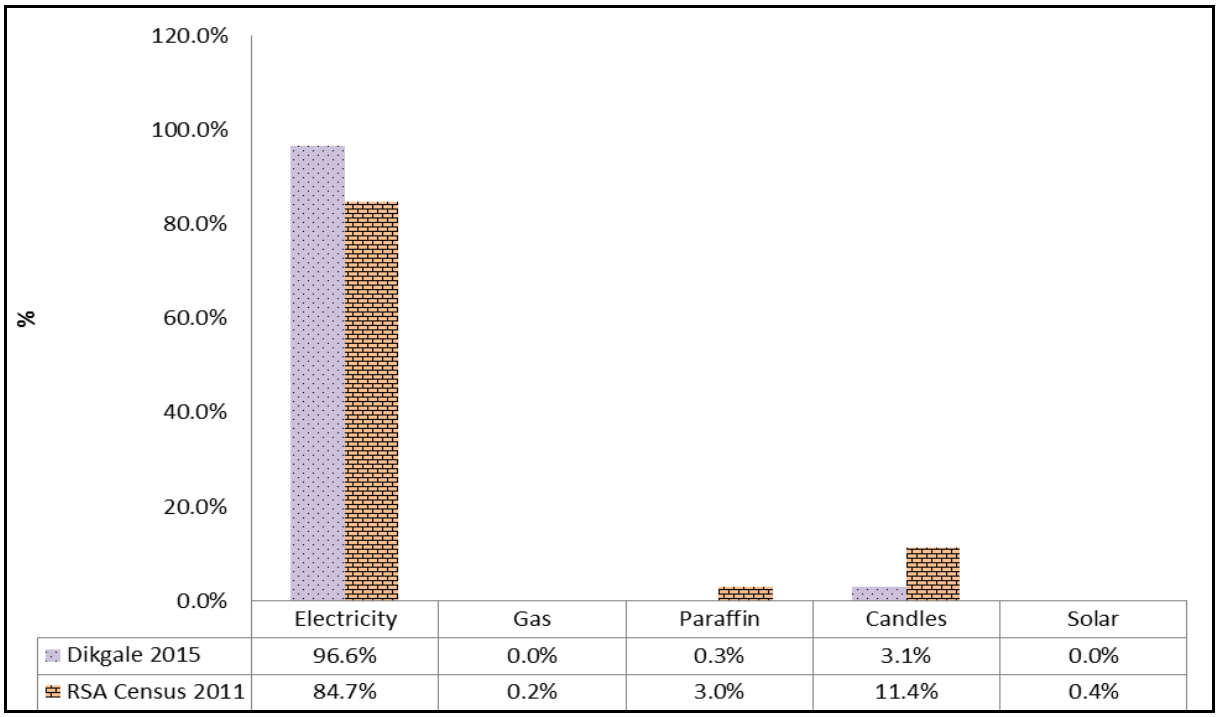
Free basic electricity (FBE) is provided by the government through Polokwane Municipality as a subsidy to alleviate the energy poverty among the poor. Any household earning less than R3 000.00 per month qualifies for FBE of 100kWh, however the households must be registered to receive the grant.

Currently only 22% (85 in number), of the households are receiving FBE. This is surprising given that this is one of the poorest neighbourhoods of Polokwane with the vast majority (65%) of the households headed by either a pensioner or an unemployed person. Figure 3.4 showed us that more than 92% of the households earn less than R3 200.00 which shows that almost 70% (92%-22%=70%) of the households that are eligible for FBE are not accessing it.

In addition, 73 (86%) of the 85 households that are receiving FBE are only getting 50kWh per month instead of the stipulated 100kWh. These anomalies need to be investigated and addressed in order to ameliorate the poverty within this community.

3.2.3 Sources of energy for cooking, lighting, heating and cooling

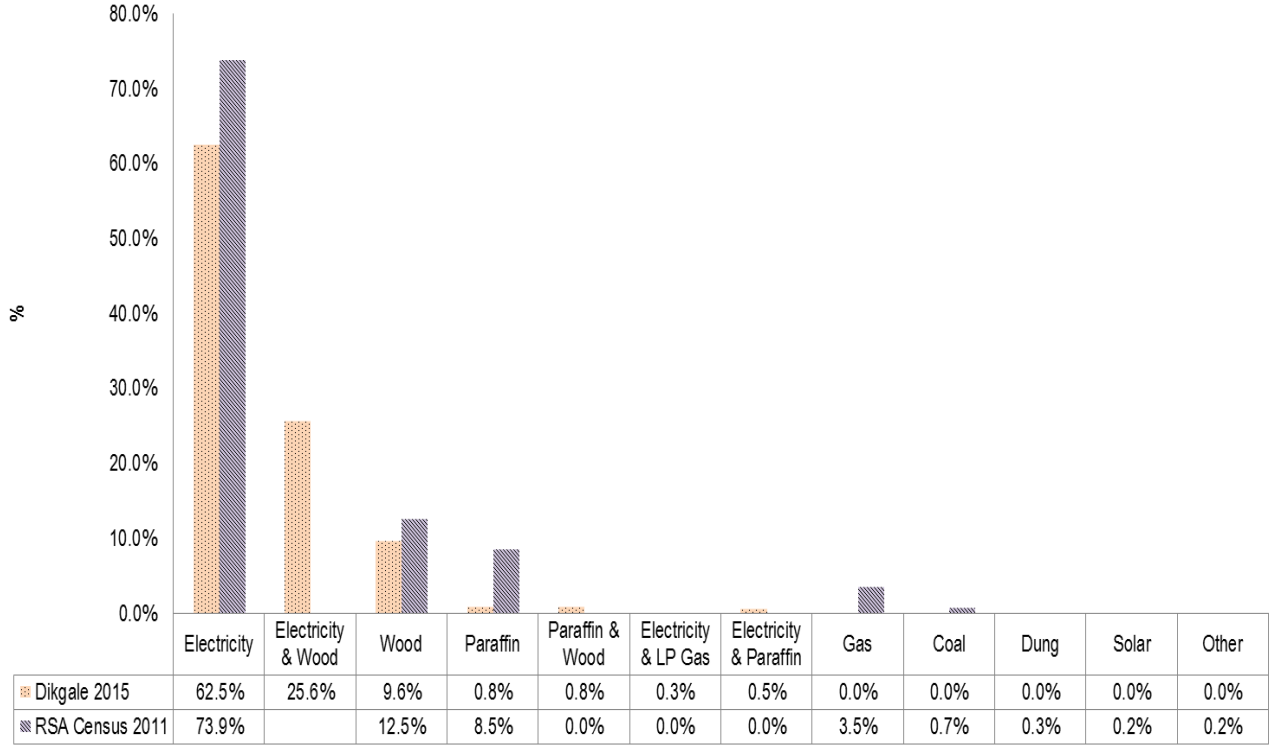
The proportion of households using electricity for lighting is 96.6% (See Figure 3.5). This is higher than the national level (84.5%) and Limpopo province (87.1%). Very small proportions are still using paraffin (0.3%) and candles (3.1%) for lighting.



	Electricity	Gas	Paraffin	Candles	Solar
Dikgale 2015	96.6%	0.0%	0.3%	3.1%	0.0%
RSA Census 2011	84.7%	0.2%	3.0%	11.4%	0.4%

Figure 3.5 Percentage distribution of households by type of energy used for lightning: Dikgale 2015 survey and National Census 2011

The majority of Dikgale residents (62.5%) use electricity for cooking. This is more than the usage in Limpopo Province (50%) but less than the national usage of electricity for cooking which is at 73.9%. Wood is still commonly used in Dikgale with 25.6% of the respondents indicating that they use both electricity and wood for cooking while 9.6% said they used wood only.



	Electricity	Electricity & Wood	Wood	Paraffin	Paraffin & Wood	Electricity & LP Gas	Electricity & Paraffin	Gas	Coal	Dung	Solar	Other
Dikgale 2015	62.5%	25.6%	9.6%	0.8%	0.8%	0.3%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
RSA Census 2011	73.9%		12.5%	8.5%	0.0%	0.0%	0.0%	3.5%	0.7%	0.3%	0.2%	0.2%

Figure 3.6 Percentage distribution of households by type of energy used cooking: Dikgale 2015 survey and National Census 2011

Water heating is predominately done using electricity (70.5%). The proportion is higher than the national proportion which stood at 58.8% in 2011 (see Figure 3.7). Wood at 20% is the second most popular source of energy for heating while another 8.3% indicated that they use both wood and electricity for heating their water.

Cooling and heating the house are not common occurrences in Dikgale as shown in Figure 3.8. Only 24% are cooling the house with electricity while the rest do not do not cool the house with any fuel (Figure 3.8 B). Electricity (25.6%) and wood (12.4%) are the popular sources of energy for heating the house (Figure 3.8 B). A high proportion of the respondents (61.2%) indicated that they do not use anything for heating the house.

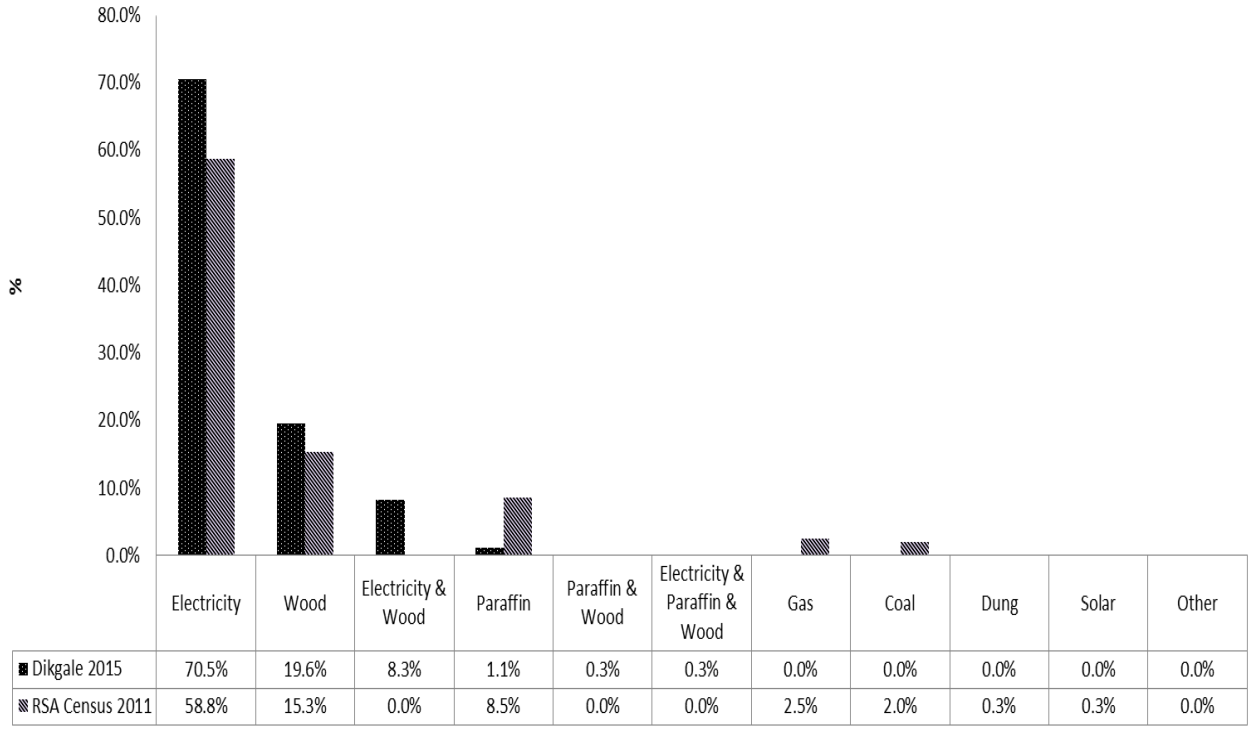


Figure 3.7 Percentage distribution of households by type of energy used for water heating: Dikgale 2015 survey and National Census 2011

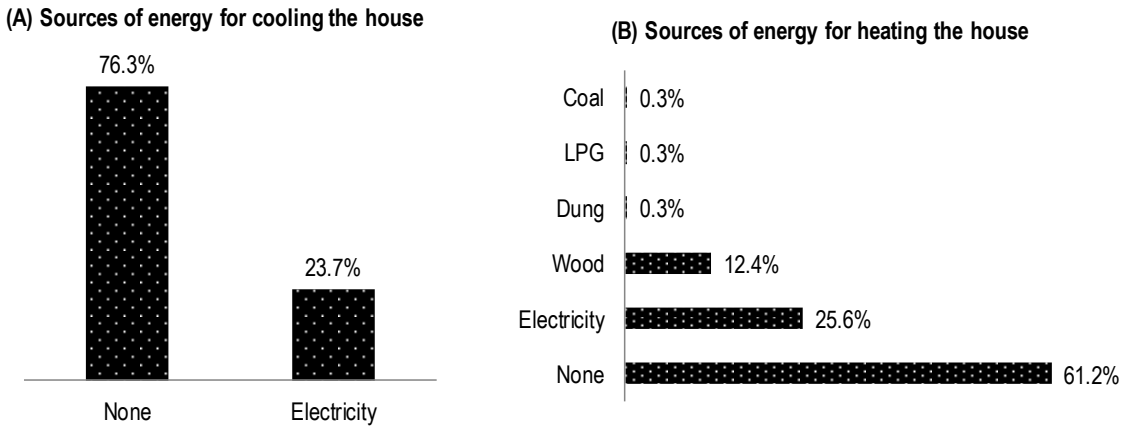


Figure 3.8 Percentage distribution of households by type of energy used for cooling and heating the house: Dikgale 2015

3.2.3 Dealing with shortages of fuel energy for cooking

There are times when households run out of electricity. Respondents were asked the question "Do you run out of electricity to cook?". Table 3.3 shows that 36% of the

households indicated that they sometimes run short of electricity for cooking. Households were further asked if they run out in winter. The households indicated that their electricity use is consistent both in winter and summer as only 29% reported that they ran out of electricity in winter. Wood was mostly used as the alternative to keep the households warm.

Table 3-3 Households running out of energy to cook

Do you run out of electricity to cook?	Frequency	%
Never	248	64%
Often/Sometimes	140	36%
Total	388	

The respondents were further asked why they run out of energy. The reasons they gave are shown in Table 3.4. It is clear that the main reason for running short of energy to cook is lack of money with 64% indicating so. Of concern to the municipality is the high level of technical faults in the areas at 26%.

Table 3-4 Reasons for running short of electricity for cooking

Reason	Frequency	%
Lack of money	89	64%
Loadshedding Raining/technical faults	36	26%
Units exhausted	13	9%
Didn't collect enough wood/dung	2	1%

The respondents who ran out of energy for cooking were further asked the question "What do you do when you are short of electricity for cooking?" Their responses are shown in Table 3.5. The highest proportion (44%) of respondents indicated that they resort to collecting firewood/dung for cooking, indication of cash shortages as households revert to free energy sources. Some said they will humble themselves and borrow money from neighbours, relatives or friends (22%) while 17% said they will cook with either paraffin or gas. Only 5% can afford to buy more electricity while 3% will have to sleep without eating at all.

Table 3-5 Actions taken by those who run short of cooking energy

Action	Frequency	%
Ask friends/neighbours/relatives for money	29	22%
Buy more electricity	6	5%
Collect/cook with wood/dung	59	44%
Cook with paraffin/Gas	23	17%
We wait	12	9%
Sleep hungry	4	3%

The households running out of energy for cooking were further dissected by fuel type to gain more insight on which fuel runs out more. The results are shown in Figure 3.9. About 30% of the households sometimes ran out of electricity while 10% percent ran out of wood (Figure 3.9 (a)). A small proportion (4%) did not indicate the fuel type that they run short of.

Figure 3.9 (b) shows that a very high proportion (89%) of those who ran out of electricity for cooking was because of monetary shortages. Money issues (affordability) remain the main problem leading to running out of energy even for wood with 79% giving the same reason while 18% of those running short of wood do so because they are unwilling to buy something they know they can fetch for free and would rather wait until they can fetch themselves (see Figure 3.9 (c)). Those in old age and staying alone (3%) run out when there is no one to fetch wood for them and can only wait for someone to fetch the wood for them.

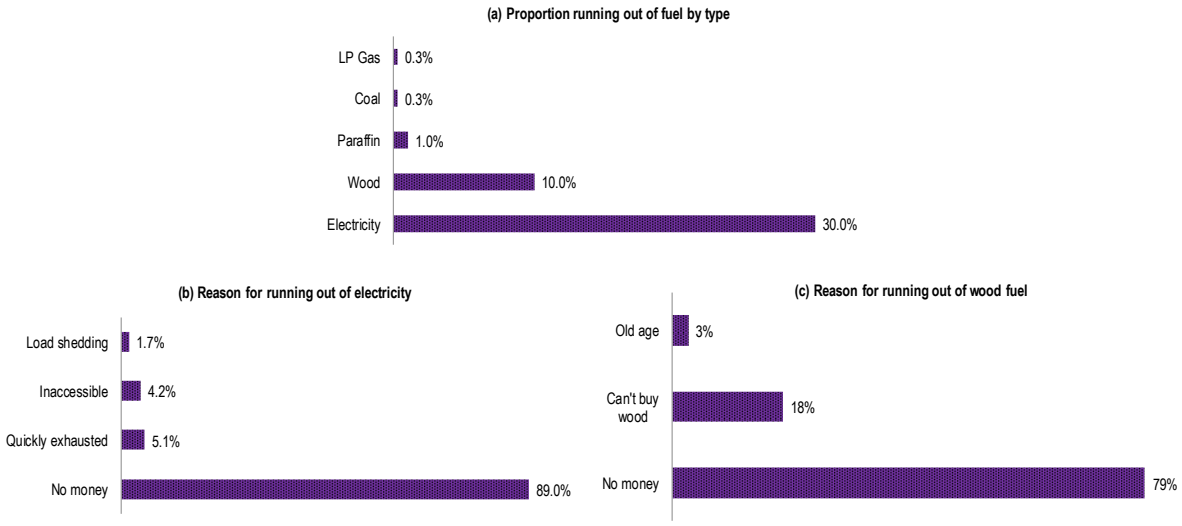


Figure 3.9 Distribution of households by type of energy for cooking that runs out and the reasons for running out

3.2.4 Frequency of outages

There are some respondents who indicated that technical faults make them run out of fuel for energy to cook (see Table 3.4). The outages that are considered here exclude scheduled load shedding. The frequencies of the technical faults by regularity are shown in Table 3.6. It does not seem that technical faults are a regular thing with 62% saying that these "sometimes" happen but none said always.

Table 3-6 Frequency of technical faults and outages in Dikgale

Frequency of Outages	Frequency	Percent
Don't know	2	0.52
NA	8	2.06
Never	45	11.6
Often	28	7.22
Rarely	64	16.49
Sometimes	241	62.11
Always	0	0

3.2.2 The monthly household energy expenditure

Energy burden in traditional literature is measured as the percentage of household expenditure spent on meeting energy needs, with a situation of 'energy poverty' being considered to exist when the energy burden is greater than 10%. The survey results indicated that the average energy burden of households in the Ga-Dikgale area was around 10%. However, Table 3.3. shows that some 36% of households noted that they run out of energy to cook each month; and households also indicated that they make use of wood. Field observation indicates that wood collection from the veld takes place on a daily basis in the area. Thus the indication is that households revert to 'free' energy services from the environment when they cannot afford more cash-based energy services.

Table 3-7 Monthly household energy expenditure

Monthly household expenditure	Electricity		Wood		Paraffin		Coal		Candles		Wood (Adjusted)	
	n	%	n	%	n	%	n	%	n	%	n	%
R1-R100	252	67.4%	37	38.1%	7	87.5%	0	0.0%	11	100.0%	37	92.5%
R101-R200	96	25.7%	3	3.1%	1	12.5%	1	50.0%	0	0.0%	3	7.5%
R201-R300	17	4.5%	9	9.3%	0	0.0%	1	50.0%	0	0.0%	0	0.0%
R301-R400	4	1.1%	9	9.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
R401-R600	2	0.5%	38	39.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
R601-R800	2	0.5%	1	1.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
R801-R1000	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
R1001+	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Average Household expenditure	**R**	**121.97**	**R**	**291.82**	**R**	**75.33**	**R**	**220.00**	**R**	**26.00**	**R**	**55.75**
Total Expenditure	**R**	**45,738.00**	**R**	**25,680.00**	**R**	**678.00**	**R**	**440.00**	**R**	**286.00**	**R**	**2,230.00**

Overall Household energy expenditure	**R**	**196.82**	*Energy burden :*	*10%*
Overall Household energy expenditure (Wood adjusted)	**R**	**133.44**	*Adjusted Energy burden :*	*7%*

3.3 Household Energy Appliances

3.3.1 Cooking

Cooking is one of the key household activities that consumes energy. The survey results indicate that the majority (77%) of the households in Dikgale use electric stoves to meet their cooking needs - an indication that electricity is the main energy source. This figure is higher than the provincial figure at 63.8% of households in Limpopo that use electricity for cooking. Only 20% of the respondents indicated using a secondary appliance to substitute their main appliance for cooking. Wood appliances were the prominent secondary appliances for cooking while gas and paraffin where less prominent. Running out of the fuel during the month and saving the main fuel for the

main appliance were the main reasons households were using a secondary appliance for cooking.

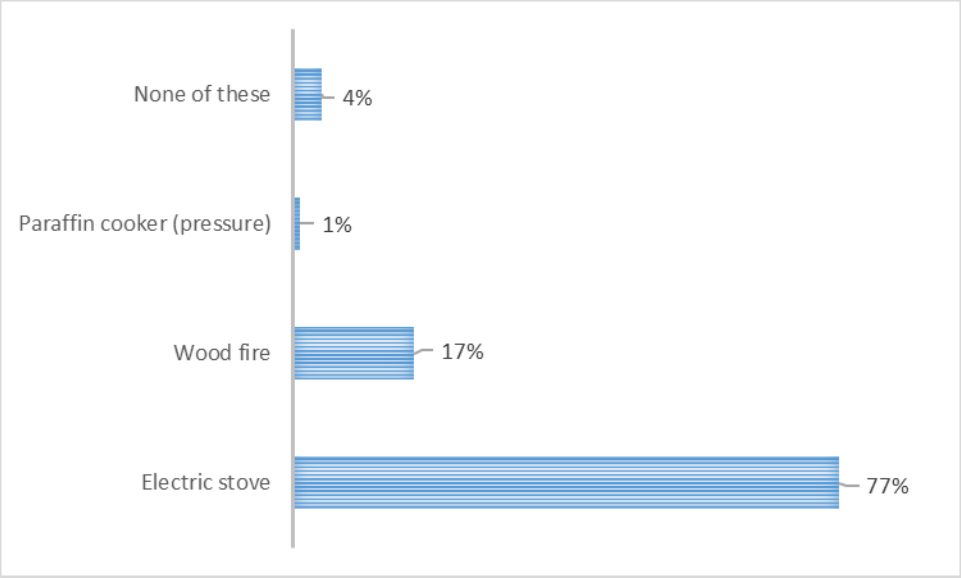


Figure 3.10 Main appliances used by households for energy use (%)

Gas, coal and paraffin appliances were the most unpopular among the households according to the survey (Figure 3.11). The appliances were unpopular according to the households because they perceived these appliances to be dangerous.

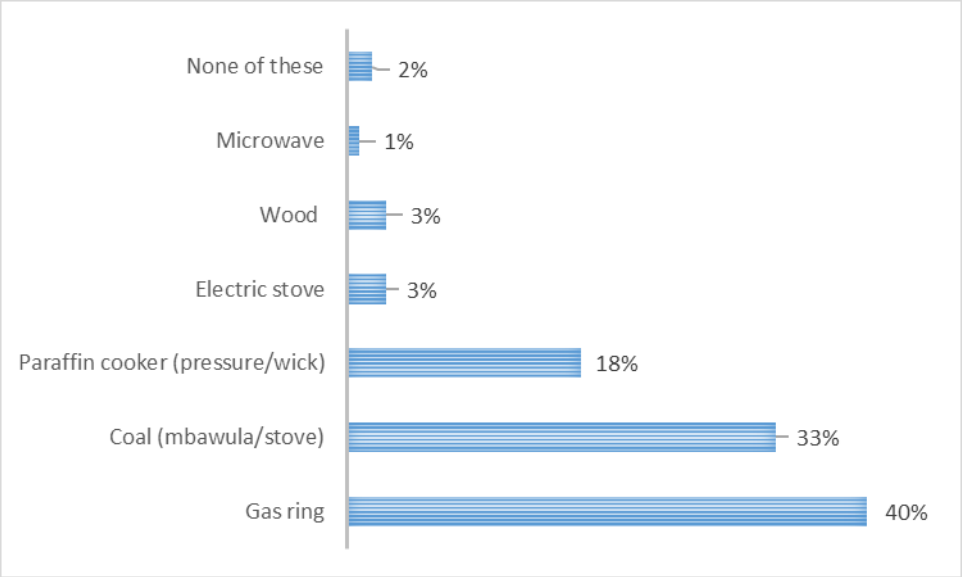


Figure 3.11 Cooking appliances households would rather not use for cooking

3.3.2 Water heating

Electric kettle and wood appliances were reported to be the main water heating appliances used by households (Figure 3.12). These appliances households use interchangeable as the same fuels were also the secondary fuels used for water heating purposes, although only 11% indicated that they use secondary fuels. The households that use multiple appliances for water heating purposes indicated several reasons which include:

"*We use wood for bathing water then the kettle when it's urgent or for making tea*"

"*To save electricity*"

"*To save energy*"

"*Like when we want to use lots of water because kettle is too small*"

"*Geyser for bathing and kettle for tea*"

"*Because of loadshedding*"

"*We use wood fire regularly and the hotplate is used when it's raining or during the day when it is hot*"

"*Because expense is low*"

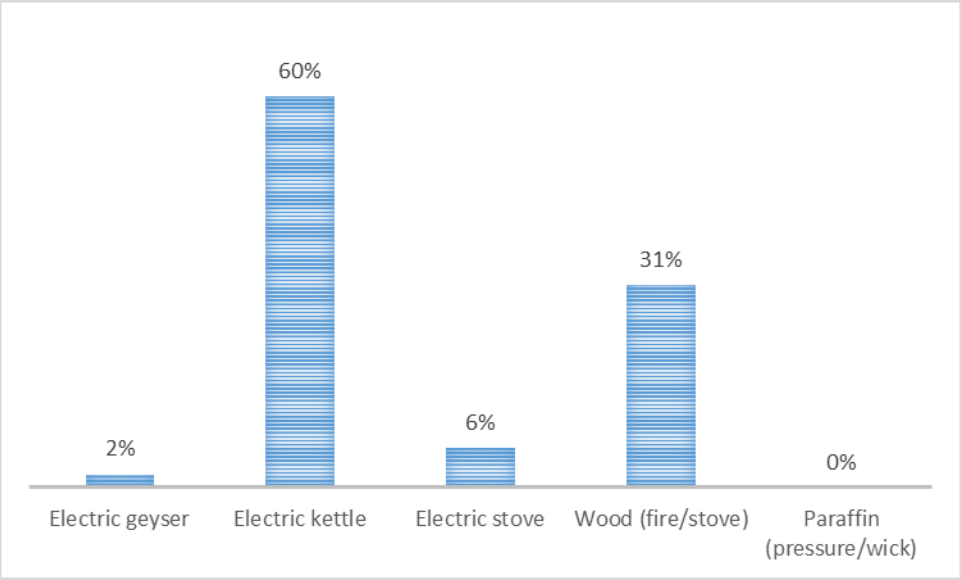


Figure 3.12 Main appliances used for water heating in %

The electric kettle was the most favoured appliance by households for water heating (Figure 3.13) and as mentioned above this is in line with what the households are already using. Although it is a small percentage (19%), there is an interest from the community for solar geysers. Solar geysers are energy saving and also have financial and health benefits for households. The households that preferred this appliance indicated the above benefits (no cost and energy saving) as the main reason they considered the appliance to be the best for water heating purposes. Speed of heating the water was the main reason households prefer using an electric kettle, while the use of coal or wood appliances was attributed to the affordability of the fuel. Affordability came up as a big issue why the households owned an electric kettle even though they would prefer to own electric geysers and solar geysers. This can be attributed to the high unemployment levels in the area.

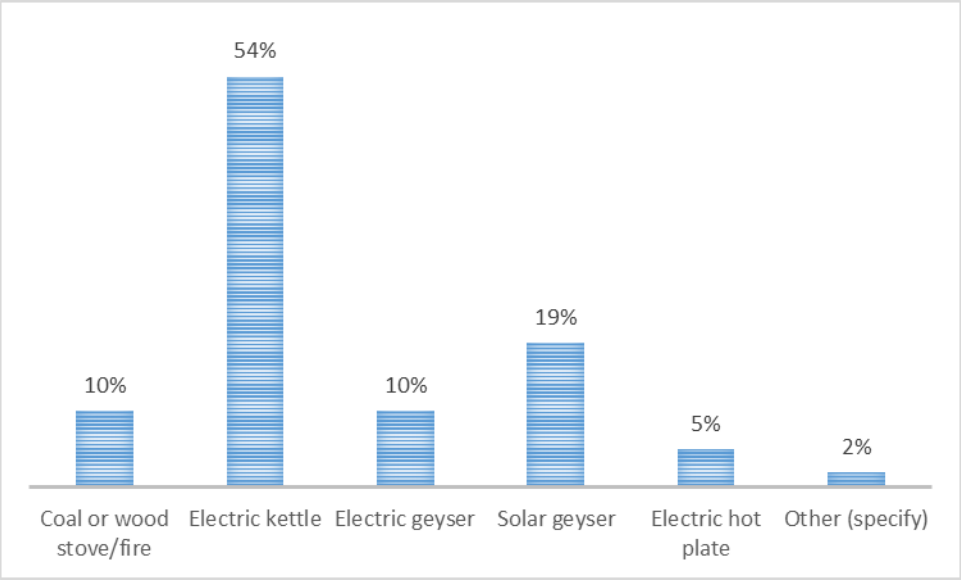


Figure 3.13 Main appliances preferred for water heating

Households were asked about the appliances that they would rather not use for water heating purpose; gas ring, electric geyser and electric plate were among the main appliances listed by the respondents. Gas was perceived as being too dangerous to be

used as a fuel source for water heating while the electric hot plate was perceived as being too slow for water heating purposes. Households further indicated that an electric geyser consumes a lot of electricity that is why they would rather not use it compared to other appliances.

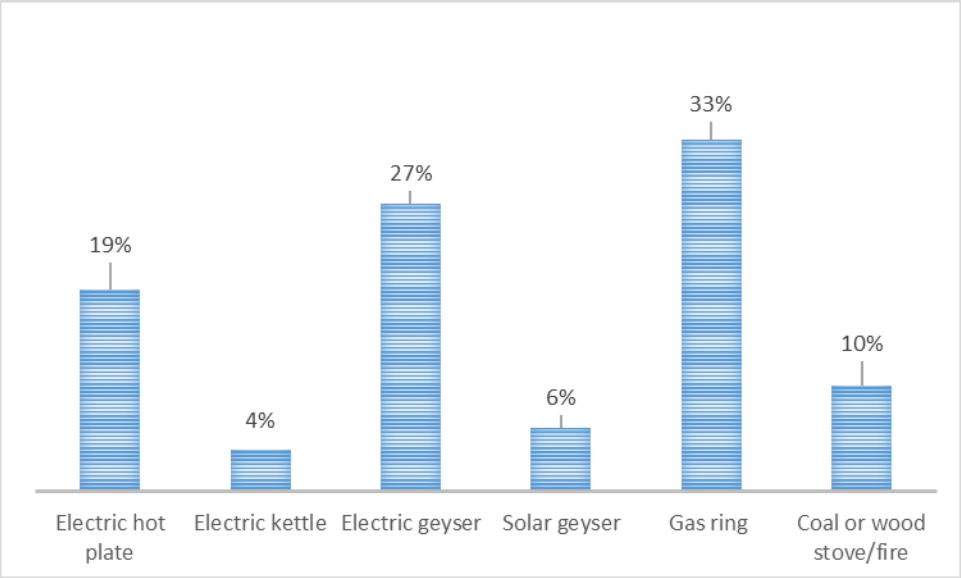


Figure 3.14 Appliances households would rather not use for water heating (%)

3.3.3 Space heating

Unlike cooking and water heating which takes place every day, space heating is limited to the winter seasons when temperatures are colder. With most households, energy consumption increases during this time. Households in Dikgale reported that they mostly use wood fire (39%) for heating purpose while others use electric heaters (22%) and only a very small percentage use gas, coal and dung fire as their main appliance. However, 37% indicated that they do not use anything for space heating purposes. The households that use appliances for space heating indicated that they only use the main appliance for space heating unlike with cooking or water heating where some households used more than one appliance to supplement their main appliance.

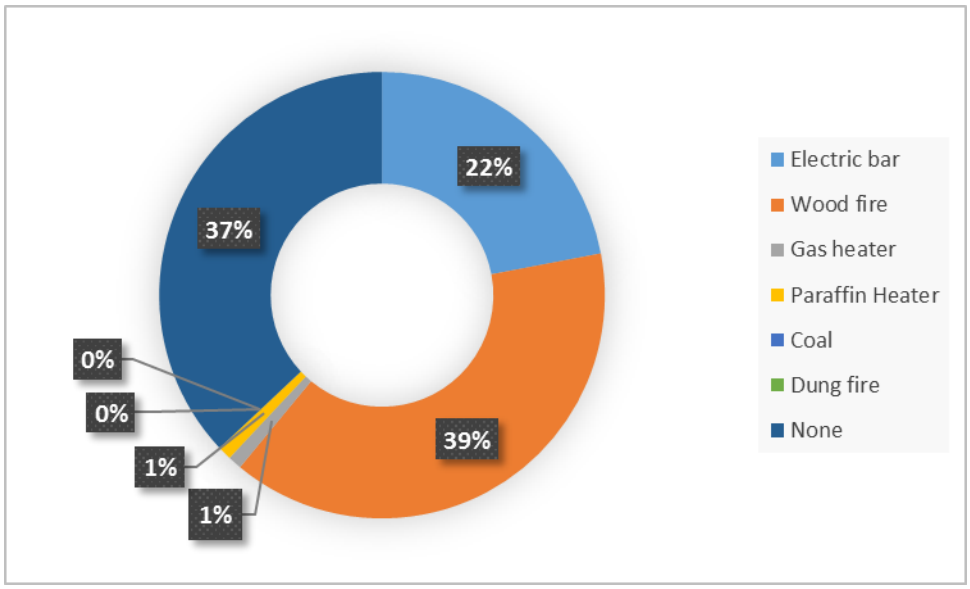


Figure 3.15 Main appliances households use for space heating (%)

When asked about the appliances the households considered to be the best for space heating purposes, the electric heater was among the most favoured. Although wood is currently the most used appliance for space heating, only 19% of the households thought it was a good appliance for space heating. Coal, paraffin, dung and gas appliances were the least favoured appliances with the households. Safety issues were attributed to the households not considering these appliances (coal, gas and paraffin) for space heating purposes, particularly gas and coal appliances. 45% and 30% of the households reported they would rather not use these coal and gas appliances to heat their homes, respectively. Electric heaters were perceived best because most households consider this appliance as easy to use, portable to move around the house, safer, saves energy and they all said unlike other appliances, an electric heater keeps the entire house warm while other appliances are concentrated in one place. On the other hand, wood appliances were thought to be affordable compared to electric heaters and most said they collect themselves. 9% of the households did not consider any appliances to be the best for space heating. These households are also currently not using any appliances for space heating. The households said that there was no need to use any appliances since it was not too cold during winter. Affordability also came up as key reason why the households did not

own any space heating appliances although this reason was insignificant. The appliances that households considered best for space heating, most households currently do not own. This was attributed to lack of affordability of the appliances.

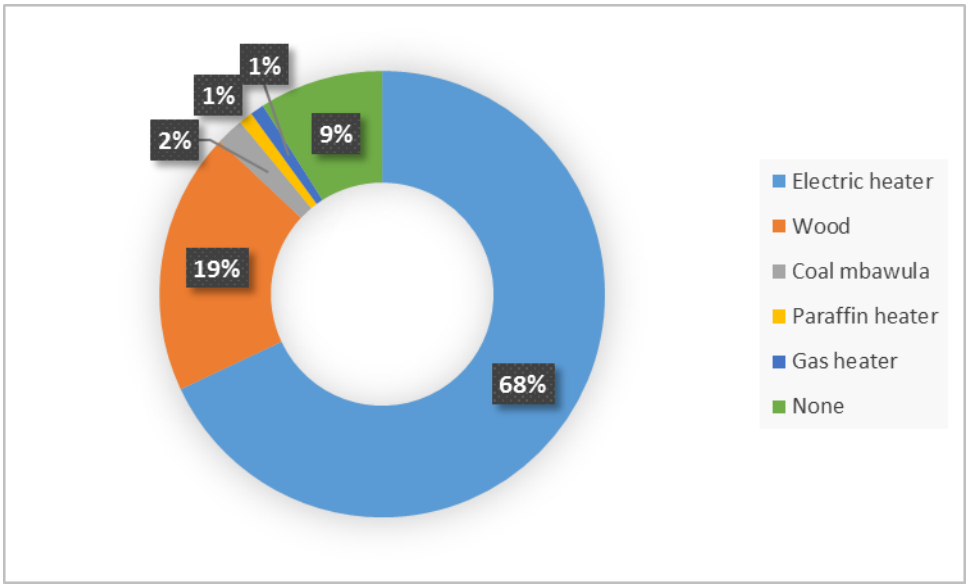


Figure 3.16 Appliances household would prefer to use for space heating (%)

3.4 Household energy choices: usage patterns and awareness

CFLs save 80% energy compared to incandescent lightbulbs. Majority of the households (206) are aware of energy efficient lightbulbs and are currently using it (Figure 3.17). A further 27 households although currently not using energy efficient lightbulbs they intend to use them in the future. 15 households indicated that they do not intend to use them and only 6 household do not know about the energy efficient lightbulbs. Eskom's roll-out of free efficient lights to reduce energy consumption and increase efficiency based on the study results is reaching remote areas of the country and is successful.

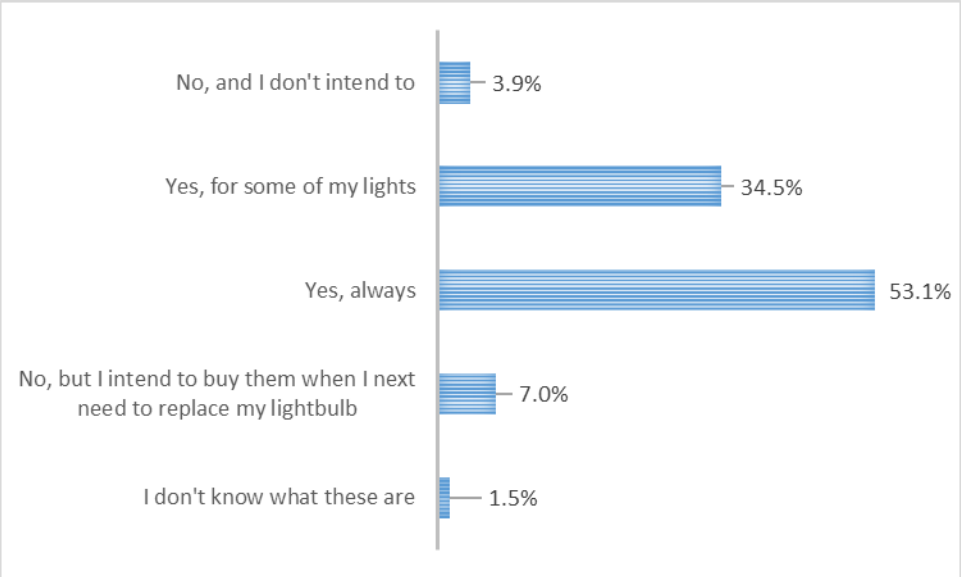


Figure 3.17: Number of households using energy efficient lightbulbs

Diesel/petrol generators were the alternative technology most known by the households. Solar lamps came second as alternative technology known by the households. Solar lamps were perceived as energy saving technology. The wonderbag is a great energy saving technology, when used it can help households reduce their energy consumption by 50% for cooking. However, only 5% of the households were aware of this technology and used it because it saves electricity and time. For households that are currently not using the wonderbag, the following reasons were provided; they would only use it if they saw someone else use it, that it didn't cook the food well and they did not trust the technology. Solar powered cooker was the least known technology. This technology is still at its early stages this could be the reason a few households are aware of it and furthermore the technology is limited to daytime use. Overall, the lack of awareness of safe, clean and efficient energy options could be as result of either lack of knowledge of the technologies or lack of availability and accessibility of the different fuels and technologies in the area.

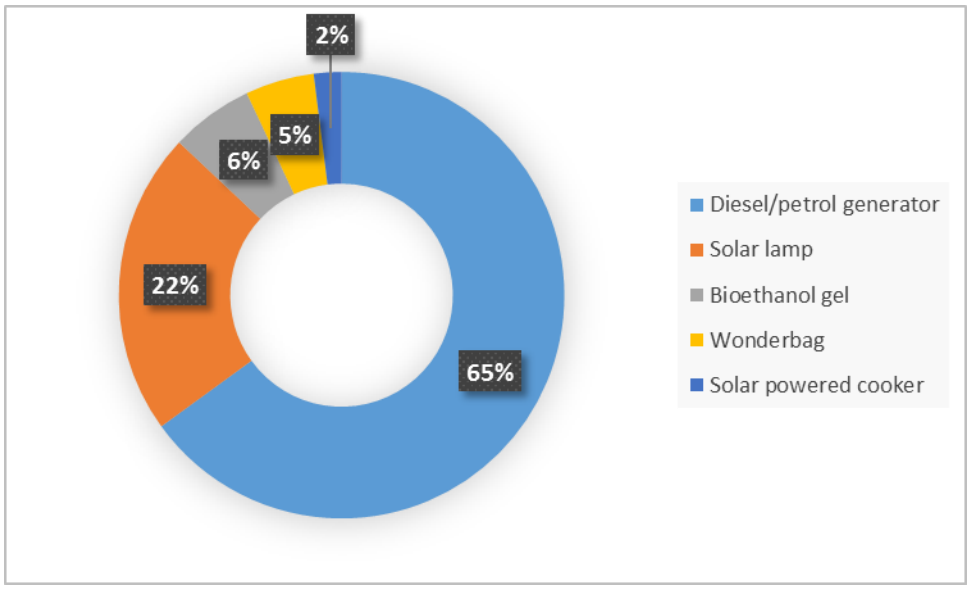


Figure 3.18: Household awareness of different clean energy technologies

Polokwane municipality introduced an inclining block tariff to protect low income households from paying high electricity prices. This tariff can be beneficial to households if their electricity consumptions are below a certain level but if consumption increases households pay higher per unit charges. The survey found that majority of Dikgale households are aware of the Inclining block tariff and they try to use less than 350 units to get cheaper electricity (Table 3-8). A further 50 households indicated that they were aware of the tariff but were either unable to stay below the 350 units limits or they did not understand how the tariff works and 74 households did not know about the tariff. Although many of the households are aware of the tariff, the municipality should create awareness to ensure that all households are aware and understand how the tariff works not only to protect the households from excessively spending but also to reduce electricity consumption and increase energy efficiency within the municipality.

Table 3-8: Knowledge of different electricity prices for households that use below a certain number of units per month

Knowledge of different electricity prices	Frequency
Yes, I have heard about different prices, and try and use less than 350 units so I can get cheaper electricity	264
Yes I think I heard about it, but I don't know the details and I don't know what I am being charged at	24
No I haven't heard about this	74
Yes, I have heard about different prices, but I am not able to use less than 350 units each month	26

3.5 Health and safety in household energy use

The use of wood, paraffin, candles and illegal electricity has serious health and safety consequences for the well-being of the household members. Despite some households indicating that they use fuels such as wood, paraffin, candles; only 2% of the households indicated there have been minor accidents caused by any energy appliance or fuel in the past 5 years (Figure 3.19). These minor accidents according to respondents were caused by the following; gas cylinder exploding, hot stove, paraffin, electric shock, fire, candles as well as boiling water.

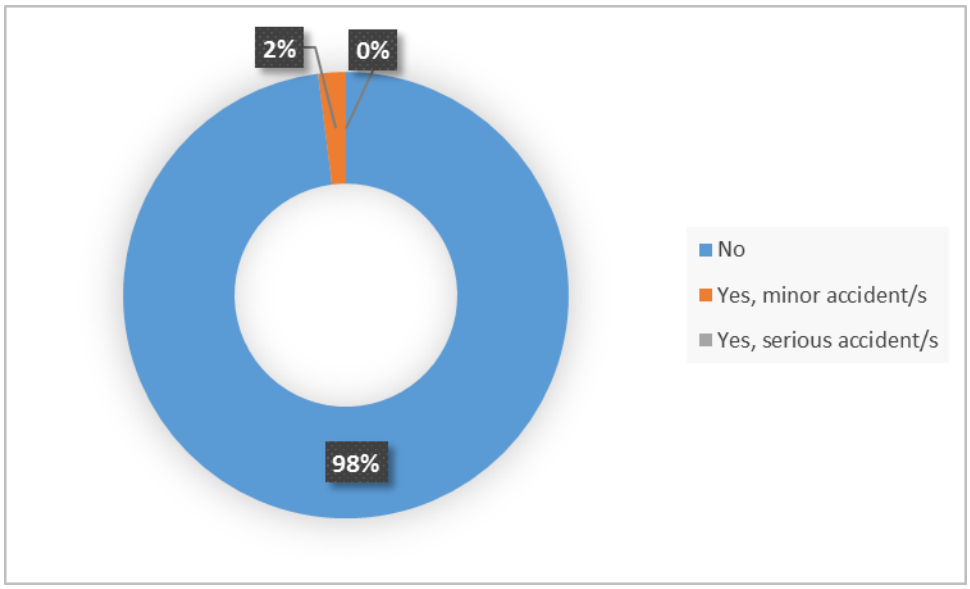


Figure 3.19 The percentage of households that have had accidents due to fuel or appliance use

There were further health and well-being impacts indicated by households in Dikgale, although these cannot be directly linked to the use of different energy sources or appliances. Similarly a small percentage of households having had accidents with energy fuels and appliance, only 127 households indicated suffering from the following diseases; Asthma, TB, burn, eye disease, skin disease, acute respiratory infection and pneumoconiosis. As indicated in the graph below (Figure 3.20) many of the households were mostly affected by eye disease (64%), followed by skin disease (12%) and burns (10%). Although males, females and children has eye disease, females were the most impacted compared to the other group. This pattern can be seen in all the other diseases as well. This maybe the result of the females being primary group that often directly handles energy fuels and appliances for cooking, lighting and heating purposes.

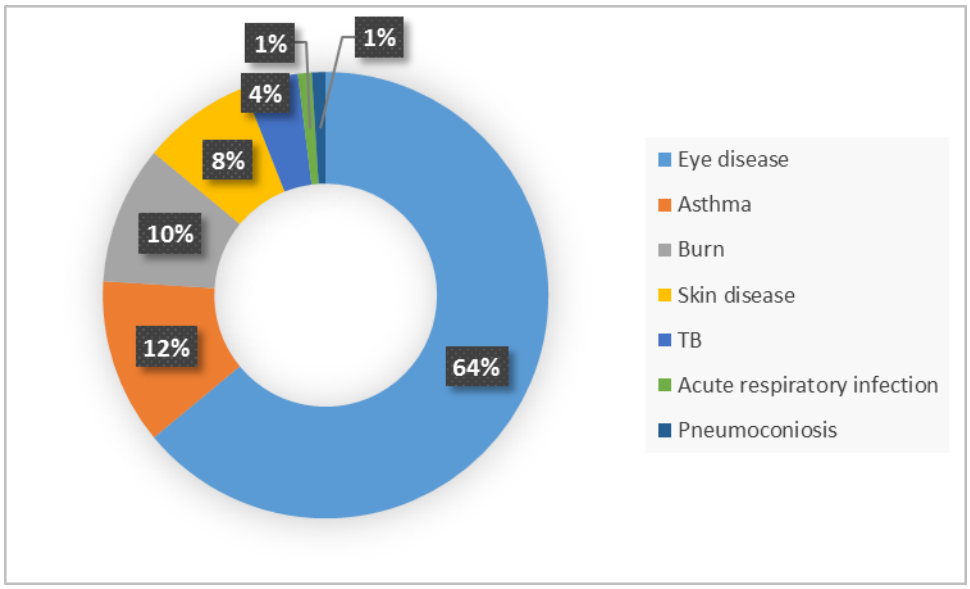


Figure 3.20: Percentage of households suffering from these common diseases

On the other side, Dikgale residents show that they are aware of the adverse impacts on health and well-being from the use of coal, wood and paraffin as only 23 households indicated that they burn wood/coal inside the house.

3.6 Affordability

In this section we evaluate the perceptions among households around energy affordability. The intention is to understand user perception of different energy sources to be able to develop appropriate and effective marketing and awareness programmes when rolling out alternative energy technology options. Households were asked about fuels they considered cheapest for the following energy services; cooking, heating and lighting (Table 3-8). Majority of the households considered electricity as the cheapest fuel for cooking and paraffin as the most expensive. The same was reported for water heating fuels. Electricity, paraffin, candles and solar were considered as cheap fuels for lighting however, more people still considered candles to be expensive as lighting source and a further 166 households indicated paraffin as the most expensive fuel followed by solar (96) and candles (90). Although some of the households have indicated the use of fuels such as paraffin and candles for cooking, lighting and heating, the responses to the

fuels households perceived as cheap indicates that the use of unclean fuels is mainly influenced by affordability compared to other reasons such as clean fuels or technology and/or safety.

Table 3-8: Cheapest fuels for energy services

	Cooking		Heating		Lighting		
	Cheap	Expensive	Cheap	Expensive	Cheap	Expensive	Most expensive
Electricity	324	57	316	47	253	82	26
Paraffin	54	295	44	278	34	25	166
Gas	7	28	12	37	0	0	0
Candles	0	0	0	0	36	237	90
Solar	0	0	0	0	64	43	96

Households have had to be energy efficient to reduce their energy consumption in order to avoid paying high prices as since 2008 electricity prices have been increasing steeply. Electricity price increases have impacted many households in the Dikgale area. Although 51% of the households said they could afford enough energy to meet their household requirements (Figure 3.21), which is further supported by 79% of the households who have continued to use the same amount of energy when electricity prices increased (Figure 3.22). 49% percent of the households are struggling to keep up with the electricity prices as indicated in Figure 3.21 with some of the households running out during the month due to affordability. This has caused 14% of the households to switch to other energy sources, unclean energy sources but easy to access and affordable in the short term compared to electricity (Figure 3.22). A small percentage (6%) of the households however indicated that they have reduced their electricity consumption.

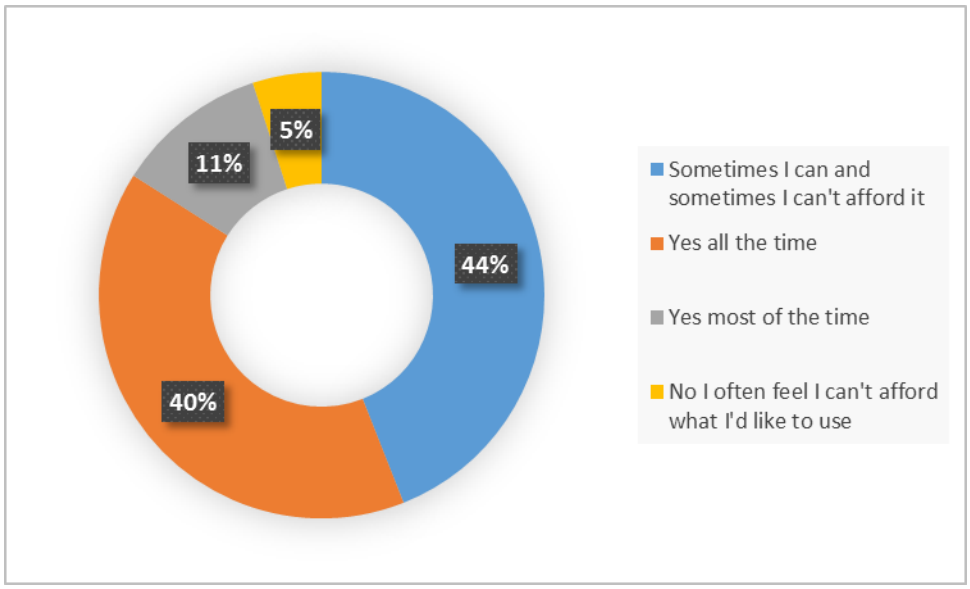


Figure 3.21: Perception of affordability of energy to meet household requirements

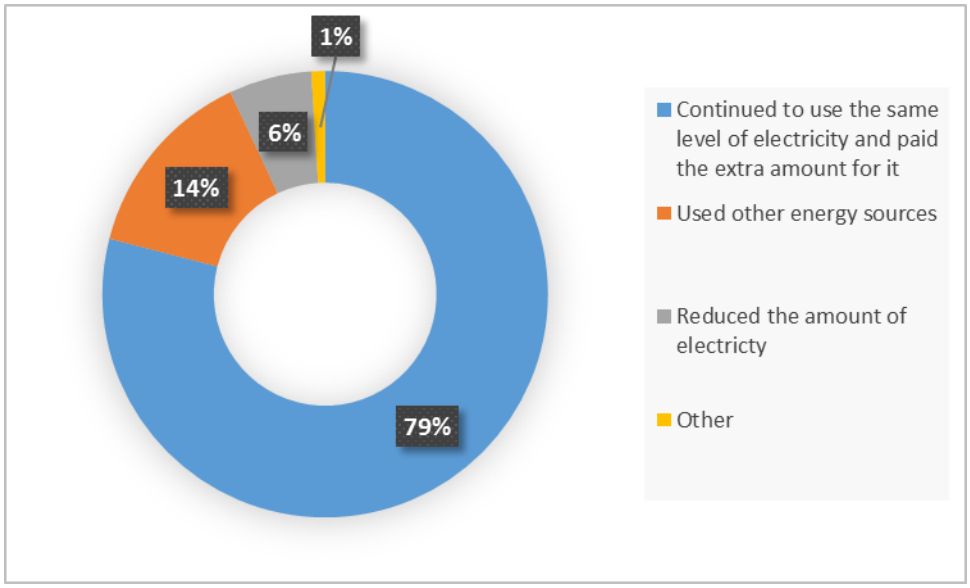


Figure 3.22: Responses provided by households for coping after electricity price increases

3.7 Business

In order to understand the influence of electricity demands other than domestic energy needs, households were asked if they were running businesses at home. This information

will assist in designing energy implementation plans that will consider energy options for different types of households with different energy needs. Only 12 households indicated running businesses at home (Figure 3.23) and only 8 of the businesses required energy for their daily activities. The type of businesses that required energy were spaza shops, shebeen, printing shop, selling cold drinks and meat, keeping products cool, cooking food, lighting and running machines (fridges, printing machine).

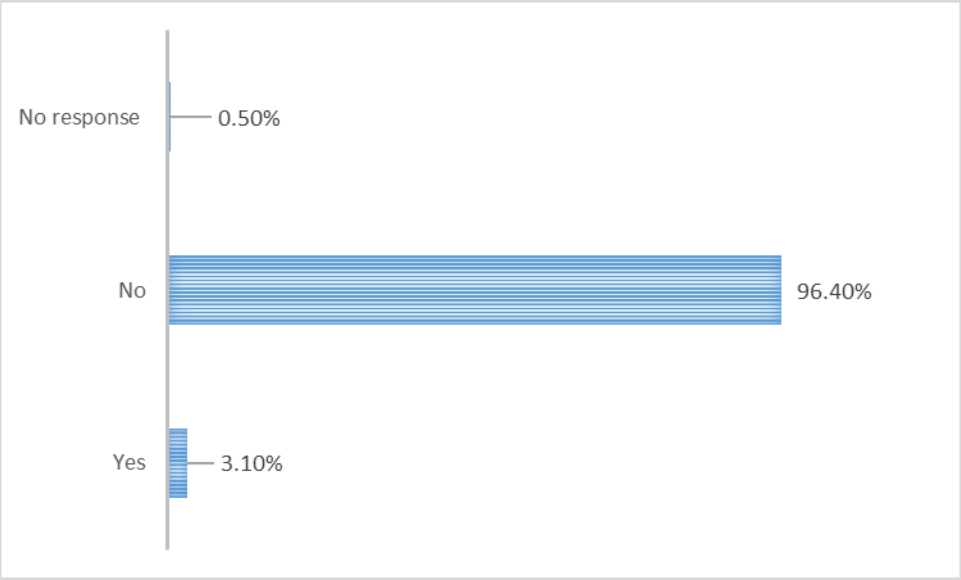


Figure 3.23: Number of households running businesses at home

3.8 Transport

A significant number of households indicated spending more than 60 minutes traveling to work daily and only 28% spend less than an hour (Figure 3.24). Many of these trips are made using taxis, buses and walking to commute to work. Households indicated using multiple of these mode of transports to commute. 358 households use taxis to travel to work and a further 145 households walk to work (Figure 3.26). The high figures are similar to the national figures as 22% and 18% of households use taxis and walking to travel to work respectively in 2013 according to the 2013 General household survey. This is a result of households not owning private motorized vehicles as 76% of the households indicated that they do not own a car while less than 24% of the households

own 1 or more cars (Figure 3.25). According to the State of Energy report 2015 public transport consumes the least amount of transport energy compared to privately owned motor vehicles. Thus, this is a great opportunity for the municipality to maintain this culture and further encourage households to continue using public transport and non-motorised transport.

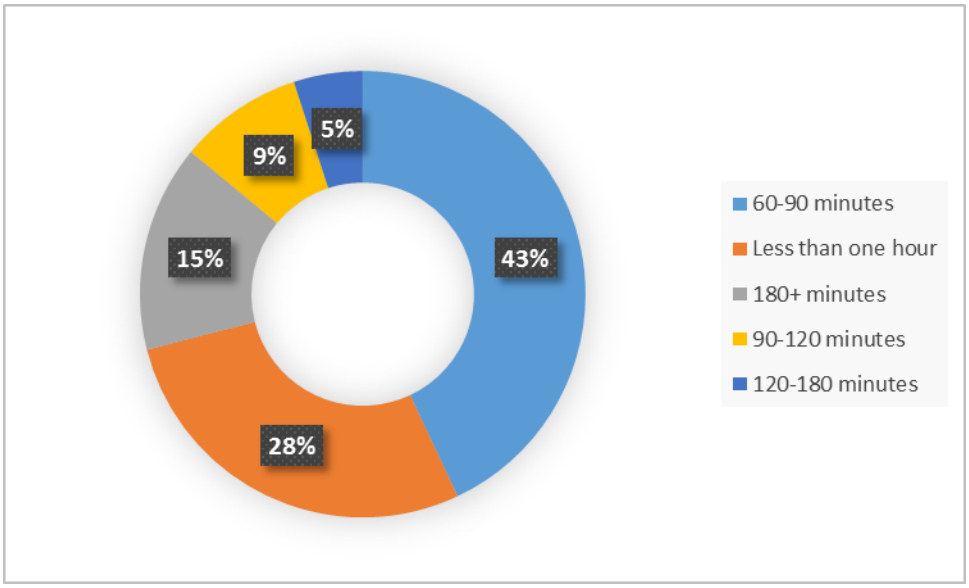


Figure 3.24: Amount of time spent travelling to work everyday in both directions

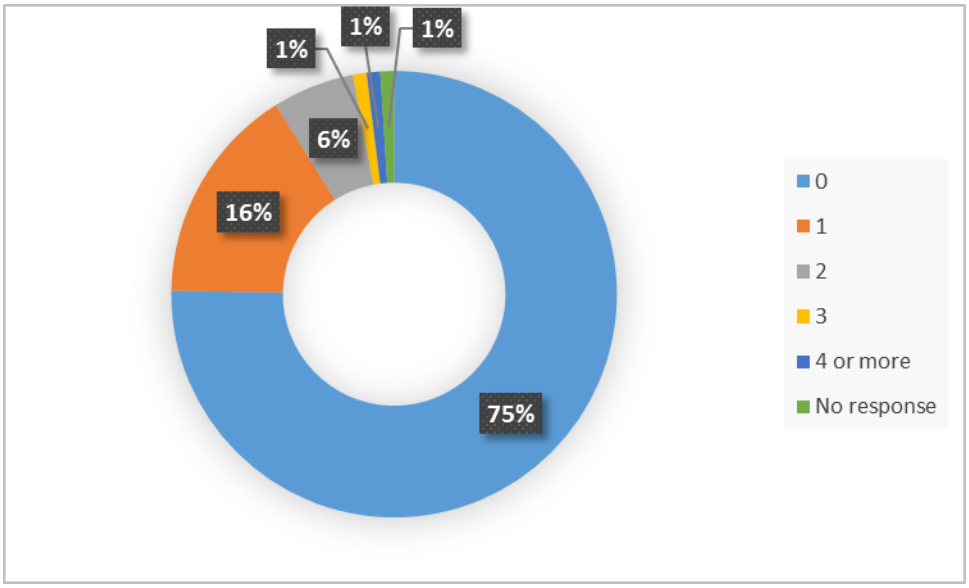


Figure 3.25: Number of households owning cars

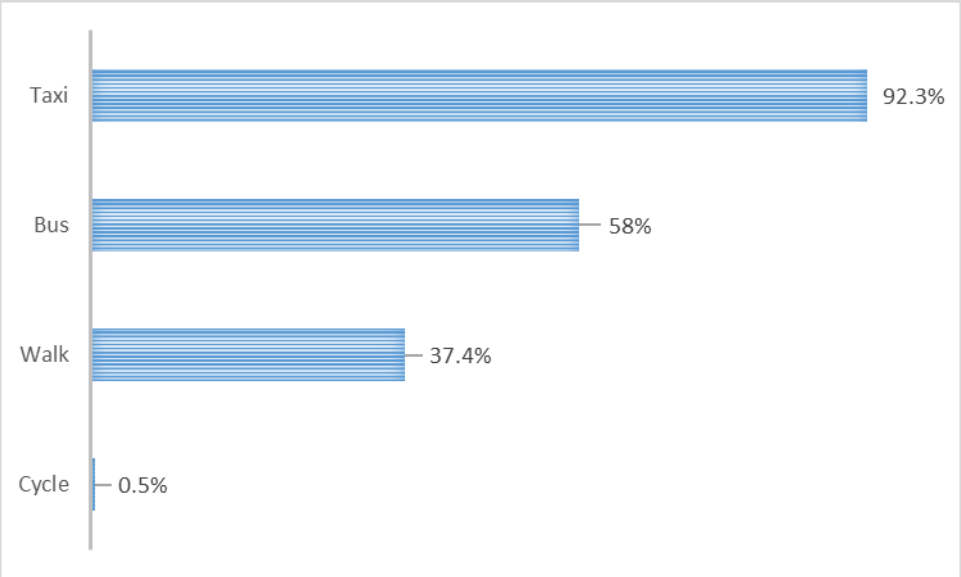


Figure 3.26: Main modes of transportation used to travel to work

Chapter 4. Discussion and concluding remarks

This survey has been important in highlighting the important issues related to energy usage patterns in peri-urban areas of South Africa. This extensive survey looked at household energy requirements for cooking, lighting, heating and cooling. The purpose of the survey was to gain an understanding of current energy use demands and needs as well as household perceptions around energy use and awareness.

In an area like Ga-Dikgale that is peri-urban, having access to high levels of access to electricity as well as high levels of use of that electricity is a good indication of decreased use of dangerous fuels e.g. firewood and paraffin and thus decreasing deforestation and diseases associated with the use of dangerous fuels. The most striking thing about the survey was the impressive electrification drive, as nearly 100% of the households have been electrified. Most households utilise electricity for their end energy uses – lighting, cooking, and appliance usage. Furthermore, there was a good level of awareness with regards to electricity tariff structures and efficient lighting with many of the households indicating that they are using CFLs lights. This is positive evidence of low income households' awareness of being energy efficient and cutting down on their electricity consumption.

However, although households are electrified, this study showed that households continue to use biomass fuels along with electricity to meet their monthly energy needs. The survey indicated that this was due to affordability. Households are not able to use only electricity for the whole month. This is linked to the extreme levels of poverty in the area and the rapid increase in the cost of electricity experienced in South Africa over the past five years. As money runs out, households revert to using 'free' energy services, such as fire wood, or services that they may have stored, or can purchase on 'tick' from local shops, e.g. paraffin.

The majority of households in the survey earn less than R3500. Although this qualifies the households to receive the Free Basic Electricity grant, only 22% currently receive it. This is a serious concern and challenge for the households and the municipality,

particularly in a context of steeply rising electricity prices, as the survey indicates that households resort to free and unclean fuels when money for electricity runs out. With this data the municipality could address the issue by ensuring that households are aware of the existing government grants for energy and ensuring the effective management of the subsidy registration process.

The use of multiple fuels by households as means to meet their monthly household energy needs, despite electrification, emerges as an important finding. Although this current energy package is mixed with dirty energy fuels, there is also an opportunity to change the energy package to a cleaner one. Since affordability emerged as a the key challenge for majority of households, the use of affordable alternative technologies such as solar lights, hot boxes and solar hot water boxes could reduce household energy consumption as well as energy costs. These alternative technologies are energy efficient, cleaner, safer and more affordable to households as they only require once-off/upfront, relatively low cost, payments. Other options for households include gas for cooking, ceilings to improve the thermal performance of the house and solar water heaters for heating water. However, as indicated in the results there is lack of awareness and usage of these fuels and technologies, with some households holding strong fears of using gas. Addressing these barriers to new technology uptake will require awareness raising and demonstration efficacy and safety. The municipality may have an important role to play to address issues of some of the technologies' prices and accessibility to the community as fuels like gas have varying prices and are difficult to access in remote areas while upfront payments for ceilings and solar water heaters maybe expensive to pay.

The findings challenge the conventional measure of energy poverty which indicates energy poverty when over 10% of income is spent on meeting energy needs of a household. At around 10% of income, households in the survey appeared to turn to 'free' energy services from the environment to meet their energy needs. Thus the household suffers 'energy poverty' not in direct cost terms, but through the indirect costs of indoor air pollution, environmental degradation and time costs and physical impact and dangers of fuel collecting in the *veld*. Further studies may want to look at the different levels of

service available from the energy inputs into a household to help explain energy switching and the extent of energy poverty in the area.

This study also investigated household transport use even though it was not extensive. The survey indicated that there was high level of use of public transport and walking. This is important and very positive as it means less carbon emissions as well as reduced transport fuel consumption such as petrol and diesel. Furthermore, there is less congestion in the roads, a positive sign as many growing cities are battling with constant road congestion by the use of private cars. It is essential for the municipality with the community to maintain and support this culture to avoid the growth of private car usage in the future as the trends show with increasing monthly household income; households tend to move towards owning their own private cars.

In conclusion, the information from this survey will be used extensively by Polokwane Municipality for the Energy and Climate Change strategy formulation as well as planning at all spheres of government and will be important contribution to the growing national picture of household energy poverty. Furthermore, the exercise itself has raised awareness among households and municipality around household energy consumptions.

Appendix 1 : Questionnaire

Polokwane municipality household energy services survey November 2015	Sustainable Energy Africa and Polokwane Municipality Tel _____

Introductory note (read to respondent): Hello, my name is …… I am a researcher from University of Limpopo/Provincial LEDET Energy efficiency trainee programme.

We are conducting a survey for Sustainable Energy Africa (SEA) and Polokwane Municipality about household energy use in Polokwane. We are interested in learning more about the energy sources that different households use for lighting, cooking and heating, as well as the affordability and safety of electricity and other energy sources. We ask that you help us by participating in a short interview, which should only take about 30 minutes. The information you give will be kept confidential.

SECTION I: Interview information

QUESTIONNAIRE NUMBER

I.1 Fieldworker name:			I.4 Village		
I.2 Date of survey			I.6 Household No		
I.3 Respondent age			I.8 Cellphone No		
I.3 Respondent sex	F	M	I.9 Consent has been read and obtained?	Yes	No
I.10 Signature of respondent					

SECTION A: HOUSE AND PEOPLE

A.1 Indicate the type of main dwelling that the household occupies?				
Free-standing individual house	Semi-detached house or apartment	Traditional\Hut	Informal Shack (not backyard)	Backyard Shack
1	2	3	4	5

A.2 Do you own or rent the house?	(1) Rent
	(2) Own

A.3 Is there a ceiling in this house?	(1) Yes
	(2) No

A.4 State who the head of the household is, his/her relation to you, sex, age and employment status.					
(1) Head of household (name)					
(2)Relationship (grandparent/husband/ wife/daughter /son /relative /friend etc)					
(3)M/F					
(4) Age (approx)					
(5) Employment status (TICK)	scholar/ student	pensioner	not employed	permanent employment	casual/temporar y employment

A.5 Could you please tell us the number of people in your household in each of the age categories below.					
Age	**1. 0-1**	**2. 1-15**	**3. 16-65**	**4. 66+**	**6. Total**
Number					

A.6 What are the main sources of income?				
(1) Wages	(2) Child grant	(3) Grant	(4) Disability grant	(99) Other (specify)

A.7 What is the total monthly income of the household coming from all sources, such as wages, pensions, child grants etc.?					
Income	1. R0-800	2. R801-R1600	3. R1601-R3200	4. R3201-R6400	5. R6401 +

A.8 Do you have any livestock?	Yes
	No

→ IF No, **GO TO B1**

A.9 IF YOU DO, please indicate type and number of livestock owned. Otherwise go to B1.						
Type of Livestock	Cow	Goat	Poultry/ Duck	Donkey	Sheep	Other Specify
Number						

SECTION B: HOME ENERGY

B.1 Do you have electricity in this household? (**TICK**)	(1) Yes
	(2) No

→ IF Yes, **GO TO B3**

B.2 If your home has no electricity, can you please tell me the reasons why?

↓ **GO TO B9**

B.3 Do you receive free basic electricity (FBE)? (TICK)	(1) Yes
	(2) No
	(3) Sometimes
	(99) Don't know

→ IF No, Sometimes & Don't know, **GO TO B5**

B.4 If yes, how much per month?	R
	(KWh)

B.5 When was the house connected to electricity? (Year)	

B.6 What type of electricity connection does the dwelling have?	
Prepaid meter in own dwelling and I am the only household using it	1
Prepaid meter in own dwelling and I also sell to neighbours from my meter	2
Buy from neighbour (no meter)	3
Other:	99

B.7 Do you sell electricity to neighbours?	Yes
	No

→ IF No, **GO TO B9**

B.8 If you sell electricity to neighbouring households, do you like selling electricity?	
Yes, it is an opportunity to earn extra money	1
No, because the electricity often trips because so many people use it	2
Other, please explain:	3

B.9 What types of energy do you use for the following household tasks? Please choose more than one if necessary. Rank them from most frequently to least frequently used.

	1. Electricity	**2. LPG Gas**	**3. Paraffin**	**4. Wood**	**5. Coal**	**6. Candles**	**7. Ethanol gel**	**8. Solar**	**9. Dung**	**10. None**
Example – cooking	*1*		*2*	*3*						
Cooking										
Lighting										
Heating your house in winter										

Cooling your house in summer										
Water heating										

B.10 (a) Do you run short of energy/fuel to cook with?	(1) never	(2) sometimes	(3) often
(b) IF YOU DO, why do you run short			
(c) IF YOU DO, what do you do when you run short?			

B.11 Is it a **problem to buy/fetch….. (only ask for fuels used)**			
(a)….electricity?	Yes	No	IF YES. Why?
(b)…paraffin?	Yes	No	IF YES. Why?
(c)…LPG / gas?	Yes	No	IF YES. Why
(d)… coal?	Yes	No	IF YES. Why?
(e)…wood?	Yes	No	IF YES. Why?
(f)…dung?	Yes	No	IF YES. Why?

B.12 Do you use more energy/fuel in winter than summer?	(1) Yes
	(2) No
	(99) Don't know

→ If No & Don't know, **GO TO B14**

B.13 If YES, what energy source/fuel you use more and for what purpose in winter

B.14 What is the total Quantity and/or Cost of the following types of fuel that you obtain or use on average per month?					
	Qty used/mth (optional)	**Cost R/mth**		**Qty used/mth** (optional)	**Cost R/mth**
(a) Electricity	1. kWh	2. R	(f) Wood	1. kg/bundles	2. R
(b) Paraffin	1. lit	2. R	(g) Candles	1. Packets	2. R
(c) LPG (gas)	1. kg/cyl	2. R	(h) Battery – dry cell (PM9, PM10, torch)	1. No.	2. R

(d) Charcoal	1. kg	2. R	(i) Car battery	1. charges	2. R
(e) Dung	1. kg	2. R	(i) Solar	1. kWh	2. R
(i) Other (specify)……				1.	2. R

B.15 State person(s) with the following responsibilities				
Energy source used	**(a)Who decides to buy and when to buy?** (man/ woman / daughter/ son /…..)	**(b) Who goes to fetch/buy?** (man/ woman / daughter/ son /…..)	**(c) Who pays?** (man/ woman / daughter/ son /…..)	**(d) How much do you buy/fetch at a time?**
(a) Electricity	(1)	(1)	(1)	(1) R
(b) Paraffin	(2)	(2)	(2)	(2) R
(a) LPG / gas	(3)	(3)	(3)	(3) R
(b) Charcoal	(4)	(4)	(4)	(4) R
(c) Wood (bought)	(5)	(5)	(5)	(5) R
(d) Dung	(6)	(6)	(6)	(6)

B.16 Technical problems: if your household is electrified, how often do you experience technical problems (such as tripping) related to your electricity supply (excluding scheduled loadshedding)?					
Always	Often	Sometimes	Rarely	Never	Don't Know
1	2	3	4	5	99

B.17 Do you collect wood (for free)?	(1) Yes, often
	(2) Sometimes
	(3) No

→ If No, **GO TO B19**

B.18 IF YOU DO, who fetches?	(a)
	…how much at a time?
	(b)

B.19 Do you collect dung (for free)?	(1) Yes, often
	(2) Sometimes

→ If No, **GO TO C1**

	(3) No

B.20 IF YOU DO, who fetches?	(a)
	…how much at a time?
	(b)

SECTION C: HOME APPLIANCES

C.1 Which of the following equipment do you have in your residence (select more than one category)		
Appliance	**(TICK)**	**Who decided to buy it?** (man/ woman / daughter/ son /…..)
ELECTRIC		
Lights		
Heater		
Hotplate		
Stove/oven		
Microwave		
Iron		
Fridge		
TV		
Hi-fi		
Kettle		
Geyser		
PARAFFIN		
Lamp		
Cooker (wick)		
Cooker (pressure)		
Heater		

LPG/GAS		
Lamp		
Cooker (ring)		
Cooker (stove)		
Cooker (oven)		
Heater		
WOOD		
Stove		
COAL		
Stove		

C.2	What is the main appliance used for **cooking**? (**mark with '1'**) Other appliance used? (**mark with '2'**)					
	1. Electricity	**2. Gas**	**3. Paraffin**	**4. Wood**	**5. Coal**	**6. Other -specify**
(a)	Elec hotplate	Gas (ring)	Par (wick)	Wood stove	Coal stove	
(b)	Elec stove/oven	Gas (stove)	Par (pressure)	Wood fire	Coal Mbawula	
(c)	Microwave					
(d)	Other (Specify)					

C.3	IF USING MORE THAN ONE APPLIANCE: Why? What's the difference between them?

C.4	If you could choose from any (whether have it or not), what are **the best** appliances for cooking?(**first choice mark with '1', second with '2'**)					
	1. Electricity	**2. Gas**	**3. Paraffin**	**4. Wood**	**5. Coal**	**6. Other - specify**

(a)	Elec hotplate	Gas (ring)	Par (wick)	Wood stove	Coal stove	
(b)	Elec stove/oven	Gas (stove)	Par (pressure)	Wood fire	Coal Mbawula	
(c)	Microwave					
(d)	Other (Specify)					

C.5 Why are these best?

C.6 IF YOU DON'T HAVE: Why don't you have these?

C.7 Which appliance would you rather **not** use for cooking (whether you have it or not)?						
	1. Electricity	**2. Gas**	**3. Paraffin**	**4. Wood**	**5. Coal**	**6. Other - specify**
(a)	Elec hotplate	Gas (ring)	Par (wick)	Wood stove	Coal stove	
(b)	Elec stove/oven	Gas (stove)	Par (pressure)	Wood fire	Coal Mbawula	
(c)	Microwave					
(d)	Other (Specify)					

C.8 Why?

C.9 What is the main appliance used for heating or cooling the house? (mark with '1') Others used? (mark with '2').						
	1. Electricity	**2. Gas**	**3. Paraffin**	**4. Wood**	**5. Coal**	**6. Other - specify**
(a)	Elec bar heater	Gas heater	Par heater	Wood fire	Coal Mbawula	
(b)	Elec fan heater					
(c)	Other (Specify)					

C.10 IF USING MORE THAN ONE APPLIANCE: Why? What's the difference between them?

C.11 Choose the ONE best appliance for heating the house (whether you have it or not)?					
Elec bar heater	Elec fan heater	Par heater	LPG/ Gas heater	Coal mbawula	Wood fire
Other (specify)…….			Other (specify)…….		

C.12 Why is this best?

C.13 Which appliances would you rather not use for heating the house (whether have them or not?					
Elec bar heater	Elec fan heater	Par heater	LPG/ Gas heater	Coal mbawula	Wood fire
Other (specify)…….			Other (specify)…….		

C.14 IF DON'T HAVE IT: Why don't you have it?

C.15 Why?

C.16 What is the main appliance used for **boiling or heating water to cook, clean or bathe with**? (**mark with '1'**) Other appliance used? (**mark with '2'**)						
	1. Electricity	**2. Gas**	**3. Paraffin**	**4. Wood**	**5. Coal**	**6. Other -specify**
(a)	Elec hotplate	Gas (ring)	Paraffin (wick)	Wood stove	Coal stove	
(b)	Elec geyser		Paraffin (pressure)	Wood fire	Coal Mbawula	
(c)	Kettle					
(d)	Other (Specify)					

C.17 IF USING MORE THAN ONE APPLIANCE: Why? What's the difference between them?

C.18 Choose the ONE best appliance for boiling water (whether you have it or not)?					
Elec hotplate	Elec kettle	Elec geyser	Solar geyser	Gas ring	Coal or Wood stove/fire
Other (specify)…….			Other (specify)…….		

C.19 Why is this best?

C.20 IF DON'T HAVE IT: Why don't you have it?

C.21 Which appliances would you **rather not use** for heating the house (whether have them or not)?					
Elec hotplate	Elec kettle	Elec geyser	Solar geyser	Gas ring	Coal or Wood stove/fire
Other (specify)…….			Other (specify)…….		

C.22 Why?

C.23 What other appliances would you (not your family) most like to get still?	
1.a	b. Why?
2. a	b. Why?

C.24 Why have you not got these?

C.25 What other appliances do you think **your family (not YOU)** would most like to get still?	
1a.	b. Who wants this?
2a.	b. Who wants this?
3a.	b. Who wants this?

SECTION D: ENERGY CHOICES, USAGE PATTERNS AND AWARENESS

D.1 Do you use energy efficient lightbulbs/ CFL's?	
Yes, always	1
Yes, for some of my lights	2
No, and I don't intend to	3
No, but I intend to buy them when I next need to replace my lightbulb	4
I don't know what these are	5

D.2 Do you know that there are different electricity prices for households that use below a certain number of units per month?	
Yes, I have heard about different prices, and try and use less than 350 units so I can get cheaper electricity	1
Yes, I have heard about different prices, but I am not able to use less than 350 units each month	2
Yes I think I heard about it, but I don't know the details and I don't know what I am being charged at	3
No I haven't heard about this	4
Other, please explain:	5

D.3 Are you aware of any of the following fuels or appliances? *Please tick all the appropriate boxes*.					
(1) Bioethanol gel	(2) Solar lamp	(3) Solar-powered cooker	(4) Wonderbag	(5) Diesel/petrol generator	(6) Other (specify)

D.4 What is your experience or perception of any of them? *Please complete for each fuel and appliance listed*.	
(1) Bioethanol gel	
(2) Solar	
(3) Wonderbag	
(4) Diesel/petrol generator	
(5) Other (specify)	

SECTION E: HEALTH AND SAFETY IN ENERGY USE

E.1 Has anyone in this household had an accident with energy (with a fuel or an appliance) (in the last 5 years)?	
Yes, fatal accident/s (resulting in death(s))	0
Yes, serious accident/s	1
Yes, minor accident/s	2
Yes both serious and minor	3
No	4
I don't know	5

E.2 If yes, what kind? (*Please tick all the appropriate boxes*)

1. Lightning	
2. Gas cylinder exploded	
3. Burn from touching hot plate/stove	
4. Child drank liquid paraffin	
5. Electrical fire	
6. Stove knocked over	
7. Flame burn	
8. Electric shock	
9. Candle fell over	
10. Stove exploded	
11. Fire	
12. Other:	

E.3 Which of the following common diseases the household is suffering or suffered from in the past? Please mark (✓) and specify number of members suffering/suffered from each disease.

Name of the diseases associated with Cooking/lighting fuel	**Male**	**Female**	**Children**
Asthma			
Tuberculosis			
Eye disease			
Pneumoconiosis			
Skin disease			
Acute Respiratory Infection			
Burn			

E.4 If you use paraffin, does it cause any household members discomfort (affects eyes, headaches, breathing, nausea etc.)?

Yes, a little bit	1
Yes, very badly	2
No	3
Not applicable	4

E.5 If you use wood or coal, do you ever use wood (e.g. in an

imbaula) inside the house?	
Yes	1
Yes, but only after the fire has burnt down a bit	2
No	3
Not applicable	4

SECTION F: AFFORDABILITY

F.1 What in your opinion is the cheapest fuel for the following energy services? Please rank from cheapest to most expensive – where 1 is cheapest, 2 is more expensive, 3 is most expensive etc.				
	Electricity	**Paraffin**	**Gas**	
Cooking				
Heating your house				
	Electricity	**Paraffin**	**Candles**	**Solar**
Lighting				

F.2 Do you generally feel that your household is able to afford enough energy to meet its requirements?	
Yes all the time	1
Yes most of the time	2
Sometimes I can and sometimes I can't afford it	3
No I often feel I can't afford what I'd like to use	4
Don't know	5

F.3 What did your household do as a result of the increase in electricity prices in the last 12 months?	
Continued to use the same level of electricity and paid the extra amount for it	1
Reduced the amount of electricity used	2
Used other energy sources, such as paraffin, gas, coal, wood and candles	3
Other (specify)	4
Don't know	5

SECTION G: ENERGY FOR BUSINESS/INCOME GENERATION

G.1 Do you have a business at your house or in this settlement?	Yes
	No

→ If No, **GO TO H1**

G.2 If so, what kind? (*Please tick appropriate box*)	
Spaza	1
Preschool/creche	2
Shebeen	3
Hairdresser	4
Printing	5
None	6
Other business, please specify:	7

G.3 Does your business require energy?	Yes
	No

→ If No, **GO TO H1**

G.4 If yes, what kind? (*Please tick all the appropriate boxes*)	
Electricity	1
Paraffin	2
Gas	3
Wood	4
Coal	5
Candles	6
Not applicable	7
Other (specify)	8

G.5 For what purpose does your business use this energy?

G.6 Are you satisfied with the energy you currently use for your business?	Yes
	No

→ If Yes, **GO TO H1**

G.7 If no, how could it be improved to serve your business better?

SECTION H: TRANSPORT

H.1 How do you travel? (*Please tick all the appropriate boxes*)				
1. Taxi	2. Bus	3. Animal drawn vehicle	4. Walk	5. Cycle

H.2 If you work, how long does it take you to travel every day both ways?				
Less than one hour	60-90 minutes	90-120 minutes	120–180 minutes	180+ minutes

H.3 How many cars does your household have?				
0	1	2	3	4 or more

GENERAL

Any general comments?

THANK YOU FOR YOUR TIME!

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