

# Activity 8



## Household Survey Report: KwaZamokuhle



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## EXECUTIVE SUMMARY

There is an increasing demand for current and detailed demographic and socio-economic data for households and individuals in developing countries. Such data has become indispensable in economic and social policy analysis, development planning, programme management and decision-making at all levels. To meet this demand, policy makers and other stakeholders have frequently turned to household surveys. Consequently, household surveys have become one of the most important mechanisms for collecting information on populations in developing countries.

In accordance with the scope of work, for Activity 8, a household survey was conducted on 365 households in Kwazamokuhle. This was to be done to establish baseline information on socio-economic conditions, energy use patterns, household emission sources, perceptions of air pollution and quality of life in the communities, prior to the implementation of interventions.

The approach to survey entailed a fair & transparent recruitment process which was followed by training and capacity building to the successful incumbents. A pilot study was conducted prior to execution of the household survey. The household survey was conducted between the 22nd and 28th February 2023 wherein a total of 407 households completed the questionnaire. These households had not received interventions as of the above date to ensure none bias in the results. Undoubtedly, people's perceptions are informed by their most recent experiences unless explicitly asked to reflect on specific events or moments in time. It is widely understood that local concentrations of air pollutants depend upon the strength of their sources and the efficiency of their dispersion. Day to day and seasonal variations in concentrations are more affected by meteorological conditions than by changes in source strengths. Under some conditions both factors may play a part, for example in cold, still weather, dispersion is reduced whilst production is increased by the increased use of domestic space heating and cooking etc. In summer,

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as temperatures rise, dispersion is better. This in turn affects the way people respond to their lived experiences of pollution. Therefore, in order to have a more representative response, surveys must be repeated at different times in the year.

However, it must be noted that the academic integrity of the study was preserved by ensuring compliance with ethical principles at every stage of the research process. The following section presents a summary of the household survey results in KwaZamokuhle.

- *Household Demographics*

In terms of gender distribution, it was evident that for KwaZamokuhle the majority of the surveyed population are females. This is statistically significant as woman in general represent the most vulnerable group in South Africa but also more importantly, are directly exposed to indoor air pollution through activities such as cooking. Most of the respondents were between the ages 20-60 years. Typically, people in this age group are more resilient to air quality related illnesses and this manifests in the health response received.

An analysis of the age distribution for female headed households indicated that ~18% were headed by young female adults (20 to 39 years old); with ~42% headed by middle aged female adults (40 to 59 years old) and 40% headed by old female adults (60 to 99). This is an interesting dynamic for Eskom AQO intervention roll-out to note as the old female adults are typically weary of LPG solutions from a safety and risk perspective. A targeted awareness and safety training in terms LPG at this old female (60 to 99) adult segment may plausibly result in a higher uptake herein.

- *Housing*

In KwaZamokuhle, the largest percentage of people (60.2%) were residing in RDP housing. Directionally this supports the rollout of the Eskom AQO intervention in KwaZamokuhle due to the availability of the large number of RDP homes. The percentage

of shacks in backyards in KwaZamokuhle was 5%. This compares favourably to the national 2011 Census number of 7%<sup>1</sup>. The low percentage of shacks present in KwaZamokuhle indicates that their contribution to ambient air pollution in KwaZamokuhle should be low and thus will not significantly deteriorate the KwaZamokuhle airshed.

- *Materials used in construction.*

In KwaZamokuhle, half the roofing was made up of tiles and the remainder was constructed of metal sheet. With only half the homes having ceilings and no insulation, thermal comfort is compromised in KwaZamokuhle, which may lead to the use of “dirty” fuels through energy stacking in winter months. The absence of ceilings in the households reinforces and supports the roll-out of Eskom’s AQO ceiling intervention solution.

In terms of the main dwellings floor type, more than half of floors were of cement and the balance were covered by tiles, carpets were a luxury reported by few. Perhaps a low hanging fruit could be the rollout of carpets to households to aid in improving the thermal comfort of the homes in winter, however the socio-economic viability of this hypothesis will need to be tested. Carpet fibres are natural insulators with low heat conduction values. In addition, carpet surface pile, with its millions of tiny fibres, traps air and further increases its thermal insulation<sup>2</sup>

Material	Thermal insulation R Value (m <sup>2</sup> K/W)
Concrete (10 cm thick)	0,07
Plywood (1 cm thick)	0,08
Carpet (1 cm thick)	0,18
Fibreglass insulation (1 cm thick)	0,22

<sup>1</sup> Census 2011, Statistics South Africa, <https://www.statssa.gov.za/publications/P03014/P030142011.pdf>

<sup>2</sup> TecSom, <https://tecsom.com/en/news/carpet-thermal-insulation-performance#:~:text=Carpet%20is%20an%20exceptionally%20good,further%20increases%20its%20thermal%20insulation.>

Table 1: Comparison of thermal resistance of different materials

- *Energy use*

- Use of electricity from interconnected grid or isolated system*

Almost all the respondents (99.26%) indicated that they have access to electricity. However only 63.9% of respondents indicated that they utilise electricity continuously throughout the year. Electricity is used predominantly for lighting. From the survey results its evident that only 42% use energy saving light bulbs whilst the rest still use incandescent light bulbs. An opportunity exists herein for Eskom to replace these incandescent light bulbs with energy saving lightbulbs which will contribute to increasing the monthly disposable income of the households. In terms of expenditure on electricity, 51% of the households reported using between R200-R500 per month whilst 34% reported spending only R1-200 per month. The most popular appliances used are the refrigerator, iron and TV and in decreasing order electric stove, microwave and washing machine. In case of electricity failure most (84%) use candles as a backup while almost none use gas lamps, generators, car batteries or any other backup.

- Candle use*

Six to twelve candles are used by most households (81%) every month; mainly for home use during load shedding. Candles are used for lighting and present a major fire hazard more so than contributing to poor air quality. An opportunity may exists herein for Eskom to replace the use of candles by providing the homes with rechargeable electric lights. However, the viability of this solution at scale will need to be tested.

- Use of LPG*

In KwaZamokuhle, only 43 households of the interviewed households reported the use of LPG. Whilst LPG is utilized in small amounts by the households with a lower income, it

seems that there is a slight increase in LPG use associated with the households that have a higher income threshold (>R20 000). The most popular gas cylinder size was the 9Kg which is used by 70% (30 of the 43) households utilising LPG. The preference for a 9kg cylinder is aligned to Eskom's AQO intervention rollout of 9kg cylinders in the area. The gas is mainly used by these households for heating (LPG heater) and cooking (stove).

There are a number of innovative, new modalities for LPG gas sales and use that Eskom may want to pursue. This includes interventions such as "pay as you gas" ie users can decide exactly how much they would like to spend on gas, whether it be R10 or R100 OR "pay as you use" – users receive a filled gas cylinder and pay for only what they use. This has the potential to develop a whole new LPG distribution and SSME ecosystem.

#### *Firewood*

Firewood is a cheap, easily available fuel source for cooking and heating in KwaZamokuhle as compared to electricity and LPG. The majority of residents pay just over R100 for a bundle which is usually obtained within one kilometre from their dwelling. The bundle of firewood lasts for at least a month. However, it contributes to poor air quality as a result of particulate matter. Shifting residents away from firewood, not only eliminates deforestation but also avoids soil erosion and aids in dust suppression, a significant source of particulate matter.

#### *Use of charcoal*

Less than 5% of households use charcoal and as a result the data is very limited for the purposes of this analyses. Charcoal is not only more expensive than coal but also not as easily available. Charcoal is purchased from shops and is used for cooking and heating.

Because coal is more readily available than charcoal, households tend to migrate towards coal.

#### *Use of coal*

The survey results indicate that coal is used by 47% of the households and the coal is typically sourced within 50 meters of the dwelling. The coal is reliably provided by multiple suppliers who are located in a close proximity to the households. Most of the respondents purchase a 50kg bag of coal paying just more than a R100 which lasts a month. Of all the fuel sources, coal is the least expensive by energy content. It's noted that the survey was conducted in February (summer) and the space heating requirements are considerably higher in winter, hence this coal usage will vary accordingly.

#### *Animal dung*

Only three households in KwaZamokuhle reported the use of dung, making a proper analysis of such a small sample insignificant.

- *Cooking, Space Heating & Lighting*

For cooking, 45 % of households reported mainly electricity as their main energy source, while only 3,6% reported that LPG is used as the main source of energy for cooking. Firewood is used more often than LPG for cooking with 11.3% of households using mainly wood, coal is used by 23% households as the main cooking fuel. In terms of heating, 50% of the households reported use of electricity with only 3% using LPG. Again, firewood and coal are used more often than gas for heating. Virtually all households (99%) use electricity for lighting, rarely using any other source of energy as an alternative for light.

It was reported that 46% of the households use a coal stove and 45% use an electric stove. Most homes have one window only in the cooking area using predominantly either

electricity, coal or firewood. With poor ventilation, exposure to household air pollution is exacerbated by use of dirty fuels.

- *Quality of Life*

- Health*

In KwaZamokuhle, ~52% of the respondents indicated an overall satisfaction with their overall health and only 28% felt dissatisfied. Eye diseases or irritation was self-reported by 54% households with varying degrees of severity and cough was reported by 58% of the respondents. Additionally, it is important to note that the respondents indicated that ~52% of the households are non-smoking. This precludes smoking as a contributor to respiratory diseases for these households. The converse holds true for the 48% of smoking households.

- Wellbeing*

For KwaZamokuhle, 46.7% of households earn reliable incomes of between R1000 and R5000 per month, mainly through pensions or grants with few inhabitants employed. This is reflective of the national norm with high unemployment rates and reliance on basic income grants. Generally, in KwaZamokuhle there isn't enough disposable income left over for energy purchases, and therefore energy stacking becomes significant. This factor can influence the viability and sustainability of wide-scale LPG adoption in KwaZamokuhle for the Eskom AQO Project.

Fruit and vegetables are not grown nor sold on the properties except for a few exceptions. An opportunity could exist to promote the development of subsistence and communal vegetable gardens which may directly help to reduce fugitive dust emissions in the area. Vegetable and fruit trees and plants stabilize soil, preventing erosion and reducing dust.

- Education*

In KwaZamokuhle, only 14% of the respondents attend an educational institution. The bulk of respondents and breadwinners have a Grade 8-Matric qualification, with a third unsatisfied and two-thirds satisfied with their qualifications. Seen simplistically, it will be a challenge for most respondents to break the cycle of their current socio-economic

### *Standard of Living*

Standard of living reflects on other services received by households such as water, sanitation and refuse removal. Although not key determinants of air pollution and associated health risks, they play an equally important role in overall socio-economic conditions and health impacts on people in low-income households.

### *Water*

In KwaZamokuhle, households have access to piped water with fewer than 4% of respondents indicating that they have to source water from long distances. However, availability of water is intermittent. Every month, water is available between 11 and 20 days with some households reporting 100% availability. Water costs is less than R500 per month. Rainwater is harvested by 45% of the households. Although not directly related to air pollution, interventions encompassing rain water harvesting can be a useful social compact and goodwill capital for Eskom in the community.

### *Sanitation*

In KwaZamokuhle, all the surveyed 407 households had flushing toilets on the property and neighbours do not use their toilets which is better than the national norm.

### *Waste*

Waste is collected at 95% of the surveyed households, from outside the house, once a week and the collection is reported as reliable. When not collected the homeowner normally waits for the next collection day or takes the waste to the waste dump. It was noted that each extension in KwaZamokuhle has its own dumping bin point, thereafter the municipality will collect these bins to the main waste site outside of KwaZamokuhle. This prevents solid waste burning which contributes to air pollution in the airshed.

### *Safety & Security*

Despite the national crime statistics, participants were feeling generally safe (68%) in the area where they live with only 11 people reported being a victim of crime on the past year. Burglary was the highest experienced crime in Kwazamokuhle.

- *Air Quality Awareness*

The survey responses suggest that the residents of KwaZamokuhle are generally not aware of the air pollution and its associated impact on health and wellbeing. It is strongly recommended that Eskom embarks on an awareness campaign on this and possibly other socially relevant topics. From the survey responses on education, it is proposed that targeting children at schools as primary recipients will achieve the desired objective. There is generally a greater efficacy of generating adult awareness of environmental air pollution through children who share the message back home.

Importantly, its noted that ~47%the respondents indicated that they were generally satisfied with the air they breathe and a similar percentage (46%) of respondents did not feel that air pollution was a problem.

The household survey at KwaZamokuhle provided valuable insight into the community perceptions, wants and needs. It has reaffirmed and support for the Eskom AQO interventions for targeting RDP households with the celing insulation and electric stove

retrofits. Additionally, the study results have indicated that there may exist an opportunity for Eskom to consider other potential low-hanging fruit (Table 1) that may aid and support the Eskom AQO project. However, its noted the viability and feasibility of these proposed solutions (Table 1) will need to be tested prior to embarking on a large scale rollout.

**Table 1: Other opportunities identified to support the Eskom AQO project**

Intervention	Description
<b>1. LPG awareness and safety campaign for older females.</b>	A targeted awareness and safety training in terms LPG to the old female (60 to 99) adult segment may plausibly result in a higher uptake herein.
<b>2. Covering up of cement floors in homes</b>	Rollout of carpets to households to aid in improving the thermal comfort of the homes in winter
<b>3. Replacement of incandescent light-bulbs.</b>	An opportunity exists herein for Eskom to replace these incandescent light bulbs with energy saving lightbulbs which will contribute to increasing the monthly disposable income of the households.
<b>4. Providing households with rechargeable electric lights</b>	To replace the use of candles during loadshedding by Eskom providing the homes with rechargeable electric lights.
<b>5. Reducing fugitive dust emissions of households</b>	Fruit and vegetables are not grown nor sold on the properties except for a few exceptions. An opportunity could exist to promote the development of subsistence market gardens which may directly help to reduce fugitive dust emissions in the area
<b>6. Targeted air quality awareness training for primary and secondary schools</b>	The survey responses suggest that the residents of KwaZamokuhle are generally not aware of the air pollution and its associated impact on health and wellbeing. It is strongly recommended that Eskom embarks on an air quality awareness campaign that is targeted to children at primary and secondary schools as primary recipients will achieve the desired objective.

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## 1. BACKGROUND

### 1.1 AIR QUALITY OFFSETS GUIDELINE

An environmental offset is an action(s), designed to compensate for a negative environmental impact of resource use, a discharge, emission or other activity. The Department of Environment, Forestry & Fisheries (DEFF) defines air emissions offsets as an intervention, or interventions, specifically implemented to counterbalance the adverse and residual environmental impact of atmospheric emissions in order to deliver a net ambient air quality benefit within, but not limited to, the affected airshed where ambient air quality standards are being or have the potential to be exceeded and whereby opportunities and need for offsetting exist (Notice 333 of 2016).

### 1.2 ESKOM'S APPROACH TO AIR QUALITY OFFSETS

DEFF's Air Quality Offset Guideline has shaped and informed Eskom's Air Quality Offsets Implementation Plan. This Plan has been based on a scientific process of feasibility studies, testing and demonstration, and on consultation with key stakeholders. Figure 1 illustrates the concept schedule for the phased implementation of Eskom's air quality offsets.

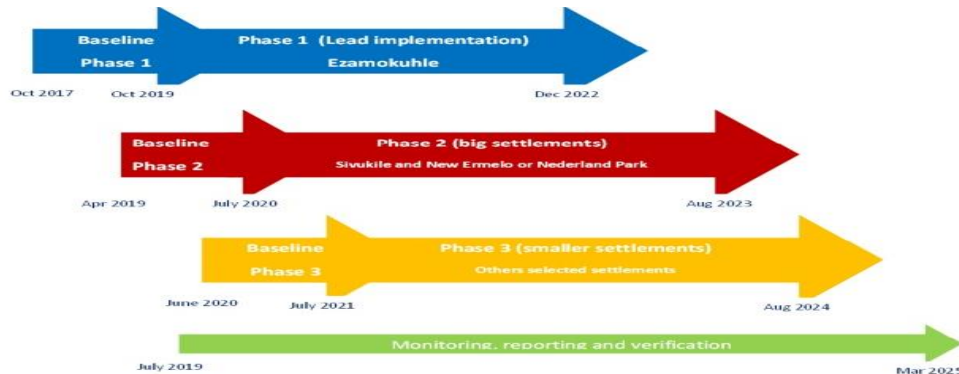


Figure 1: Concept Schedule for the implementation of Eskom’s air quality offsets (Matimolane, 2020)

Eskom has adopted the phased approach (Figure 2) herein to increase the probability of success and to ensure that learnings from early phases are incorporated into the large-scale roll-out. (Matimolane, 2020).

Figure 2: Eskom’s Phased approach to the rollout of air quality offset interventions (Matimolane, 2020)

Phase 1	Phase 2	Phase 3
<ul style="list-style-type: none"> <li>•Lead Phase</li> <li>•The intervention is tested on an entire community in order to determine the best way forward for scaling up the initiative.</li> </ul>	<ul style="list-style-type: none"> <li>•Full implementation on the remaining households in the larger settlements</li> <li>•Learnings from the Lead Phase incorporated herein.</li> <li>•Intervention will be rolled out simultaneously at several large communities across the three district municipalities and selected areas in the Vaal.</li> </ul>	<ul style="list-style-type: none"> <li>• Full implementation on the remaining households in the smaller settlements</li> <li>• Learnings from the Lead Phase incorporated herein.</li> <li>• The intervention will be rolled out simultaneously at several small semi-rural communities the three district municipalities and selected areas in the Vaal.</li> </ul>

Eskom's air quality offsets programme is designed to reduce human exposure to harmful levels of air pollution by reducing emissions from local sources, like domestic coal burning and waste burning. Thus, air quality offsets can improve ambient air quality in low-income communities in the vicinity of Eskom's power stations. Eskom has developed air quality offset (AQO) implementation plans for three district municipalities; Nkangala, Gert Sibande, and Fezile Dabi.

### 1.3 ESKOM'S PLANNING, MONITORING AND VERIFICATION (PMV) PROJECT

For Eskom's phase one of the PMV Project, interventions to reduce household emissions from domestic coal/wood burning will be rolled out in KwaZamokuhle, Ezamokuhle and Sharpeville in the Mpumalanga Highveld. For formal dwellings the intervention will be a thermal insulation retrofit and an electricity starter pack and installation. The intervention for informal dwellings still needs to be selected and tested. Waste intervention solutions have been identified and implemented in Sharpeville, Gauteng. Since domestic coal burning is less prevalent in Sharpeville, it is expected that a community-scale intervention, like reducing waste burning, will be more suitable there.

Air Resource Management (ARM) (Pty) Ltd has been appointed by Eskom to support the PMV services in support of the *Phase 1: Lead implementation* at: KwaZamokuhle; Ezamokuhle and Sharpeville. Its ARM (Pty) Ltd understanding that the overall objective *Lead Implementation Phase* is to benefit the specific local communities, minimize implementation risk, increase practical and scientific knowledge, and develop and refine monitoring, reporting and verifications processes. To achieve this, Eskom has included sixteen targeted work package Activities (Table 2) for these respective communities. This report focuses on *Activity 8: Household Survey in the Kwazamokuhle community*.

Table 2: Eskom PMV Activity Schedule (Eskom PMV NEC Contract,27082020)

Activities	Kwazamokuhle	Ezamokuhle	Sharpeville
Activity 1: Preliminary air quality assessment		✓	
Activity 2: Gather Area intelligence		✓	
Activity 3: Rapid in situ assessment		✓	
Activity 4: Obtain ethical clearance		✓	
Activity 5: Census	✓	✓	✓
Activity 6: Community source survey		✓	
Activity 7: Fuel source survey		✓	
Activity 8: Household surveys		✓	
Activity 9: Annual (household/community) surveys and monitoring of project effectiveness	✓	✓	✓
Activity 10: Ambient air quality monitoring	✓	✓	✓
Activity 11: Conduct indoor air quality monitoring	✓	✓	
Activity 12: Atmospheric Dispersion Model	✓	✓	✓
Activity 13: Design of Intervention		✓	✓
Activity 14: Development of Database Reporting	✓	✓	✓
Activity 15: Strategic Assistance and offsets methodology	✓	✓	✓
Activity 16: Research and Development	✓	✓	✓

## 1.4 SCOPE OF WORK

There is an increasing demand for current and detailed demographic and socio-economic data for households and individuals in developing countries<sup>3</sup> (include references). Such data has become indispensable in economic and social policy analysis, development planning, programme management and decision-making at all levels. To meet this demand, policy makers and other stakeholders have frequently turned to household surveys. Consequently, household surveys have become one of the most important mechanisms for collecting information on populations in developing countries.

<sup>3</sup> <https://www.imf.org/en/Publications/fandd/issues/2020/03/changing-demographics-and-economic-growth-bloom>,  
[https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms\\_216451.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms_216451.pdf)  
[https://unstats.un.org/unsd/hhsurveys/pdf/household\\_surveys.pdf](https://unstats.un.org/unsd/hhsurveys/pdf/household_surveys.pdf)

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In accordance with the scope of work, for Activity 8: *Household Survey in the Kwazamokuhle Community*, ARM is to conduct household surveys on a statistically significant number of households in KwaZamokuhle which will be 10% of the total households in KwaZamokuhle (365 nonintervened households) which will allow a margin of error of  $\pm 5\%$  with a 95% confidence level. This is aligned to international best practice for scientific research. This is to be done to establish baseline information on socio-economic conditions, energy use patterns, household emission sources, perceptions of air pollution and quality of life in the communities, prior to the implementation of interventions. It's noted that the local community must be recruited and trained to conduct these surveys.

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## 2. METHODOLOGY

### 2.1 APPROACH

In this study ARM focused on using the most appropriate survey sampling methods. Our approach (Figure 3) was framed considering the following mandatory principles below:

- 1) *Consent is first obtained from the local leadership (Councilor's) to conduct the surveys in the community.*
- 2) *A fair and transparent recruitment processes is followed aligned to both Eskom's and the local leadership's guidance.*
- 3) *It remains the responsibility of ARM to preserve the academic integrity of the study by ensuring compliance with ethical principles at every stage of the research process. ARM did obtain formal Eskom permission for use of the questionnaires and the method allowed for effective collection of data. Care was taken to ensure that the identities of the respondents are protected and that both confidentiality and anonymity is maintained during the data collection process. The researcher ensured integrity of the research process by accurately reporting findings.*
- 4) *Data collected was securely stored to maintain anonymity. All recordings are safely stored for a period of five years and thereafter erased.*
- 5) *To mitigate existing assumptions and to achieve reflexivity, ARM made use of fieldworkers to aid with the gathering of data. All fieldworkers were fluent in Zulu to enable meaningful communication & participation with all the participants in KwaZamokuhle.*
- 6) *The researcher fulfilled an ethic role and objectively viewed, interpreted, and reported on research findings.*

Figure 3 highlights the process that ARM adopted to conduct the household survey in KwaZamokuhle. At a high level, a fair & transparent recruitment process was first conducted. Thereafter training and capacity building was provided to the successful

incumbents. A pilot study was conducted prior to execution of the household survey. The fieldworkers captured the household respondents answers onto an online questionnaire. Thereafter the data and results were analysed.

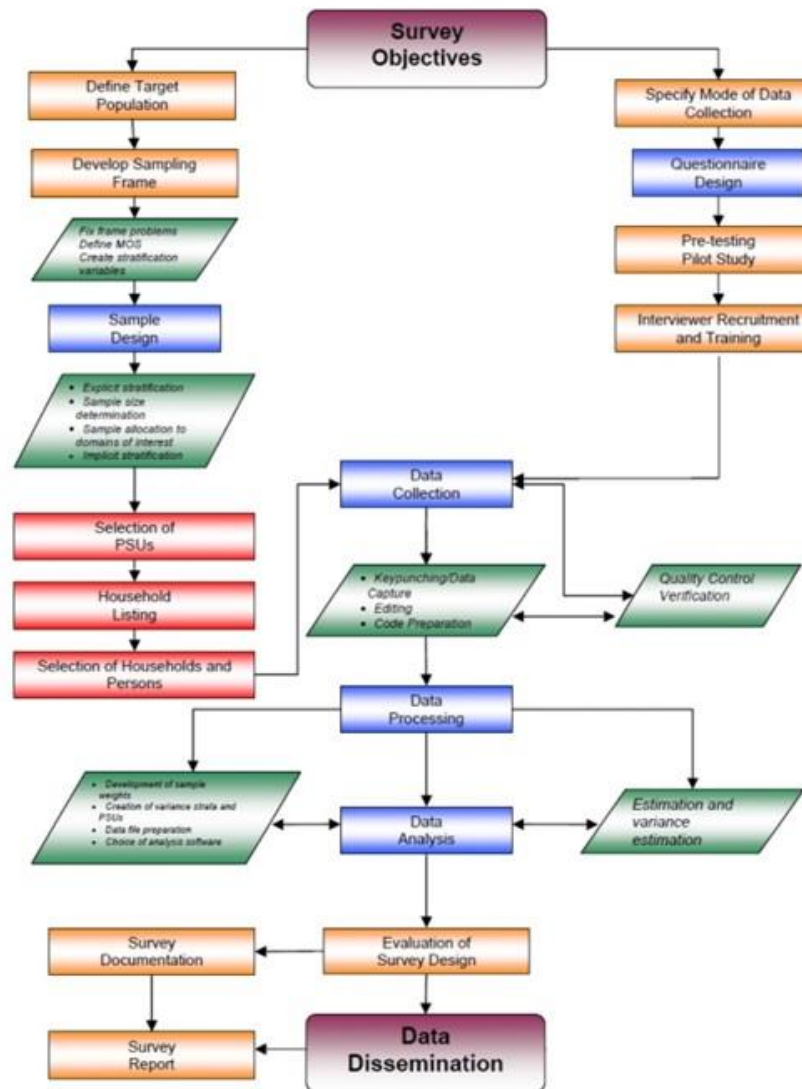


Figure 3: Flowchart of the household survey process that was adopted for the study

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### 2.1.1 PERMISSION TO CONDUCT THE STUDY

In conjunction with Eskom Communications team, the local leadership (Councillors) of KwaZamokuhle were engaged to obtain their permission and support to conduct the household survey in KwaZamokuhle. An in-person meeting was held with the local KwaZamokuhle ward Councillors to highlight the: proposed recruitment process; data collection methods; reporting; ethical considerations, and the intended contribution of the study. After obtaining the guidance, support and buy-in from the Councillors, the team thereafter proceeded with the recruitment process.

### 2.1.2 RECRUITMENT OF FIELDWORKERS

ARM followed the recruitment process as advised by the Kwazamokuhle Ward 1, 2 and 3 Ward Councillors, which was further supported by the wider Eskom team. Advertisements noting the positions, amount of people and scope of work were distributed at main centres for viewing (Youth Community Centre, Taxi rank and Library), with candidates being able to leave their curriculum vitae's, ID copies, and of proof residence at the Project Management team's office located at the KwaZamokuhle Youth Centre. Interviews were then conducted with 23 interviewees. The 14 candidates scoring the highest scores from the interview panel were offered fieldworker positions. A copy of the advertisement is shown in Annexure 1.

### 2.1.3 TRAINING OF FIELDWORKERS

On the 21<sup>st</sup> February 2023, a training session held with the fieldworkers at the KwaZamokuhle Youth Center (Figure 4). The topics covered included:

- Safety induction and training including the risk assessment for the household survey component
- Correct use of the PPE that ARM had issued to all fieldworkers

- An overview of the Eskom Air Quality Offset Project including the PMV component
- The household survey required for Activity 8
- The detailed questionnaire to be utilized for Activity 8
- The JotForm mobile application that was to be utilized for capturing the questionnaire



**Figure 4: Fieldworker training workshop at KwaZamokuhle youth center**

Additionally, all fieldworkers were provided with access to all materials presented at the training workshop.

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#### 2.1.4 FIELD SURVEY

On the 23<sup>rd</sup> of February 2023, our team (Figure 5) of 13 fieldworkers started the field survey. The team worked in pairs (one male and one female) to ensure that our team was always safe. As per the SoW (section 1), a total of 365 households were required to be sampled in KwaZamokuhle. Thus 122 households per KwaZamokuhle ward (Figure 6) was required to be sampled. The household survey Eskom-approved questionnaire (Annexure 2) were conducted in Zulu by the fieldworkers onto mobile devices. The questionnaire captured key themes including *inter alia*: household details; main dwelling characteristics; electricity and energy use; cooking devices; health & well-being; education; safety & security; standard of living and air quality awareness. The questionnaires took no longer than 30 minutes for each household to complete. The data from these devices were securely transferred to the cloud in real-time in JotForm. It is noted that our team did exceptionally well as at the end of the campaign, a total of 407 households completed the questionnaire.

#### 2.1.5 DATA ANALYSES OF SURVEY QUESTIONNAIRES

The quantitative and qualitative data collected by the survey differed in complexity and purpose. For the survey the data was collected through a simple questionnaire that featured a mix of qualitative and quantitative answers from 407 respondents, as a result simple statistical analysis methods would be employed. Most item responses constitute free text where the fieldworker captured responses in JotForm.



Figure 5: Our fieldworker All-Star team on the ground



Figure 6: KwaZamokuhle wards

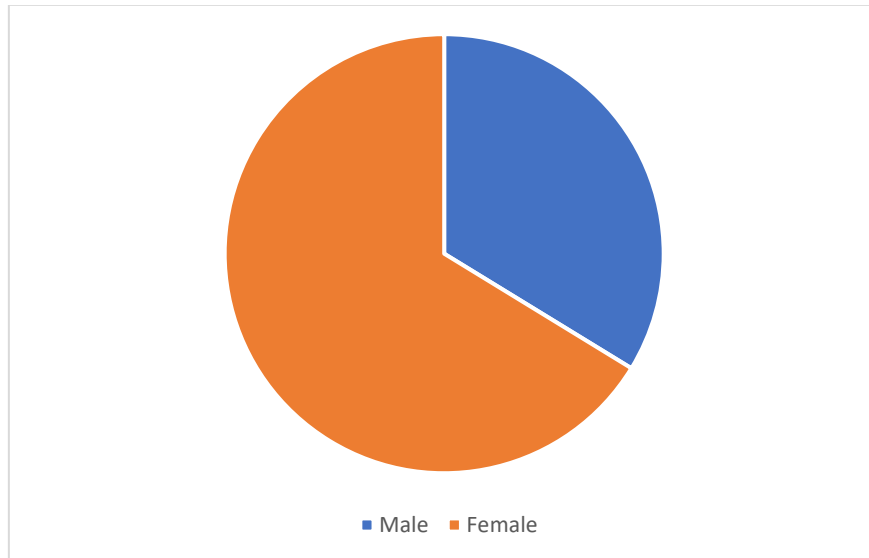
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### 3. RESULTS AND DISCUSSION

It's noted that a total of 407 participants completed the questionnaire between 22 and 28 February 2023, i.e., summer months (February) in the Highveld area. Undoubtedly, people's perceptions of air pollution are informed by their most recent experiences unless explicitly asked to reflect on specific events or moments in time. It is widely understood that local concentrations of air pollutants depend upon the strength of their sources and the efficiency of their dispersion. Day to day and seasonal variations in concentrations are more affected by meteorological conditions than by changes in source strengths. Under some conditions both factors may play a part example in cold, still weather, dispersion is reduced whilst production is increased by the increased use of domestic space heating and cooking etc. In summer, as temperatures rise, dispersion is better. This in turn affects the way people respond to their lived experiences of pollution. Therefore, in order to have a more representative response, surveys must be repeated at different times in the year. The following section presents a summary of the household survey results in KwaZamokuhle.

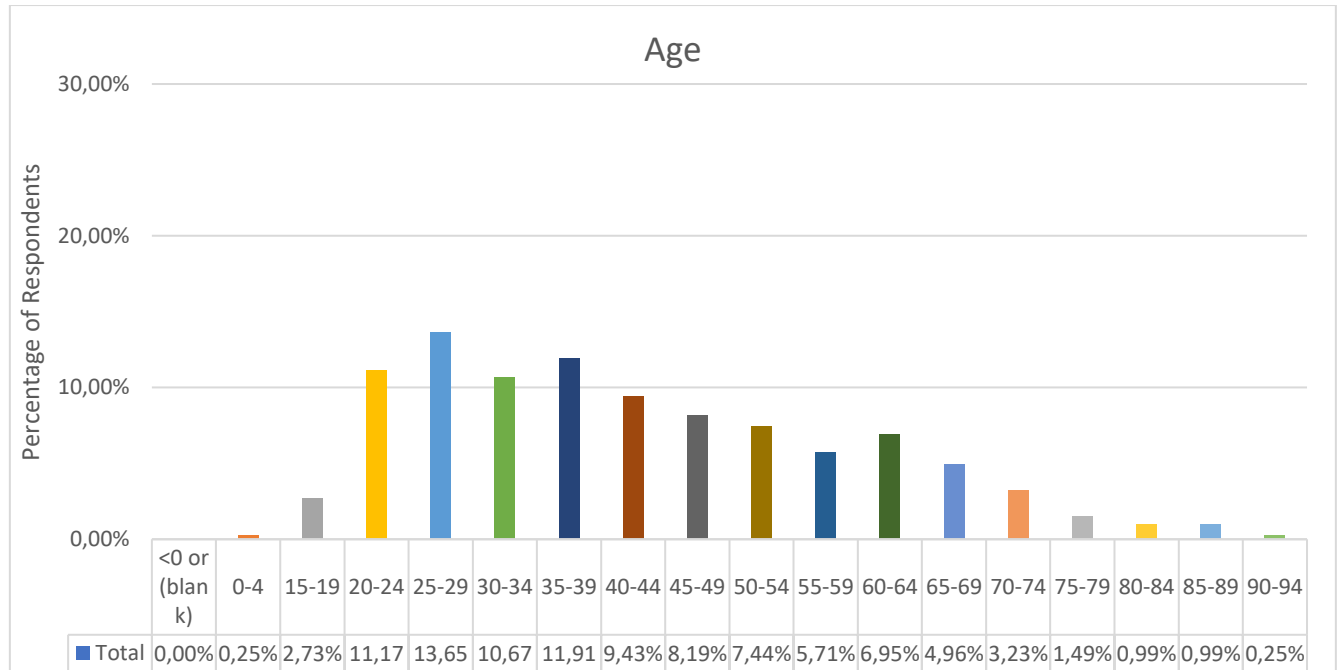
#### 3.1 HOUSEHOLD DEMOGRAPHICS

Participants that completed the questionnaire were mainly female (269) with the balance of males (137) (Figure 7). This is statistically significant as woman in general represent the most vulnerable group in South Africa but also more importantly, are directly exposed to indoor air pollution through activities such as cooking.



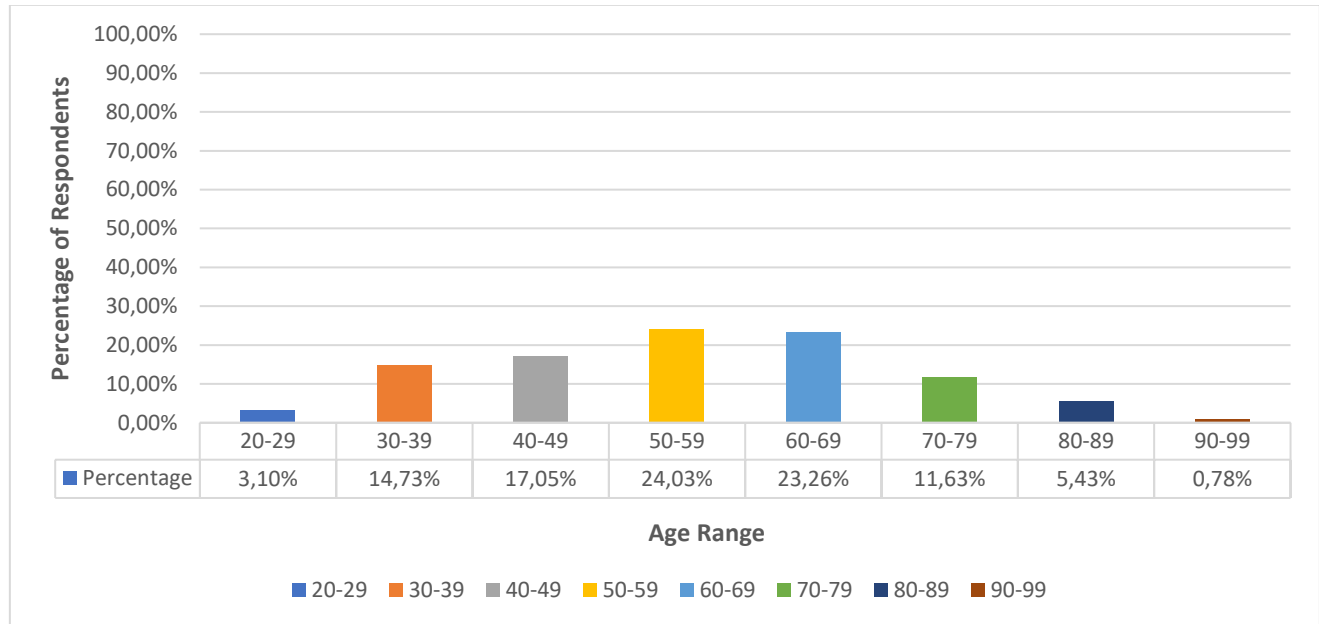
**Figure 7: Gender distribution in percentage for KwaZamokuhle**

In terms of age distribution of the surveyed KwaZamokuhle population, ~50% are young adults (10 to 39 years old); ~31% are middle aged adults (40 to 59 years old) and 19% are old adults (60 to 99) (Figure 8). It's evident from Figure 8 that most of the respondents are between the ages 20-60 years. Typically, people in this age group are more resilient to air quality related illnesses which is noted with the response received from the respondents when asked about their satisfaction of their personal health.



**Figure 8: Age distribution in Kwazamokuhle**

An analysis of the age distribution for female headed households (Figure 9) indicates ~18% are headed by young female adults (20 to 39 years old); with ~42% headed by middle aged female adults (40 to 59 years old) and 40% headed by old female adults (60 to 99). This is an interesting dynamic for Eskom AQO intervention roll-out to note as the old female adults are typically weary of LPG solutions from a safety and risk perspective. A targeted awareness and safety training in terms LPG at this old female (60 to 99) adult segment may plausibly result in a higher uptake herein.



**Figure 9: Age distribution of female heads of families**

The number of dependents that each household must support is also an indicator of the amount of disposable income available to a family to spend on electricity and other sources of energy. It is also an important proxy for the indoor air quality. The survey (Figure 10) indicated an average number of 3.6 dependents per household compared to the number of 1,99 dependents reported by the 2011 STATSA census<sup>4</sup>, with a high of 13 dependents in certain instances. Comparatively, according to a study conducted by Stats SA in 2021, South Africa, has an average household size of 3.34 persons nationally<sup>5</sup>

<sup>4</sup> Stats SA, [https://www.statssa.gov.za/?page\\_id=4286&id=11564](https://www.statssa.gov.za/?page_id=4286&id=11564)

<sup>5</sup>Stats SA, [https://www.statssa.gov.za/?p=15473#:~:text=Nationally%2C%20more%20than%20half%20\(52,at%20least%20one%20elderly%20person.](https://www.statssa.gov.za/?p=15473#:~:text=Nationally%2C%20more%20than%20half%20(52,at%20least%20one%20elderly%20person.)

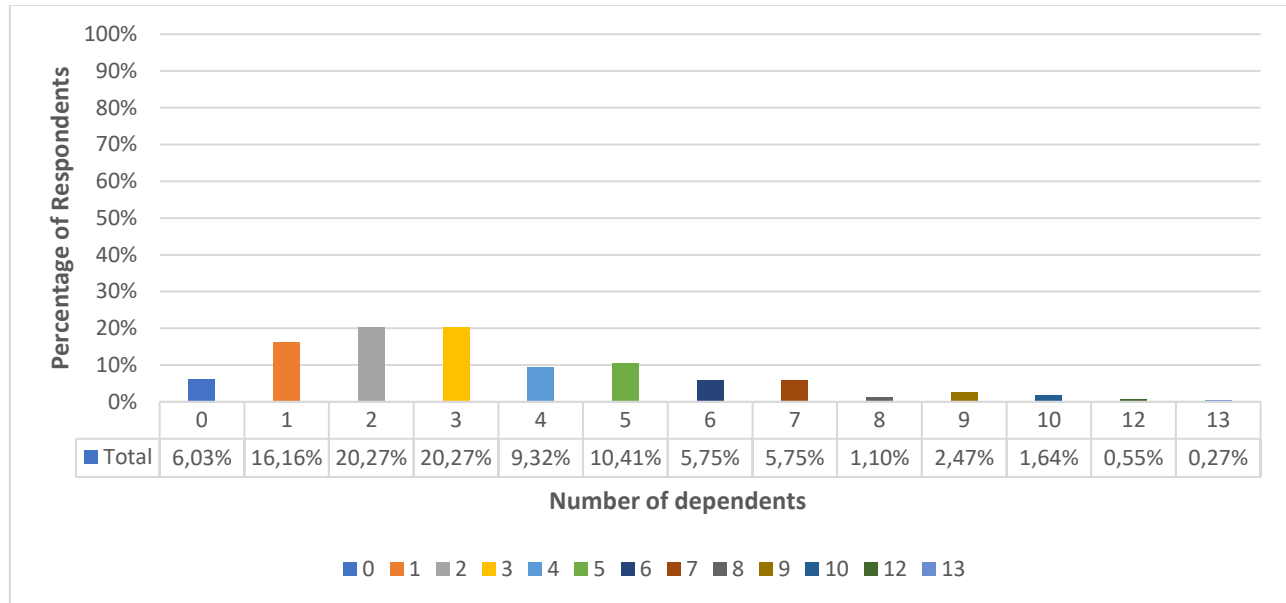


Figure 10: Number of dependents supported per household

### 3.2 HOUSING

The type and structure of housing in any settlement is often seen as a social determinant of health, particularly in low-income households. The direct effects of physical housing defects is an important causal pathway for health related issues in low-income, vulnerable households<sup>6</sup>.

According to Stats SA, in 2021, more than four-fifths (83,6%) of all households lived in formal dwellings; 11,7% lived in informal, and 4,2% lived in traditional, dwellings<sup>7</sup>(dwellings one made of clay, mud, thatch or other traditional materials. It can be round or square in shape). Almost 70% of households owned the dwelling they lived

<sup>6</sup>Krieger, J., Higgins, D.L, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447157/>

<sup>7</sup> STATSSA, <https://apps.statssa.gov.za/census01/census96/html/metadata/Docs/Dfntns.html>

in while 18,7% rented it and 11,6% indicated that they lived in their dwellings without charge.<sup>8</sup>

The sampled households interviewed fall primarily into three categories as illustrated by Figure 11. By far, the largest percentage of households (60.2%) were residing in RDP housing, compared to 63% reported in the KwaZamokuhle pilot study report (2015). 24% of households lived in formal brick houses, and 15.4% households have converted their homes from formal RDP houses to more spacious dwellings. On average, homes had 4.67 rooms with 95% of respondents indicating that they did not have a backyard dwelling, typically in the form of a shack.

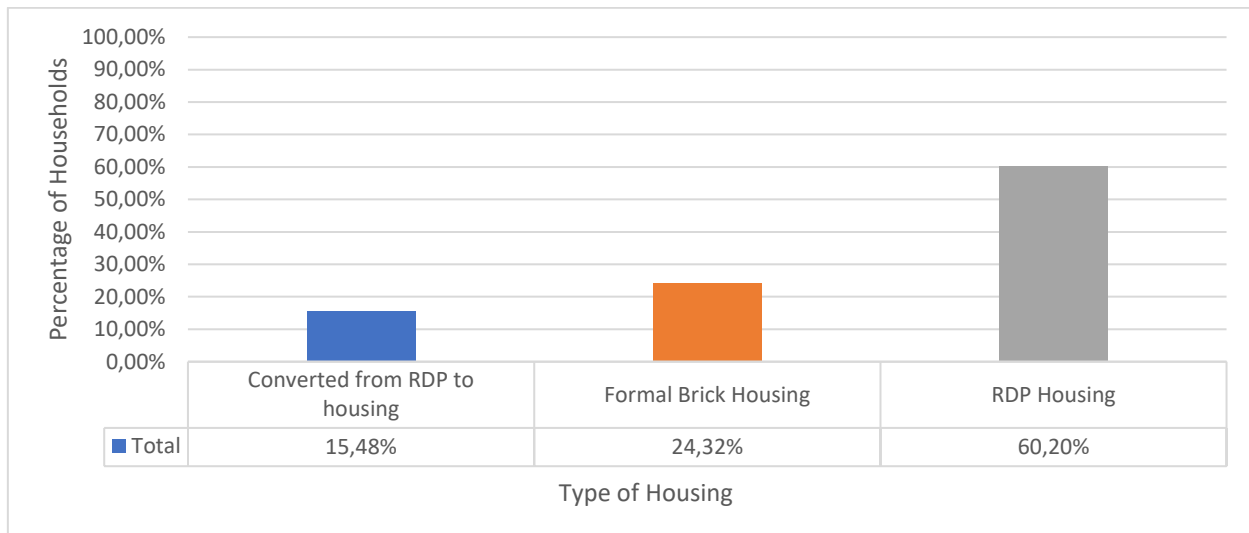


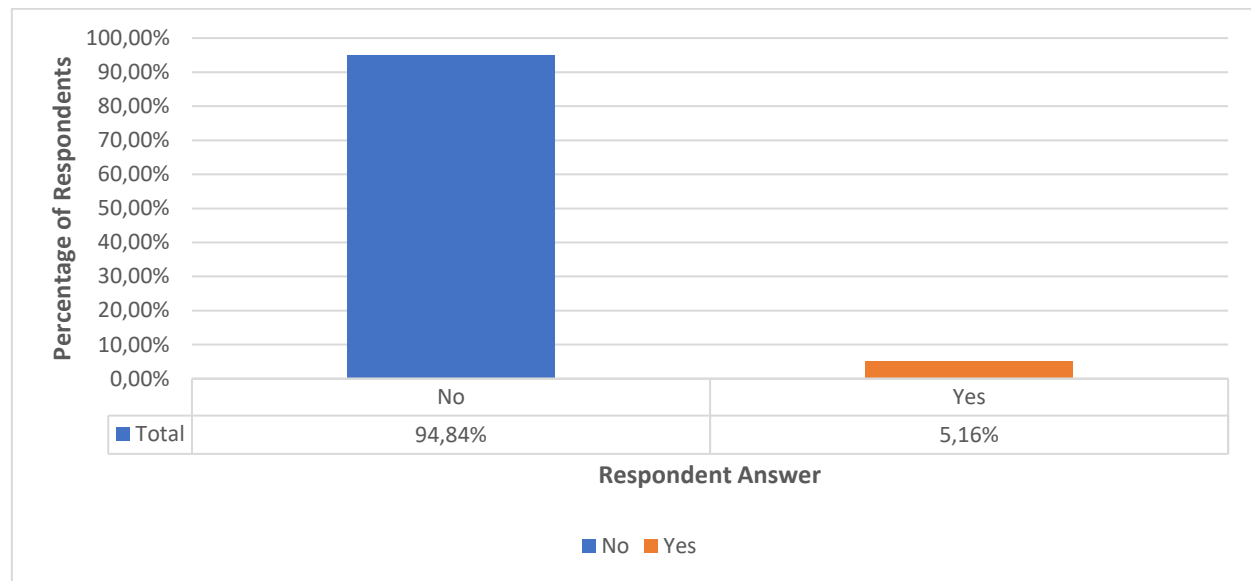
Figure 11: Type of dwelling of KwaZamokuhle respondents

<sup>8</sup> Stats SA, [https://www.statssa.gov.za/?p=15473#:~:text=Nationally%2C%20more%20than%20half%20\(52,at%20lea,st%20one%20elderly%20person.](https://www.statssa.gov.za/?p=15473#:~:text=Nationally%2C%20more%20than%20half%20(52,at%20lea,st%20one%20elderly%20person.)

The percentage of shacks in backyards in KwaZamokuhle of the sampled households was 5% (Figure 12) compares favourably to the national Census number of 7%. This is welcome as “shacks” present an extraordinary structural challenge based on the materials of construction such as wood, tin, plastics etc Shacks are illegal dwellings that RDP homeowners build in their backyards to generate income in the form of rent. Shacks do not conform to any building regulations and are unserviced with respect to electricity, water and sanitation. , forcing people to move to alternate “dirty” fuels as a result of energy stacking thus predisposing them to poor air quality. Eskom will need to proceed sensitively with the AQO intervention roll out as not doing anything with shacks may create social unease and distrust. Education and awareness and extremely selective interventions such as stove roll outs to shacks may address some of these concerns.

RDP houses on the other hand are better constructed using bricks and mortar in most cases. They are generally electrified and have access at the very least to free basic electricity (FBE), which is electricity allocated to support low-income households, enough to run basic lighting, basic media access, basic ironing and boil water using an electrical kettle. Indigent households can qualify for at least 6kl of water and 50 kWh of basic electricity per household per month. Households are required to register with municipalities to qualify for these free basic services and successful applicants are granted indigent status. Different municipalities have different criteria to qualify as indigent. According to COGTA (Cooperative Governance and Traditional Affairs), South Africa’s 257 municipalities registered 3,51 million indigent households in 2017.<sup>1</sup> That’s about 1 in every 5 of the country’s 16,2 million<sup>2</sup> households. Whilst this survey recognizes this important parameter as an omission and will include this as a question in subsequent surveys, it is a safe assumption that generally all RDP homes qualify as indigent. Furthermore, in KwaZamokuhle, 40% of respondents have also either improved their RDP homes by either extending or modifying the houses or have proper brick housing

which minimises health risks from poor indoor air quality. Improvements broadly describe extensions to the homes, and other minor modifications such tiling of floors etc.



**Figure 12: Number of backyard dwellings in KwaZamokuhle**

### 3.2.1 MATERIALS USED IN CONSTRUCTION

The materials used in construction is a key determinant of thermal comfort and subsequently indoor air quality. The thermal comfort is low in house, where there are neither ceilings nor plastering of the walls, and where space heating is affected by solid fuel burning.

From the sampled 407 households half the roofing was made up of tiles and the other half of roofing was constructed of metal sheeting (IBR) (Figure 13). Approximately 60% of the households had a ceiling with 40% households without ceilings. With 60% of the homes having ceilings and no insulation, thermal comfort is compromised in KwaZamokuhle, which may lead to the use of “dirty” fuels through energy stacking in

winter months. The absence of ceilings in the households reinforces and supports the roll-out of Eskom's AQO ceiling intervention solution. However, spray polyurethane foam (SPF) insulation may present application challenges for clay roof or concrete tiled roofs and consideration should be given to other forms of insulation such as aerolite. SPF will not easily adhere to the tiles or concrete and the shape of the roof may present application challenges.

In terms of the main dwellings floor type, more than half of floors were of cement and the balance were covered by tiles (Figure 14), whilst about 6% of households used carpets which were a luxury reported by few.

Although concrete floors look solid, it is actually very porous, thus moisture can easily penetrate it. Around 15% of heat loss from a building can be through the floor. Without much effort, perhaps a low hanging fruit could be the rollout of carpets to households to aid in improving the thermal comfort of the homes in winter<sup>9</sup>, however the socio-economic viability of this hypothesis will need to be tested.

Additionally adequate concrete floor insulation like a polystyrene insulated rib and block slabs system has superior insulation and is eco-friendly. These type of slabs if placed on the floor/foundation of a home will improve insulation and prevent heat loss improving thermal comfort. However the feasibility and viability of this potential solution will need to be tested.

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[https://www.researchgate.net/publication/298352974\\_The\\_Thermal\\_Properties\\_of\\_Wool\\_Carpets](https://www.researchgate.net/publication/298352974_The_Thermal_Properties_of_Wool_Carpets)

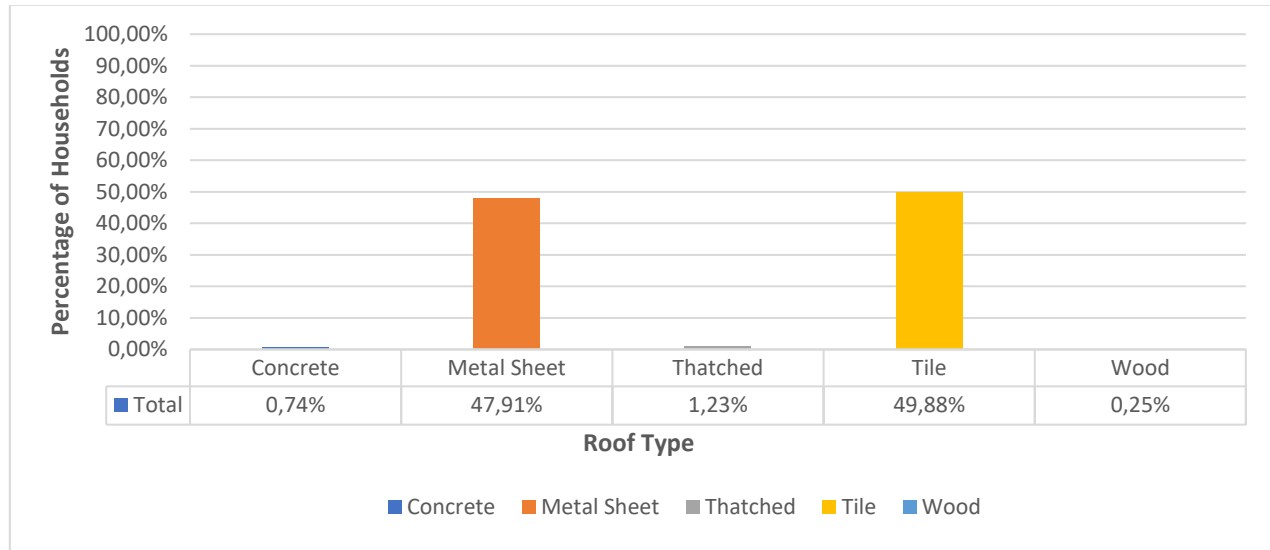


Figure 13: Main dwelling roof types in Kwazamokuhle

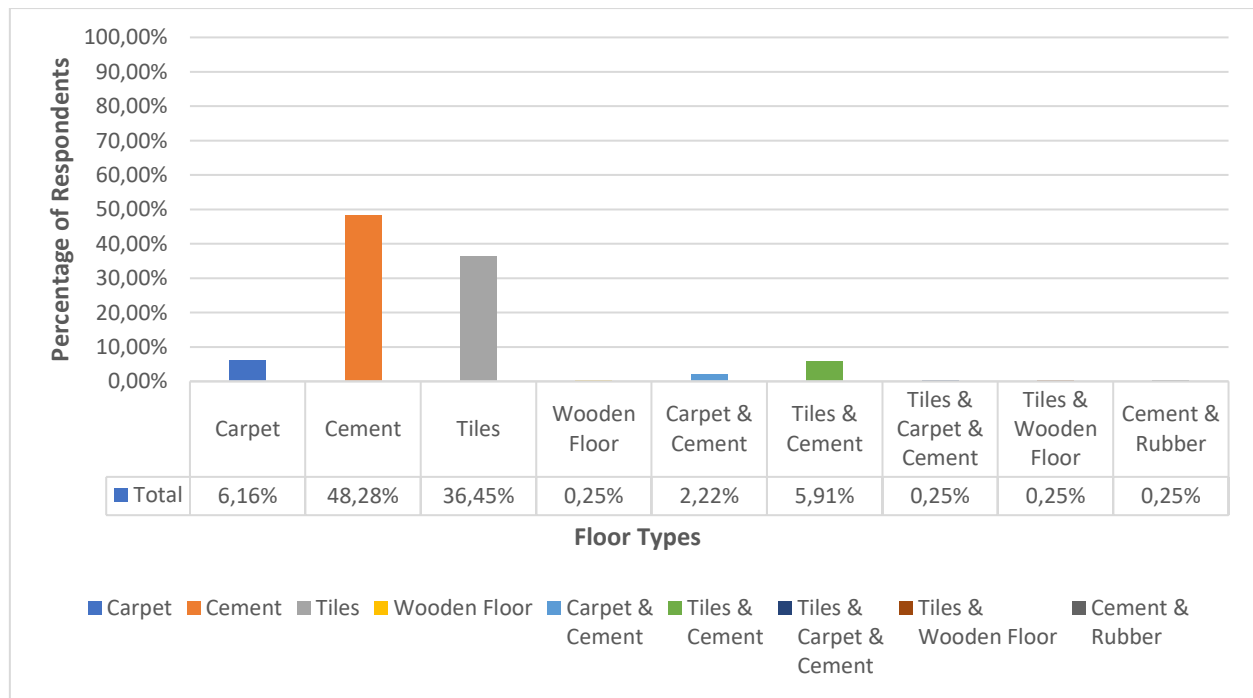


Figure 14: Main dwelling floor types in KwaZamokuhle

### 3.3 ENERGY USE

Access to electricity shifts households up the energy ladder<sup>10</sup> (reference). However, in low-income households, socio-economic conditions and electricity availability, for example loadshedding, drive households towards the energy stacking model and fuel switching towards biomass and coal becomes a reality particularly in winter months. Typically, low-income households have access to free basic electricity.

Almost all the respondents (99.26%) indicated that they have access to electricity (Figure 15). Interestingly, even with access to electricity, only 63.9% of respondents indicated that they utilise electricity continuously throughout the year which is attributed to the rising cost in electricity for the 36.1% of respondents, who then have to rely on other energy sources.(Figure 16). This implies that electricity is the primary energy source for the 63.9%of respondents, and fuel switching is limited irrespective of time of year. Electricity is used predominantly for lighting, cooking and heating. Approximately 50% of respondents indicated that they also have access to coal and wood as needed. However, only 17% of respondents indicated that they have access to coal stoves, implying that many respondents also employ rudimentary brazier stoves made of metal drums with perforations of varying sizes punched around the sides and a wire grate installed across the middle to support the fuel bed. 38% of respondents use electricity and 26% use coal for spatial heating (Figure 17). Comparatively, according to Census 2011, the proportion of households using electricity for heating compared to other energy sources was higher at 58.8%.

<sup>10</sup> Hanna,R.,Oliva,P.  
03/moving\_up\_energy\_ladder.pdf

[https://epod.cid.harvard.edu/sites/default/files/2018-03/moving\\_up\\_energy\\_ladder.pdf](https://epod.cid.harvard.edu/sites/default/files/2018-03/moving_up_energy_ladder.pdf)

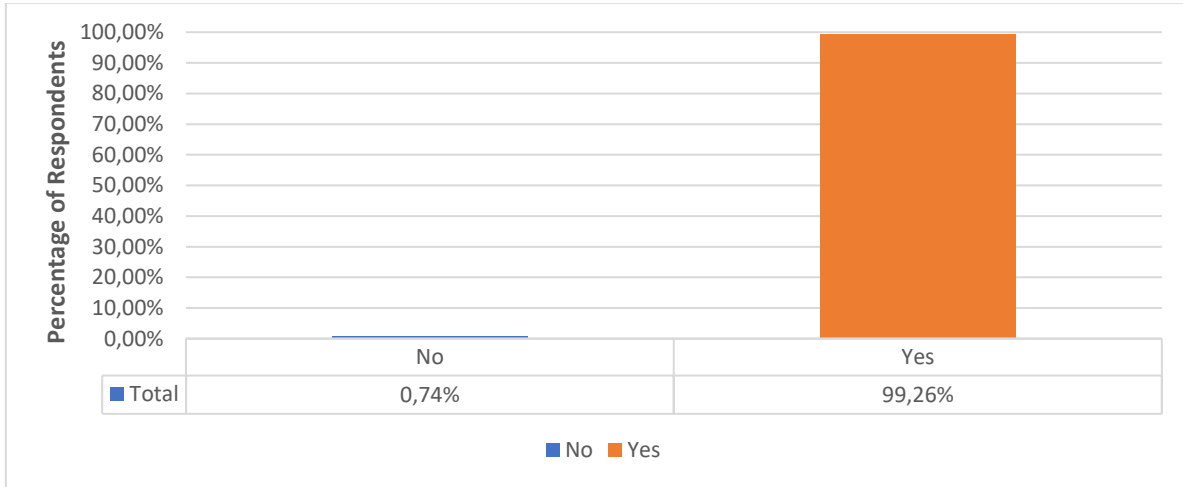


Figure 15: Number of sample households with an electricity connection

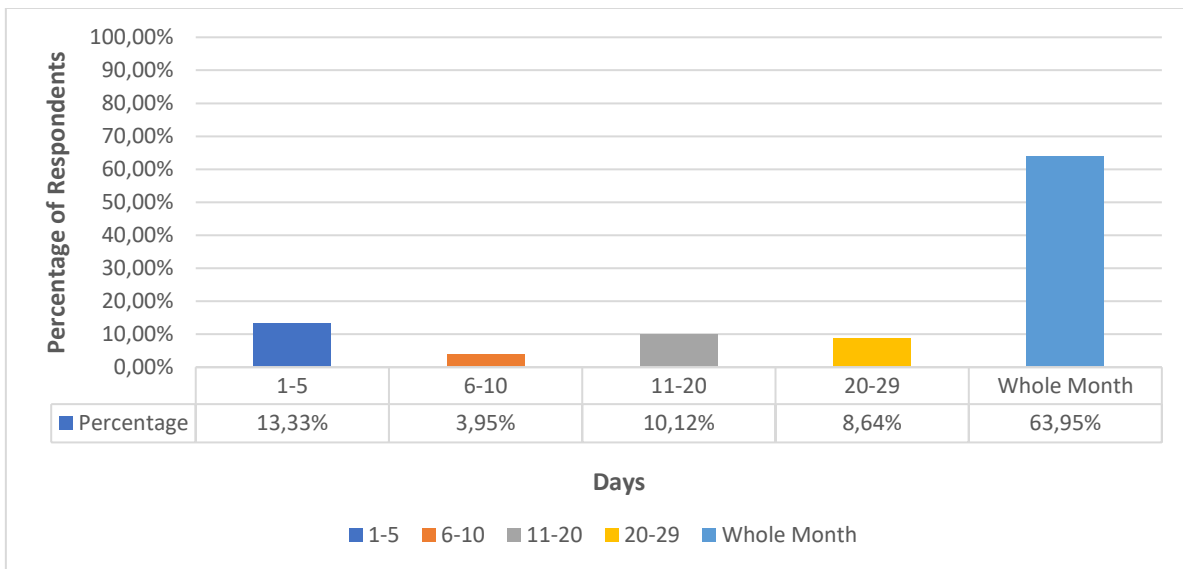


Figure 16: Days electricity is used in the sample households in KwaZamokuhle

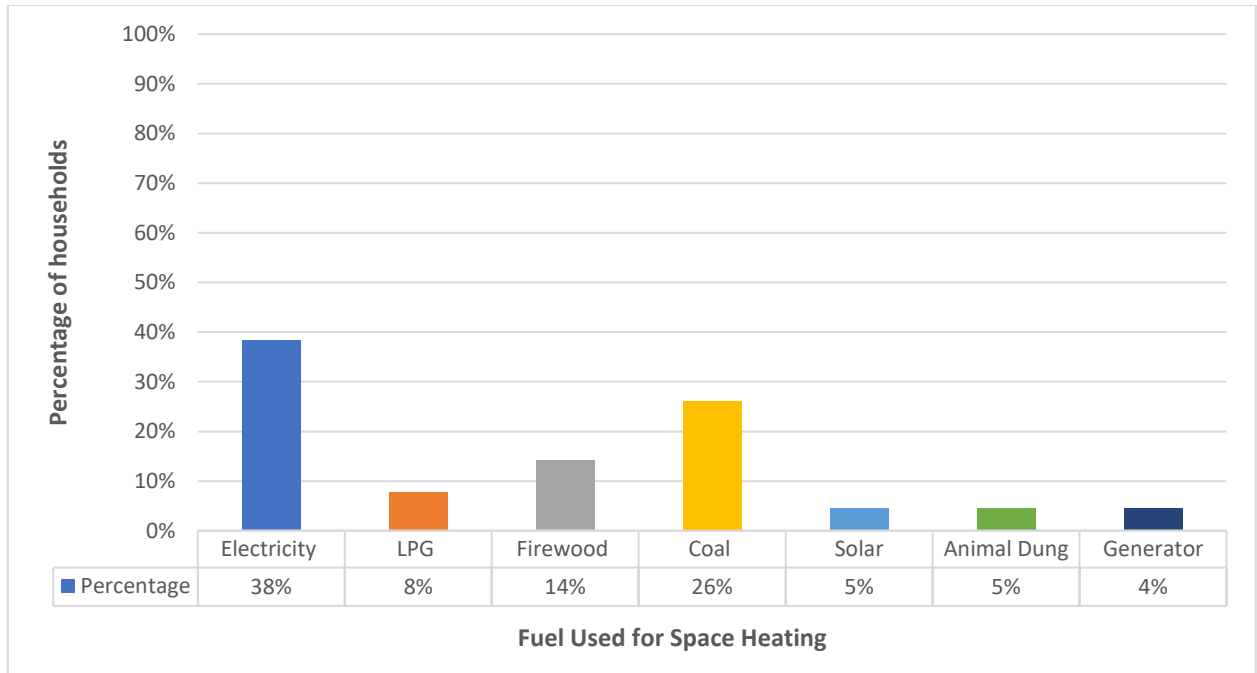
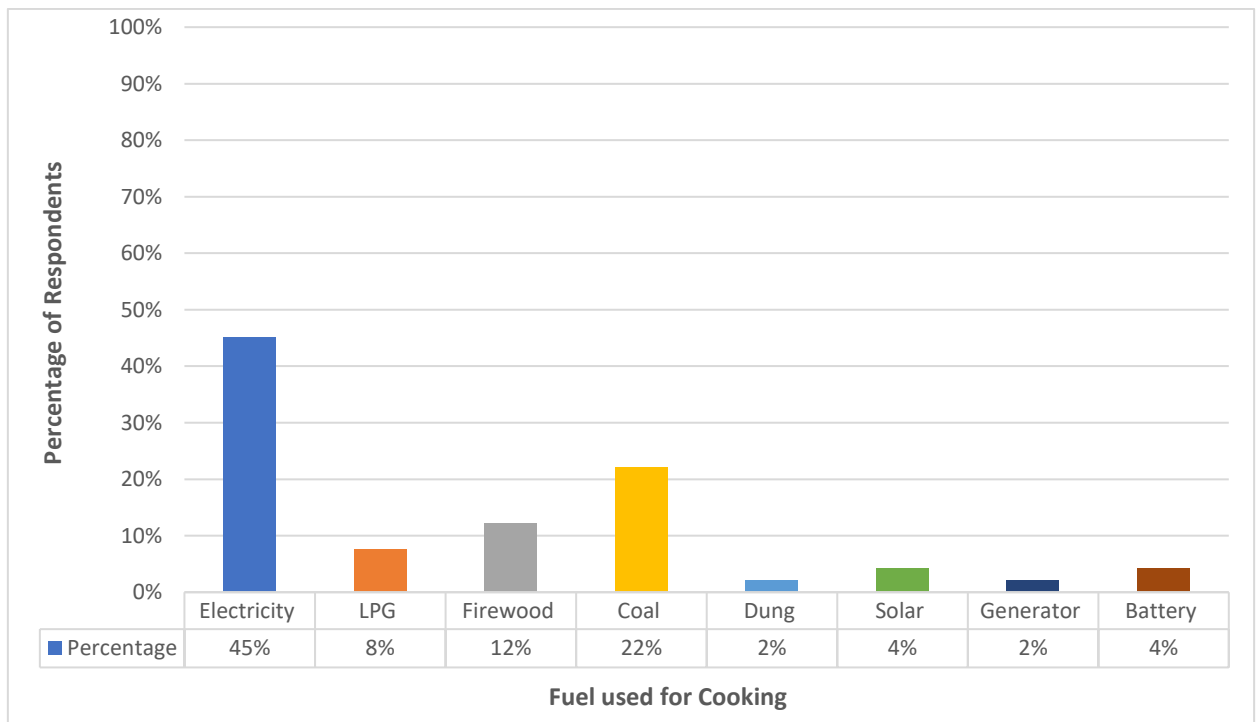
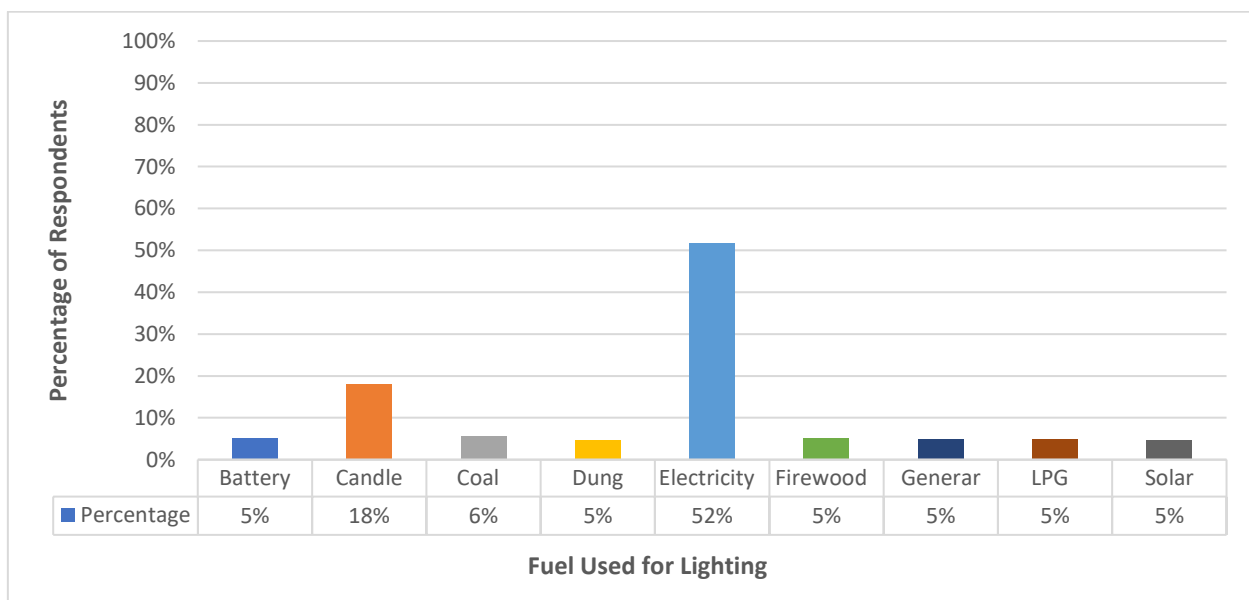


Figure 17: Household energy use for Space Heating



**Figure 18: Household energy use for Cooking**

Interestingly, Census 2011, shows that the proportion of households using electricity for cooking increased from 47,5% to 73,9% in 1996 to 2011 respectively. The proportion of households using paraffin, wood and coal as sources of energy for cooking decreased from 21,6%, 23,0% and 3,6% to 8,5%, 12,5% and 0,7% in Census 1996 and 2011 respectively.



**Figure 19: Household energy use for Lighting**

Census 2011 shows that households using electricity for lighting increased from 58,2% in 1996 to 84,7% in 2011, while those using paraffin and candles decreased over the same period. The use of paraffin and candles for lighting also decreased from 12,7% to 3,0% and from 28,7% to 11,4% in 1996 and 2011, respectively.

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### 3.3.1 USE OF ELECTRICITY FROM INTERCONNECTED GRID OR ISOLATED SYSTEM

In addition to lighting, electricity is seen by the respondents as major reason to have for: information (50%), watching the news (52%) entertainment (40%), while 40% of the households use electricity for safety. Surprisingly, few households reported the use of electricity to aid income, run a business or for education of children.

Virtually all households have an electricity meter (99%) and use electricity for lighting, electric appliances and cooking. From the survey results it's evident that only 42% use energy saving light bulbs whilst the rest still use incandescent light bulbs. A total of 208 households (51%) reported electricity use of between R200-R500 per month, and 141 households (34%) reported use of only R1-200 per month.

In case of electricity failure most (84%) use candles as a backup while almost none use gas lamps, generators, car batteries or any other backup. The most popular appliances are the refrigerator, electric iron and the tv, and in decreasing order the electric stove, microwave and washing machine. Less popular is sound equipment, radios with almost no dishwashers present (5%).

### 3.3.2 CANDLE USE

Six to twelve candles are used by most households (81%) every month; mainly for home use during load shedding (Figure 20). Candles are used for lighting and present a major fire hazard more so than contributing to poor air quality. Approximately 80% of the surveyed respondents used more than 6 candles in the month (Figure 21).

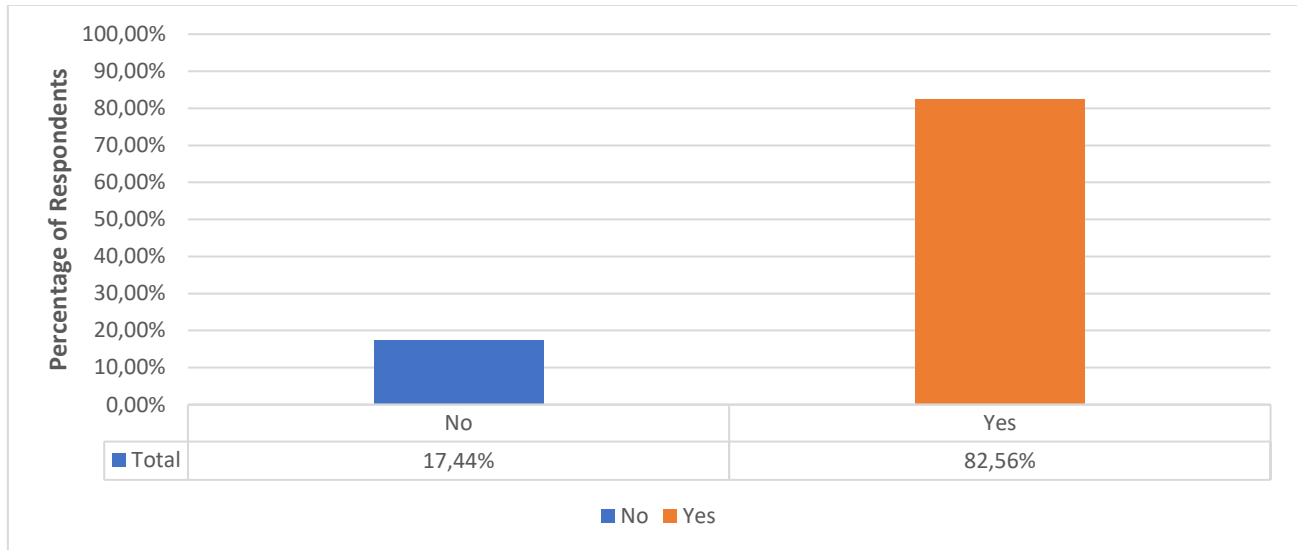


Figure 20: Respondent Households that use Candles in Kwazamokuhle

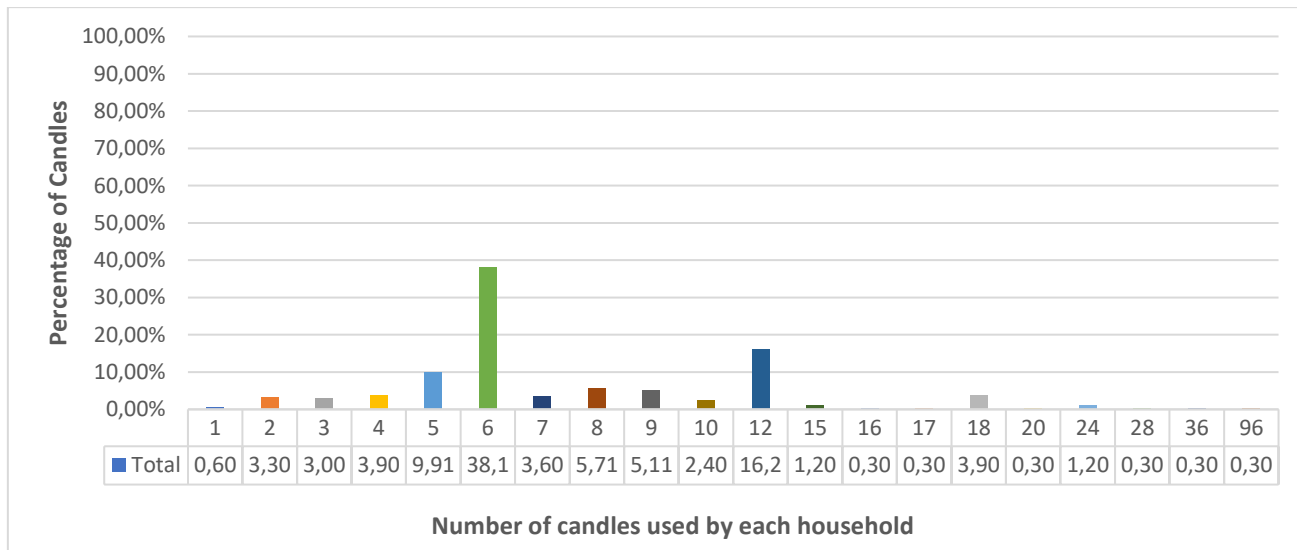


Figure 21: Number of candles used by respondent households

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### 3.3.3 USE OF LPG

LPG should ordinarily be considered a cleaner transition fuel. However, for low income houses both perceptions of safety and energy value as well as costs deter more widespread utilisation. Gas distribution and last mile delivery also present challenges and limits more extensive users. LPG distribution in townships is limited to stores such as hardware and retail service stations or respondents need to travel out to nearby towns to refill cylinders.

This is reflected in the responses received. From the sampled households, only 43 households reported the use of LPG. The most popular gas cylinder size is 9Kg which is used by 70% (30 of the 43) households utilising LPG. The gas is mainly used by these households for heating (LPG heater) and cooking (stove).

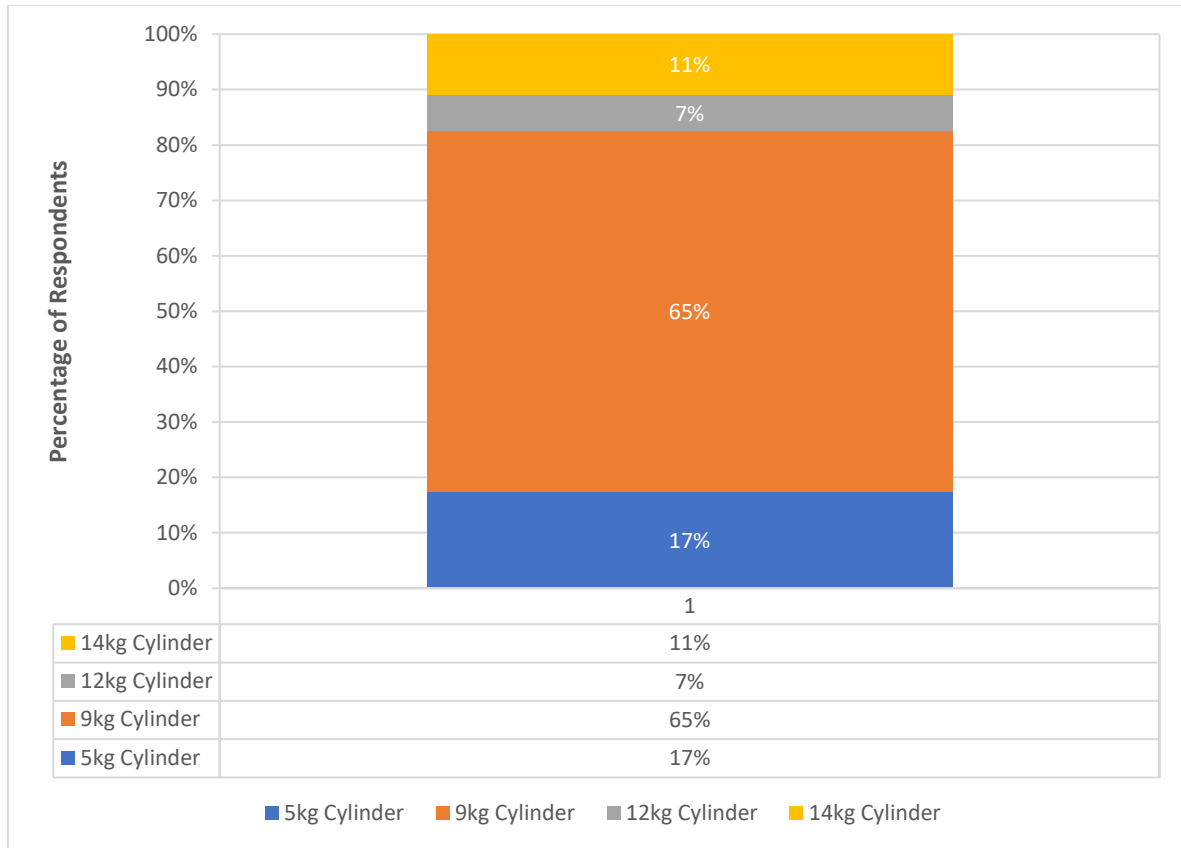
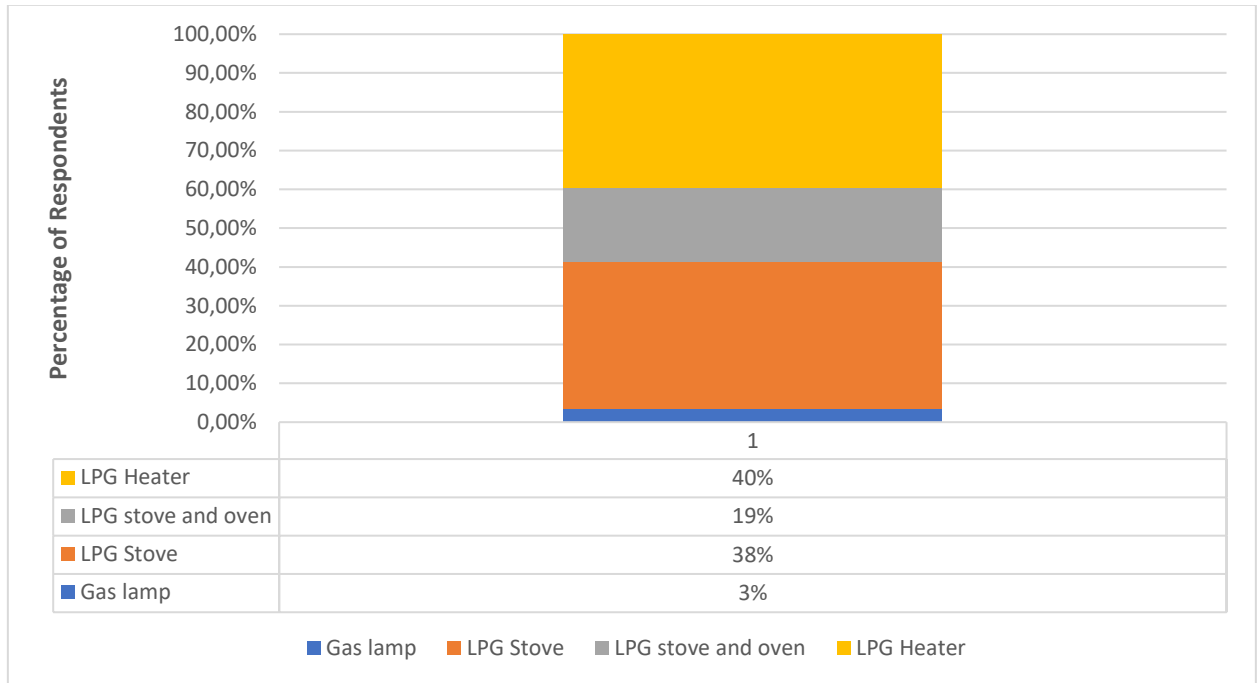


Figure 22: Gas Cylinder use of Respondents



**Figure 23: Gas Devices used by Respondents**

### 3.3.4 FIREWOOD

Firewood is a cheap, easily available fuel source for cooking and heating in KwaZamokuhle, with respondents indicating that they are able to collect firewood in close proximity to their households, or from nearby farms. (Figure 26 to Figure 28). However, it contributes to poor air quality as a result of particulate matter (PM).

Firewood is more often used than LPG with 33% of households using firewood with the majority paying more than R100 for a bundle obtained (in 25kg bags or wheelbarrow loads) within one kilometre from the dwelling and lasts at least a month. Firewood is sourced mostly from what respondents refer to as the bush, resulting in deforestation and soil erosion which then compounds atmospheric particulate matter through fugitive dust emissions.

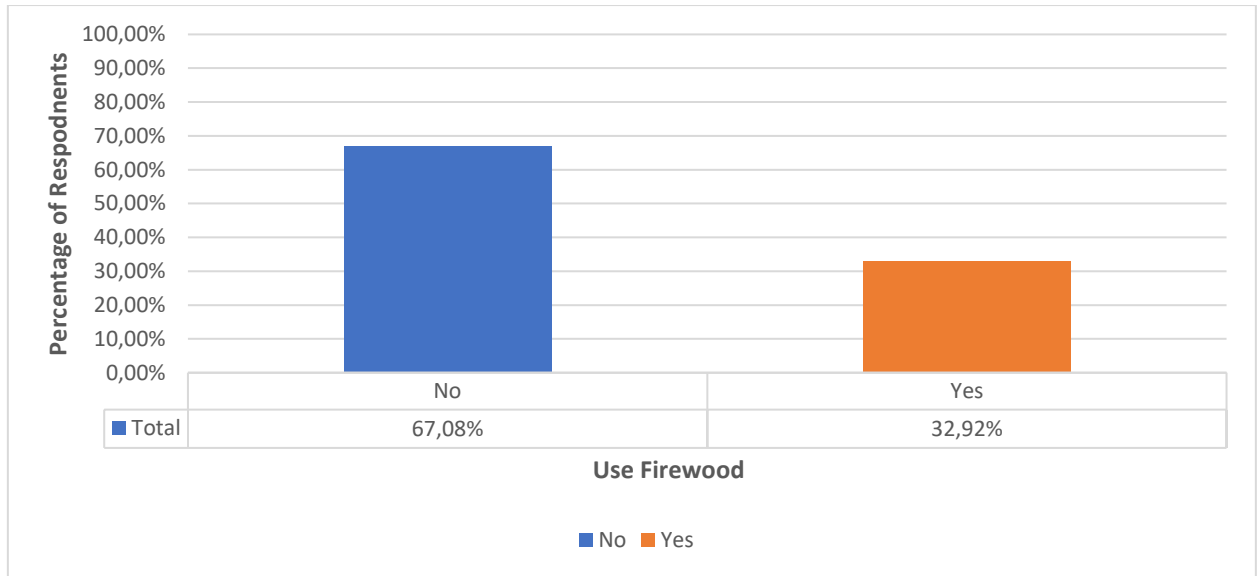


Figure 24: Households that use firewood in KwaZamokuhle

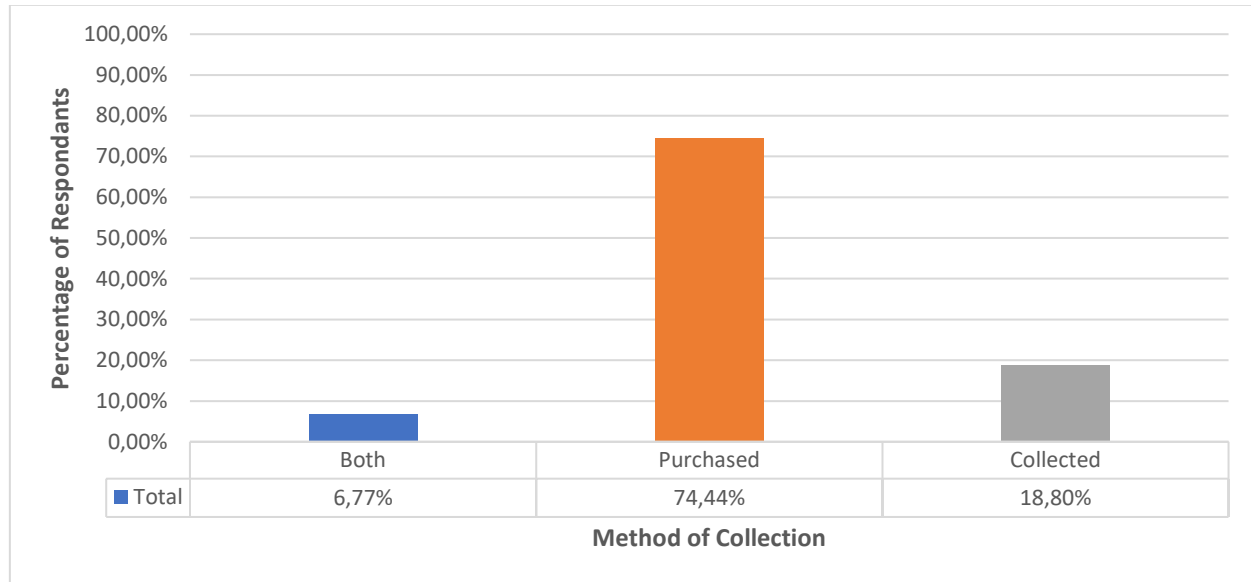


Figure 25: How respondent households obtain firewood in KwaZamokuhle

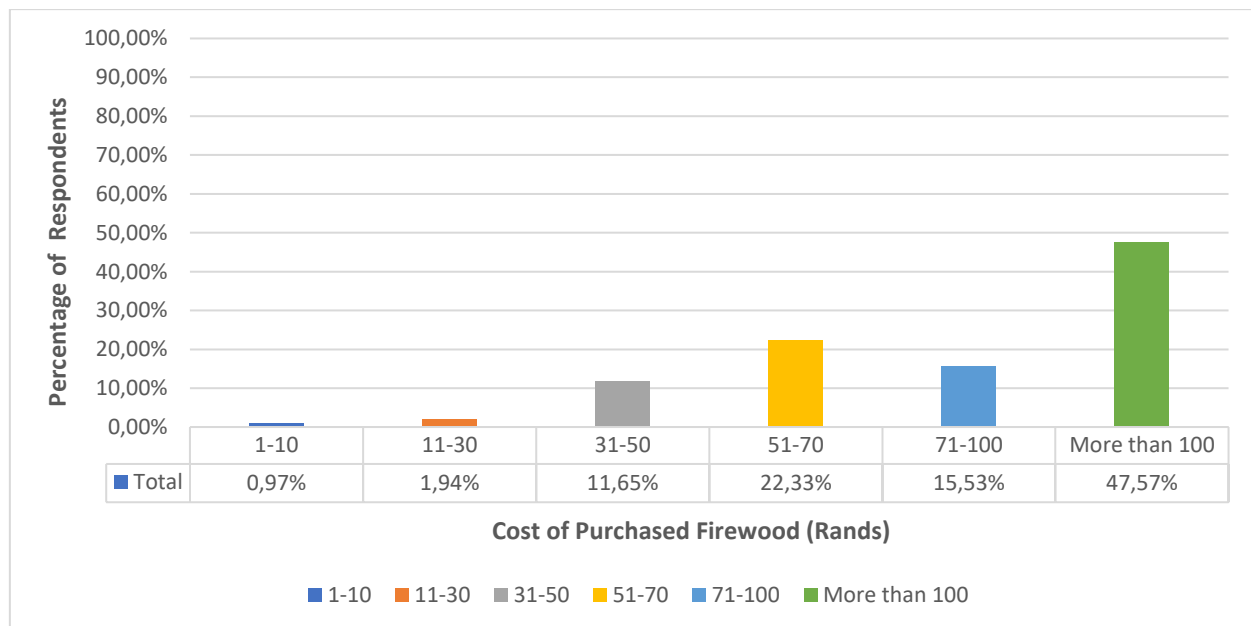


Figure 26: Cost of firewood purchase (30kg bag) for respondent households in KwaZamokuhle

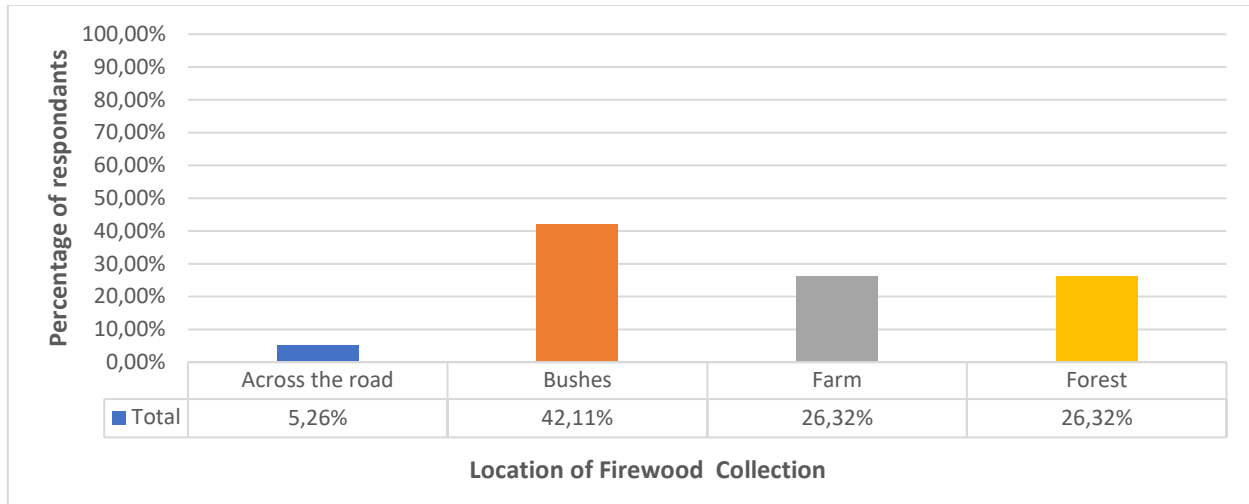


Figure 27: Where respondent households collect firewood in KwaZamokuhle

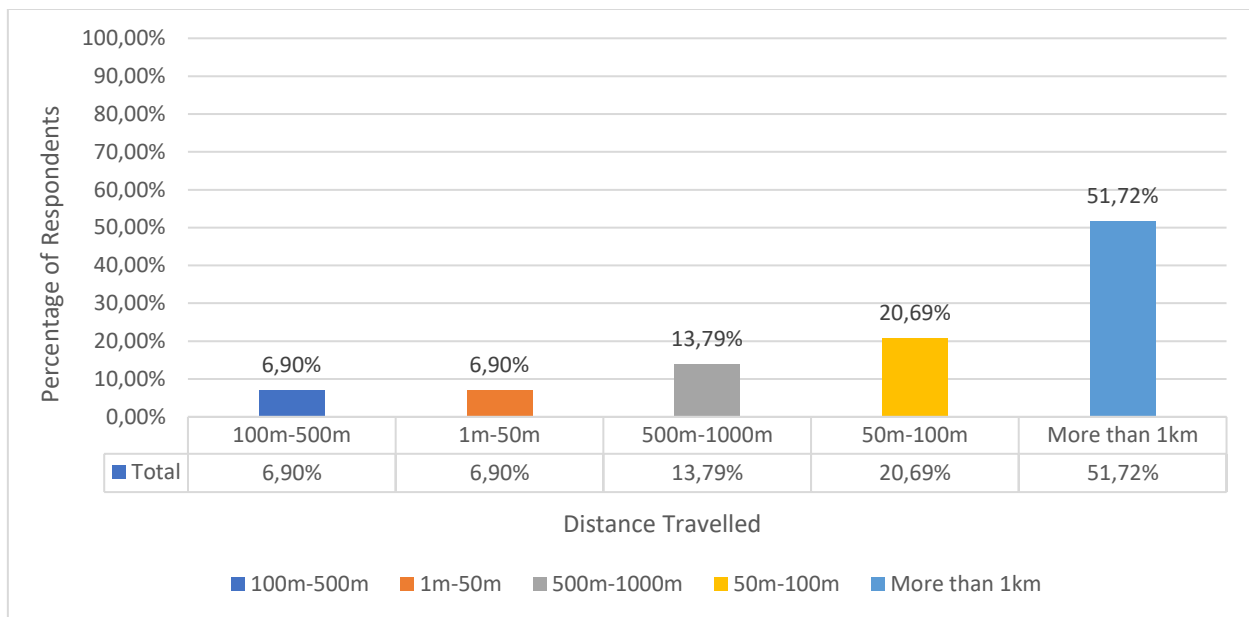
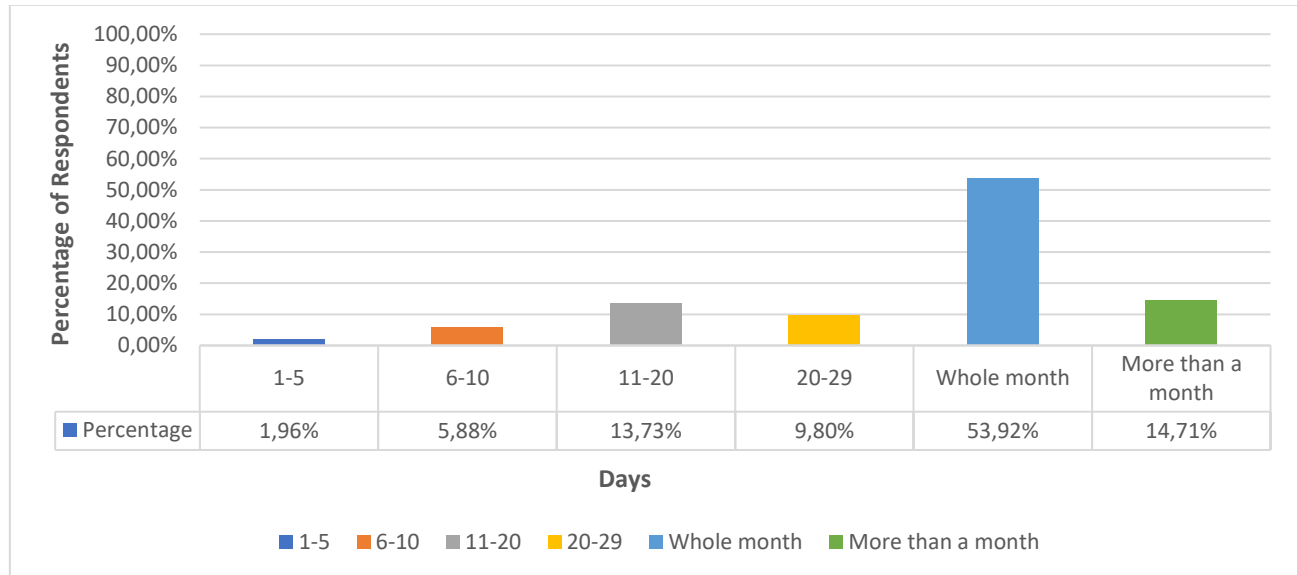


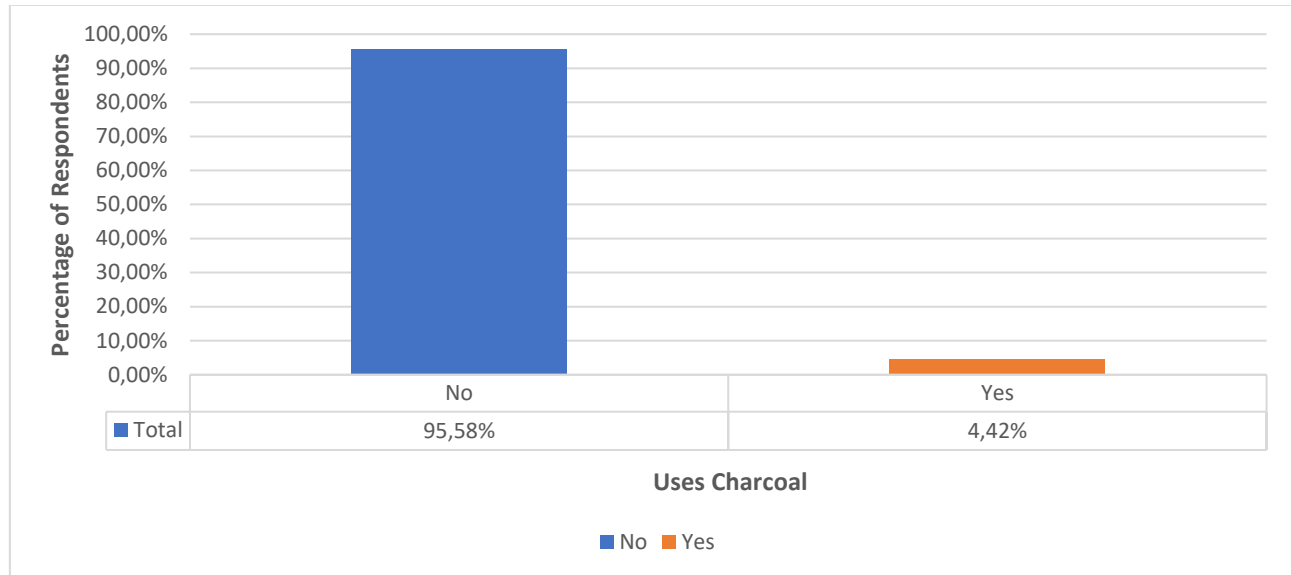
Figure 28: Distance travelled by respondent households to collect firewood



**Figure 29: Amount of days bundle of purchased firewood lasted for respondent households in KwaZamokuhle**

### 3.3.5 USE OF CHARCOAL

Less than 5% of households use charcoal and as a result the data is very limited for the purposes of this analyses (Figure 30). This is probably because coal is more readily available than charcoal and households tend to migrate towards coal. Charcoal is primarily used for cooking and heating.



**Figure 30: Respondent charcoal use in KwaZamokuhle**

### 3.3.6 USE OF COAL

Of all the fuels used by low-income households, coal is probably the dirtiest. Coal combustion significantly elevates gaseous pollutant concentrations in indoor air. Coal is a widely used solid fuel for cooking and heating activities in low-income households, whose incomplete combustion in inefficient household stoves releases a range of gaseous pollutants.

In the KwaZamokuhle household survey, coal is used by 47% of the households (Figure 31), and the coal is typically sourced within 50 meters of the dwelling (Figure 32), paying just more than R100 (Figure 33) for a load of roughly 50 Kg and lasting for a month. The coal is provided by multiple sources (coal merchants, spaza shops) and is a reliable (Figure 34) source of energy to the households.

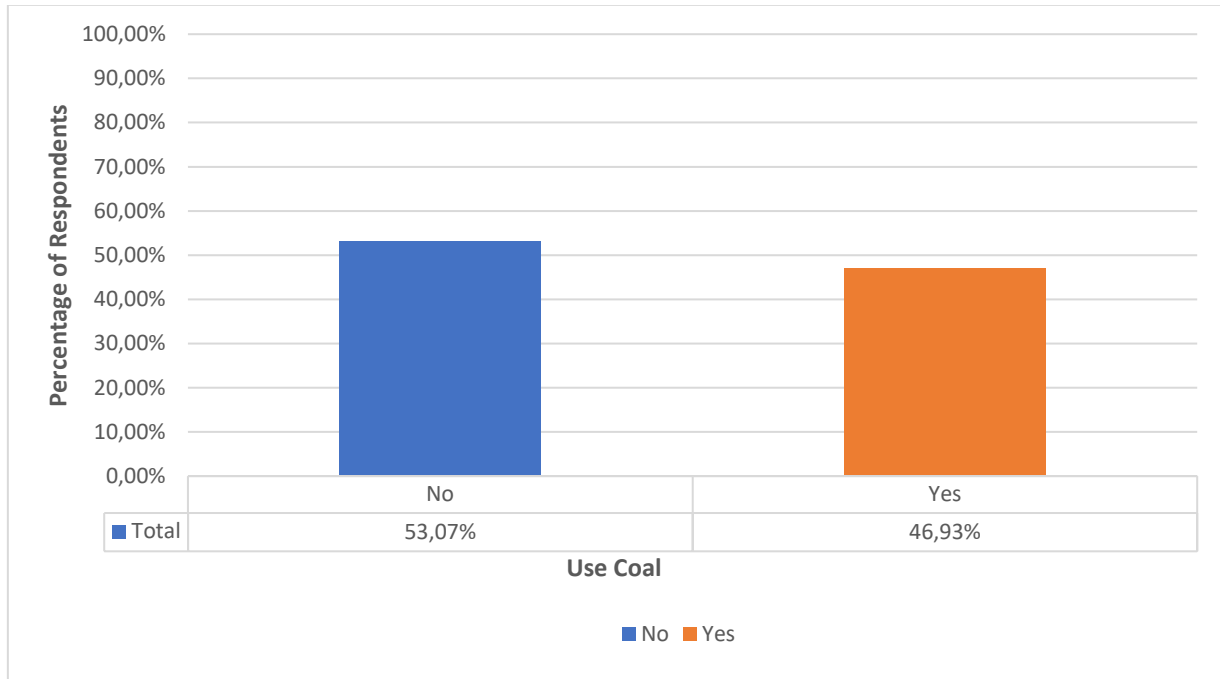


Figure 31: Respondent households using coal

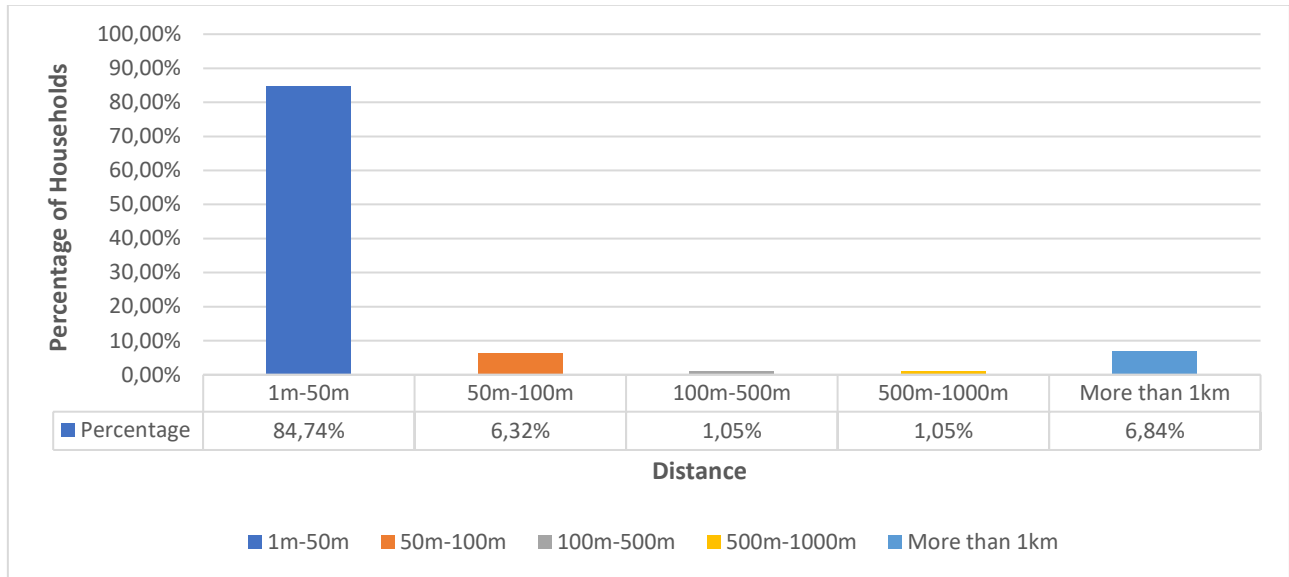


Figure 32: Distance travelled by households to purchase coal

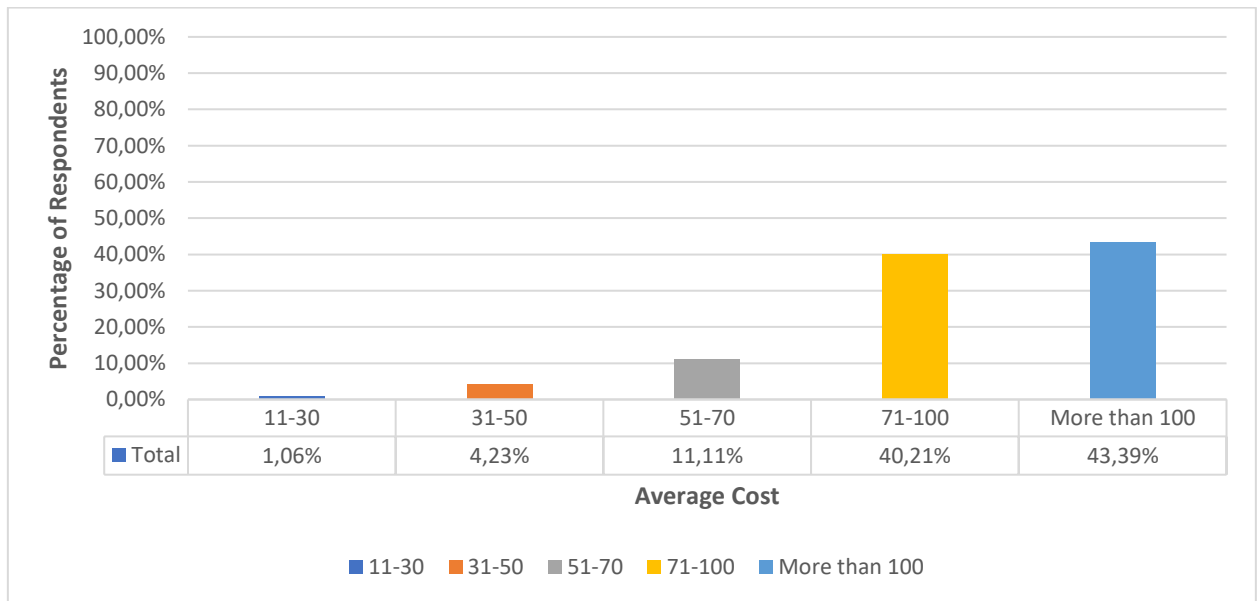
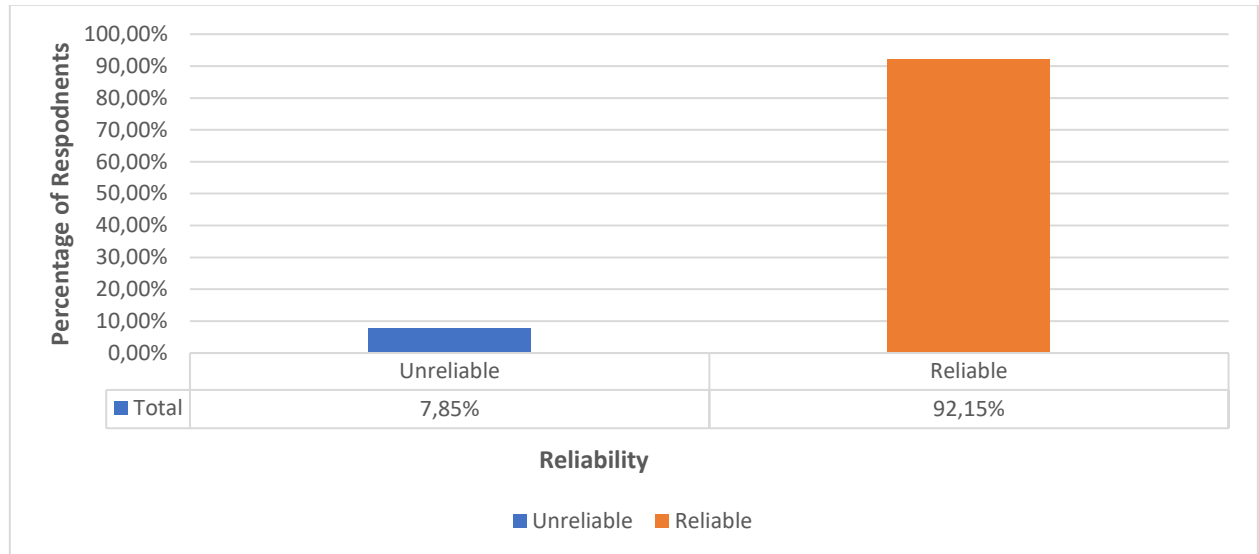


Figure 33: Average cost of coal respondent households pay per month



**Figure 34: Reliability of respondent household's coal source**

### 3.3.7 ANIMAL DUNG

Only three households (0,74%) in KwaZamokuhle reported the use of dung, making a proper analysis of such a small sample insignificant.

### 3.3.8 A COMPARISON OF THE ENERGY MIX ACROSS HOUSEHOLD INCOME LEVELS

A comparison of the different fuel types used by the respondents across the different income levels (Figure 35) indicates:

- Electricity is the dominant fuel type, however availability (load-shedding) and utilization is moderate as only 65% of respondents indicated that they utilise electricity continuously throughout the year (Figure 16)
- Candles are utilized across all income levels in terms of load-shedding situations as the preferred lighting solution.

- Whilst LPG is utilized in small amounts by the households with a lower income, it seems that there is a slight increase in LPG use associated with the households that have a higher income threshold (>R20 000).
- The usage of both coal and firewood plays a dominant role as part of the energy mix for the households. Conversely both animal dung and charcoal play an insignificant role herein.
- Its noted that the results presented in is representative of the energy mix that was present in summer (February 2023). Its plausible that these results will change in winter when the requirements for space heating increases & additionally the duration of loadshedding will impact the choice of fuel types utilized.

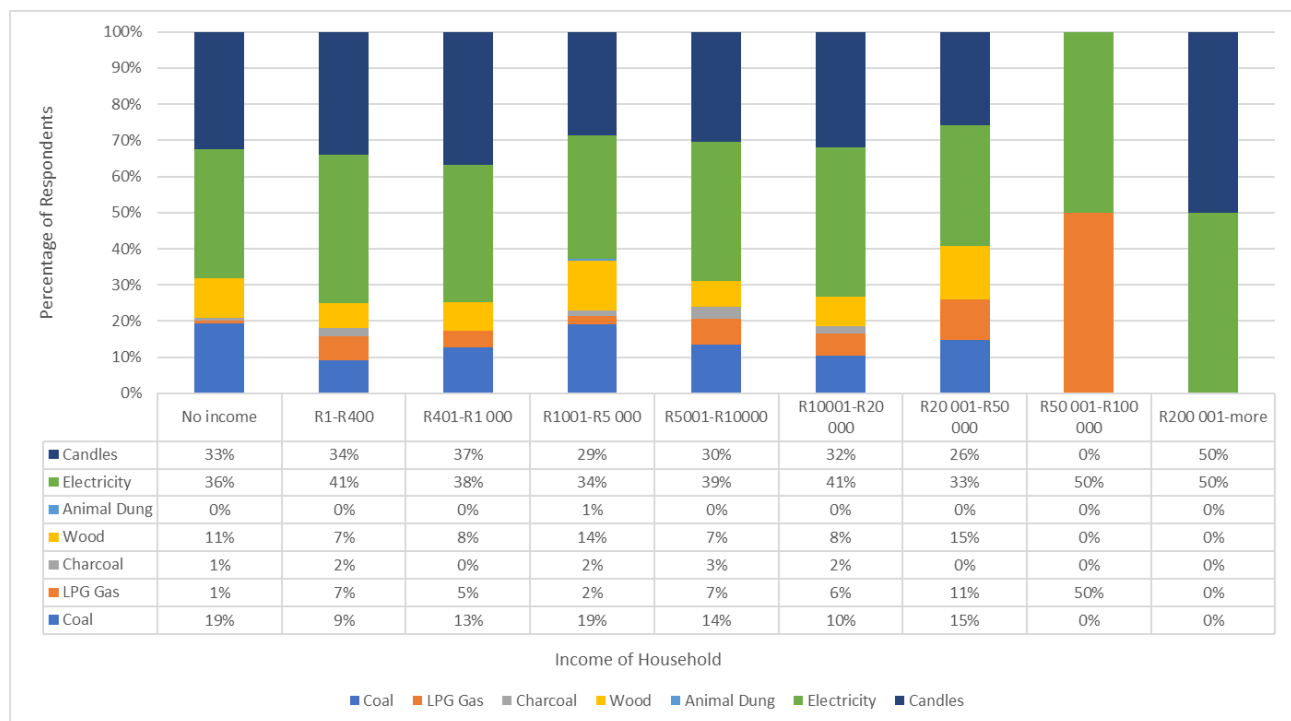


Figure 35: Energy mix across the different household income levels for KwaZamokuhle

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### 3.4 COOKING, SPACE HEATING & LIGHTING

For cooking, most households reported mainly electricity as their main energy source, while only 3,6% reported that LPG is used as the main source of energy for cooking. Firewood is used more often than LPG for cooking with 11.3% of households using mainly wood, coal is used by 23% households as the main cooking fuel.

For heating, 50% of the households reported use of electricity with only 3% using LPG. Again firewood (15%) and coal (32%) are more often used than gas for heating. Virtually all households (99%) use electricity for lighting, rarely using any other source of energy as an alternative for light.

#### 3.4.1 COOKING DEVICES

Use of inefficient cooking appliances increases the risk of gaseous pollutant emissions and subsequently poor indoor air quality. From the household survey in KwaZamokuhle, 46% of the households use a traditional stove and 45% use an electric stove. Most homes have one window only in the cooking area using predominantly either electricity, coal or firewood. With poor ventilation, exposure to indoor air pollution is exacerbated.

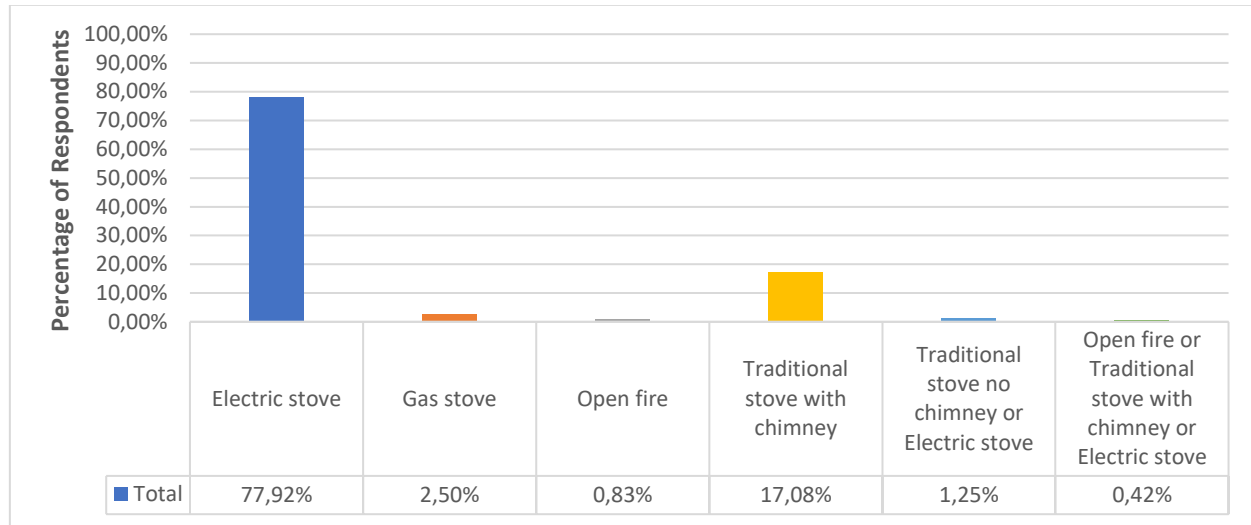
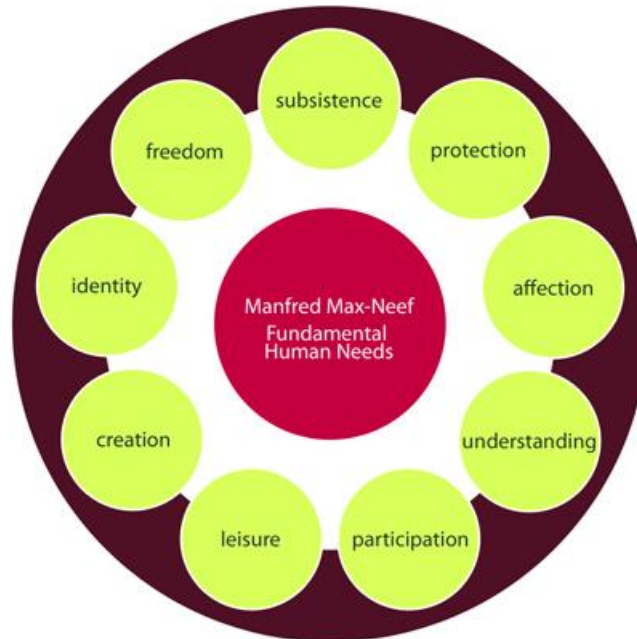


Figure 36: Stove Tyes Used by Respondents to Cook

### 3.5 QUALITY OF LIFE

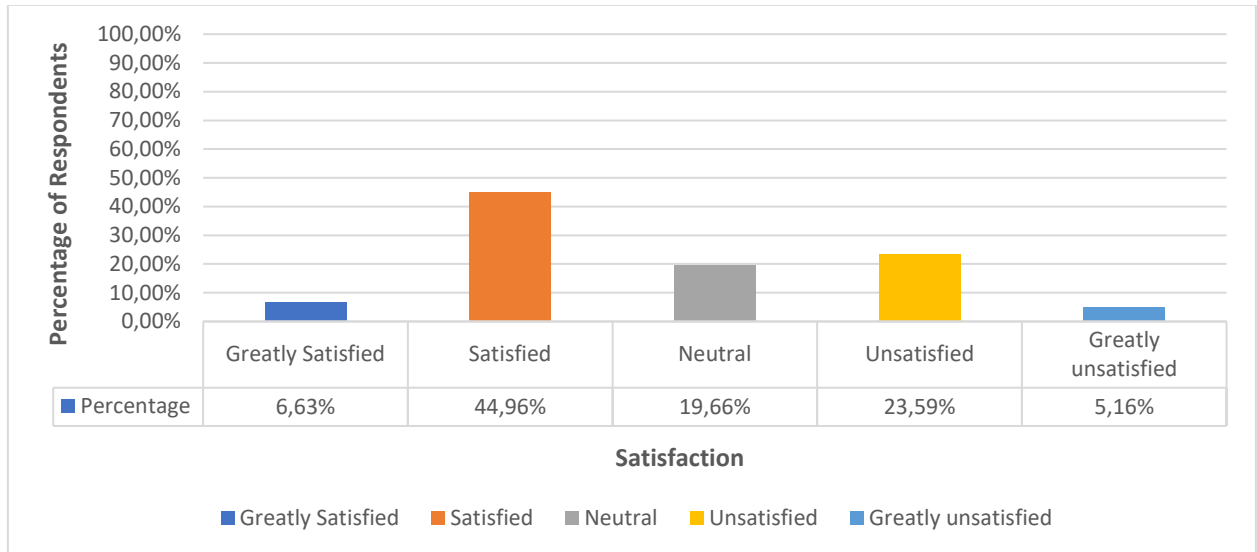
The household survey also determined the quality of life in the affected community in KwaZamokuhle. We utilised the conceptual framework of “*Fundamental human needs and human-scale development*” (Figure 37) to qualitatively determine the quality of life for the households at KwaZamokuhle. In this system, there is no hierarchy of needs (apart from the basic need for subsistence or survival) as postulated by Western psychologists such as Maslow, rather, simultaneity, complementarity and trade-offs are features of the process of needs satisfaction. Manfred Max-Neef and his colleagues developed a taxonomy of human needs and a process by which communities can identify their "wealths" and "poverties" according to how their fundamental human needs are satisfied. The following metrics of health, well-being, education, standard of living, safety and security and air quality was utilised herein.



**Figure 37: Manfred Max-Neef Fundamental Human Needs**

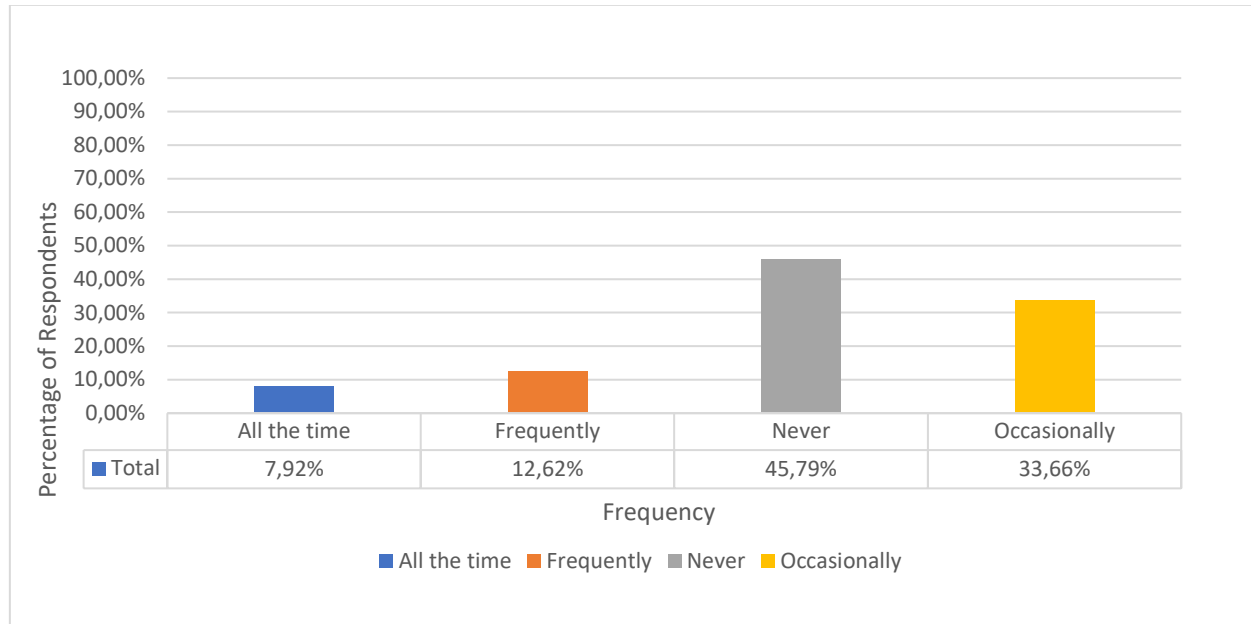
### 3.5.1 HEALTH

One of the key challenges noted in the sustainable development goals for good health and wellbeing (SDGs 3) is both ambient and household air pollution. Household solid fuel combustion represents one of the biggest threats to human health in South Africa. In KwaZamokuhle, ~52% of the respondents indicated an overall satisfaction with their overall health (Figure 38) and only 28% felt dissatisfied.



**Figure 38: Respondents Satisfaction with Health**

Often chronic respiratory cardio- and cerebrovascular morbidity and mortality as a result of air pollution may be masked as acute effects like asthma exacerbation, skin and eye irritation. Eye diseases or irritation was reported by 54% households with varying degrees of severity (Figure 39) while 46% households did not report any problems. Cough was reported as a slightly more common occurrence (58%) and 42% never experienced coughs. Additionally, it is important to note that the respondents indicated that ~52% of the households are non-smoking. This precludes smoking as a contributor or confounding factor to respiratory diseases for these households. For the smoking households (48%), 60% had one smoker whilst the remainder of these households had two or more smokers.



**Figure 39: Frequency of Respondent Household members Experiencing Eye Disease or Irritation**

### 3.5.2 WELLBEING

According to Stats SA, in 2021, income from wages and salaries (59%) and from social grants (51%) were the most common source of income for households, followed by remittances (15%) and income from a business (15%) across all sectors. Nationally, 52% of households listed salaries and wages as their main source of income compared to social grants (24%). However, in Eastern Cape, the percentage of households that received grants as a main source of income exceeded those that received salaries and wages (42% compared to 37%).

Comparatively, for KwaZamokuhle, most households earn reliable incomes of between R1000 and R5000 per month (Figure 40), mainly through pensions or grants with few inhabitants employed (Figure 41 and Figure 42). Fruit and vegetables are not grown nor

sold on the properties except for a few exceptions. This is reflective of the national norm with high unemployment rates and reliance on the basic income grants.

Income is an indicator of available disposable income. In low-income households, generally there isn't enough disposable income left over for energy purchases, and therefore energy stacking becomes significant.

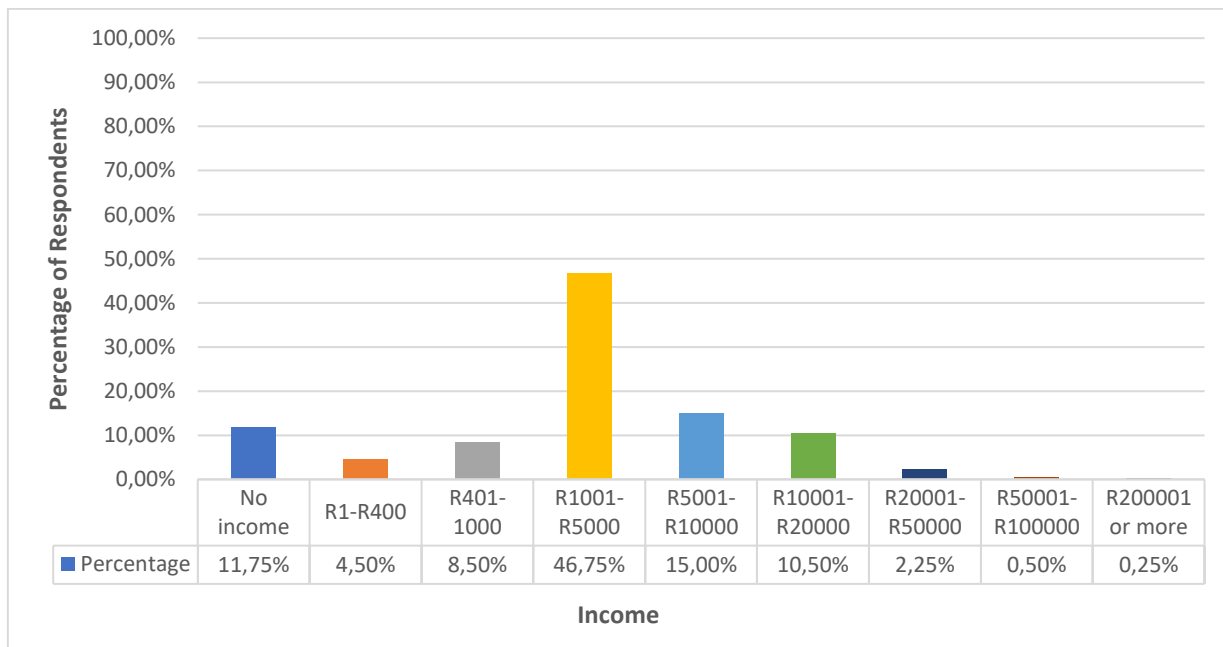


Figure 40: Respondent household total income

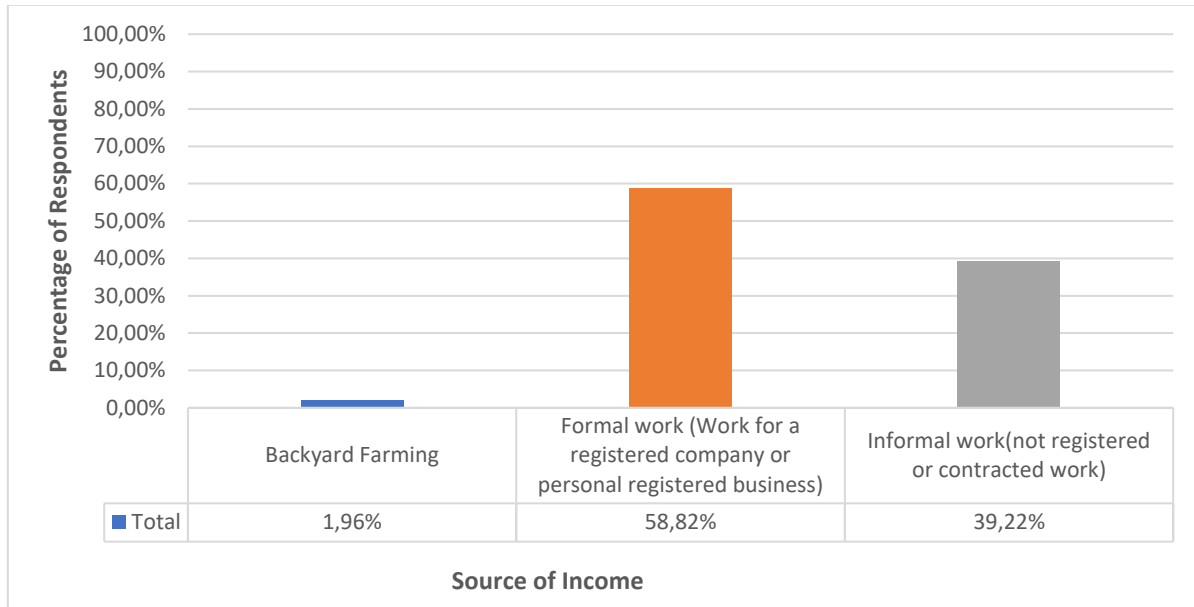


Figure 41: Primary Source of Income of Respondents

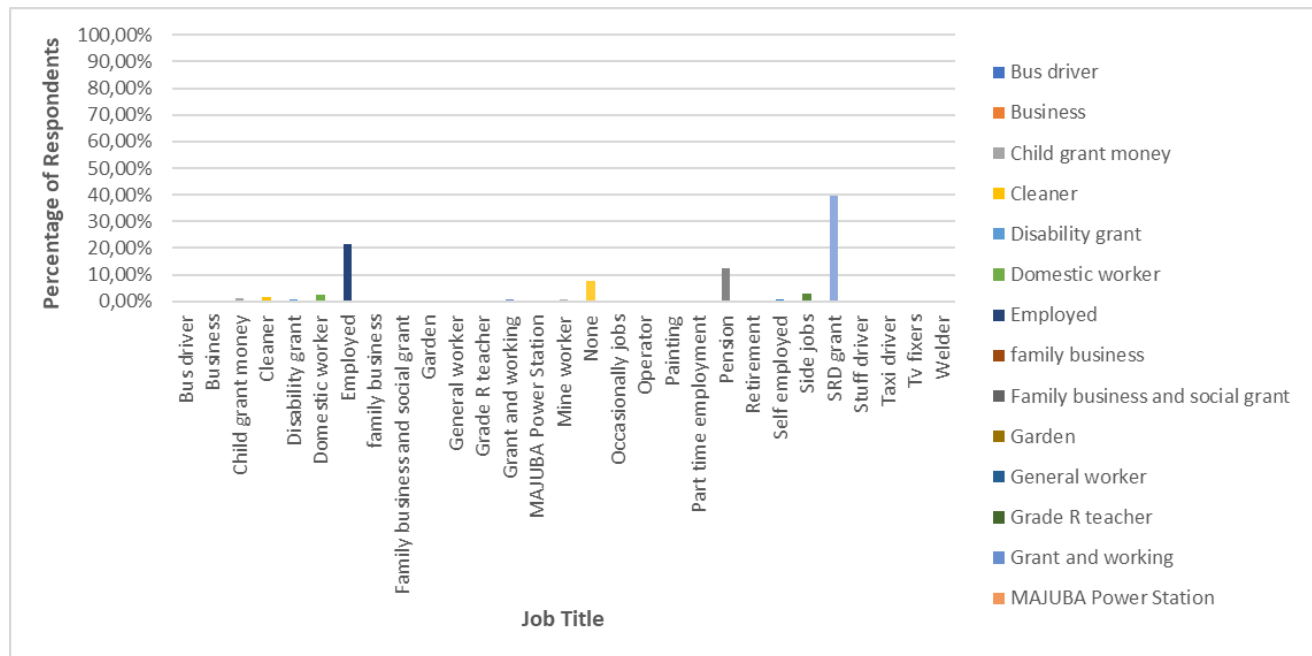


Figure 42: Detailed Breakdown of Respondent Primary Source of Income

### 3.5.3 EDUCATION

Basic and higher education are important levers for households to break the cycles of poverty and improve socio-economic circumstances. In KwaZamokuhle, only 14% of the respondents attend an educational institution (Figure 43). The bulk of respondents and breadwinners have a Grade 8-Matric qualification (Figure 44), with a third unsatisfied and two-thirds satisfied with their qualifications. Seen simplistically, it will be a challenge for most respondents to break the cycle of their current socio-economic circumstance.

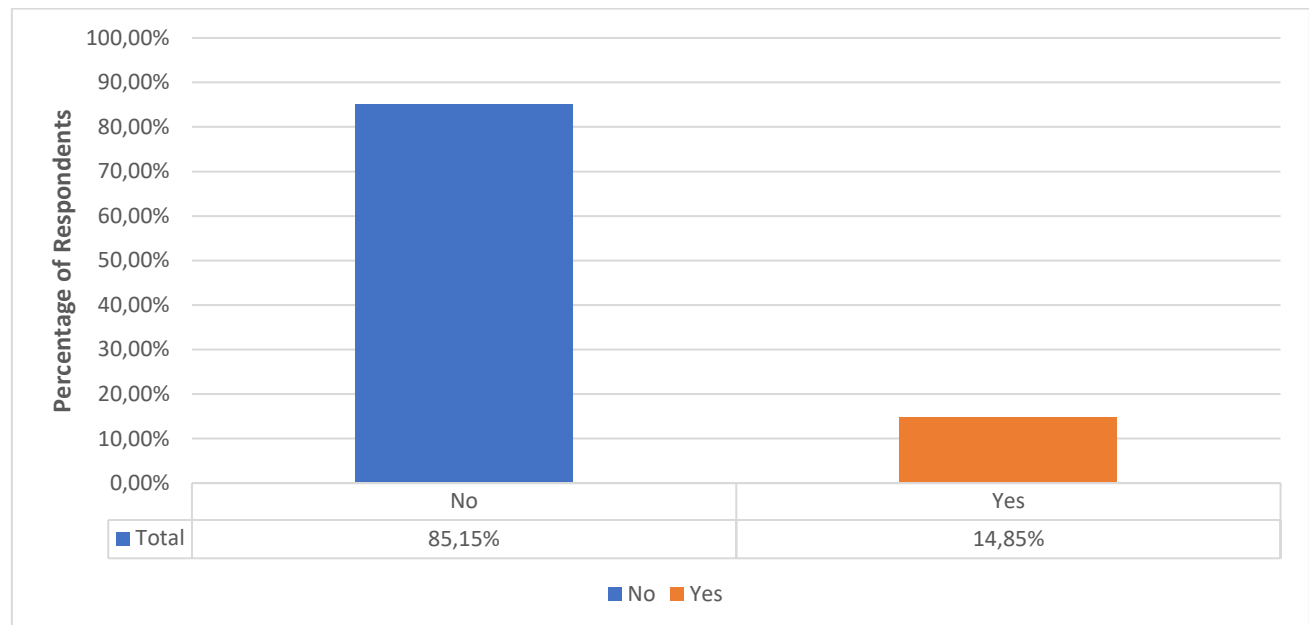


Figure 43: Respondents attending an educational institution

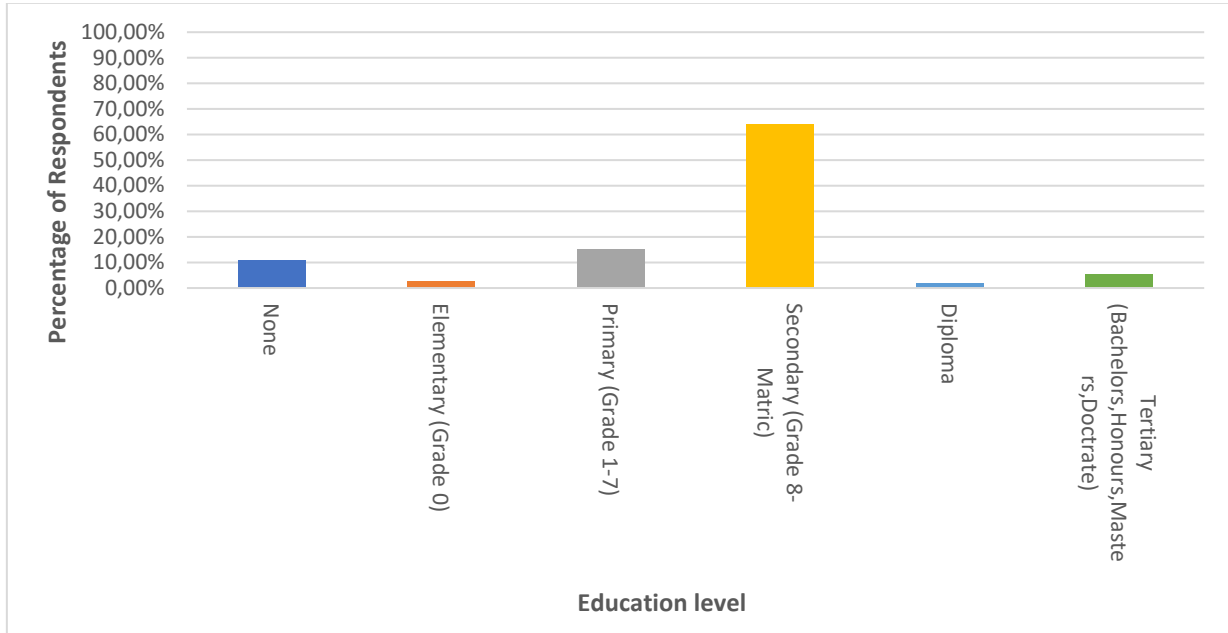


Figure 44: Respondents highest level of education

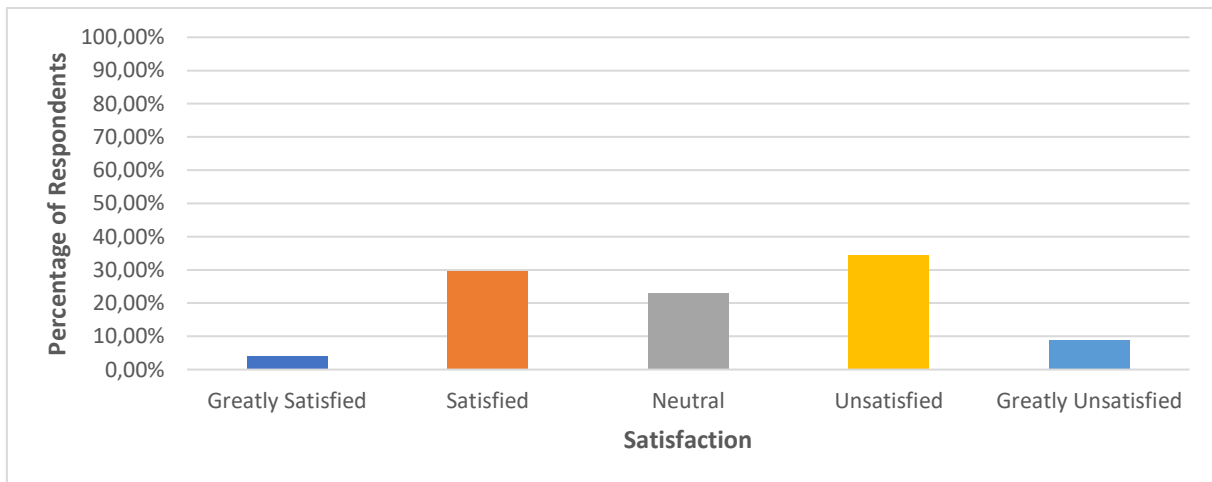


Figure 45: Respondents satisfaction with education

### 3.5.4 STANDARD OF LIVING

Standard of living reflects on other services received by households such as water, sanitation and refuse removal. Although not key determinants of air pollution and associated health risks, they play an equally important role in overall socio-economic conditions and health impacts on people in low-income households.

#### WATER

For context, according to Stats SA, although 88,7% of all households used tap water in their dwellings, their yards or from their neighbour's or communal taps, only 45,2% had water inside their dwellings. An evaluation by income quintile [https://www.statssa.gov.za/?p=15473 - edn1](https://www.statssa.gov.za/?p=15473-edn1) shows that the percentage of households with access to piped water in the dwelling increases with higher income quintiles, while reliance on other sources, including using taps in the yard, decreases. The converse is true for low-income households.

In KwaZamokuhle, households have access to piped water with fewer than 4% of respondents indicating that they have to source water from long distances (Figure 46). Households obtain water from either outdoor taps (29%) or indoor taps (18%), with 49% of households (Figure 47) obtaining from both outside and indoor taps which is within the national norms. However, availability of water is intermittent. Every month, water is available between 11 and 20 days with some households reporting 100% availability (Figure 48). Water costs less than R500 and only 15 households have to walk to find water elsewhere. Rainwater is harvested by 186 of the households.

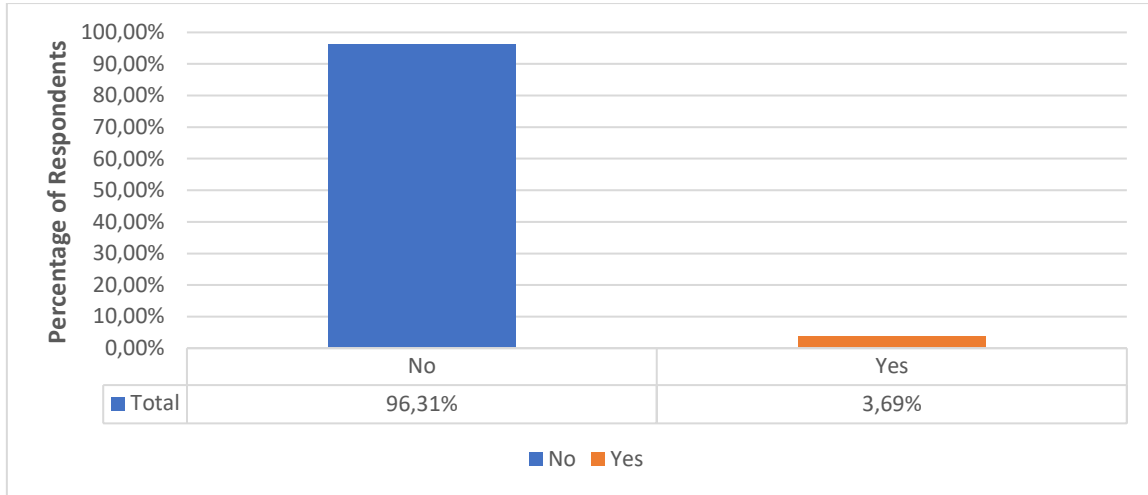


Figure 46: Distance respondent households must walk from home to fetch water

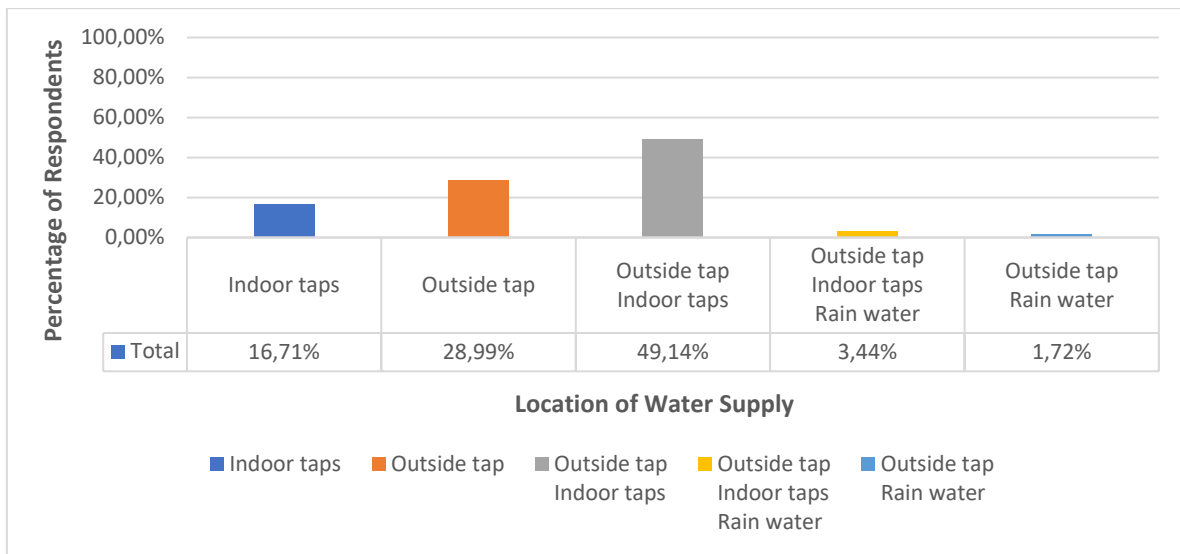


Figure 47: Respondent households' main source of water supply

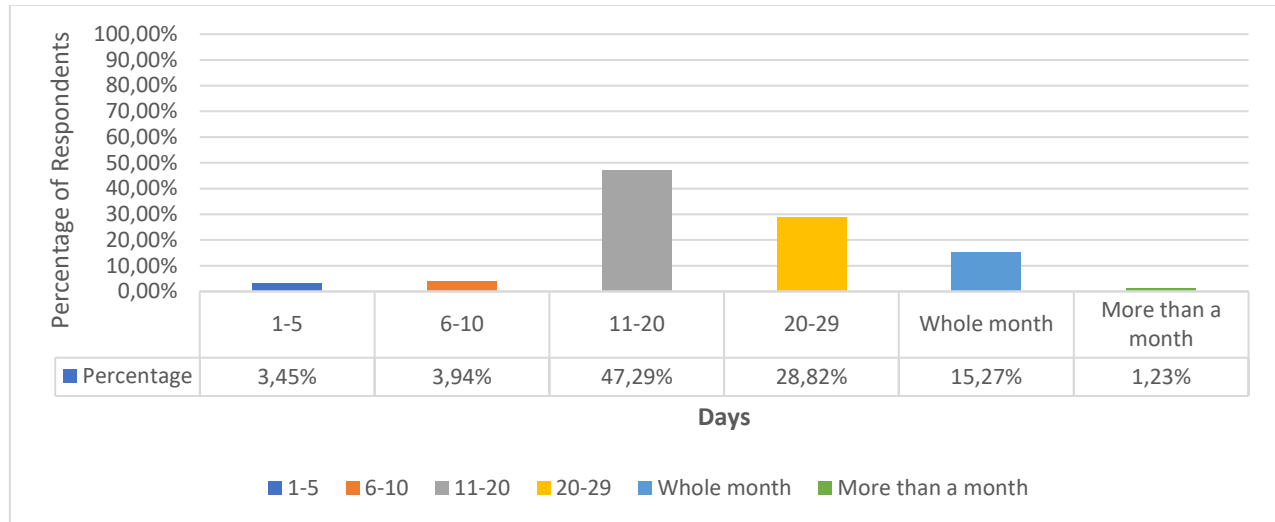


Figure 48: Number of days respondents have water

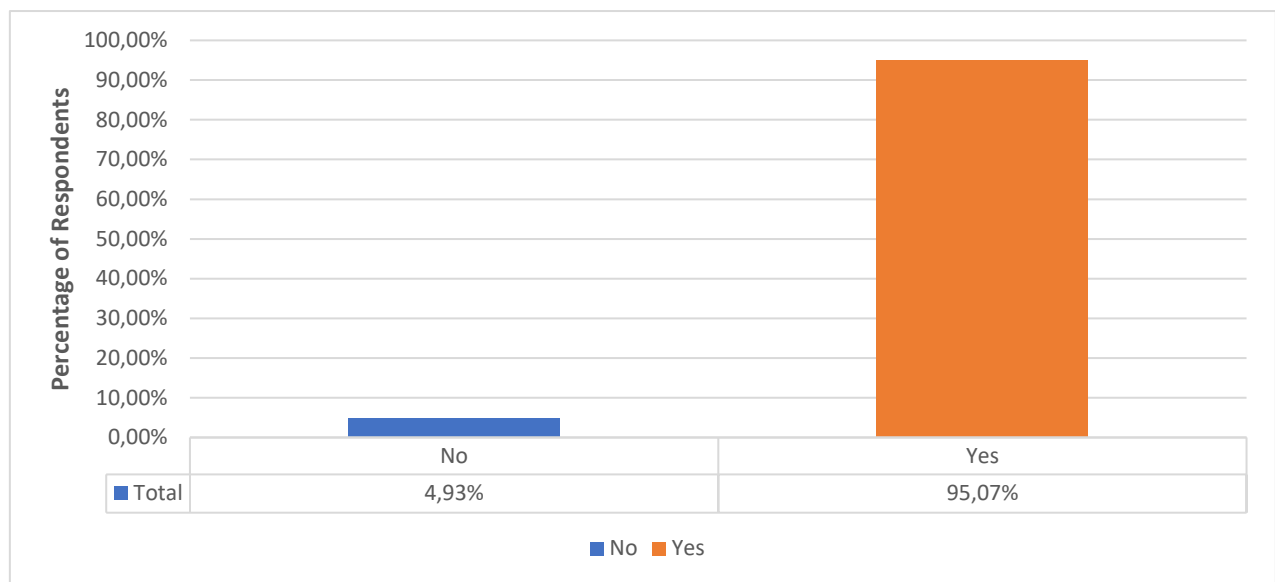
### SANITATION

Stats SA reported that household access to sanitation increased from 61,7% in 2002 to 84,1% by 2021. Nationally, only 64,8% of households used flush toilets, while 19,3% used pit toilets with ventilation pipes and 13,4% used pit toilets without ventilation pipes. Approximately 94% of households in income quintile 5 used a flush toilet compared to 43,3% of quintile 1 households. In KwaZamokuhle, all the surveyed 407 households had flushing toilets on the property and neighbours do not use their toilets which is better than the national norm.

### WASTE

Stats SA also indicated that household refuse was removed at least once per week or less often for 62,9% of all households, while more than one-third (35,1%) of households had to rely on communal or their own refuse dumps. Refuse removal was most common in urban areas (85,4%) while 79,4% of rural households used their own refuse dumps.

Waste is collected at 95% of the surveyed households (Figure 49), from outside the house, once a week and the collection is reported as reliable (Figure 50). When not collected the homeowner waits for the next collection day or takes the waste to the waste dump (Figure 51). This suggested that KwaZamokuhle is in a better position than other places in the country. More importantly, if waste is regularly collected, it negates waste dumping and waste burning which leads to increased air pollution.



**Figure 49: Respondent households that have household waste collected**

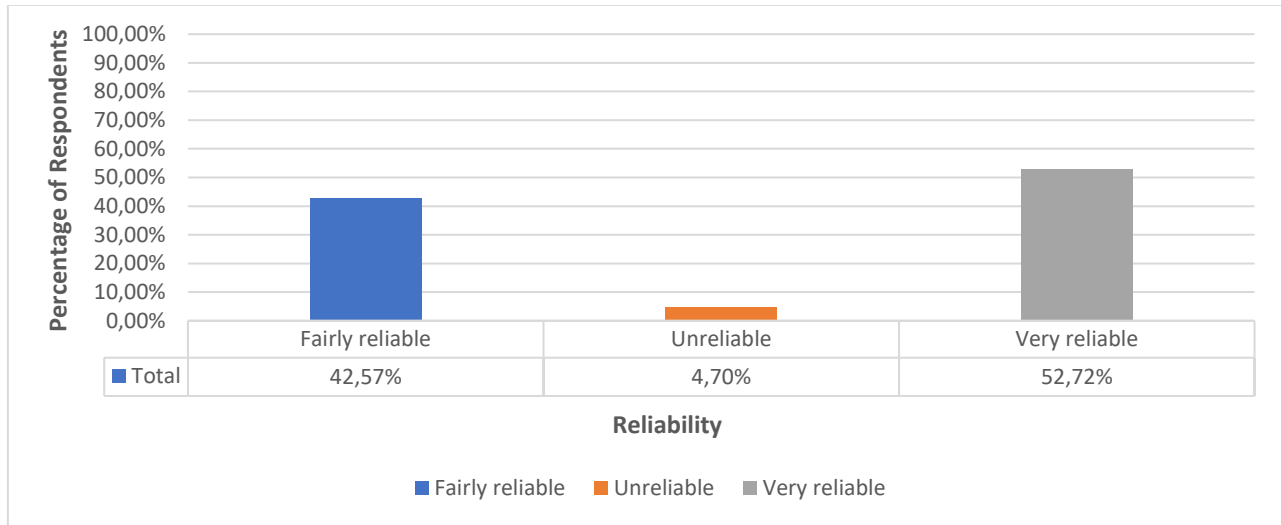


Figure 50: Reliability of waste collection to respondent households in KwaZamokuhle

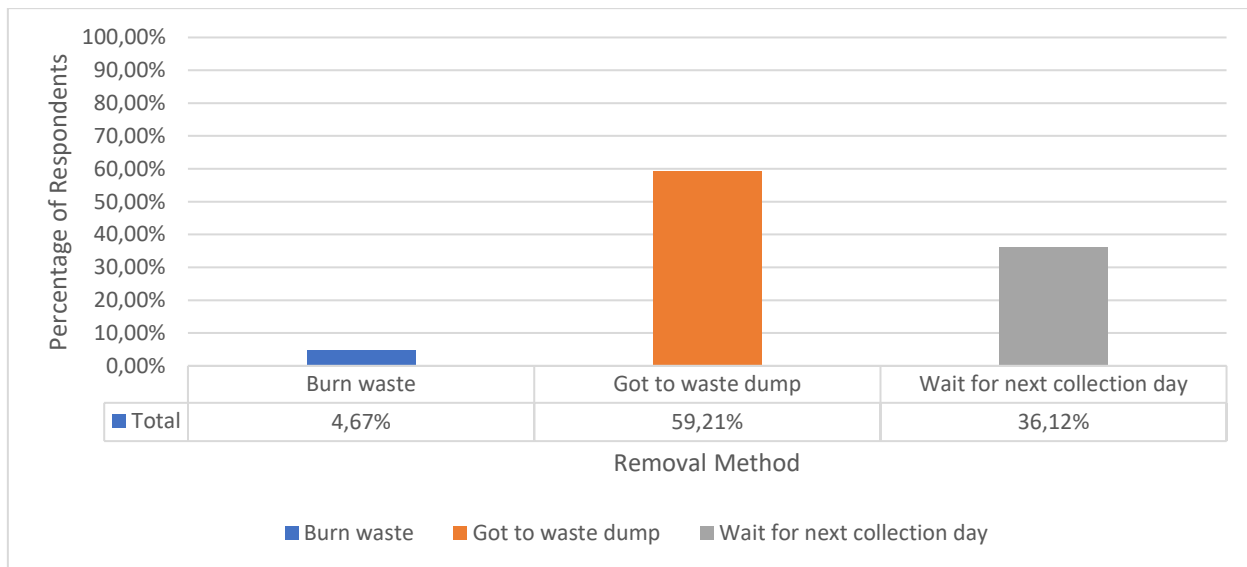


Figure 51: Alternate waste removal method if waste is not collected at respondent households

### 3.5.5 SAFETY & SECURITY

Despite the national crime statistics, participants were feeling generally safe (68%) (Figure 52) in the area where they live with only 11 people reported being a victim of crime on the past year (Figure 53). Burglary was the highest experienced crime in KwaZamokuhle (Figure 54).

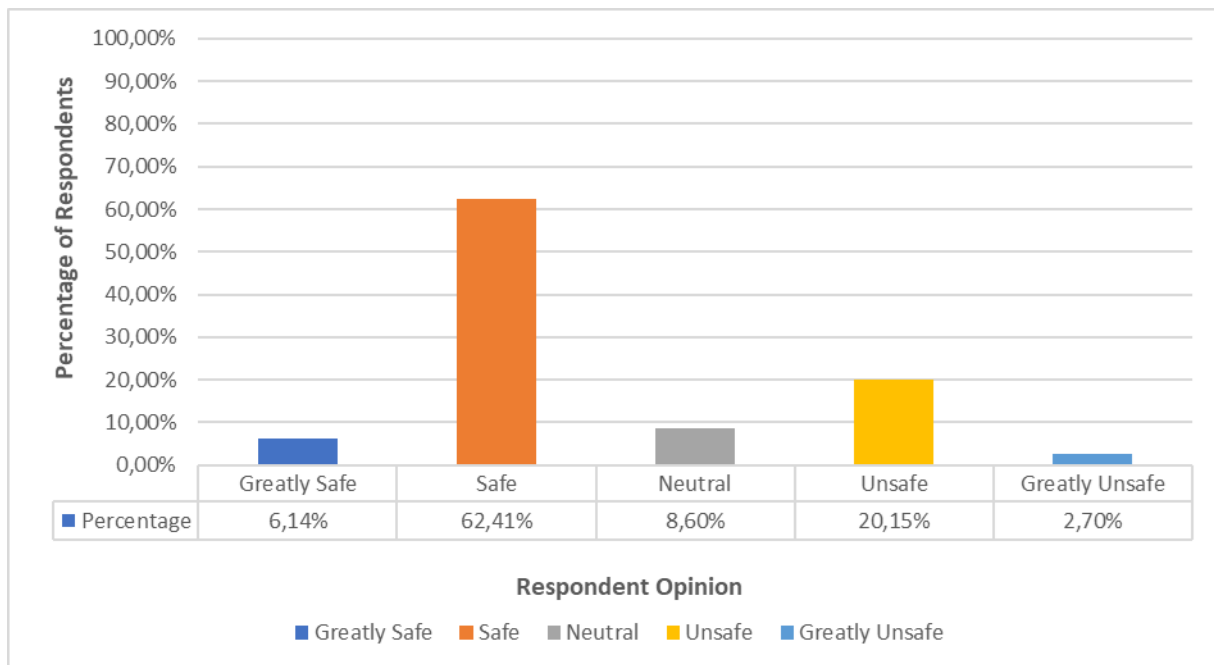
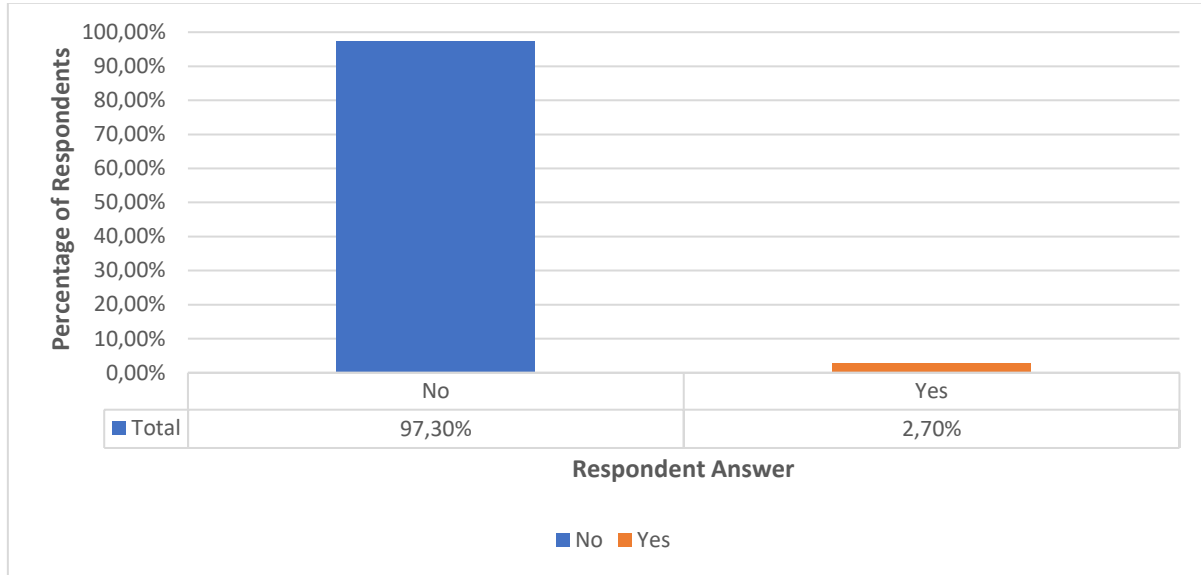
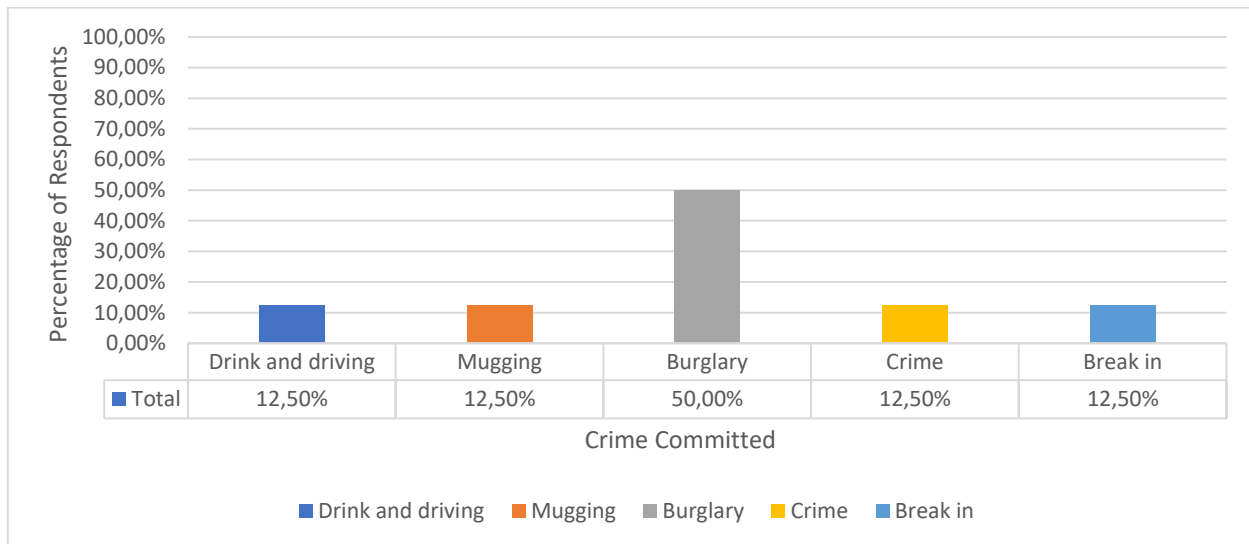


Figure 52: Respondent's view of area safety



**Figure 53: Members of household who were victims of a crime in the last twelve months in KwaZamokuhle**

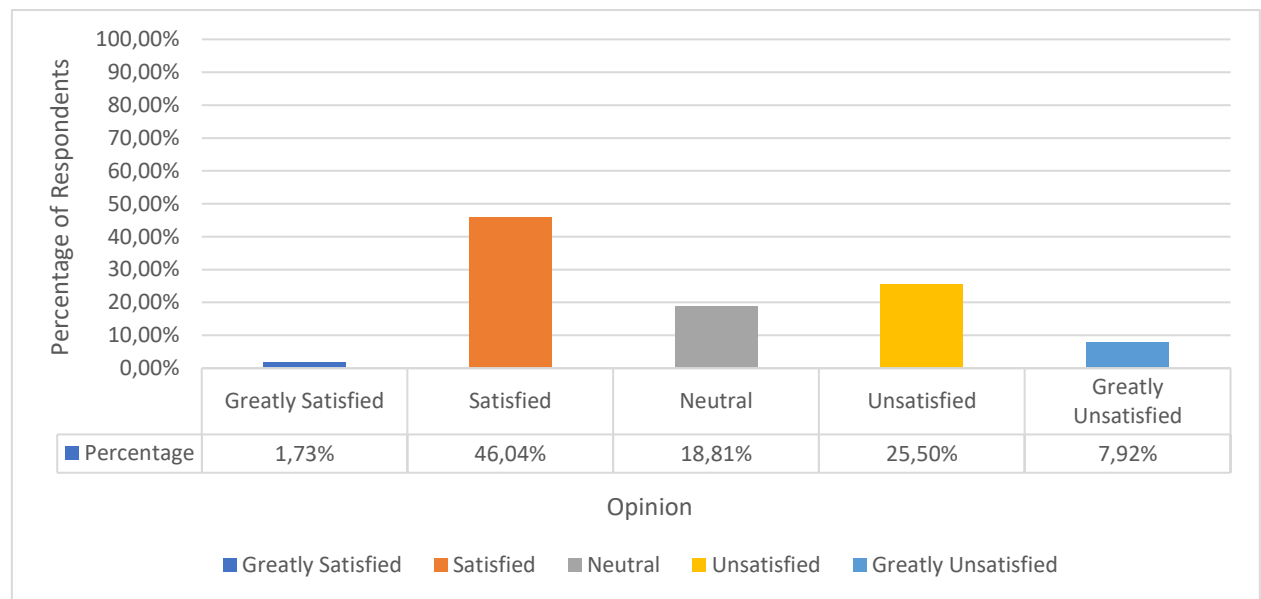


**Figure 54: Crimes committed against household members in KwaZamokuhle**

### 3.5.6 AIR QUALITY AWARENESS

The survey responses suggest that the residents of KwaZamokuhle are generally not aware of the air pollution and its associated impact on health and wellbeing. It is strongly recommended that Eskom embarks on an air quality awareness campaign on this and as start, first targets the primary and secondary school learners in the area.

Importantly, its noted that ~47% the respondents indicated that they were generally satisfied with the air they breathe (Figure 55) and a similar percentage (46%) of respondents did not feel that air pollution was a problem (Figure 56).



**Figure 55: Respondents satisfaction with air they breathe**

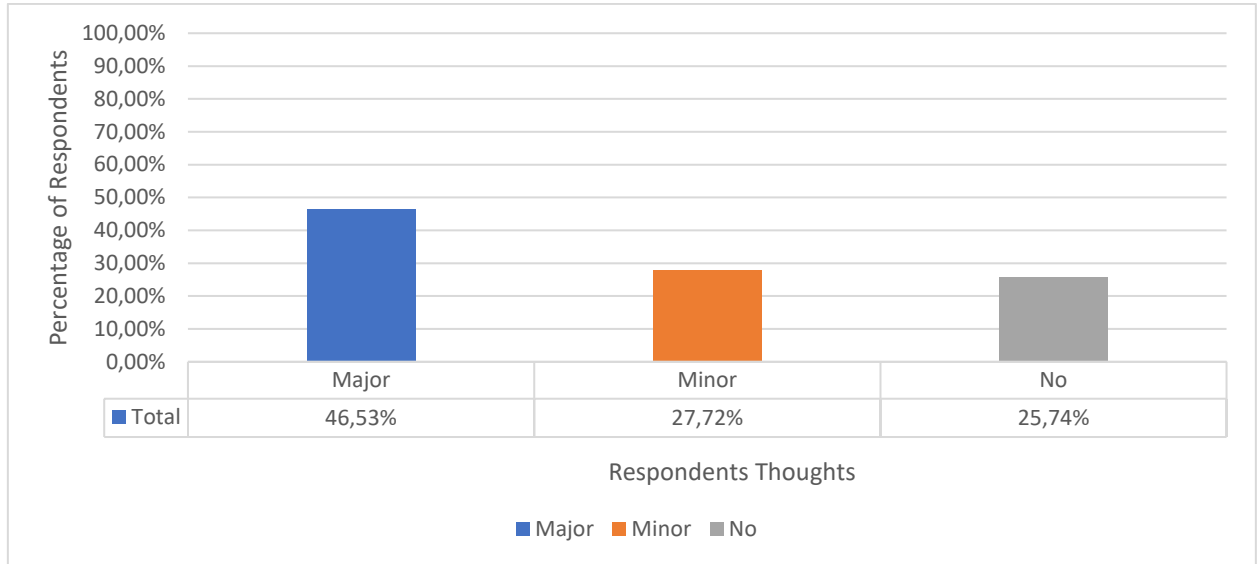


Figure 56: Respondents thoughts on air pollution being a problem in KwaZamokuhle

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## 4. CONCLUSIONS

Household surveys of low-income settlements, provides an important window into the socio-economic conditions of some of most vulnerable people in our society as it relates to air quality.

A door-to-door survey was conducted late in February 2023. Four hundred and seven (407) participants were interviewed. All 407 dwellings surveyed were either RDP homes, modified RDP homes or formal houses. The average house has cement floors or floor tiles, metal sheet roofing or roof tiles, and two thirds of homes have a ceiling installed. More than half of households income is well below R5000 per month and highest level of education is typically Grade 8 to Matric.

KwaZamokuhle is almost fully electrified with electricity access reaching close to 100%. However, whilst the households should be moving up the energy ladder, the responses reveal that energy stacking is commonly practiced. The household respondents indicate that they almost always switch to alternative fuels such as firewood and coal. This is typical of low-income households, with limited disposable income.

Access to tapped, reticulated water, flushed toilets and refuse removal are better than the national norm in KwaZamokuhle. The health questions, suggest that the respondents do not perceive air pollution as a concern, and this is further reflected in their answers to the illness related questions. However, it is important to contextualize that the study provides a snapshot of KwaZamokuhle in the summer months. A comparative winter survey may provide contrasting responses.

The household survey at KwaZamokuhle provided valuable insight into the community perceptions, wants and needs. It has reaffirmed and support for the Eskom AQO interventions for targeting RDP households with the ceiling insulation and electric stove retrofits. Additionally, the study results have indicated that may exist an opportunity for

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Eskom to consider other potential low-hanging fruit (Table 1) that may aid and support the Eskom AQO project. However, it is noted the viability and feasibility of these proposed solutions (Table 1) will need to be tested prior to embarking on a large scale rollout.

# ANNEXURE 1: KWAZAMOKUHLE FIELDWORKER ADVERT



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## ESKOM AIR QUALITY OFFSETS PROJECT

Air Resource Management (Pty) Ltd will be undertaking the above project.

### VACANCIES AVAILABLE

- X 14 Field Workers

### REQUIREMENTS

- Be a RSA citizen with no criminal record
- Have a minimum of a Senior Certificate (Matric or equivalent)
- Be able to read, speak and write English and Zulu fluently
- Be willing to work over weekends and outside of normal office hours.
- Unemployed Youth to age 35
- Applicants are required to submit the following documents when they apply:
  - Proof of home/residential address (e.g. lease agreement, Affidavit, Tribal Authority letter, Municipality bill, clothing account bill and others
  - Certified copies of ID and matric certificate

### BRIEF JOB DESCRIPTION

- Going door-to-door in Kwazamokuhle to collect information from households with a mobile device
- Complete the survey at each household on the mobile device
- Build relationships with the households and explain the benefits of the Air Quality Offset Project to the community

**Closing Date: 9 December 2022**

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# APPENDIX 2: KWAZAMOKUHLE JOTFORM

## Household Survey-Kwazamokuhle

### Protection of Personal Information Act (POPIA)

The Protection of Personal Information Act (POPIA), No 4 of 2013, promote the protection of personal information that is processed by public and private bodies while introducing certain conditions to establish minimum requirements for the processing of personal information. Pertinent sections of the Act became effective on 1 July 2021. Air Resource Management (Pty) Ltd will collect, maintain and store personal information from participants partaining to this survey. Collected contact details managed by Air Resource Management will only be used for information quality control only. Air Resource Management (Pty) Ltd further acknowledge that this survey is for private use for the Household survey activity and deleted after the activity has been completed.

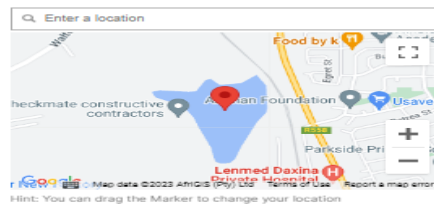
### Household Details

#### Name of Respondent

<input type="text"/>	<input type="text"/>	<input type="text"/>
Title	First Name	Last Name

#### House Address

#### Detected Location



#### Gender

- Male  
 Female

#### Age

#### Relationship to head of Household

#### Number of breadwinners

#### Number of dependents

#### Does the Household have a backyard dwelling

- Yes (include page 17)  
 No (exclude page 17)

Next

### Main Dwelling characteristics

#### Total Number of People in Household

ex: 23

#### Type of Dwelling

- Shack
- Formal Brick Housing
- RDP Housing
- Converted from RDP to housing
- Other

#### Floor Type

- Tiles
- Carpet
- Wooden Floor
- Cement
- Other

#### Roof Type

- Concrete
- Tile
- Thatched
- Wood
- Metal Sheet

#### Ceiling

- Ceiling
- No Ceiling

#### Number of Rooms

ex: 23

#### The house our household occupies is:

- Rented
- Owned(built by ourselves)
- Owned (bought)
- Owned (inherited)

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Next

**Energy Usage**

---

Are the following energy sources used in your home?

<input type="checkbox"/> Electricity from grid	<input type="checkbox"/> Electricity from isolated system
<input type="checkbox"/> LPG	<input type="checkbox"/> Solar
<input type="checkbox"/> Firewood	<input type="checkbox"/> Animal dung
<input type="checkbox"/> Coal	<input type="checkbox"/> Generator
<input type="checkbox"/> Candle	<input type="checkbox"/> Charcoal
<input type="checkbox"/> Other	

Which one of the following is the main energy source?

<input type="checkbox"/> Electricity from grid	<input type="checkbox"/> Electricity from isolated system
<input type="checkbox"/> LPG	<input type="checkbox"/> Solar
<input type="checkbox"/> Firewood	<input type="checkbox"/> Animal dung
<input type="checkbox"/> Coal	<input type="checkbox"/> Generator
<input type="checkbox"/> Candle	
<input type="checkbox"/> Other	

Which one of the following is the main energy source for cooking?

	Mainly	Sometimes	Rarely	Never
Electricity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LPG	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Firewood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Animal Dung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Battery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which one of the following is the main energy source for heating?

	Mainly	Sometimes	Rarely	Never
Electricity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LPG	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Firewood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Animal Dung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Battery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which one of the following is the main energy source for lighting?

	Mainly	Sometimes	Rarely	Never
Electricity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LPG	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Firewood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Animal Dung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Battery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Does your home have an electricity connection?

- Yes
- No

If your home does not have an electricity connection, please indicate if the statement is major, minor or no reason

	No reason	Minor reason	Major reason
Electricity is not available in my area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our household can't pay the connection fee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our household can't pay the cost of housewiring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our household can't afford the monthly payment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our household can't afford to buy electrical equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We are satisfied with present energy source	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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**Use of electricity from interconnected grid or isolated system**

What do you mostly use your electricity for?

	No reason	Minor Reason	Major Reason
For entertainment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For information and/or the news	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For better lighting within the home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Friendliness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For better safety outside the home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To improve income	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Because electricity is cheaper than other fuels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For education of your children	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Does your household use electricity for the following purposes?

	Yes	No
Lighting	<input type="radio"/>	<input type="radio"/>
Cooking	<input type="radio"/>	<input type="radio"/>
Electric appliances	<input type="radio"/>	<input type="radio"/>
Family business	<input type="radio"/>	<input type="radio"/>
Farm irrigation	<input type="radio"/>	<input type="radio"/>

Does your home have an electricity meter?

- Yes
- No

How many days per month do you utilise electricity?

- 1-5
- 6-10
- 11-20
- 20-29
- Whole Month

What is your cost of electricity (Rands)

- 1-200
- 200-500
- 500-1000
- 1000-2000
- More than 2000

Type of lighting

	Yes	No	Does not know
Incandescent light bulb	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fluorescent tubes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy saving light bulbs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In case of power failure, what do you use as a backup?

	Yes	No
Candles	<input type="radio"/>	<input type="radio"/>
Gas lamp	<input type="radio"/>	<input type="radio"/>
Generator	<input type="radio"/>	<input type="radio"/>
Car/motorcycle battery	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>

Other backup power

Does your household use the following appliances?

	Yes	No
Radio	<input type="radio"/>	<input type="radio"/>
TV	<input type="radio"/>	<input type="radio"/>
Sound equipment	<input type="radio"/>	<input type="radio"/>
DVD	<input type="radio"/>	<input type="radio"/>
Electric motor	<input type="radio"/>	<input type="radio"/>
Electric Stove	<input type="radio"/>	<input type="radio"/>
Microwave	<input type="radio"/>	<input type="radio"/>
Washing Machine	<input type="radio"/>	<input type="radio"/>
Dishwasher	<input type="radio"/>	<input type="radio"/>
Refridgerator	<input type="radio"/>	<input type="radio"/>
Electric Iron	<input type="radio"/>	<input type="radio"/>

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### Candle Use

Does your household use candles?

- Yes
- No

How many candles did your household use in the past month?

ex: 23

What are the candles used for?

	Yes	No
Home use	<input type="radio"/>	<input type="radio"/>
family business	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>

Other Candle Use

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### Use of LPG

Does your household use LPG?

- Yes  
 No

What size of gas cyclinder/tank does your household use?

	Yes	No
5kg cylinder	<input type="radio"/>	<input type="radio"/>
9kg Cylinder	<input type="radio"/>	<input type="radio"/>
12kg cylinder	<input type="radio"/>	<input type="radio"/>
14kg cylinder	<input type="radio"/>	<input type="radio"/>

Does the household use the following gas appliance?

	Yes	No
Gas Lamp	<input type="radio"/>	<input type="radio"/>
LPG stove	<input type="radio"/>	<input type="radio"/>
LPG stove and oven	<input type="radio"/>	<input type="radio"/>
LPG heater	<input type="radio"/>	<input type="radio"/>

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Firewood

Does your household use firewood?

Yes  
 No

How does your household obtain firewood for domestic use?

Purchase  
 Collected/gathered  
 Purchase and Collected/gathered

Following Questions are for purchased Firewood

What is the cost of the purchased firewood? (Rands)

1-10  
 11-30  
 31-50  
 51-70  
 71-100  
 More than 100

How long does it take to travel one way to purchase?

1m-50m  
 50m-100m  
 100m-500m  
 500m-1000m  
 More than 1km

How many days will the bundle last?

1-5  
 6-10  
 11-20  
 20-29  
 Whole month  
 More than a month

Following questions are for collected firewood

Where did you collect your firewood?

How far did you travel to collect the firewood?

1m-50m  
 50m-100m  
 100m-500m  
 500m-1000m  
 More than 1km

How many days did the previous collected firewood last?

1-5  
 6-10  
 11-20  
 20-29  
 Whole month  
 More than a month

**Use of charcoal**

Does your household use charcoal?

- Yes
- No

How many KGs of charcoal do you use in one month?

- 1-5
- 6-10
- 10-20
- 30-40
- 50-100

How far do you travel to purchase charcoal?

- 1m-50m
- 50m-100m
- 100m-500m
- 500m-1000m
- More than 1km

How many days does the charcoal last for?

- 1-5
- 6-10
- 11-20
- 20-29
- Whole month
- More than a month

What is the average cost of the charcoal? (Rands)

- 1-10
- 11-30
- 31-50
- 51-70
- 71-100
- More than 100

How reliable is your source of charcoal?

- Very reliable
- Fairly reliable
- Unreliable

Do you use more than one source for your charcoal?

- Yes
- No

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Next

### Use of Coal

Does your household use coal?

- Yes
- No

How many KGs of coal do you use in one month?

- 1-5
- 6-10
- 10-20
- 30-40
- 50-100

How far do you travel to purchase coal?

- 1m-50m
- 50m-100m
- 100m-500m
- 500m-1000m
- More than 1km

How many days does the coal last for?

- 1-5
- 6-10
- 11-20
- 20-29
- Whole month
- More than a month

What is the average cost of the coal? (Rands)

- 1-10
- 11-30
- 31-50
- 51-70
- 71-100
- More than 100

How reliable is your source of coal?

- Very reliable
- Fairly reliable
- Unreliable

Do you use more than one source for your coal?

- Yes
- No

Back

Next

## Animal Dung

In the past month, did your household use dung at home?

- Yes  
 No

How many times a week do you collect animal dung?

ex: 23

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Next

## Cooking devices

What is the main stove that your household uses for cooking?

- Open fire
- Traditional stove no chimney
- Traditional stove with chimney
- Gas stove
- Electric stove

Where is the stove located?

- Outdoors
- Semi-enclosed
- Separate kitchen
- In living area

Is there a vent or window in the cooking area?

- None
- One only
- Two or more

What type of fuel does your household use for cooking?

- Firewood
- Coal
- Charcoal
- LPG
- Electricity
- Dung cakes

Back

Next

## Health

Are you satisfied with your health?

- Greatly unsatisfied
- Unsatisfied
- Neutral
- Satisfied
- Greatly Satisfied

How many members of your household smoke?

ex: 23

How often do you or a member of your household experience eye diseases or irritation?

- Never
- Occasionally
- Frequently
- All the time

How often do you or a member of your household experience an illness with a cough?

- Never
- Occasionally
- Frequently
- All the time

Back

Next

### Standard of living

What is the main source of water supply for the household?

- Outside tap
- Indoor taps
- Borehole/Well
- Neighbour
- Rain water

How many days has your water supply been available in the past month?

- 1-5
- 6-10
- 11-20
- 20-29
- Whole month
- More than a month

How much do you pay for water?

- 0
- 1-R500
- R500-1000
- R1000-R2000
- More than R2000

Do you have to walk away from your home to fetch water?

- Yes
- No

How far do you have to walk to fetch water ?

- 1m-50m
- 50m-100m
- 100m-500m
- 500m-1000m
- More than 1km

What type of container do you use to fetch water?

Do you use a container to collect rain water?

- Yes
- No

What kind of toilet do you have on the property?

- Pit latrine
- Flushing toilet
- Both

Do your neighbours use your toilet?

- Yes
- No

Is your household waste collected?

- Yes
- No

Where is your household waste collected?

- Outside home
- Waste skip
- Dumping site
- Other

How often is your waste collected?

- Once a week
- Once every 2 weeks
- Once a month
- Never

Is the waste collection reliable?

- Very reliable
- Fairly reliable
- Unreliable

What do you do when your waste is not collected

- Got to waste dump
- Burn waste
- Wait for next collection day

Back

Next

Well-Being

What is the income category that best describes the household income of all sources of income

- No income
- R1-R400
- R401-1000
- R1001-R5000
- R5001-R10000
- R10001-R20000
- R20001-R50000
- R50001-R100000
- R100001-R200000
- R200001 or more

What is your primary source of income?

What is your primary source of income?

- Formal work (Work for a registered company or personal registered business)
- Informal work(not registered or contracted work)
- Backyard Farming

Is your primary source of income reliable?

- Highly reliable
- Fairly reliable
- Unreliable

Do you grow fruits on your property?

- Not at all
- Rarely
- Often

Do you sell the fruits for money?

- Yes
- No

Do you grow vegetables on your property?

- Not at all
- Rarely
- Often

Do you sell the vegetables for money?

- Yes
- No

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Next

## Education

Does the respondent currently attend an educational institution

- Yes
- No

What is the highest level of education of the respondent

- None
- Elementary (Grade 0)
- Primary (Grade 1-7)
- Secondary (Grade 8-Matric)
- Tertiary (Bachelors,Honours,Masters,Doctrate)
- Diploma

What is the highest level of education of the breadwinner

- None
- Elementary (Grade 0)
- Primary (Grade 1-7)
- Secondary (Grade 8-Matric)
- Tertiary (Bachelor's,Honours,Masters,Doctrate)
- Diploma

How satisfied are you with your education?

- Greatly Unsatisfied
- Unsatisfied
- Neutral
- Satisfied
- Greatly Satisfied

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Next

## Safety & Security

Do you think the area where you live is safe?

- Greatly Unsafe
- Unsafe
- Neutral
- Safe
- Greatly Safe

Has anyone in the household been a victim of crime in the last 12 months?

- Yes
- No

Please indicate all the crimes that the members of this household have been victims of in the past 12 months?

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Next

## Air Quality Awareness

---

How satisfied are you with the air you breathe?

- Greatly Unsatisfied
- Unsatisfied
- Neutral
- Satisfied
- Greatly Satisfied

Do you think air pollution is a major problem where you live

- No
- Minor
- Major

---

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Next

### Backyard Dwelling

#### Protection of Personal Information Act (POPIA)

The Protection of Personal Information Act (POPIA), No 4 of 2013, promote the protection of personal information that is processed by public and private bodies while introducing certain conditions to establish minimum requirements for the processing of personal information. Pertinent sections of the Act became effective on 1 July 2021. Air Resource Management (Pty) Ltd will collect, maintain and store personal information from participants partaining to this survey. Collected contact details managed by Air Resource Management will only be used for information quality control only. Air Resource Management (Pty) Ltd further acknowledge that this survey is for private use for the Household survey activity and deleted after the activity has been completed.

#### Household Details

##### Name of Respondant

<input type="text"/>	<input type="text"/>	<input type="text"/>
Title	First Name	Last Name

##### Respondant Gender

- Male
- Female

##### Age

##### Relationship to head of Household

##### Number of breadwinners

##### Number of dependents

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Next

**backyard Dwelling Characteristics**

---

**Total Number of People in Household**

**Type of Dwelling**

- Shack
- Formal Brick Housing
- RDP Housing
- Converted from RDP to housing
- Other

**Floor Type**

- Tiles
- Carpet
- Wooden Floor
- Cement
- Other

**Roof Type**

- Concrete
- Tile
- Thatched
- Wood
- Metal Sheet

**Ceiling**

- Ceiling
- No Ceiling

**Number of Rooms**

**The house our household occupies is:**

- Rented
- Owned(built by ourselves)
- Owned (bought)
- Owned (inherited)

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**Energy Usage**

Are the following energy sources used in your home?

- |  |   |
|--|---|
| <input type="checkbox"/> Electricity from grid | <input type="checkbox"/> Electricity from isolated system |
| <input type="checkbox"/> LPG                   | <input type="checkbox"/> Solar                            |
| <input type="checkbox"/> Firewood              | <input type="checkbox"/> Animal dung                      |
| <input type="checkbox"/> Coal                  | <input type="checkbox"/> Generator                        |
| <input type="checkbox"/> Candle                | <input type="checkbox"/> Charcoal                         |
| <input type="checkbox"/> Other                 |   |

Which one of the following is the main energy source?

- |  |   |
|--|---|
| <input type="checkbox"/> Electricity from grid | <input type="checkbox"/> Electricity from isolated system |
| <input type="checkbox"/> LPG                   | <input type="checkbox"/> Solar                            |
| <input type="checkbox"/> Firewood              | <input type="checkbox"/> Animal dung                      |
| <input type="checkbox"/> Coal                  | <input type="checkbox"/> Generator                        |
| <input type="checkbox"/> Candle                |   |
| <input type="checkbox"/> Other                 |   |

Which one of the following is the main energy source for cooking?

	Mainly	Sometimes	Rarely	Never
Electricity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LPG	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Firewood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Animal Dung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Battery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which one of the following is the main energy source for heating?

	Mainly	Sometimes	Rarely	Never
Electricity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LPG	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Firewood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Animal Dung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Battery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Which one of the following is the main energy source for lighting?

	Mainly	Sometimes	Rarely	Never
Electricity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LPG	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Firewood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Candle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Animal Dung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Battery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Does your home have an electricity connection?

- Yes
- No

If your home does not have an electricity connection, please indicate if the statement is major, minor or no reason

	No reason	Minor reason	Major reason
Electricity is not available in my area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our household can't pay the connection fee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our household can't pay the cost of housewiring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our household can't afford the monthly payment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our household can't afford to buy electrical equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We are satisfied with present energy source	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Use of electricity from interconnected grid or isolated system

What do you mostly use your electricity for?

	No reason	Minor Reason	Major Reason
For entertainment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For information and/or the news	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For better lighting within the home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Friendliness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For better safety outside the home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To improve income	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Because electricity is cheaper than other fuels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For education of your children	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Does your household use electricity for the following purposes?

	Yes	No
Lighting	<input type="radio"/>	<input type="radio"/>
Cooking	<input type="radio"/>	<input type="radio"/>
Electric appliances	<input type="radio"/>	<input type="radio"/>
Family business	<input type="radio"/>	<input type="radio"/>
Farm irrigation	<input type="radio"/>	<input type="radio"/>

Does your home have an electricity meter?

- Yes
- No

How many days per month do you utilise electricity?

- 1-5
- 6-10
- 11-20
- 20-29
- Whole Month

What is your cost of electricity (Rands)

- 1-200
- 200-500
- 500-1000
- 1000-2000
- More than 2000

Type of lighting

	Yes	No	Does not know
Incandescent light bulb	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fluorescent tubes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy saving light bulbs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In case of power failure, what do you use as a backup?

	Yes	No
Candles	<input type="radio"/>	<input type="radio"/>
Gas lamp	<input type="radio"/>	<input type="radio"/>
Generator	<input type="radio"/>	<input type="radio"/>
Car/motocycle battery	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>

Other backup power

Does your household use the following appliances?

	Yes	No
Radio	<input type="radio"/>	<input type="radio"/>
TV	<input type="radio"/>	<input type="radio"/>
Sound equipment	<input type="radio"/>	<input type="radio"/>
DVD	<input type="radio"/>	<input type="radio"/>
Electric motor	<input type="radio"/>	<input type="radio"/>
Electric Stove	<input type="radio"/>	<input type="radio"/>
Microwave	<input type="radio"/>	<input type="radio"/>
Washing Machine	<input type="radio"/>	<input type="radio"/>
Dishwasher	<input type="radio"/>	<input type="radio"/>
Refridgerator	<input type="radio"/>	<input type="radio"/>
Electric Iron	<input type="radio"/>	<input type="radio"/>

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### Candle Use

Does your household use candles?

- Yes
- No

How many candles did your household use in the past month?

What are the candles used for?

	Yes	No
Home use	<input type="radio"/>	<input type="radio"/>
family business	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>

Other Candle Use

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Next

### Use of LPG

Does your household use LPG?

- Yes  
 No

What size of gas cylinder/tank does your household use?

	Yes	No
5kg cylinder	<input type="radio"/>	<input type="radio"/>
9kg Cylinder	<input type="radio"/>	<input type="radio"/>
12kg cylinder	<input type="radio"/>	<input type="radio"/>
14kg cylinder	<input type="radio"/>	<input type="radio"/>

Does the household use the following gas appliance?

	Yes	No
Gas Lamp	<input type="radio"/>	<input type="radio"/>
LPG stove	<input type="radio"/>	<input type="radio"/>
LPG stove and oven	<input type="radio"/>	<input type="radio"/>
LPG heater	<input type="radio"/>	<input type="radio"/>

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**Firewood**

Does your household use firewood?

Yes  
 No

How does your household obtain firewood for domestic use?

Purchase  
 Collected/gathered  
 Purchase and Collected/gathered

**Following Questions are for purchased Firewood**

What is the cost of the purchased firewood? (Rands)

1-10  
 11-30  
 31-50  
 51-70  
 71-100  
 More than 100

How long does it take to travel one way to purchase?

1m-50m  
 50m-100m  
 100m-500m  
 500m-1000m  
 More than 1km

How many days will the bundle last?

1-5  
 6-10  
 11-20  
 20-29  
 Whole month  
 More than a month

**Following questions are for collected firewood**

Where did you collect your firewood?

How far did you travel to collect the firewood?

1m-50m  
 50m-100m  
 100m-500m  
 500m-1000m  
 More than 1km

How many days did the previous collected firewood last?

1-5  
 6-10  
 11-20  
 20-29  
 Whole month  
 More than a month

**Use of charcoal**

Does your household use charcoal?

- Yes
- No

How many KGs of charcoal do you use in one month?

- 1-5
- 6-10
- 10-20
- 30-40
- 50-100

How far do you travel to purchase charcoal?

- 1m-50m
- 50m-100m
- 100m-500m
- 500m-1000m
- More than 1km

How many days does the charcoal last for?

- 1-5
- 6-10
- 11-20
- 20-29
- Whole month
- More than a month

What is the average cost of the charcoal? (Rands)

- 1-10
- 11-30
- 31-50
- 51-70
- 71-100
- More than 100

How reliable is your source of charcoal?

- Very reliable
- Fairly reliable
- Unreliable

Do you use more than one source for your charcoal?

- Yes
- No

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Next

### Use of Coal

Does your household use coal?

- Yes
- No

How many KGs of coal do you use in one month?

- 1-5
- 6-10
- 10-20
- 30-40
- 50-100

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- 500m-1000m
- More than 1km

How many days does the coal last for?

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- 20-29
- Whole month
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What is the average cost of the coal? (Rands)

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- 71-100
- More than 100

How reliable is your source of coal?

- Very reliable
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- Yes
- No

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## Animal Dung

In the past month, did your household use dung at home?

- Yes  
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How many times a week do you collect animal dung?

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## Cooking devices

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- Traditional stove with chimney
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Where is the stove located?

- Outdoors
- Semi-enclosed
- Separate kitchen
- In living area

Is there a vent or window in the cooking area?

- None
- One only
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What type of fuel does your household use for cooking?

- Firewood
- Coal
- Charcoal
- LPG
- Electricity
- Dung cakes

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## Health

Are you satisfied with your health?

- Greatly unsatisfied
- Unsatisfied
- Neutral
- Satisfied
- Greatly Satisfied

How many members of your household smoke?

ex: 23

How often do you or a member of your household experience eye diseases or irritation?

- Never
- Occasionally
- Frequently
- All the time

How often do you or a member of your household experience an illness with a cough?

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### Standard of living

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- Indoor taps
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How many days has your water supply been available in the past month?

- 1-5
- 6-10
- 11-20
- 20-29
- Whole month
- More than a month

How much do you pay for water?

- 0
- 1-R500
- R500-1000
- R1000-R2000
- More than R2000

Do you have to walk away from your home to fetch water?

- Yes
- No

How far do you have to walk to fetch water ?

- 1m-50m
- 50m-100m
- 100m-500m
- 500m-1000m
- More than 1km

What type of container do you use to fetch water?

Do you use a container to collect rain water?

Yes

No

What kind of toilet do you have on the property?

Pit latrine

Flushing toilet

Both

Do your neighbours use your toilet?

Yes

No

Is your household waste collected?

Yes

No

Where is your household waste collected?

Outside home

Waste skip

Dumping site

Other

How often is your waste collected?

Once a week

Once every 2 weeks

Once a month

Never

Is the waste collection reliable?

Very reliable

Fairly reliable

Unreliable

What do you do when your waste is not collected

Got to waste dump

Burn waste

Wait for next collection day

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Well-Being

What is the income category that best describes the household income of all sources of income

- No income
- R1-R400
- R401-1000
- R1001-R5000
- R5001-R10000
- R10001-R20000
- R20001-R50000
- R50001-R100000
- R100001-R200000
- R200001 or more

What is your primary source of income?

What is your primary source of income?

- Formal work (Work for a registered company or personal registered business)
- Informal work(not registered or contracted work)
- Backyard Farming

Is your primary source of income reliable?

- Highly reliable
- Fairly reliable
- Unreliable

Do you grow fruits on your property?

- Not at all
- Rarely
- Often

Do you sell the fruits for money?

- Yes
- No

Do you grow vegetables on your property?

- Not at all
- Rarely
- Often

Do you sell the vegetables for money?

- Yes
- No

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## Education

Does the respondent currently attend an educational institution

- Yes
- No

What is the highest level of education of the respondent

- None
- Elementary (Grade 0)
- Primary (Grade 1-7)
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What is the highest level of education of the breadwinner

- None
- Elementary (Grade 0)
- Primary (Grade 1-7)
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- Diploma

How satisfied are you with your education?

- Greatly Unsatisfied
- Unsatisfied
- Neutral
- Satisfied
- Greatly Satisfied

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## Safety & Security

Do you think the area where you live is safe?

- Greatly Unsafe
- Unsafe
- Neutral
- Safe
- Greatly Safe

Has anyone in the household been a victim of crime in the last 12 months?

- Yes
- No

Please indicate all the crimes that the members of this household have been victims of in the past 12 months?

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## Air Quality Awareness

---

How satisfied are you with the air you breathe?

- Greatly Unsatisfied
- Unsatisfied
- Neutral
- Satisfied
- Greatly Satisfied

Do you think air pollution is a major problem where you live

- No
- Minor
- Major

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Additional Comments (Fieldworker to fill out IF you notice some interesting information that is useful for the team to know about)

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Submit

## **REPORT DISCLAIMER**

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**Activity 8: Household Survey in KwaZamokuhle**

