ASSESSING THE LPG UPTAKE IN KAMPALA: A CASE STUDY OF MAKINDYE DIVISION

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UGANDA CHRISTIAN UNIVERSITY

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DECLARATION

I, KALIISA EMMANUEL hereby declare that this report is my own original work and that it has not been presented and has never been presented to any institution or university for a similar award.

Signature: kaliisaemanuel

Date: 04/24/2024

SUPERVISOR'S APPROVAL

This is to certify that this report is compiled under my supervision. It is now ready for submission to the University Board of Examiners for review.

Signature ……... Date…24th April,2024…….

Mrs. Nantongo Monicah

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First, I give thanks to God for the Grace and Favour for having made me able to run the full course of this academic journey.

A special thanks to the Uganda National Oil Company for being supportive in the research process.

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I also grateful to everyone who has helped in making this journey a success from my family to course mates to lecturers.

DEDICATION

This research is dedicated to my family and everyone working hard to move this country to a cleaner and environmentally friend energy sector.

ABSTRACT

The study conducted a survey on LPG consumption in Kampala district using Makindye division as a case study. The study was guided by the following study objectives: To establish the factors contributing to the use of LPG among households in Kampala district Makindye division, to identify the challenges associated with the use of LPG among households in Kampala district Makindye division and to find out the sustainability of LPG use among households in Kampala district-Makindye division. Using a cross sectional research design; a sample size of = 155 respondents was obtained and used in the study by simple random sampling and purposive sampling techniques. Data was analyzed using SPSS software version 18.0. The study revealed that the prices and availability of LPG cylinders to be more affordable by the community increases the demand for gas, LPG consumption were influenced by various factors, such as economic factors, household characteristics and demographic characteristics as well as other factors for increased demand of LPG, LPG consumption leads to a serious threat to leakage and human health and a lot of pollutants from household LPG consumption are harmful to human health. The study concluded that there remain some challenges in the field of LPG consumption, and it is worthwhile devoting much effort, although the number of scientific research is relatively large while the quality is relatively low. Therefore, it is suggested that, while developing the research field of LPG consumption of households, the quality of research results should also be improved, and high-quality papers should be published, and high-quality scientific research institutions should be established. The study recommends that the LPG market players should invest heavily in changing the mindset of the public towards accepting LPG as a cleaner, safer and environmentally friendly form of cooking over the other energy sources and the study also recommended that there is need for promotion of the use of efficient energy appliances.

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CHAPTER ONE

1.0 Introduction

This chapter presents the background of the study, problem statement, purpose of the study, objectives of the study, research questions, scope of the study, significance of the study and outline of the report.

1.1 Background of the study

Liquefied Petroleum Gas (LPG) is a hydrocarbon gas that is colorless, has low carbon and a highly efficient fuel. LPG as a clean and efficient cooking fuel, consisting mainly of propane and butane, has the potential to alleviate the health and environmental issues associated with traditional biomass and solid fuel cooking methods, such as wood and charcoal (WHO, 2021).

Uptake has become an issue in the move to promote clean and sustainable cooking energy under the UNDP's SDG 7 that aims at achieving affordable and clean energy by 2030 (ATLAS,2017). In a bid to achieve this milestone, governments are increasingly under pressure to increase the use of LPG as a cleaner and more sustainable energy source for cooking. The Government of Uganda (GOU) has taken on this mandate through the Ministry of Energy and Mineral Development (MEMD).

Uptake of LPG can be understood as the rate at which people are willing to make use of the available LPG. More recently, the government of Uganda (GOU) has turned to LPG and aims at increasing its uptake through Uganda National Oil Company (UNOC) a limited liability company wholly owned by the GOU in which MEMD is a major shareholder. The goal is to increase LPG uptake by making LPG the most desirable energy source for every Ugandan. However, despite its numerous advantages, the penetration of LPG in Ugandan households

remains significantly low at only 1.4% compared to other cooking energy sources at 73% and 21% for firewood and charcoal respectively making up 94% of biomass dependents (UBOS, 2021).

1.2 Problem statement

Uganda National Oil Company's role is to provide affordable, reliable and sustainable LPG to the Ugandan market. The Government of Uganda has made deliberate efforts through the Ministry of Energy and Mineral Development to increase LPG market penetration in that it distributed free LPG starter kits to low-income earners in order to eliminate the initial high cost of switching to LPG (MEMD, 2022). The ministry has also run campaigns to educate the masses on the benefits of switching to LPG and the health and environmental hazards related to using biomass as an energy source for cooking.

Despite these efforts, LPG uptake has remained significantly low in comparison to other cooking energy sources as shown in the table below:

COOKING ENERGY	**USAGE BY POPULATION IN PERCENTAGES** (some people use more than one cooking energy source)
FIREWOOD	73%
CHARCOAL	21%
ELECTRICITY	24% (6% in Kampala use electricity for cooking)
LPG	1.4%

Source: Annual report from MEMD,2022

It is against this that the researcher found it necessary to assess the LPG uptake in Uganda.

1.3 Purpose of the study

The purpose of the study was to assess the LPG uptake as a cooking energy source by the population.

1.4 Objectives of the study

i. To establish the factors contributing to the use of LPG among households in Kampala district-Makindye division.
ii. To identify the challenges associated with the use of LPG among households in Kampala district Makindye division.
iii. To find out the sustainability of LPG use among households in Kampala district-Makindye division.

1.5 Research questions.

i. What are the factors contributing to the use of LPG among households in Kampala district-Makindye division?
ii. What are the challenges associated with the use of LPG among households in Kampala district Makindye division?
iii. How sustainable is the LPG use among households in Kampala district-Makindye division?

1.6 Scope of the study

1.6.1.1 Subject Scope

The study focused on assessing the uptake of LPG in Uganda. It also identified the reasons for that uptake and suggested how to increase the LPG uptake in the market.

1.6.1.2 Geographical scope

This study was carried out in Kampala. This is because it has the highest concentration of LPG users in Uganda.

1.6.1.3 Time scope

The study was conducted within a period of 9 months that is August 2023 to April 2024 however preceding years have been used for reference.

1.7 Significance of the Study

The findings of this study will provide the leadership at the Ministry of Energy and Mineral Development and other stakeholders like Uganda National Oil Company with an in-depth understanding of the reasons for the prevailing rate of LPG uptake in the market.

It will also be of realistic value in persuading various stakeholders such as policy makers, authorities, ministries and market players, with new ideas on key useful techniques that could be taken under consideration to make certain positive changes on overall performance of LPG in Uganda based on the consumers' point of view.

The findings will also inform future researchers in this study's related areas hence enriching the available literature on the LPG uptake in Uganda.

Theoretical framework

The study was guided by the Energy Consumption Theory by Babak Vosooghzadeh, in (2021), which assumes that the cost of energy production and energy consumption can be compensated by considering the revenue that these energy operations would generate for businesses, industries, financial institutions and consumers (due to the consequential financial transactions and the monetary multiplier effect and by allocating a small fraction of the resulting overall revenues - usually in the form of consequential extra tax revenue to cover the cost.)

In other words, if the cost associated with an energy-related project exceeds its revenue in the NPV (Net Present Value) discounted analysis, and if a fraction of the tax on the extra revenue that affected businesses and consumers would earn is greater than the energy-related project loss,

the amount can be used to cover the project loss in the form of subsidies. The second condition is critical to ensure that the project loss is covered by the revenue that the energy-related project would generate for others. Otherwise, the project loss must be covered by raising taxes or borrowing which is detrimental to the economy (www.researchgate.net/publication/353913991).

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter gives an account for the reviewed literature on the performance of LPG in relation to other cooking energy sources in Uganda.

2.1The concept of LPG

Liquefied petroleum gas (LPG) is a fuel gas which contains a flammable mixture of hydrocarbon gases, specifically propane, propylene, butylene, isobutane and butane.

LPG is used as a fuel gas in heating appliances and cooking equipment. It is increasingly marketed as a better energy source for cooking in an effort to promote respiratory health and reduce damage to the ozone layer.

Some of the key market players in the LPG industry in Uganda include Total energies, Shell, Stabex, K-Gas, Oryx, Ramco, among others.

2.2 LPG uptake in Uganda

Of the 94% Ugandan households that primarily depend on biomass, 73% use firewood while 21% use charcoal for cooking, electricity (1.4%), kerosene (0.6%), and other sources including LPG, biofuels account for 3.9% as reported under: (UBOS, 2021). There is a variety of cooking technologies used given the diversity of cultures whose cooking behavior differs considerably as do the staple foods consumed in different parts of the country. For instance, for preparation of a millet or sorghum bread meal which is enjoyed by people in parts of Eastern, Northern and Southwestern Uganda, the three stone fire or a sturdy wood stove with a high fire power is commonly used for roasting simsim, sorghum and millet before milling; while cooking steamed and mashed banana (matooke) largely consumed in Central and Western Uganda is commonly

done on a stove that preserves heat for long hours e.g. a ceramic lined charcoal stove. Stacking of cooking fuels and technologies is also a common practice in Ugandan households especially in urban areas.

With energy poverty defined as the absence sufficient choice in adequate, affordable, reliable, and safe energy services by (Reddy, 2000), Uganda's over-reliance on traditional sources such as biomass is an indicator of a country trapped in a tragedy of environmental degradation and its concomitant impacts related to health, gender and household expenditure (GIZ, 2014). Uganda suffers a degradation loss of USD 2.3 billion, of which 25% is wood fuels as reported by (National Planning Authority, 2020, p. 145). According to the National Environment Management Authority (NEMA), 2.6% of Uganda's forests are cut down annually for firewood, charcoal, agriculture, and to make way for population growth. If this trend persists, Uganda will lose all its forest cover in less than 25 years (NEMA, 2020).

Uganda's population is predominantly rural (73%); however, the proportion of population living in urban areas is increasing. The latest data from the Bureau of Statistics (UBOS, 2021) shows a two percent increase from 25% in 2016/17 to 27% in 2019/20 (UBOS 2021). Due to the increase in urbanization, the urban energy demand is increasingly growing with most of the urban households - (86%) using biomass for cooking of which majority use charcoal (57%) compared to only 9% of households in rural areas. The per capita fuelwood and charcoal consumption are 240kg and 680kg per annum respectively and demand for charcoal is 1.5 million tons as reported by: (MEMD, 2015). According to a report on Uganda Wood Asset and Forest Resources Accounts by (UBOS, 2020), demand for wood is led by the high requirements for charcoal

production. A combination of inefficient methods of charcoal production relying on the traditional earth mound kiln and inefficient traditional cooking appliances - three stone hearth and metallic charcoal - with low thermal efficiencies and saving ability, worsen the case for biomass use. The current charcoal market structure and value chain offer minimal incentive for the adoption of improved kilns, as frequently promoted, because charcoal operates under sub-optimal subsistence conditions that are less profitable than firewood production.

Uganda's energy landscape that is abundant with renewable and non-renewable energy resources has created a multipolar cluster of fuel-based institutions formed on account of anticipated conventional fuel (charcoal and wood) scarcity and Uganda's rich portfolio of locally available alternative fuels. The local governance anatomy is tripolar; namely state, private sector and civil society organizations, and each of these categories comprises a cohort of institutions with either direct or indirect interest in the cooking energy sector. The Ministry of Energy and mineral Development (MEMD) is the government lead agency responsible for the management and development of the energy sector through coordinated national policy formulation, implementation, and monitoring. The mission of the Ministry is to create conditions for the provision of safe, reliable, efficient, cost effective and environmentally appropriate energy services to all sectors on a sustainable basis and thereby contribute to the economic growth of the country (REA, 2020). The ministry also launched a distribution of LPG starter kits in a move to drive the population towards LPG (MEMD, 2022).

2.3 Factors hindering LPG uptake.

The uptake of Liquefied Petroleum Gas (LPG) in Uganda, is hindered by various factors. These factors can vary in their significance and impact, but they often combine to create barriers to the widespread adoption of LPG as a clean cooking fuel. Some of the key factors hindering LPG uptake in Uganda include:

High Initial Costs: The cost of purchasing LPG equipment, such as cylinders and stoves, can be prohibitive for many Ugandans, especially those in low-income households. This initial investment deters many from switching to LPG.

Limited Infrastructure: In many parts of Uganda, there is a lack of LPG distribution infrastructure, including refilling stations and distribution networks. This makes it challenging for consumers to access LPG, particularly in rural areas.

Safety Concerns: There are concerns about the safety of using LPG, especially among consumers who are unfamiliar with its proper handling and storage. This fear of accidents or leaks can deter people from using LPG.

Lack of Awareness: Many Ugandans are not aware of the benefits of LPG over traditional cooking fuels like firewood or charcoal. A lack of awareness campaigns and education programs hinders the promotion of LPG usage.

Inconsistent Supply: The availability of LPG can be inconsistent, leading to shortages and price fluctuations. This can be a significant barrier for consumers who rely on LPG for their cooking needs.

Limited Financing Options: Access to financing options for purchasing LPG equipment can be limited, especially for low-income individuals. The lack of affordable financing options makes it difficult for them to invest in LPG.

Cultural Preferences: Traditional cooking methods, such as using open fires or charcoal stoves, are deeply ingrained in Ugandan culture. Convincing people to switch to LPG often requires changing long- standing cultural practices.

Government Regulations: Regulatory challenges, such as taxes and import restrictions, can impact the affordability and availability of LPG. These regulations can also create barriers for LPG suppliers.

Lack of After-Sales Support: Inadequate customer support and maintenance services for LPG equipment can discourage consumers from adopting LPG, as they may fear not getting assistance in case of issues.

2.4 Strategies to increase LPG uptake.

Subsidies and Incentives: The government can provide subsidies or incentives to make LPG equipment and refills more affordable for low-income households. This can include reducing import taxes, providing cash vouchers, or offering discounts on LPG equipment.

Awareness Campaigns: Launch targeted and widespread awareness campaigns to educate consumers about the benefits of LPG, including its safety, efficiency, and environmental advantages. These campaigns should be culturally sensitive and use local languages.

Infrastructure Expansion: Invest in the expansion of LPG distribution infrastructure, including refilling stations and distribution networks, particularly in rural areas. This will make LPG more accessible to a broader population.

Safety Training: Implement safety training programs for LPG users, emphasizing proper handling, storage, and maintenance of LPG equipment. This will help alleviate safety concerns.

Financing Options: Collaborate with financial institutions to provide affordable financing options for the purchase of LPG equipment. This can include low-interest loans or installment plans to spread the cost over time.

Community Engagement: Engage local communities through community leaders, schools, and community-based organizations to promote LPG adoption. Peer-to-peer influence can be powerful in changing behavior.

CONCLUSION

LPG supply and consumption can ease the lives of poor households and as such should be included in poverty alleviation strategies. However, behavioral, economic and technological constraints may prevent the fast expansion of electrical networks and the intensification of LPG use. It is important to understand the factors determining the adoption of domestic sources and the requirements of the suppliers, so that a better demand-supply fit may be sought. The best energy saving strategy is the consideration of consumers‟ interest, opinion and preferences. People should first be given the possibility of choosing their way of reducing consumption: different tariffs, information and feedback or a combination of different measures. If, however, their consumption levels remain high, then the new technological advances in the field of LPG cylinders should be applied. Consumers involvement in the process is important in increasing their awareness and creating sustainable long-term reductions in their energy use. The main challenge and a key area for future research is finding a way to keep consumers interested in the goal of keeping consumption low and continuing to find ways to further reduce it.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter presents a description of the methods that were employed by the researcher in the study. It includes the research design, study population, sample size and selection, sampling techniques, research methods, study instruments, measurements of variables, reliability and validity, data analysis and ethical considerations.

3.1 Research design

The study used a cross-sectional study design to examine an analysis on the LPG consumption by the households of Kampala district-Makindye division. A cross-sectional study is a type of observational study that analyzes data from a population, or a representative subset Cooper (2014). This design was preferred over the other designs because the study took place at a single point in time and did not involve manipulating variables – this allowed the researcher to look at numerous characteristics at once (age, income, gender, and so many more.)

The design was relatively inexpensive and allowed the researcher to collect a great deal of information quite quickly. Data was obtained using self-report surveys and the researcher was able to collect large amounts of information from a large pool of participants. As regards to this Amin, (2005) argued that qualitative method offers detailed information, while a quantitative design involves the collection of numerical data, which gives facts on a given phenomenon. Further, a quantitative method was used because it enabled descriptive data to be presented using charts and tables.

3.2 Study population

The target population is the population to which the researcher ultimately wants to generalize the results (Amin, 2015). According to https://www.citypopulation.de/en/uganda/central/admin/kampala/SC0456 Makindye division has a population 438,300 that is of year 2020. Therefore, from the study population the study consider the 260 people.

3.2.1 Sample Size

This refers to the number of items being selected from the universe to constitute a sample argued by Kothari, (2014). However, from the target population of 260 respondents, a sample size of 155 respondents was selected based on a formula for determining Sample size by Krejcie & Morgan table of (1970). Respondents included officials from Uganda National Oil Company, Makindye division officials, and selected households from Makindye Division.

3.2.2 Sampling method

The study used both simple random sampling and purposive sampling procedures. Purposive sampling was used to select different categories of respondents to get first-hand information from the key informants. Simple random sampling was used because respondents have equal chances of being selected. Krejcie & Morgan table of 1970 was used to determine sample size from a given population. This was done by defining the population, choosing a sample size, listing the population, assigning numbers to the units, finding random numbers and selecting a sample size.

The sampling process was guided by the table below.

Table 3.1: Sampling Procedures

SN	Category	Population	Sample	Sampling procedure
1	Officials from Uganda National Oil Company	15	15	Purposive sampling

2	Makindye division officials	55	45	Purposive sampling
3	Selected households from Makindye division	190	95	Random sampling
	Grand Total	**260**	**155**	

Source: Primary data, (2023) and Krejcie & Morgan table of 1970

3.6 Data sources

The study used primary data collection methods to collect relevant data to the study. Primary data was collected from the respondents through interviews, and self-administered questionnaire. Primary data was important in answering questions about the study topic. Data collection methods were considered in such a way so that relevant information was collected as much as possible with little inconvenience to respondents.

3.7 Data collection methods

Data was collected from primary and secondary sources. Primary data was collected by the researcher that reflects the individual viewpoints of the participants by administering questionnaires and respondent's interviews, using structured interview schedules. Researcher collected the data himself, using questionnaires, Interviews (Research Directory, 2014).

3.8 Data Collection instruments

3.8.1 Interview Guide

The researcher also used interview guide to collect data from 5 respondents - the Makindye division officials and officials from Uganda National Oil Company. The interview questions were both open-ended and closed. The open-ended questions gave chance to more discussions,

while the closed questions were asked for responses. The interview method helped to collect additional views from respondents on the theme of the study.

3.9 Research Procedures

The researcher got an introductory letter from the school of Business, Uganda Christianity University. Permission was sought by the researcher from the respondents to be sampled in to allow for the relevant data to be collected. The researcher kept confidentiality levels at a high, for the privacy of all respondents when findings were presented.

3.9.1 Data analysis

The quantitative data involved information from the questionnaires only. Data from the field was too raw for proper interpretation. The raw data obtained from questionnaires was cleaned, sorted and coded. The coded data was entered into the computer, checked and statistically analyzed using the Statistical Package for Social Scientists (SPSS) software package to generate descriptive and inferential statistics Descriptive analysis was applied to describe the primary variable and associated indicator items related to the study objectives. The frequency tables were bio data of study while regression analysis was for all the objectives.

3.9.2 Ethical considerations

It was important during the process of research for the researcher to make respondents to understand that participation was voluntary and that participants are free to refuse to answer any question and to withdraw from participation any time they are chosen.

Another important consideration involved getting the informed consent of those going to be met during the research process, which involved interviews and observations on issues that were delicate to some respondents. The researcher undertook to bear this seriously in mind.

3.10 Limitations of the Study

The researcher encountered some hindrances. These included some uncooperative respondents; some respondents did not have time and commitment to fill in the questionnaires, this was influenced by their busy daily works. To mitigate this, the researcher asked the respondents during their free time and then the researcher administered the questionnaires to the respondents during their free time.

Also, the researcher dropped the questionnaire for the respondents to fill in during their free time and collected them later. Some of the division officials may have felt victimized by their seniors for giving sensitive information about the division as regards to; to address this challenge, the division staff was assured by the researcher that the study was for academic purposes only and that no form of identification was required from them during the data collection exercise.

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF DATA

4.0 Introduction

This chapter presents the response rate, demographic factors of the respondents (bio data), descriptive analysis of the study objectives, Pearson correlation of the variables and regression analysis of the household survey on LPG consumption in Makindye division Kampala district.

4.1 Background Characteristics of the respondents

The background information of the respondents was important because it comprised of both genders but of different marital statuses and age groups from various settings. This was intended in order to get a variety of views and unbiased responses which made the study a reality. The respondents were divided into the Makindye official, UNOC employees, and other authorized persons. The findings are shown in the figures below;

Category	**Grouping**	**Number**
Age	Below 35yrs	15
	From 35 to 50yrs	60
	Above 50yrs	5
Gender	Male	60
	Female	40
Marital status	Married	45
	Single	35
Level of education	Undergraduate	10
	Graduate	53

	Postgraduate	17

Source: Primary data

4.2 Descriptive analysis of the factors contributing to the use of energy among households in Kampala district-Makindye division.

In this objective, the researcher sought to determine the factors contributing to the use of LPG among households in Kampala district-Makindye division. These questions were based on a five-point Likert scale, in which respondents were asked to rate the factors contributing to the use of LPG among households in Kampala district-Makindye division by indicating whether they strongly agree, agree, neutral, disagree and strongly disagree with each question in the questionnaire instrument. The SPSS 23 software was used to analyze their responses using means and ranks.

Table 4.2: Definition of Scales

Mean range	**Response range**	**Status**
1.00 - 1.75	Strongly disagree	Very Low
1.76 - 2.99	Disagree	Low
3.0 - 3.45	Agree	High
3.46 - 4.00	Strongly agree	Very High

Table 4.3: Descriptive statistics of the factors contributing to the use of LPG among households in Kampala district-Makindye division

	Factors contributing to the use of LPG among households in Kampala district-Makindye division	**Mean**	**Std deviation**	**Response mode**	**Interpretation**
B1	LPG is considered a cleaner alternative to traditional fuels such as wood, coal,	3.50	1.45556	Strongly	Very high

	or kerosene.			agree	
B2	LPG is convenient to use for cooking and heating purposes.	3.48	1.44377	Strongly agree	Very high
B3	LPG is stored and transported in sealed containers under pressure, which reduces the risk of spills and leaks compared to other fuels.	3.48	1.44377	Strongly agree	Very high
B4	LPG is readily available in most regions and is not dependent on seasonal variations like biomass fuels	3.48	1.44377	Strongly agree	Very high
B5	The initial setup costs for LPG equipment may be relatively high, the overall running costs can be lower compared to other fuels due to its efficiency and clean combustion.	3.40	1.46368	Agree	High
B6	LPG can be used for various household applications, including cooking, heating water, space heating, and even powering certain appliances such as refrigerators and generators.	3.40	1.46368	Agree	High
B7	Government policies and incentives, such as subsidies, tax breaks, and awareness campaigns promoting the use of LPG, can significantly influence its adoption among households.	3.32	1.52373	Agree	High
B8	Cultural factors, such as culinary traditions and cooking practices, can also play a role in the adoption of LPG.	3.32	1.52373	Agree	High
B9	With increasing awareness of environmental issues such as deforestation and air pollution, households may opt for LPG as a more environmentally friendly alternative to traditional fuels, contributing to sustainability efforts.	3.10	1.33099	Agree	High
	Total	**3.44**		**Agree**	**High**

Source: Primary Data, (2023)

4.4 Descriptive statistics of the challenges associated with the use of LPG among households in Kampala district Makindye division.

	Challenges associated with the use of LPG among households in Kampala district Makindye division	**Mean**	**Std deviation**	**Response mode**	**Interpretation**
C1	The upfront cost of purchasing LPG cylinders, regulators, and stoves can be prohibitive for some households, particularly those with lower incomes.	3.36	1.45556	Agree	High
C2	Access to LPG infrastructure, such as distribution networks and refilling stations, may be limited in rural or remote areas.	3.50	1.45556	Strongly agree	Very high
C3	Improper handling, storage, or installation of LPG equipment can pose significant safety risks, including fire hazards and gas leaks.	3.48	1.44377	Strongly agree	Very high
C4	While LPG is cleaner burning compared to traditional fuels like coal or biomass, it still emits carbon dioxide and other pollutants when combusted.	3.48	1.44377	Strongly agree	Very high
C5	LPG cylinders require adequate storage space within households, which may be limited in smaller or densely populated living environments.	3.43	1.47713	Agree	High
C6	Limited awareness about the benefits of LPG, as well as safety and health risks associated with traditional cooking fuels, can hinder the uptake of LPG among households.	3.43	1.47713	Agree	High
	Sub-total	**3.36**			

Source: Primary Data, (2023)

4.5 Contribution of sustainability of LPG use among households in Kampala district-Makindye division

	Sustainability of LPG use among households in Kampala district-Makindye division	**Mean**	**Std. Deviation**	**Response mode**	**Interpretation**
B1	LPG emits fewer pollutants compared to traditional solid fuels like wood or coal when burned for cooking or heating.	3.27	1.808	Agree	High
B2	The use of LPG can help reduce deforestation pressures.	3.21	1.792	Agree	High
B3	LPG is highly energy-efficient, providing a reliable and consistent source of heat for cooking and heating.	2.82	1.679	Disagree	Low
B4	LPG does produce carbon dioxide when burned, it emits fewer greenhouse gases (GHGs) per unit of energy compared to coal or oil.	2.18	1.476	Disagree	Low
B5	The adoption of LPG often necessitates the development of infrastructure such as distribution networks and storage facilities.	2.87	1.694	Disagree	Low
	Average mean	**2.60**	**1.49**		**Low**

Source: Primary Data, (2023)

4.6 Pearson Correlations

Pearson Correlations was derived by assessing the degree of variations in the independent variable (household survey) and the dependent variable (LPG consumption) vary.

Correlation Analysis between household survey and LPG consumption.

		1	2
Household survey	Pearson Correlation	1	.794 **
	Sig. (2-tailed)	.	.000
	N	155	155
LPG consumption	Pearson Correlation	.794 **	0.02
	Sig. (2-tailed)	.000	.
	N	155	155

**. Correlation is significant at the 0.01 level (2-tailed).

Results in the table above indicate that there was a significant positive relationship between household survey and LPG consumption (r =.794> 0.02). This means if there was a well carried out household in communities such Makindye division there would be clear LPG consumption, hence a decrease in emissions and other climate dangers in communities.

By comparing the significance of the correlation (p = .000) to the recommended significance at 0.02. Given that the p value was less than 0.01, the null was rejected, and the research hypothesis was accepted, and it was concluded that there was a strong relationship between household survey and LPG consumption in Makindye division. The result further implies that a household LPG survey justifies the means of gathering statistically representative information on residential fuel demand and use so as to help precisely define household LPG issues and aid in formulating appropriate strategies.

CHAPTER FIVE: FINDINGS

4.7 Introduction

This chapter focuses on the discussion of findings of the data collected from the field. The findings are presented in line with the objectives of the study and are intended to give answers to the research questions which were asked in relation to the study.

4.8 Factors contributing to the use of LPG among households in Kampala district-Makindye division

LPG is considered a cleaner alternative to traditional biomass fuels such as firewood and charcoal. As urbanization increases in Kampala, households are shifting towards cleaner fuels to reduce indoor air pollution and associated health risks.

LPG is convenient to use and offers efficient cooking compared to traditional fuels. It provides instant heat and precise temperature control, making cooking easier and faster for households, especially those with busy schedules.

The Ugandan government has implemented initiatives to promote LPG use, including subsidies for LPG equipment and cylinders, as well as awareness campaigns highlighting the benefits of switching to LPG. These efforts have encouraged households in Kampala to adopt LPG for cooking purposes.

The expansion of LPG distribution networks and infrastructure in Kampala has made it more accessible to households. Increased availability of LPG refilling stations and distribution points ensures a steady supply of gas to meet the demand of consumers.

Growing awareness of environmental issues and the impacts of deforestation has led to a shift towards cleaner cooking fuels like LPG. Many households in Kampala are choosing LPG as a sustainable option to reduce their carbon footprint and contribute to environmental conservation efforts.

While LPG may initially require a higher upfront investment compared to traditional fuels, its affordability in the long run makes it an attractive option for households with moderate to high income levels in Kampala. As household incomes rise, more families can afford to switch to LPG for their cooking needs.

Rapid urbanization and changing lifestyles in Kampala have led to increased demand for modern energy sources like LPG. As households' transition from rural to urban settings and adopt modern lifestyles, the demand for convenient and efficient cooking fuels like LPG continues to grow.

4.9 Challenges associated with the use of LPG among households in Kampala district Makindye division.

One of the significant barriers to adopting LPG is the initial cost of purchasing gas cylinders, regulators, and cooking appliances. Many households in Kampala might find it difficult to afford these upfront costs, especially those with lower incomes.

There are often safety concerns associated with the use of LPG, including the risk of gas leaks, fire, and explosions. Improper installation or maintenance of gas appliances can exacerbate these risks. Lack of awareness and education about safe handling practices can also contribute to accidents.

Ensuring a consistent and reliable supply of LPG can be challenging, particularly in areas with inadequate infrastructure or unreliable distribution networks. Some households in Kampala may struggle to access LPG due to limited availability or long distances to refill stations.

While LPG is generally considered more cost-effective in the long run compared to alternative fuels like charcoal or firewood, the recurring cost of refilling gas cylinders can still be a burden for some households, particularly those on tight budgets.

Cooking Habits and Preferences: Cultural and culinary preferences may influence the adoption of LPG. Some households may prefer traditional cooking methods or perceive the taste of food cooked with LPG differently, which could impact their willingness to switch to gas.

In some cases, households may perceive traditional cooking methods as more reliable or efficient than LPG. This perception can be based on past experiences or misinformation about the performance of gas appliances.

In densely populated urban areas like Makindye, the infrastructure for safe storage, transportation, and distribution of LPG must be well-planned and maintained. Inadequate infrastructure can hinder the widespread adoption of LPG and pose safety risks.

While LPG is considered cleaner than traditional fuels like charcoal or firewood in terms of indoor air pollution and greenhouse gas emissions, its combustion still contributes to air pollution and carbon emissions. Efforts to mitigate these environmental impacts, such as promoting renewable energy sources or improving stove efficiency, may also influence the adoption of LPG.

4.10 Sustainability of LPG use among households in Kampala district-Makindye division

LPG is cleaner burning compared to other traditional fuels like charcoal or firewood. Its use reduces indoor air pollution and mitigates deforestation caused by wood fuel consumption. Therefore, promoting LPG can contribute to environmental sustainability by reducing carbon emissions and preserving local ecosystems.

LPG usage decreases indoor air pollution, which can lead to respiratory diseases. This improves the health and well-being of households, particularly women and children who are most affected by indoor smoke inhalation from traditional cooking methods.

Affordability and accessibility of LPG are critical factors for its sustainability. Ensuring that LPG is economically viable for households, particularly low-income families, through subsidies or financial assistance programs can encourage its adoption and continued use.

The availability of infrastructure for LPG distribution and refilling stations is essential. Investing in a reliable supply chain and distribution network ensures that households have access to LPG consistently. Additionally, promoting the use of safe cooking appliances compatible with LPG encourages its sustainable adoption.

Educating households about the benefits of LPG, proper usage, safety precautions, and maintenance practices is crucial for its sustained use. Awareness campaigns can dispel myths and misconceptions surrounding LPG and encourage behavioral change towards cleaner cooking fuels.

Implementing and enforcing regulations related to LPG safety standards, storage, and transportation are necessary to ensure its safe usage. Regulatory frameworks also play a role in preventing illegal practices such as adulteration or improper handling of LPG, which can compromise safety and sustainability.

Involving local communities in decision-making processes regarding LPG adoption and addressing their concerns fosters ownership and promotes sustainable practices. Understanding the cultural and social dynamics within communities helps tailor interventions that resonate with their needs and preferences.

Continuous monitoring of LPG usage patterns, impact assessments, and feedback mechanisms from households allow for adjustments and improvements in sustainability initiatives. Regular evaluations help identify challenges and opportunities for enhancing the sustainability of LPG use in Kampala District.

CHAPTER 6: CONCLUSION AND RECOMMENDATION

5.0 CONCLUSION

There remain some challenges in the field of household LPG consumption, and it is worthwhile devoting much effort, although the number of scientific research is relatively large while the quality is relatively low. Therefore, it is suggested that, while developing the research field of LPG consumption of households, the quality of research results should also be improved, and

high-quality papers should be published, and high-quality scientific research institutions should be established. In addition, it is necessary to strengthen international cooperation in this field. It can enhance its cooperative relations from the three levels of scholars, institutions, and countries. This will greatly benefit institutions and scholars in their research capabilities and levels in this field.

Secondly, findings from field it is suggested to keep up with the international frontiers and reveal the internal and external relations of LPG consumption in accordance with the special national conditions and regional characteristics of the country. People intend to know how to achieve reasonable and efficient use of resources. In addition, key research can be done on household LPG consumption within and between regions and rural household LPG consumption, including aspects of residential behavior, environmental protection, and household gas management.

Economic conditions, resource availability, and consumption are the primary influencing factors that determine rural LPG consumption levels and structure changes. Currently, the LPG structure is undergoing a transformation period. Rural LPG consumption must take advantage of such resources and combine demand with their potential to match rural, economic, and social development. It is important to consider LPG conservation, emissions reduction, and ecological protection. Applications of new technologies and appliances are technically feasible and have an economic rationale.

5.1 RECOMMENDATION

From the findings discussed above, it is possible to point out a few specific recommendations.

The study recommends that the LPG market players should invest heavily in changing the mindset of the public towards accepting LPG as a cleaner, safer and environmentally friendly form of cooking over the other energy sources. This can be done through intensive promotions, and it will enable LPG to increase its penetration into the masses once people start to understand it.

There is need for promotion of the use of efficient energy appliances and their availability switching completely to cooking with clean fuels, such as LPG is the most certain way to lower exposure to indoor air pollution dramatically and obtained maximum energy efficiency. However, the incremental costs of switching to modern and superior fuels are prohibitive for many rural households. Improved gas cylinders will thus continue to be an option for reducing exposure, for a large majority of the rural poor.

The Uganda National Oil Company in collaboration with local Non- Government Organizations (NGOs) and researchers interested and committed to addressing the LPG issues could take up the challenge of developing improved low-cost cylinders to promote adequate use of LPG in the community.

5.2 AREAS OF FURTHER STUDIES

Impact of pricing on LPG market performance.

Impact of deforestation on LPG market share.

How local content in Uganda's Oil and Gas can improve LPG market penetration?

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QUESTIONNAIRE FOR THE RESPONDENTS IN MAKINDYE DIVISION

Dear Respondent,

I am **KALIISA EMMANUEL**, a student at Uganda Christian University pursuing bachelor's degree in science of Oil and Gas Management. I am collecting data on the household survey on LPG consumption in Kampala district using Makindye division as the case. Therefore, you have

been identified as a key person to give accurate data about the study. The study is purely academic, and all data provided shall be treated with confidentiality. Kindly spare a few minutes to answer the questions and provide the valuable information following the directions in the questionnaire.

SECTION A: BACKGROUND INFORMATION (Tick on the most appropriate)

1. Gender: Male ☐ Female ☐

2. Age

19yrs or less	20-29yrs	30-39yrs	40-49yrs	50yrs and above

3. Marital status: Single ☐ Married ☐ Widow ☐ Widower ☐

4. Level of education attained

None	Primary level	Secondary level	Certificate	Bachelor's degree	Master's degree

5. For how long have you in stayed in Makindye division?

Less than 1 year	1-3years	4-6 years	Above 6 years

INSTRUCTIONS

Indicate the extent to which you agree and disagree with the statements on the items in each of the section by ticking **(√)** the appropriate number listed in the tables.

Strongly Disagree (SD)	Disagree(D)	Not Sure (NS)	Agree(A)	Strongly Agree (SA)

1	2	3	4	5

SECTION B:

B	**Factors contributing to the use of LPG among households in Kampala district-Makindye division**	SD	D	NS	A	SA
B1	Energy Accessibility.					
B2	Energy Affordability					
B3	Health and Safety Concerns					
B4	Government initiatives such as subsidies, tax incentives, and awareness campaigns can significantly impact LPG usage.					
B5	Concerns about deforestation, air pollution, and carbon emissions contribute to the adoption of cleaner fuels like LPG.					
B6	Convenience factors such as ease of use, consistent heat output, and reliability of supply contribute to the adoption of LPG.					
B7	Cooking with LPG may be seen as modern or prestigious, leading to higher adoption rates.					
B8	Advancements in LPG technology, such as more efficient stoves and safety features, can make LPG a more attractive option for households.					
B9	Global factors such as fluctuations in oil prices, international supply chains, and geopolitical events can affect the availability and cost of LPG.					
B10	Urban areas tend to have higher LPG usage due to better infrastructure and higher income levels.					

SECTION C:

C	**Challenges associated with the use of LPG among households in Kampala district Makindye division**	SD	D	NS	A	SA
C1	LPG is generally considered an affordable energy source, the initial					

	setup costs for appliances and infrastructure can be significant.					
C2	LPG may be limited, leading to issues with availability and supply.					
C3	Improper handling or storage of LPG cylinders can pose significant safety risks, including fire hazards and gas leaks leading to potential explosions.					
C4	Incomplete combustion of LPG can produce indoor air pollutants such as carbon monoxide and particulate matter, which can lead to respiratory problems and other health issues.					
C5	Leakage of LPG during production, transportation, and storage can also contribute to environmental pollution.					
C6	LPG is considered a cleaner alternative to traditional solid fuels like biomass and coal, its combustion still produces carbon dioxide emissions, contributing to climate change.					
C7	Lack of regulatory oversight can also contribute to price fluctuations and market inefficiencies.					
C8	In households where traditional cooking methods using solid fuels like wood or charcoal are deeply ingrained in cultural practices, transitioning to LPG may face resistance due to perceived differences in taste, aroma, or cooking techniques.					
C9	Expanding LPG distribution networks to reach underserved areas requires significant investment in infrastructure development, including storage facilities, transportation systems, and safety protocols. In many cases, this infrastructure development may affect the growing demand for LPG.					

SECTION D

No. D	**Sustainability of LPG use among households in Kampala district-Makindye division**	**SD**	**D**	**NS**	**A**	**SA**
D1	Households have used LPG efficiently by providing education and information on proper usage, maintenance of appliances,					

	and conservation practices.					
D2	Governments have provided subsidies or incentives to make LPG more affordable for low-income households, ensuring equitable access while also promoting its sustainability.					
D3	Implementation of strict safety measures to prevent accidents and mishaps related to LPG usage. This includes proper installation of equipment, regular maintenance checks, and educating users about safety protocols.					
D4	Investment in infrastructure for the distribution of LPG, including storage facilities, transportation networks, and retail outlets. This ensures reliable access to LPG for households, even in remote areas.					
D5	LPG is cleaner compared to traditional fuels like coal or biomass, promoting even cleaner alternatives such as renewable energy sources (like solar or biogas) for cooking and heating can further enhance sustainability.					
D6	Implementing programs for recycling LPG cylinders and managing waste associated with LPG usage.					
D7	Involving local communities in decision-making processes related to LPG usage and infrastructure development to ensure responsibility towards sustainability.					

Thank you very much for your cooperation.