UNIVERSITY of LUSAKA

SCHOOL OF EDUCATION, SOCIAL SCIENCES AND TECHNOLOGY.

INVESTIGATING THE ADOPTION OF ALTERNATIVE ENERGY SOURCES IN ALLEVIATING ENERGY POVERTY IN LUSAKA'S PERI-URBAN: A CASE OF GARDEN COMPOUND.

A DISSERTATION

SUBMITTED TO THE SCHOOL OF TECHNOLOGY AND SOCIAL SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A BACHELOR OF ARTS DEGREE IN DEVELOPMENT STUDIES.

BY

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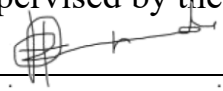
Author's Declaration

I, Agatha Tande, hereby declare that this research titled " **Investigating the Adoption of Alternative Energy Sources in the Alleviation of Energy Poverty in Peri-Urban Areas: A Case of Garden Compound."** is my own original work and has not been submitted to the University of Lusaka or any other institution of higher learning. All references in this study have been properly cited.

This research was supervised by the undersigned.

Student's Signature: 

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Dedication

I would like to dedicate this dissertation to my late mother Majorie, who's constant words of encouragement and praise echoed throughout my academic journey and helped me remain grounded and principled in what is right.

Abstract

This study investigated the adoption of alternative energy sources and their contribution to reducing energy poverty among households in Garden Compound, a peri-urban area of Lusaka. The study was guided by three objectives: to examine how the adoption of alternative energy sources affects household energy expenditure, to identify factors influencing the adoption rate of alternative energy sources, and to assess how alternative energy adoption contributes to improved energy access. The research was informed by the Energy Poverty Theory and the Sustainable Livelihoods Framework, which provided a basis for understanding household vulnerability and coping capacity in relation to energy access. A structured questionnaire was used to gather primary data from a selected group of Garden Compound homes as part of a quantitative research methodology. The results showed that the adoption of alternative energy sources remained relatively low, mostly because of high initial prices, low family incomes, competing household expenditures, dependability issues, unfavorable attitudes about new technologies, and poor knowledge. As a result, the majority of homes continued to use conventional energy sources, which, although reasonably priced in small amounts, eventually resulted in a significant financial burden. The research also found that families using alternative energy sources were able to adapt to power outages and changes in energy prices because they had better access to essential energy services and a wider variety of home energy alternatives. Low-income families continued to be disproportionately impacted by energy poverty, even with an uneven distribution of these advantages. The research came to the conclusion that although alternative energy sources offer a great potential to increase energy availability and lower long-term energy costs, specific interventions are needed to remove structural, financial, and informational obstacles. Policymakers and development stakeholders looking to advance sustainable energy access in peri-urban areas may benefit greatly from the results.

Key words: *Alternative energy sources, Energy Poverty, Household Energy Expenditure, Energy Access, Peri-Urban Communities, Adoption of Renewable Energy.*

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CHAPTER ONE:

INTRODUCTION

1.0 Introduction

Energy is an essential part of everyday life. Around the world, many communities still struggle to access reliable, affordable, and clean sources of energy. This challenge is especially visible in low-income and peri-urban areas. In Zambia, many households depend on charcoal and firewood because electricity is either too expensive or not consistently available. As a result, energy poverty continues to affect people's health, income, education, and general quality of life. Household energy poverty remains a critical barrier to socio-economic development across sub-Saharan Africa, where an estimated 600 million people lack reliable access to modern, affordable, and clean energy services (IEA, 2023). This chapter presents a study investigating the adoption of alternative energy sources in peri-urban areas, offering a detailed overview of the context, challenges and objectives of the research.

1.1 Background of the Study

Over 745 million people worldwide still do not have access to electricity, the majority of whom reside in South Asia and Sub-Saharan Africa (International Energy Agency [IEA], 2024). But the Global South is not the only place where energy poverty exists. Energy poverty takes on numerous forms in high-income nations. For instance, about 35 million individuals in the European Union alone struggle to keep their homes adequately heated, especially in the winter (European Commission, 2023). This has brought the "just energy transition" back into the spotlight, highlighting the need to achieve climate objectives with affordability and fairness. As a result, it is evident that energy poverty endures globally at various sizes and via various processes.

Sub-Saharan Africa, which is still the world's least powered region. Over 80% of the world's population lacks access to electricity in the area, and as of 2024, almost 600 million people were still without power, despite advancements in the deployment of renewable energy (IEA, 2024). Furthermore, access is very uneven; whereas some metropolitan areas have fairly steady supply, rural and peri-urban areas suffer from ongoing shortages, unreliable grids, and dependence on traditional biomass. Southern African countries including Zambia, Malawi, Zimbabwe, and Mozambique still have energy deficits because of outdated hydropower infrastructure, little

investment in other energy sources, and rapid population expansion that outpaces energy development (World Bank, 2023).

In the region, traditional biomass—primarily firewood and charcoal—continues to be the primary source of household energy for heating and cooking. Approximately 84% of families in Sub-Saharan Africa rely on biomass, with rural rates surpassing 90% in many nations (UN SDG7 Tracking Report, 2023). The World Health Organization estimates that indoor air pollution causes over 490,000 deaths in Africa alone each year, and this reliance adds to deforestation, environmental degradation, and serious health hazards (WHO, 2023). Charcoal usage in peri-urban regions like Lusaka's Garden Compound in nations like Zambia is a reflection of both inadequate availability to clean energy sources and pricing issues.

Energy poverty in the region is further shaped by economic constraints and infrastructural gaps. Many national utilities struggle with financial instability, resulting in frequent load shedding and unreliable supply. Zambia, for example, relies heavily on hydroelectricity, making the country vulnerable to climate-related droughts that reduce water levels in major dams like the Kariba Dam (ZESCO, 2022). This vulnerability intensifies electricity shortages and pushes households to fall back on costly or polluting alternatives. Affordability is another major barrier: even when grid connections are available, high connection fees and electricity tariffs can be prohibitive for low-income households (SEforALL, 2022). As a result, peri-urban settlements often experience both physical and economic energy poverty

In Zambia, energy poverty is a continuous problem, especially for those living in rural and periurban areas like Garden Compound in Lusaka. Many houses still struggle to get dependable, affordable, and clean energy for everyday requirements like cooking, lighting, and heating. Although Zambia's access to electricity has increased over time, official data reveal that only over 31% of the country's rural population is linked to the national grid, compared to greater levels in metropolitan areas (World Bank, 2023). Due to frequent load shedding and expensive connection expenses, electricity is either uncertain or too expensive for many low-income homes, especially in periurban areas. Because of this, most families choose to utilize charcoal and firewood as their main energy sources. Over 70% of Zambian households continue to use traditional fuels and less than 20–25% of low-income households in Lusaka use any form of alternative energy beyond charcoal and grid electricity**,** with charcoal remaining dominant for cooking (Energy Regulation

Board, 2023).,This reliance adds to environmental harm, indoor air pollution, and the growing demand for charcoal, particularly in the Lusaka area.

Zambia's energy poverty is significantly impacted by hydropower, which provides more than 80% of the nation's electricity. Large dams like Kariba lose water during droughts, which lowers energy generation, causing prolonged outages and forcing individuals to go back to traditional fuels (ZESCO, 2022). In periurban regions, electricity is not only expensive but often scarce. Due to hefty upfront connection charges and fluctuating monthly payments, households struggle to maintain access to the grid even when it is physically available (SEforALL, 2022).

Because of this, a lot of individuals suffer from both "economic energy poverty" (cannot pay to use power) and "physical energy poverty" (no connection). Local research have shown that this condition affects household and small business economic activity, health, and safety (Kaambo, 2021; Kalaba et al., 2020). Reducing local energy poverty requires expanding renewable energy sources like solar, improving grid reliability, and creating affordable payment choices for low-income users.

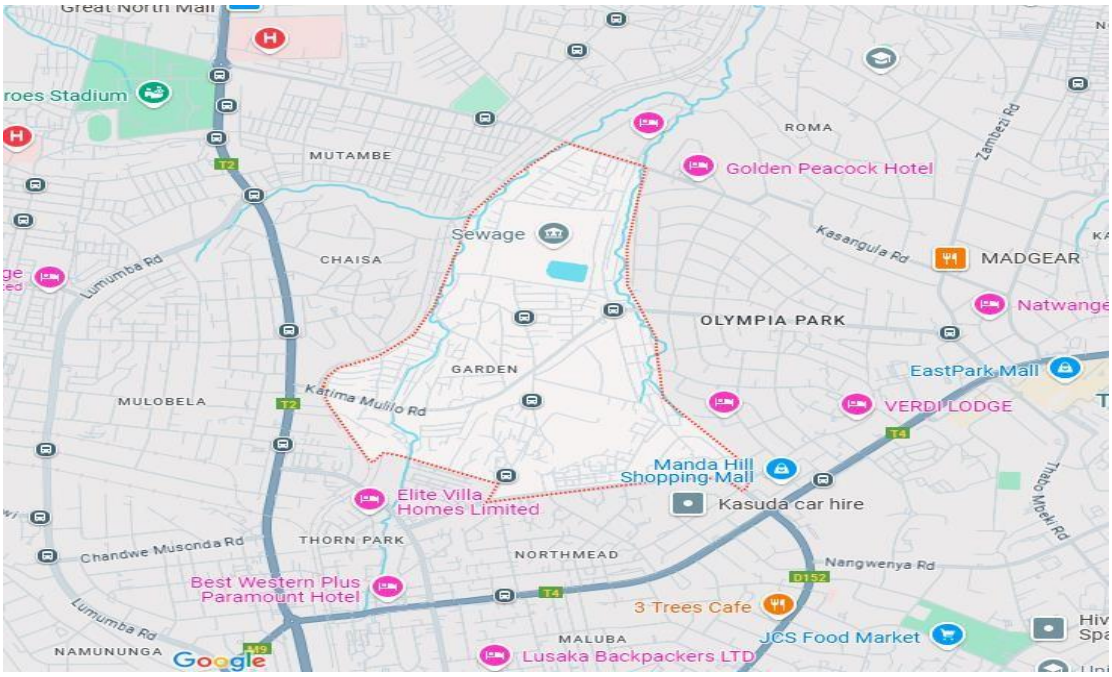

Figure 1: Map of study area.

Source :(Author, 2025).

1.2 Statement of the Problem

Energy poverty refers to the lack of access to modern, affordable, and reliable energy services that are essential for daily life, economic development, and human well-being (IEA,2010).It includes not just the lack of electricity but also the use of typical, harmful fuels for cooking and lighting, like kerosene, wood, and charcoal. Energy poverty is still a complicated and ongoing problem in Zambia, especially in peri-urban communities like Garden Compound.

The core problem in Garden Compound is the continued dependence on charcoal and other inefficient fuels despite the availability of alternative energy options such as solar systems, improved cookstoves and biomass briquettes. Households face unreliable electricity supply due to load shedding, high connection costs, and unaffordable tariffs, which discourage consistent grid use (SEforALL, 2022; ZESCO, 2022). Consequently, residents spend a significant portion of income on polluting fuels that undermine health, productivity and environmental sustainability.

Although programmes and private actors are promoting alternative energy in Lusaka, adoption in low-income peri-urban areas remains low. Existing studies such as Cosmas (2021) and Mshelia (2019) focus mainly on the presence of clean energy technologies and their potential benefits, but provide limited insight into the socio-economic, institutional and behavioural factors that influence household energy choices in peri-urban settlements. This creates a knowledge gap regarding why households with access to alternatives continue to rely on traditional fuels.

Without understanding these underlying barriers, interventions risk being ineffective. Continued dependence on charcoal exposes households to indoor air pollution, increasing respiratory illnesses, especially among women and children (Mills, 2016). Poor lighting constrains children's ability to study at night and limits income-generating activities for adults (IEA, 2017). Environmentally, high charcoal demand accelerates deforestation around Lusaka, reducing long-term sustainability and resilience to climate change (Kalaba, Quinn & Dougill, 2020).

Therefore, the problem this study addresses is the low adoption and limited effectiveness of alternative energy sources in alleviating energy poverty in Garden Compound, Lusaka**,** and the lack of empirical understanding of the factors that promote or hinder their uptake. By examining

these factors and assessing how adopted alternatives have contributed to reducing energy poverty, the study contributes to the body of knowledge on peri-urban energy transitions and provides evidence-based guidance for improving clean energy access in Zambia.

1.3 Research Objectives

1.3.1 General Objective

i. To investigate how the adoption of alternative energy sources in the alleviation of energy poverty in Garden Compound.

1.3.2 Specific Objectives

i. To investigate how the adoption of alternative energy sources affects expenditure burden in Garden Compound.
ii. To examine what factors influence the adoption of alternative energy sources in Garden Compound.
iii. To ascertain how the adoption of alternative energy sources contribute to improved energy access in Garden Compound.

1.4 Research Questions

1.4.1 General Research Question

i. How does the adoption of alternative energy sources alleviate energy poverty in Garden Compound?

1.4.2 Specific Research Questions

i. To what extent does the adoption of alternative energy sources affects expenditure burdens in Garden Compound?
ii. What factors influence the adoption of alternative energy sources in Garden Compound?
iii. How does the adoption of alternative energy sources contribute to improved energy access?

1.5 Justification of the study.

This study is justified because energy poverty remains a major development challenge in peri-urban settlements such as Garden Compound in Lusaka, where many households continue to rely on unsafe, unreliable and environmentally damaging energy sources. Dependence on charcoal, candles and inefficient electricity use negatively affects household health, education, income generation and overall quality of life (Mulenga, 2018). Despite national and private sector efforts

to promote alternative energy technologies, there is limited localized evidence on how low-income peri-urban households understand, access and adopt these options in practice.

The study is important because it generates context-specific evidence on the factors influencing the adoption of alternative energy sources in Garden Compound. By examining socio-economic, institutional and behavioural barriers to clean energy transition, the research provides practical information that can support policymakers, Lusaka City Council, NGOs such as CEEEZ and SNV, and energy providers in designing interventions that are affordable, acceptable and suited to the realities of peri-urban communities. This can contribute to reducing energy poverty, improving household wellbeing and supporting local economic activities.

In addition, the study contributes to the body of knowledge on peri-urban energy transitions in Zambia. While existing studies largely focus on rural electrification or the technical availability of renewable energy, few investigate how household decision-making, affordability, awareness and institutional support interact to shape energy choices in low-income urban settings. By focusing on Garden Compound, this research fills a gap in empirical literature on alternative energy adoption in peri-urban Zambia and provides a basis for comparative studies in similar settlements.

Finally, the study is academically significant as it fulfills the requirement for the award of a Bachelor of Development Studies degree and enhances the researcher's analytical, fieldwork and research-writing skills, contributing to professional development in the field of development and energy studies.

1.6 Scope of the Study

This study will be conducted in Garden Compound, with focus on the adoption of alternative energy sources in alleviating energy poverty in the selected community. This will help the researcher understand how the alternative energy sources introduced such as the charcoal briquettes, solar and improved gas cook stoves have impacted energy poverty. It will also help the researcher understand the social, cultural and economic factors that either hinder or encourage the adoption of these new technologies in the community.

1.7 Limitations

This study has potential limitations including the attitudes of the key respondents in relation to how willing they will be to participate. Gaining trust and access to households in informal settlements can be challenging. Another limitation would be resource constraints, the sample size, the amount of data collected, and the ability of the researcher to include the opinions of many stakeholders may all be constrained by financial and time restrictions. Additionally, the researcher will have to collect field data and also attend classes as the researcher is a full time student. The trustworthiness of the survey results may also be impacted by respondents' failure to remember exactly how much they spend on energy or how frequently they utilize particular sources. Lastly, another potential barrier may be the language spoken as not all residents of the community of Garden Compound are not fluent English speakers.

1.8 Operational Definitions

Energy Poverty- Energy poverty is the condition in which households or communities lack access to modern, affordable, reliable and sustainable energy services necessary for daily living and economic development (International Energy Agency [IEA], 2022). It is usually characterized by limited access to electricity and clean cooking fuels, this forces depence on traditional energy sources like firewood or charcoal which aren't very efficient. (Bazilian et al., 2014).

Alternative Energy Sources- Alternative energy sources are forms of energy that serve as substitutes for conventional fossil fuels. These include renewable and sustainable options such as solar, wind, hydro and biomass energy. They are considered ' alternative' because they produce less environmental pollution and contribute to reducing carbon emissions while ensuring long-term energy security (Owusu & Asumudu- Sarkodie, 2016).

Household- A household refers to a group of individuals who live together under the same roof and share common living arrangements like food, shelter and income. It includes family members or individuals who pool their resources to meet their daily needs (United Nations, 2019). In social and economic studies, the household is often considered the primary unit of consumption and decision making.

Adoption- Adoption refers to the process through which individuals, households, or communities begin to accept and utilize a new technology, practice, or idea. In the context of energy, it involves the decision and transition from traditional energy sources to alternative or renewable ones (Rogers, 2023). Factors that affect adoption could be affordability, awareness, accessibility, and perceived benefits.

Peri-urban- Peri-urban areas are transitional zones located between urban centers and rural settlements. In other words they are an area geographically located on the outskirts of a city. It is characterized by unplanned settlements, mixed infrastructure and poor access to services. These areas often experience challenges in accessing public services, including energy, water and sanitation, due to their informal or semi- formal nature (Simon, 2019; Cobbinah et al., 2021).

CHAPTER TWO:

LITERATURE REVIEW

2.0 Introduction

The researcher examines several literary works (such as books, papers, and journals) pertaining to the topic energy poverty in Garden Compound in this chapter. A literature review is crucial because it gives the researcher a thorough grasp of the current issue, exposes them to new methods for gathering data, and, finally, allows them to examine related studies carried out by other scholars.

2.1 Empirical Review

2.1.1 Energy poverty and expenditure burden in peri-urban areas.

Globally, energy poverty is still a major problem, particularly in developing nations. Traditional fuels like charcoal and firewood, which are inefficient and bad for the environment and human health, are still used in many homes. The International Energy Agency (2022) estimates that 2.3 billion people use polluting cooking fuels and that 700 million people worldwide still do not have access to electricity. This demonstrates that energy poverty is a worldwide problem associated with inequality and slow growth rather than only a local one.

Energy costs, inefficient housing, and socioeconomic vulnerabilities all have an impact. For example, low-income families experienced energy hardship in 2022–2024 due to a substantial rise in home energy expenses in North America and Europe due to growing worldwide fuel prices. "Hidden energy poverty" or "fuel poverty" occurs in households when high energy expenditures relative to income prevent families from having enough heating or cooling. European Commission, 2023.

Energy poverty is significantly more severe in Africa. Due to inadequate grid connection and limited access to conventional energy sources, many Sub-Saharan African nations often experience blackouts. Nearly 600 million people in Africa lack access to electricity, and the majority of them reside in rural and periurban regions, according to the African Development Bank (2023). Similar issues are faced by nations like Mozambique, Tanzania, and Malawi, where people

mostly rely on biomass for lighting and cooking. This restricts access to health, commercial, and educational services, proving that energy poverty is a significant obstacle to regional development.

Economic difficulties and problems with infrastructure also contribute to the region's energy poverty. Numerous national institutions have financial instability, which leads to frequent load shedding and inconsistent supplies. For instance, Zambia's heavy reliance on hydroelectricity makes it vulnerable to droughts brought on by climate change, which lower water levels in large dams like the Kariba Dam (ZESCO, 2022). Due to this susceptibility, families are forced to rely on expensive or environmentally harmful alternatives, which contributes to energy shortages.

Studies conducted in Sub-Saharan Africa further contribute to this information by showing how energy poverty's negative economic consequences are exacerbated by structural energy deficiencies. According to research from South Africa, during times of extreme power rationing, small and medium-sized firms lose between 10% and 25% of their sales; the sectors with the worst losses are those connected to food and metals (Steinbuks and Foster, 2010; Macmillan, 2023). Similar data from Zimbabwe, Kenya, and Nigeria shows that revenue losses are linked to energy poverty, which shows up as high levels of unstable off-grid power supplies, disrupting supply chains and undermining customer trust (Aweke, 2022; Odhiambo, 2023). Many African settings have limited access to electricity, which exacerbates operational inefficiencies for families and other organizations, in contrast to global contexts where outages are often planned.

In Zambia, both rural and periurban communities are impacted by energy poverty. Many low-income families in Lusaka's peri-urban areas still rely on conventional fuels despite Zambia's success in expanding access to electricity. About 60% of urban families utilize charcoal as their primary cooking energy source, mostly due to the high cost or instability of electricity, according to the Zambia Statistics Agency (2022). Families in areas like Garden Compound struggle to afford steady and sustainable energy sources due to poor living conditions and low earnings. According to Kaseke N. (2013), "affordability is another major barrier: even when grid connections are available, high connection fees and electricity tariffs can be prohibitive for low-income

households." Because of this, peri-urban communities often face both economic and physical energy poverty.

2.1.2 Assessing factors contributing to alternative energy source adoption in peri-urban areas.

Many nations across the world are shifting to alternate energy sources in an effort to combat climate change and lessen their reliance on fossil fuels. Because they are more sustainable and clean, renewable energy sources like solar, wind, and biogas are gaining popularity. About 30% of the world's power came from renewable sources in 2022, with solar energy having the quickest growth rate, according to the International Renewable Energy Agency (2023). Additionally, solar household systems and mini-grids are being used in many developing nations to reach areas that are not linked to the main electrical grid.

A research conducted in India by Saxena (2014) revealed that while most periurban settlements have widespread electric power connections, the actual service varies greatly, making some inhabitants unwilling to utilize alternate energy sources. Certain locations are classified as "industrial development areas" and get full electricity 24 hours a day, while other areas receive much less power. In one instance, some locations are assigned between 1800 and 0900. Furthermore, electricity was supplied for six hours every night, although the precise hours were not specified.

In order to lessen energy poverty and encourage green development, several African countries have begun using alternative energy. For instance, South Africa and Namibia are spending more in solar power, while Kenya has emerged as a leader in the use of wind and geothermal energy (World Bank, 2022). Due to its ease of installation and long-term cost savings, solar energy is particularly prevalent in Africa's rural and periurban areas. According to the African Union (2023), several communities in Sub-Saharan Africa now have access to clean energy thanks to tiny solar installations, demonstrating the significant impact that alternative energy may have.

In Zambia, alternative energy sources like gas and solar are gradually gaining popularity. Solar water heaters and household systems have been promoted by the government and commercial

businesses, particularly in regions with inconsistent energy supplies (Energy Regulation Board, 2022). Small companies and homes in peri-urban regions like Garden Compound are beginning to employ solar panels and lighting to satisfy their everyday requirements. However, many households still find it challenging to completely accept these alternatives due to the high initial cost of installation and low knowledge.

2.1.3 The adoption of alternative energy sources and its contribution to improved energy access in peri-urban areas.

Globally, over 3.9 billion cubic meters of wood were produced in 2000, of which 2.3 billion cubic meters were used as wood fuel. This indicates that about 60% of all wood collected from both forest and non-forest regions worldwide is used for energy (FAO, 2018). Therefore, in order to preserve the ecosystem and forests, efforts must be taken to lower the demand for wood biomass. More than 75% of woodfuel is produced in Asia and Africa (African Development Bank (AfDB), 2017). Because of its affordability and accessibility, estimates of the amount of woodfuel used worldwide by 2010 varied from 1.5 billion to 4.25 billion m^3 (FAO, 2018).

Global research conducted by the International Energy Agency (IEA, 2022) explains how, even in areas where clean energy technologies are technically doable, the adoption of these solutions is hindered by poor access to trustworthy information in poorer nations. As a result, knowledge and awareness of alternative energy sources affect adoption by influencing understanding of the advantages, expenses, and long-term savings connected to renewable energy technology. The longevity, upkeep needs, and financing possibilities of alternative energy systems are not well understood by many homes.

Low levels of energy education, little exposure to showcase projects, and poor distribution of government or private-sector energy projects can worsen knowledge gaps in peri-urban regions. Households may over price the initial installation costs while underestimating long-term economic and environmental advantages in the lack of enough awareness efforts (Bhattacharyya, 2012). Investment in alternative energy choices is discouraged and negative attitudes are reinforced by this lack of understanding.

Adoption rates are higher in nations where renewable energy technology are reasonably priced and backed by strong laws. For instance, subsidies and educational programs have pushed more people to convert to renewable energy sources in nations like China and Germany (International Energy Agency, 2022). However, in underdeveloped countries, growth is often slowed down by high costs and a lack of knowledge.

More than 90% of the wood that is taken from African forests gets used as fuel. A variable but important percentage is turned into charcoal, while the majority is utilized directly as wood fuel. Over 80% of charcoal is used in urban areas, making it the most important residential energy source in many African cities (FAO, 2018). Wood is the most important biomass, however various nations rely on it differently. Some countries, such as Tanzania in Sub-Saharan Africa, Kenya, Uganda, Rwanda, and Nepal in Asia, depend on wood fuels for at least 80% of their total energy demands. By 2030, Africa will have a higher need for wood fuel, yet there is already a shortage of it. Therefore, in order to make the use of woodfuel sustainable and to encourage afforestation and re-afforestation, methods that limit the amount consumed must be introduced.

Many African nations struggle with issues such inadequate funding, inadequate energy laws, and a lack of skilled professionals (African Development Bank, 2023). The adoption of solar energy by families in East and Southern Africa is often influenced by factors such as cost, technological accessibility, and confidence in energy providers. Cultural customs also come into play, as some individuals continue to choose conventional fuels due to their familiarity and accessibility.

Locally, income levels significantly influence the adoption of alternative energy sources, as household financial capacity determines the ability to afford initial installation and maintenance costs. Low-income households often prioritize immediate basic needs such as food, rent, and healthcare over investing in alternative energy technologies, even when these technologies offer long-term cost savings. The high upfront costs associated with solar home systems, improved cookstoves, or other renewable energy solutions therefore act as a major barrier to adoption among poorer households (Bhattacharyya, 2012). As a result, households with higher and more stable incomes are more likely to adopt alternative energy sources compared to those with irregular or

limited earnings.awareness of renewable energy options, and access to affordable technology. According to the Ministry of Energy (2022), many low-income households in peri-urban areas cannot afford the start-up costs of solar systems even though they know the benefits.

In Zambia, the adoption of alternative energy sources is influenced by a number of things. These include opinions on new technology, which have a big impact on the uptake of alternative energy sources, especially in low-income and peri-urban areas. Adoption of renewable energy solutions like solar power is encouraged by positive attitudes including openness to new ideas, trust in technology, and belief in their usefulness. On the other hand, adoption rates are often slowed by negative attitudes, such as doubt about security, refusal to change, and fear of technological failure (Rogers, 2003). Due to previous experience with current systems and fear of the new, families in many developing nation situations may choose well-known conventional energy sources like charcoal and grid power, even when these alternatives are expensive or unreliable.

Some people are also discouraged by a lack of trust in new products or poor maintenance support. In Garden Compound, the choice to adopt alternative energy is often guided by what is affordable and available locally rather than by long-term sustainability. Individuals are more likely to adopt new technologies when they perceive them as advantageous, compatible with their needs, easy to use, and observable within their community (Rogers, 2003). Where alternative energy technologies are perceived as complex or unsuitable for everyday household needs, adoption remains low. For instance, some households view solar systems as inadequate for powering high-energy appliances or associate them with limited usage, which negatively affects attitudes toward their adoption (Ondraczek, Komendantova & Patt, 2015). These perceptions, whether accurate or not, significantly shape household decisions.

In the same way, increasing energy access while promoting investments in alternative energy sources were key components of the National Energy Policy of 2019 (World Bank, 2022). However, broad solar adoption continues to be limited by high upfront costs, poor financing methods, laws and regulations, and low public awareness. Bureaucratic barriers make these problems worse (Mumba and Phiri, 2022). Residents of communities like Chalala in Lusaka often

encounter power outages. However, adoption rates are still very low despite widespread knowledge of the advantages of solar energy (Chanda et al., 2021). Future energy solutions must be based on an understanding of the basic challenges in these areas.

2.2 Research Gaps

Even while the literature on energy poverty and alternative energy transitions in sub-Saharan Africa is expanding, there are still a number of significant gaps, especially when it comes to peri-urban settings like Garden Compound in Lusaka. First off, the majority of studies that are currently available concentrate on national or regional assessments, often use macro-level data that ignore the lived reality of families in informal settlements (Odarno et al., 2020; Castán Broto & Kirshner, 2020). This leads to a gap in our knowledge of how local socioeconomic factors influence energy choices and how energy poverty is experienced at the micro-community level.

Second, little study has looked at how household attitudes and sociocultural elements affect the utilization of alternative energy sources in Zambia's peri-urban areas. Few studies have offered detailed insights into how attitudes, understanding, safety concerns, and belief in new technologies impact adoption in informal groups, despite earlier research acknowledging the importance of cost and accessibility (Zulu & Richardson, 2013).

Thirdly, there is inadequate empirical data about the effectiveness of current energy initiatives in peri-urban settlements, which often confront particular governance and infrastructure issues such informal housing, unstable tenure, and uneven service delivery (Golub et al., 2022). Thus far, little research has been done on the potential and effectiveness of suggested alternative energy solutions in these kinds of settings.

Lastly, despite Garden Compound's high rates of energy poverty, dense population, and dependence on unsafe or inefficient energy sources, there aren't many localized case studies that concentrate on the area specifically. Closing this gap is essential to creating policy suggestions that are suitable for the context and guiding focused programs.

By addressing these gaps, the present study contributes to a more grounded understanding of energy poverty and the factors influencing alternative energy adoption in Lusaka's peri-urban settlements.

2.3 Conceptual Framework

2.3.1 The Concept of Energy Poverty.

The concept of energy poverty originally emerged in the 1970s, primarily in the UK, where it was first referred to as "fuel poverty." Through her significant work, a researcher by the name of Brenda Boardman is generally acknowledged as one of the first to establish and promote the notion. Many people see her 1991 book "Fuel Poverty: From Cold Homes to Affordable Warmth" as the seminal work on energy (or fuel) poverty.

The term "fuel poverty," which is mostly used in the UK and Europe, was first used to describe families who spent too much of their income on home heating. The larger phrase "energy poverty" gained popularity, particularly in developing nations, as the conversation about global disparities in energy access expanded via international development conversations facilitated by organizations such as the United Nations and the International Energy Agency (IEA). The definition was expanded to include the inability to get any contemporary energy services, including electricity, lighting, and clean cooking energy, in addition to heating.

Thus, 'energy poverty' is a condition where individuals or households are unable to access sufficient, affordable, reliable, and clean energy for their daily needs such as lighting, cooking, heating, and communication. The concept is broader than just a lack of electricity — it also includes limited access to modern energy services that support health, education, and economic growth. According to Bouzarovski (2018), energy poverty is a form of social inequality that affects people's ability to live comfortable and dignified lives.

It is often linked to low income, poor housing, and dependence on traditional fuels. The International Energy Agency (2022) estimates that about 675 million people globally still lack access to electricity, and around 2.3 billion people rely on unsafe cooking fuels such as firewood or charcoal. In Europe, the term 'fuel poverty' is commonly used to describe households that spend a high share of their income on energy due to inefficient housing or high energy prices (Boardman, 2010).

The main causes of energy poverty in Africa are poor infrastructure and an excessive dependence on fossil fuels, particularly in rural and periurban regions. According to the African Development Bank (2023), one of the main obstacles to sustainable development on the continent is energy poverty, which lowers living standards and restricts economic prospects. Since access to energy has a direct impact on livelihoods, healthcare, and education, energy poverty is generally acknowledged as a significant developmental problem on a worldwide scale.

2.3.2 The concept of Alternative Energy Sources.

Energy sources that may be used in place of traditional fossil fuels like coal, oil, and natural gas are referred to as alternative energy sources. They are referred to as "alternative" because they provide more sustainable, renewable, and clean methods of generating electricity. These consist of geothermal, hydropower, wind, solar, and bioenergy. Alternative energy sources are crucial for lowering greenhouse gas emissions and lessening the consequences of climate change, according to Boyle (2012). They can be naturally renewed and are unlikely to run out since they are renewable. According to the International Renewable Energy Agency (2023), approximately 30% of the world's power was generated in 2022 from renewable sources, demonstrating a consistent worldwide move towards cleaner energy.

Traditional fuels including coal, charcoal, firewood, and kerosene have detrimental consequences on both people and the environment. Air pollution is one of the main issues. These fuels emit smoke as well as dangerous gasses like carbon dioxide and carbon monoxide when they burn. Particularly inside, where people cook or heat their houses, these pollutants contaminate the air and make it dangerous to breathe. According to the World Health Organization (WHO, 2015), inhaling smoke from charcoal or firewood may lead to a number of health issues, including heart disease, lung infections, asthma, and coughing. Due to their increased closeness to cooking flames, women and children are often the most impacted.

Another major effect of using traditional fuels is deforestation. In many developing countries, people cut down trees for firewood and charcoal because it is their main source of energy. Over time, this leads to the loss of forests, which are important for keeping the air clean and protecting the soil. When forests disappear, the land becomes dry and less fertile, leading to soil erosion and

reduced crop production. This not only harms the environment but also affects people's ability to grow food and earn a living.

Traditional fuels also contribute to climate change. When coal, charcoal, or kerosene is burned, it releases greenhouse gases that trap heat in the atmosphere. This causes global temperatures to rise, leading to extreme weather conditions such as droughts, floods, and heatwaves. These changes make it harder for communities to grow food, find clean water, and stay healthy. Overall, the continued use of traditional fuels harms both people and the planet. It affects health, destroys forests, worsens climate change and slows down development (Simon. L 2019). Switching to cleaner and renewable energy sources such as solar or biogas can help reduce these problems and create a safer and healthier environment for everyone.

Depending on their natural resources, many areas are adopting different types of alternative energy. For instance, nations like Kenya and Iceland employ geothermal energy because of their volcanic terrain, but Nordic nations like Norway mostly depend on hydropower. On the other hand, arid areas like the Middle East and North Africa offer enormous potential for the growth of solar energy (World Bank, 2022). Additionally, alternative energy is seen as a means of reaching global objectives such Sustainable Development Goal 7 (SDG 7), which demands that everyone have access to modern, cheap, dependable, and sustainable energy (United Nations, 2015).

2.3.3 The Concept of Peri-Urban Areas.

The term peri-urban refers to areas located at the edge or outskirts of cities, where rural and urban characteristics mix. These zones are often seen as transitional spaces — not fully urban but no longer entirely rural. They are typically formed as cities expand outward due to population growth and migration.

These communities are often unplanned and expand rapidly as people relocate from rural regions in search of better services or employment. They often feature small enterprises, farming activities, and both modern and older homes occurring side by side. However, peri-urban areas often deal with issues including unstable energy, bad roads, and limited access to clean water. In these places, a large number of people live in informal settlements, and local governments may find it difficult to provide enough services.

Similarly, Allen (2019) believes, peri-urban zone Many authors interpret the term "peri-urban" as either the rural-urban periphery or the peri-urban border. T.L. Smith coined the phrase "rural-urban fringe" in 1934. The edge of this urban fringe is referred to as the "rural-urban fringe" by Andrews (1942).

This resulted in the unplanned urbanization and the spontaneous movement that produced rural regions. He points out that between 1975 and 2000, the bulk of urban growth occurred in these third-world countries. These are "complex mosaics of opposing activities previously regarded as incompatible," Simon (2008) claims. The phrase "city villagization," or "kotedesatie," which describes areas where urban and rural activities coexist, was born out of this. The peri-urban areas have a clear pattern of land usage.

These are complex spaces where urban and rural lifestyles, land uses, and economies overlap. They often lack proper planning, which leads to challenges such as overcrowding, poor sanitation, and unreliable access to services like water and electricity. In many developing regions, peri-urban communities have grown rapidly as people move from rural areas in search of jobs and better opportunities. For instance, studies in Sub-Saharan Africa show that most urban growth now happens in peri-urban settlements, where informal housing and small-scale businesses dominate (UN-Habitat, 2020).

Researchers such as Simon (2020) argue that peri-urban areas play a key role in city expansion and economic development, but they are also highly vulnerable to poverty and environmental stress. Because of their in-between nature, they often fall outside formal urban planning and service delivery systems.

The quality of life in urban systems is often gotten at the price of villages, which is one of the distinctions between peri-urban and urban communities (Satterhwaite, 2016). External systems' pressures are a major cause of environmental changes in peri-urban settings (Allen, 2012). Due to unstable living circumstances, these pressures often result in environmental risks, the depletion of natural resources, and poor health. The works of Simon (2008) concentrate on the element of environmental deterioration, which often results in the vulnerability of peri-urban livelihoods.

The variations in the regulatory environment come next. Periurban regions are beyond the formal administrative limits of major cities, according to Parkinson and Taylor (2019). As a result, the ability to control economic activity is very limited. Peripheral areas are neither a part of the city nor a part of the rural region since they are beyond the boundaries of the city's administration. Research on the United States, France, and India indicates that land administration is different and has issues. Peri-urban growth is mostly unplanned, unofficial, and unlawful, and land use conflicts are common.

The spatial flexibility of peri-urban regions is the third problem. Peri-urban regions are a dynamic idea rather than a static one. They often develop into new forms of liveliness. Peri-urban regions travel to the countryside, grow and contract geographically, and are absorbed into the main area, according to Hans Schnek (2017). Peri-urban interfaces are described by authors like Rohilla and Lintelo as areas of change, often brought about by encroachments, spatial growth, etc.

2.4 Conceptual Framework

Conceptual Framework "A conceptual framework is a basic structure that consists of certain abstract blocks which represent the observational, the experiential, and the analytical or synthetic aspects of a process or system being conceived," according to Bogdan and Biklen (2003). The links between these components complete the framework for certain expected outcomes. Therefore, using this conceptual framework, the researcher will attempt to explain how the use of alternative energy sources results in the decrease of poverty.

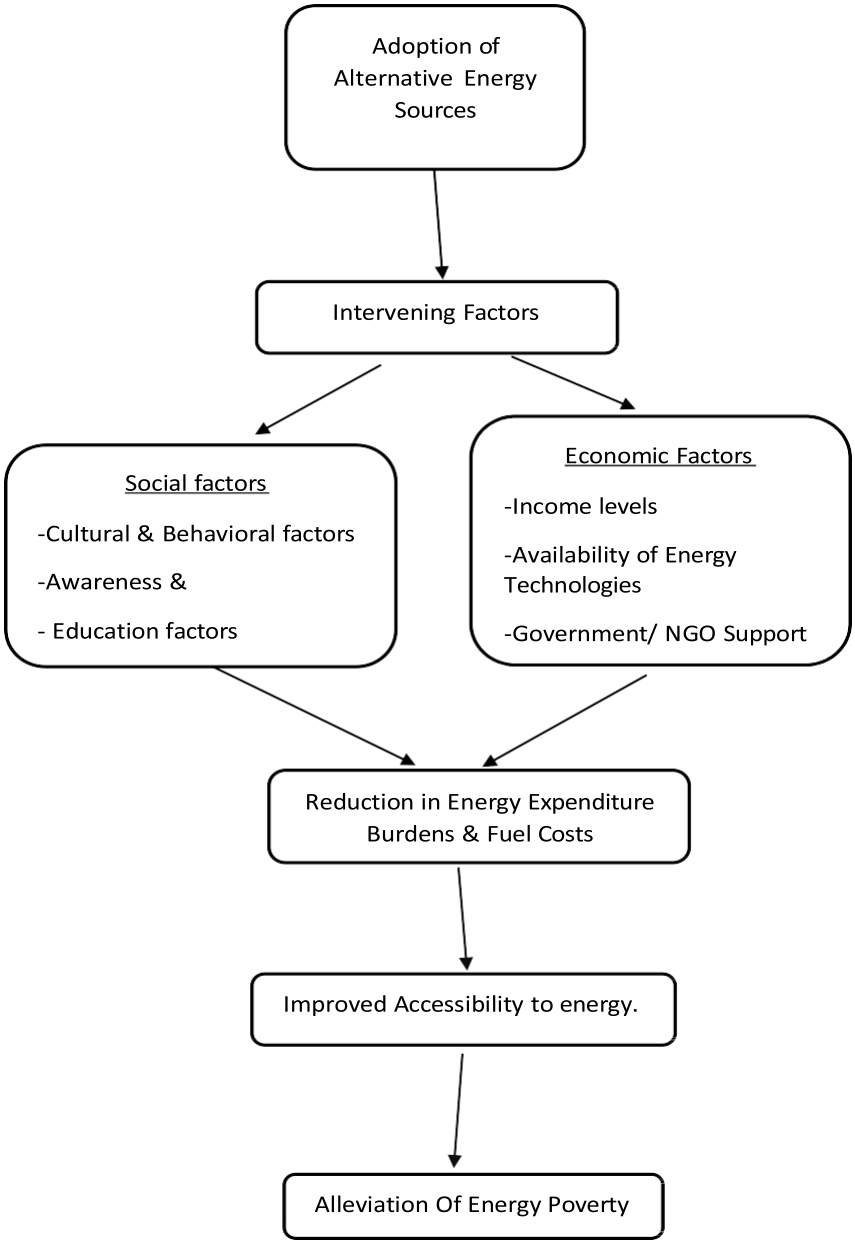

Figure. 2: Conceptual Framework

Source: (Researcher, 2025).

2.5 Theoretical Framework

Theories are statements that are derived from scientific observations that try to explain or interpret some phenomenon (Borg and Gall, 1979). The researcher will use the following theories that are directly related to this study.ss

2.5.1 Sustainable Livelihoods Framework.

The Brundtland Commission on Environment and Development initially proposed the concept of sustainable livelihoods as a means of integrating ecological and socioeconomic factors in a coherent, policy-relevant framework. The 1992 United Nations Conference on Environment and Development (UNCED, 1992) expanded the concept, and advocated for the achievement of sustainable livelihoods as a broad goal for poverty eradication. It claimed that sustainable livelihoods might act as the glue that enables programs to concurrently address poverty eradication, sustainable resource management, and development.

A lot of development agencies have been influenced by these various readings and explanations of the SLF consent to implement what is now referred to as an SL strategy to poverty reduction. This has come about as a result of both current discoveries about the nature and comprehension of poverty as well as unfavorable experiences with traditional methods of reducing it. The application of the SL strategy to poverty reduction can be explained by three aspects. The first is the understanding that, although if economic growth may be necessary to reduce poverty, the two are not necessarily related because everything depends on the impoverisher's ability to benefit from growing economic opportunities.

In order to plan aid activities appropriately, it is crucial to identify the specific factors that hinder or limit the impoverished from changing their lot in a particular situation (ibid). The second is knowing that poverty, as defined by the impoverished themselves, encompasses more than just low income; it also involves other factors like poor health, illiteracy, and a lack of social services, vulnerability to shocks like climate change, and a general sense of helplessness. Furthermore, it is now understood that there are significant connections between the many aspects of poverty, meaning that addressing one will benefit another. Increasing people's level of education could improve their health, which may increase their ability to produce. Poor people may be more likely to participate in new but more profitable business opportunities if their vulnerability to risk is decreased.

Lastly, it is widely acknowledged that the poor themselves must be included in the creation of policies and projects aimed at improving their lot since they frequently have the best knowledge of their circumstances and needs. Given a say in design, they are usually more committed to implementation. Thus, participation by the poor improves project performance (UNCED (1992).

In relation to this study, the SLF helps explain how energy poverty is not only a technical problem of supply, but also a livelihood issue influenced by household resources and capabilities. For instance, financial capital affects whether households can afford solar systems, improved cookstoves or electricity tariffs**.** Human capital**,** such as education and awareness, influences understanding of alternative energy benefits and correct usage**.** Physical capital, including housing quality and grid infrastructure, determines whether technologies can be installed and maintained. Social capital shapes information sharing, trust in providers, and collective action in adopting new technologies, while natural capital is reflected in reliance on charcoal derived from surrounding forests.

By applying the SLF, this study is able to analyse why some households adopt alternative energy sources while others remain dependent on traditional fuels, not simply based on availability, but based on how different livelihood assets and constraints interact. The framework therefore helps structure the analysis of socio-economic, institutional and behavioural factors influencing alternative energy adoption and provides a holistic understanding of energy poverty in peri-urban Lusaka.

2.5.2 Energy poverty Theory

The energy poverty theory offers a perspective on how social and economic deprivation is worsened by limited access to modern, reasonably priced, and dependable energy services. According to the (International Energy Agency, 2017), “energy poverty refers to the lack of access to modern energy services such as electricity and clean cooking facilities which are essential for human well-being and development.” Because of financial and accessibility limitations, many households in peri-urban areas like Garden Compound rely on conventional energy sources like firewood and charcoal. For this reason, this theory is notably important for understanding this community.

According to this theory, energy poverty has numerous negative impacts such as restricting opportunities for work, harming health due to relying on dangerous fuels (such charcoal or kerosene), hindering educational development because of inadequate lighting, and prolonging cycles of poverty. During blackouts, families in low-income areas often spend a significant portion of their income on possibly dangerous and ineffective energy sources.

The unequal social impacts of energy poverty, which often worsen gender, age, and wealth inequalities are also highlighted by the Energy Poverty Theory. When examining Garden Compound, where poor communities may be disproportionately affected by energy poverty, this is an important consideration.

In relation to this study, this theory helps explain that energy poverty goes beyond whether a household is connected to the grid. Even households with electricity may still be energy poor if supply is unreliable, tariffs are unaffordable, or cooking still depends on charcoal and candles. This aligns with the situation in peri-urban Lusaka where households face both physical energy poverty (lack of connection) and economic energy poverty (inability to pay for adequate energy use).

Energy Poverty Theory also links energy access to social outcomes such as health, education, gender equality and income generation. In this study, it helps interpret how reliance on charcoal and poor lighting increases respiratory illness, limits children's study time, and constrains small business activities. Furthermore, the theory highlights the transition dimension — the movement from traditional fuels to modern energy — and the barriers that slow this transition, including cost, awareness, institutional support and risk perception. By using Energy Poverty Theory, the study frames alternative energy adoption as a pathway for reducing multidimensional deprivation rather than merely introducing new technologies. It guides the research in assessing whether adopted alternatives in Garden Compound actually improve wellbeing, affordability and reliability for households. Thus, the theory supports the study in identifying not only adoption levels but also the effectiveness of alternative energy sources in alleviating energy poverty.

CHAPTER THREE:

METHODOLOGY

3.0 Introduction

The researcher describes the steps and techniques that will be used to gather data in this chapter. According to Kothari (2004), a research design is an investigative blueprint method created to get answers to research questions. It also acts as the glue that keeps the research project together (Trochim, 2005). The researcher began this study by describing the research methodology, then went on to describe the study region, sample size, sampling procedure, data collecting methods, data kinds, data analysis, reliability and validity and finally ethical considerations

3.1 Research Design

In order to get a thorough knowledge and validation, the researcher used a qualitative design in this study. The researcher was able to get a thorough grasp of the variables influencing the rate of adoption, its effects, and whether or not the use of alternative energy sources in peri-urban regions like Garden Compound is helping to alleviate energy poverty because of the qualitative study approach. Qualitative research focuses on understanding people's experiences, perceptions, and meanings within their natural setting (Creswell, 2012).

The study used a case study approach with a specific emphasis on Garden Compound. This approach was used mostly because the study focused on a particular topic in-depth rather than dispersing efforts across other topics. A more in-depth analysis of the daily effects of energy poverty on Garden Compound resident's means of sustenance was made possible via a case study approach. It also made it possible for the researcher to thoroughly examine the many factors influencing the community's acceptance rate of alternative sources. This allowed for an improved understanding of the components that bigger surveys could overlook or overlook.

3.2 Study location

This research focused on Garden Compound, a peri-urban residential neighborhood in Zambia's northwest Lusaka District. Major roads connected the study region to neighboring settlements, and it is located about ten kilometers from Lusaka's central business district. High population density and mostly unplanned house constructions were characteristics of Garden Compound. The majority of Garden Compound's economic activity was informal, with locals working as casual laborers and engaging in small-scale trade. The population reflected typical peri-urban settlement patterns in Lusaka District, with a wide range of age groups and family sizes (CSO, 2022). These characteristics made the area suitable for examining the adoption of alternative energy sources in addressing energy poverty.

3.3 Sample Size

A sample is a part of a whole or a subset of a larger set that the researcher has selected to participate in a study, according to Brink (2017). To put it simply, in order to collect data for a study, a researcher selects a small sample of people from a larger population. A subset of the elements or units from a certain population is called a sample. A sample of 25 interviewees, including heads of homes, school-age children, and small business proprietors operating unofficially inside Garden Compound, were chosen by the researcher.

The sample size of 25 people was determined using the point at which data saturation was reached. After 25 interviews, no new themes, concepts, or points of view surfaced from the responses. This implies that more interviews were not likely to provide new information. The technique mentioned earlier is in line with Guest, Bunce, and Johnson's (2006) finding that saturation in qualitative research is often reached within 12 to 25 interviews.

3.4 Sampling Technique

Sampling is a popular method for obtaining relevant data in academic research (Thompson, 1992). The researcher must choose a small sample from a broader group in order to draw conclusions about that particular community. This study used purposeful sampling, a non-probability sampling technique where participants are selected based on their direct relationship to the problem. Sekaran and Bougie (2010) claim that purposeful sampling enables the researcher to get specific data from certain target holders who could be the information's custodians.

To guarantee that all significant socioeconomic players impacted by energy poverty were represented, the sample was purposefully distributed across important stakeholder groups. Among the distribution were:

- Household leaders (men and women): 40 participants were in charge of overseeing daily tasks, energy use, and revenue-generating activities.

-Students and young people: 15 individuals were chosen to represent the social and educational effects of energy poverty, such as interrupted study plans and restricted access to digital resources.

- Owners of small businesses (such as merchants, barbers, and welders): 25 members in this group represented the local economic activities that heavily rely on energy.

Additionally the inclusion criteria required that participants: (i) be residents of Garden Compound for at least six months, (ii) be aged 18 years and above for interviews and questionnaires, and (iii) be directly involved in household energy use, schooling, or income-generating activities. Small business owners were included if their operations depended on electricity or alternative energy sources. Where as the exclusion criteria included: (i) visitors or temporary residents, (ii) individuals below 18 years for interviews without guardian consent, and (iii) residents with no direct involvement in household energy decision-making. These criteria ensured that participants were relevant and ethically suitable for the study.

3.5 Data Collection

Data collection is the process by which researchers get information from many sources to solve problems in a particular study. A researcher has to be familiar with a range of research tools in order to achieve the goal of triangulation. Primary data was collected from the selected Garden Compound participants using semi-structured questionnaires, FGDs and open-ended interviews. Conversely, secondary data on energy poverty and the utilization of alternative energy sources was collected from publications, online journals, and previous works published by various researchers.

3.5.1 Types of data

In order to get personal insight from Garden Compound residents who are directly impacted by energy poverty and to understand earlier research conducted by other researchers, the researcher gathered primary and secondary data for this study.

3.5.2 Primary data

Primary data is first-hand knowledge that is distinct (Kothari, 2004). In order to confirm the researcher's findings and ensure accurate data for triangulation, semi-structured questionnaires, focus group discussions and in-person interviews were used in this study. This allowed the researcher to discover new insights into the issue of energy poverty. Using a range of data collection techniques enhances the study's credibility in qualitative research.

3.5.3 Secondary data

Information that has been collected by previous research and is accessible to scholars is known as secondary data. It gives the researcher insight into the work of several scholars. Secondary data may be found in books, journals, newspaper articles, and theses. The researcher intended to collect secondary data in order to understand the issue of energy poverty at the local, continental, and global levels. For this study, secondary data on energy poverty was collected from published books, articles, and online journals.

3.6 Data collection tools

Different data collection tools were used for different categories of participants. The use of different tools allowed the researcher to collect both measurable trends and in-depth explanations suitable to each participant group.

3.6.1 Questionnaire

A questionnaire is a kind of research tool that consists of a set of questions intended to consistently gather responses from study participants. According to Creswell (2012), a questionnaire is a kind of survey design that participants fill out and return to the researcher. They might be organized, semi-structured, or unstructured. For this study, the researcher used a semi-structured questionnaire to get accurate data in a methodical manner. Questionnaires were administered to household heads to obtain quantitative data on energy sources, expenditure, and frequency of outages. Additionally, the researcher obtained all the background information required from the respondents at Garden Compound via semi-structured interviews.

3.6.2 Interviews

According to Ary (2010), an interview is a common method for obtaining qualitative data. It is used to find out what individuals believe, feel, and think about a certain situation. For this study, the researcher used an open-ended interview method to enable the Garden compound residents to freely express their opinions on the issue of energy poverty. Interviews were conducted with selected household heads and small business owners to explore decision-making processes and livelihood impacts. In this case, open-ended interviews allow the respondent to explain their interaction with certain problems without having to answer "yes" or "no." This allowed the researcher to fully understand the variety of experiences that the selected respondents had without limiting their responses. Additionally, the open-ended interviews allowed the researcher to understand more about Garden Compound's energy poverty.

3.6.3 Focus Group Discussions FGDs

Focus group discussions involved youth and adult community members to capture shared experiences and community-level coping strategies. There were two focus group discussions (FGDs): one with older member of the community and one with youth. These discussions were intended to document coping strategies, viewpoints, and common experiences related to energy poverty at the community level. Focus group discussions (FGDs) allowed participants to interact with one another, which allowed for the identification of common problems, social dynamics, and community responses that would not have come up in one-on-one interviews (Krueger & Casey, 2015).In addition to FGDs and interviews, document analysis was used as an extra method. This included looking at policy documents, ZESCO reports, and NGO publications to provide context and triangulate the raw data.

3.7 Data Analysis

The data analysis method used in this study was thematic analysis. This suggests that information was analyzed, categorized, and assessed based on related topics and significant themes that surface, such the impact on health, financial challenges, or coping mechanisms. Thematic data analysis is defined as "when data is collected, categorized, and analyzed according to themes and patterns observed from interrelated topics with key quotations, insights, and interpretations from the highlighted respondents" (Kombo and Tromp, 2006). Excel and Nvivo will be used to

categorize common themes and patterns in the numerical data, such as how much families spend on energy like charcoal. Additionally, they were used in the computation of fundamental statistics such as percentages and frequencies.

3.8 Reliability and Validity

According to (Creswell, 2018), "reliability refers to the consistency of measure." If a research instrument consistently yields consistent findings throughout several trials, it is deemed dependable. The main problem is the accuracy of the data collected. However, according to Morrison (2018), "validity is the extent to which the research accurately reflects the specific concept that the researcher is attempting to measure." As a result, all focus groups and interviews were audio recorded with the participants' consent and carefully transcribed to ensure the study's trustworthiness. The transcriptions were cross-checked for accuracy and coded in a systematic manner to guarantee consistency in the interpretation of responses.

Were as by comparing information from focus groups, interviews, and observations, the data was triangulated to ensure validity. Before the real interviews, a pilot study was conducted to make sure the instruments used were efficient in gathering data and that the questions were clear and relevant to the research.

3.9 Ethical Considerations

When conducting this study, the researcher took into account the following ethical principles: anonymity, confidentiality, informed consent, honesty, value neutrality, and non-guarantee. These guidelines were selected to guarantee that the respondents' names, phone numbers, addresses, and other personal information remain anonymous. Additionally, no information about the responders was to be released, and each participant received information about the research and its purpose so that they could make educated choices.

Additionally, the researcher maintained honesty at all times and neither misinterpreted the results nor altered their nature. In addition to making sure that the researcher's own beliefs did not affect how the data was interpreted, the researcher did not force her personal beliefs or ideas on the respondents.

Finally, Informed consent was obtained before data collection. Participants were provided with an information sheet explaining the purpose of the study, procedures, risks, and benefits. Verbal and

written consent were obtained prior to administering questionnaires, interviews, and FGDs. Participants were informed of their right to withdraw at any time without penalty. Permission to audio-record interviews and discussions was sought before recording began.

CHAPTER FOUR:

DATA PRESENTATION AND ANALYSIS OF FINDINGS

4.0 Introduction

This chapter involves a researcher presenting and analyzing his/her findings from the study conducted. The results are presented by the use of a mixed methods approach in line with the three (3) objectives that were indicated in chapter one, i.e., (i) to investigate how the adoption of alternative energy sources affects expenditure burden in Garden Compound. (ii) to examine what factors influence the adoption of alternative energy sources in Garden Compound. (iii) To ascertain how the adoption of alternative energy sources contribute to improved energy access in Garden Compound. The findings and analysis of the primary data gathered from the semi-structured questionnaires given out in the field and the in-person interviews that took place at Garden Compound are presented in this chapter. The researcher starts by outlining the semi-structured questionnaires' response rate, then the demographics (respondents' age, sex, occupation, educational attainment and marital statuses), and finally it presents a reflective discussion that shows the connection between the findings and relevant literature and the bigger debates on energy poverty in peri-urban areas.

Table 1: Questionnaire return rate

Number of selected candidates	Number of distributed Questionnaires	Number of returned questionnaires	Returned percentage
25	25	25	100%

Source: field work (Author, 2025)

Table 1 shows how many questionnaires were sent out and how many were returned for the research. To prevent the problem of the chosen 25 respondents requesting payment after taking part in the study, the researcher started by outlining the objectives of the research as well as the ethical considerations. The participants' willingness to openly discuss their concerns on the problem of energy poverty in Garden Compound made the research successful.

4.1 Demographic characteristics

Demographic characteristics are simply features within a population of a country. Age, gender, ethnicity, religion, and income are some of the characteristics that define them. Getting a proper understanding of the demographic characteristics of the respondents is imperative for the understanding and interpreting this study's findings. This is because people experience energy poverty differently and this is all owed to factors such as their age, gender, education, livelihood activities (occupation) and marital status. These demographic characteristics assist in explaining why certain people and households experience energy poverty differently and the section that follows presents the main demographic attributes of the respondents who participated in the study, tables and brief narrative descriptions support it.

4.1.1 Age of Respondents

Age is an important demographic factor because different age groups experience energy poverty differently. For example, it may affect people in a younger age group in terms of education, while individuals of a much older age group may be affected in terms of economic and family related disruptions. Therefore, understanding this attribute and how age is distributed in Garden Compound helps explain the differences in coping mechanisms, vulnerability levels and exposure.

Table 1 Age of Respondents

Years	Frequency	Percentage (%)
14-24	4	16
25-35	8	32
36-46	9	36
46 and above	4	16
Total	25	100

Source: Field data (Author, 2025)

Table 1 above shows the age ranges of the people who took part in the study. According to the table, 16% of the respondents were aged 14-24, 32% were aged 25-35, 36% were aged 36-46 and lastly, 14% of the respondents were aged 46 and above. The age range was considered for the purpose of obtaining different views from older people as well as younger people in terms of their understanding of energy poverty. The first group of people which made up 16% of the sample aged

14-24 highlighted how energy poverty has caused disruptions in schoolwork and the running of small businesses owned. The second age group of respondents which accounted for 32% of the sample aged 25-35 emphasized in their responses how energy poverty affected expenditure and also the informal businesses ran by them. The respondents aged 36-46 made up the larger portion of the sample which is 36%, they indicated in their responses how it is difficult to take care of their families and dependents due to toll taken on their budgets because of the constant need for traditional energy sources like charcoal. The age group of the sample were those aged 46 and above, these respondents accounted for 16% of the sample also indicated the implications energy poverty has on their ability to manage large families and care for those who depend on them.

4.1.2 Gender of Respondents

The respondents' gender is a significant factor in this study as it might affect how Garden Compound experiences and is affected by energy poverty. The roles and duties that men and women often have in the home might have an impact on their energy requirements and use habits. For instance, women are often more active in family energy management, cooking, and heating, therefore they are more directly impacted by high energy expenditures or restricted energy availability. Gender may also affect who can afford or access alternative energy sources by intersecting with income, employment, and decision-making authority. By looking at gender, the research may show possible differences in how people are impacted by energy poverty and pinpoint which groups could be more at risk, offering information for more equal energy initiatives.

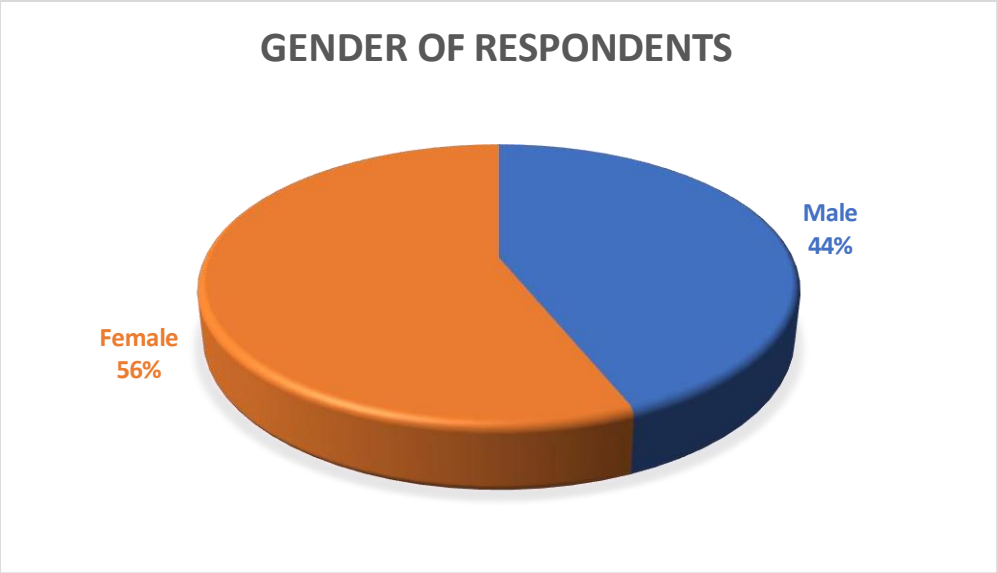

Figure 3: Gender of Respondents

Source: Field data (Author, 2025)

The sample of the study shows that 56% of the respondents were female where as 44% were male. The purpose of selecting male and female respondents was to help the researcher gain an understanding of how each of the sexes perceive the issue of energy poverty in Garden compound in accordance with their different gender roles as well as cultural backgrounds. This clearly shows that the majority of the people who took part in the study were female, the dominance in female respondents shows the reality of Garden compound. Women are the ones that are more exposed to energy poverty as they are the ones that carry out household responsibilities and overall run homes. They bring out in detail how most of the house hold work required some of energy for example, cooking and ironing and childcare can not be done without energy. The men on the other hand who accounted for 44% of the sample were mostly small business operators, they brought out the economic implication energy poverty has on their businesses and expenditure burdens they face.

4.1.3 Occupation of Respondents

Because occupation directly affects families' economic capacity and their ability to obtain and buy energy services, it is important to understand energy poverty in Garden Compound. A person's income level is typically determined by the kind of job they do, which has an impact on their capacity to pay for fuel, electricity, or other energy sources. Additionally, different occupations might influence patterns of energy use; for example, those who own small enterprises or work from home may need more energy than others who work elsewhere. In order to better understand

the causes and effects of energy poverty in the community and to promote more focused solutions, the study can determine which socioeconomic categories are most impacted by looking at respondents' jobs.

Table 3 Occupation of Respondents

Occupation	Frequency	Percentage (%)
Informal Business Owners	9	36
Formal Sector Employees	6	24
Unemployed	4	16
Student	6	24
Total	25	100

Source: Field work (Author, 2025)

Table 3 shows the occupation of the respondents. 36% informal business owners were the biggest category, indicating that many locals depend on modest, sometimes inconsistent sources of income. This can make it harder for them to regularly pay for energy services. 24% of respondents worked in the formal sector; while their income may be more steady, they make up a smaller percentage of the population. 16% of respondents were unemployed, indicating a demographic that is perhaps more susceptible to energy poverty because of their low income. Students, who accounted for 24% of the sample, can be dependent on family assistance or have little money, which might limit their access to energy.

4.1.4 Marital status of Respondents

Respondents' marital status is a crucial factor as it affects their family structure, income, and energy requirements. Incorporating marital status into this study aids the researcher in comprehending how family duties and composition impact energy use and access. Because bigger or lower-income families may have more difficulty fulfilling their energy demands, it also enables you to determine which groups are most susceptible to energy poverty.

Table 4 Marital status of Respondents

Marital status	Frequency	Percentage (%)
Single	5	8
Married	8	16
Divorced	7	20
Widow/ Widower	5	12
Total	25	100

Source: field work (Author, 2025)

The respondents' marital status reveals a diversity of household types in Garden Compound, which may have an impact on energy accessibility and demands. Of the twenty-five responders, five were widowed (12%), eight were married (16%), seven were divorced (20%), and five were single (8%). Married respondents may use more energy for everyday necessities like cooking and lighting since they often live in bigger homes. Living alone or with fewer family members may mean lower energy usage for divorced or widowed people, but it may also decrease combined household income, making energy services more difficult to pay for.

4.1.5 Educational level of Respondents

A key variable in this research is the respondents' level of education as it affects families' understanding, awareness, and energy-related decision-making. Access to knowledge about energy alternatives, comprehension of energy technology, and ability to make educated energy decisions are all impacted by education. As a result, education level offers significant background for appreciating differences in Garden Compound's energy choices and access.

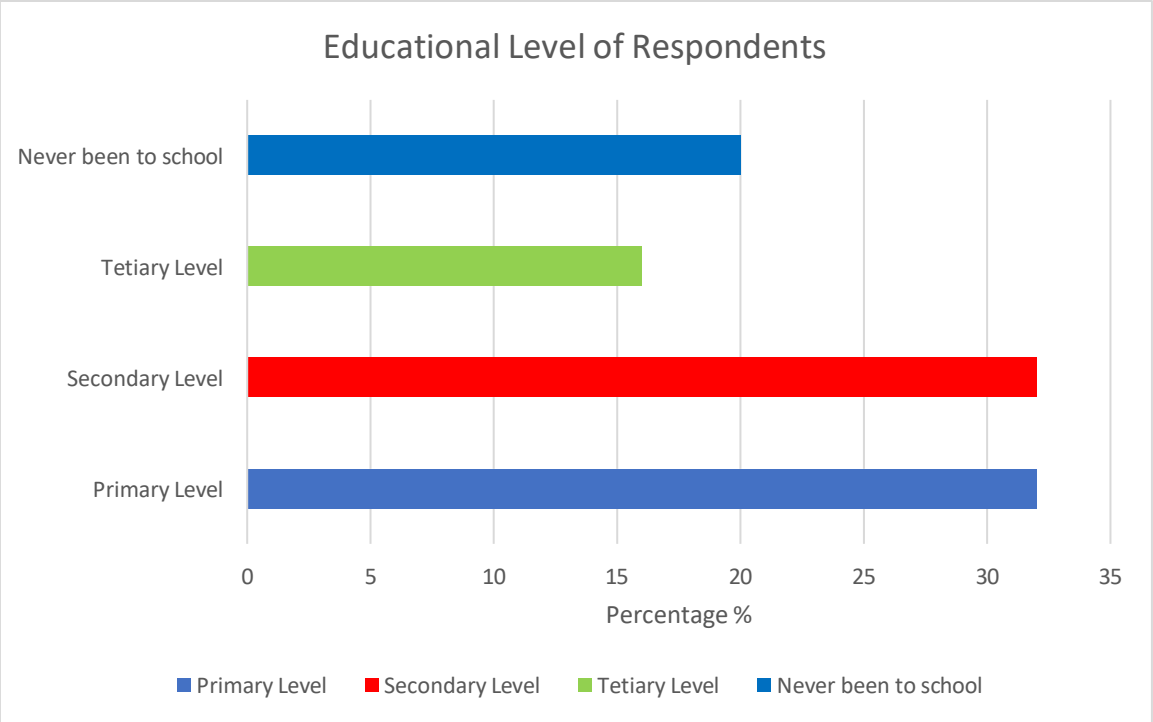

Figure 4: Educational Level of Respondents

Source: Field work (Author, 2025).

According to the findings, 32% of the participants had completed primary school, and 32% had completed secondary school. 20% of the respondents had never attended school, while just sixteen percent had completed higher education. These results show that most respondents had low to moderate levels of formal education. Since education level affects knowledge, understanding, and choices about energy alternatives, this educational profile is important in contextualizing energy poverty within the research area which is Garden Compound. Respondents with secondary and postsecondary education showed comparatively greater knowledge of alternative energy sources, such solar energy, and a better understanding of their long-term environmental and economic advantages. Consequently, it became clear that education level was a crucial socioeconomic factor explaining differences in Garden Compound's energy availability and adoption of alternative energy options.

4.2 How the adoption of alternative energy sources affects expenditure burden.

This objective explored how the adoption of alternative energy sources affects th expenditure burden in Garden compound. The results showed that most respondents' home energy expenditures in Garden Compound had not changed much. This was mainly because most homes had not embraced alternative energy sources since these technologies were expensive to buy or acquire. As a result, these families maintained their current cost burden by continuing to depend on traditional energy sources. Respondents who had used alternative energy sources, however, reported decreased energy-related costs, claiming that once implemented, these choices were more cost-effective. This suggested that alternative energy sources might lower household spending, but their total influence was still constrained by low adoption rates.

The findings indicated that expenditure was affected differently depending on the household. The first respondent was someone that had not adopted any form alternative source like solar, generators, charcoal briquettes etc. They highlighted how they have been spending the same amount of money to purchase energy sources like charcoal and sometimes wood in cases where charcoal is unavailable on the market. Respondent one, a household head said, "*the household energy budget never changed because we don't use these fancy things like solar or gas, we can not afford them. Rather than nothing it's better to use charcoal or firewood that can be bought in smaller sized portions."* This reflects the ongoing economic hardship on families trying to operate without sustainable energy sources due to the smaller portioned traditional ones available.

The findings further show that those that utilize alternative sources of energy like solar lamps and mini gas stoves spend less on energy than those that completely don't. They believed that the amount of money they used to spend on candles for lighting and charcoal for cooking has significantly been reduced. Respondent two, a formal employee, said " *Before I got a small gas stove I used to use charcoal, I thought it was better cause it can be bought in small portions for different prices. I also used to used candles cause they're cheaper, but I noticed that both candles and charcoal finish fast so you constantly need to buy more making it expensive as time goes by. I bought a gas stove and I noticed that the amount of money i used to spend on buying plastics of charcoal decreased because I don't constantly need to buy gas each time I want to cook. The gas cylinder I have small but it takes me three weeks before it finishes unlike charcoal that's bought daily unless you buy a whole sack which is now very expensive. The same goes for candles, I*

bought two solar lamps and I've never used candles since cause all I have to do is put in the sun to charge and it goes on." From this it can be deduced that traditional sources of energy despite being cheaper in smaller quantities is expensive overtime due to their fast depletion rate. Furthermore, if adopted in the right quantities, alternative energy has the ability to affect expenditure positively.

The findings also highlight that high adoptions rates can positively affect expenditure significantly, however, external factors can either exacerbate or lessen the effects of this. External factors such as the number of dependents in a household and inflation rate. Respondent three, a small business owner, has this to say " *I started using gas cause charcoal wasn't lasting long enough, gas is not as expensive once the cylinder and stove have been bought. It only becomes expensive if it being overused. I keep eight people and gas too can be expensive especially if their a lot of people frequently using it. It can be cheaper if the right amount is bought for the right number of people living in a house and expensive if you buy a wrong size cause you'd constantly have to refill it and if the dollar is high the expense is felt."* This reflects how household energy can affect expenditure but due to factors such as how big a household is and inflation rates, the positive impacts of this can be greatly reduced. A larger household needs more energy making more costly, where as inflation can either increase or decrease the expenditure of a household's energy.

In summary the findings show that the adoption of sustainable sources of energy can affect household energy expenditure either positively or negatively. For those with larger households and more dependents, more energy is required making the expenditure higher. Whereas those with smaller households require less energy making cheaper and thus the expenditure lesser.

4.3 Factors influencing the adoption rate of alternative energy sources.

Identifying and understanding the main factors responsible of whether or not Garden Compound homes used alternative energy sources was the goal of this project. In particular, the objective was to investigate the social, and economic factors that either promoted or prevented families from using alternative energy sources. By examining these variables, the study sought to shed light on the possibilities and obstacles influencing the uptake of alternative energy sources in the research region as well as to explain why adoption rates of various sources are either high or low. A bar chart was used to analyze and display the variables affecting the adoption of alternative energy

sources. The results showed that economic factors, especially the high initial cost of alternative energy technologies and low family income levels, had the most impact. Adoption rates were also impacted by social issues, such as a lack of knowledge on alternate energy sources. Household choices were also shown to be influenced by technical variables, such as the availability and dependability of alternative energy sources. Overall, the findings indicated that, despite the potential advantages of alternative energy sources, Garden Compound's adoption of them was limited by a number of interrelated constraints.

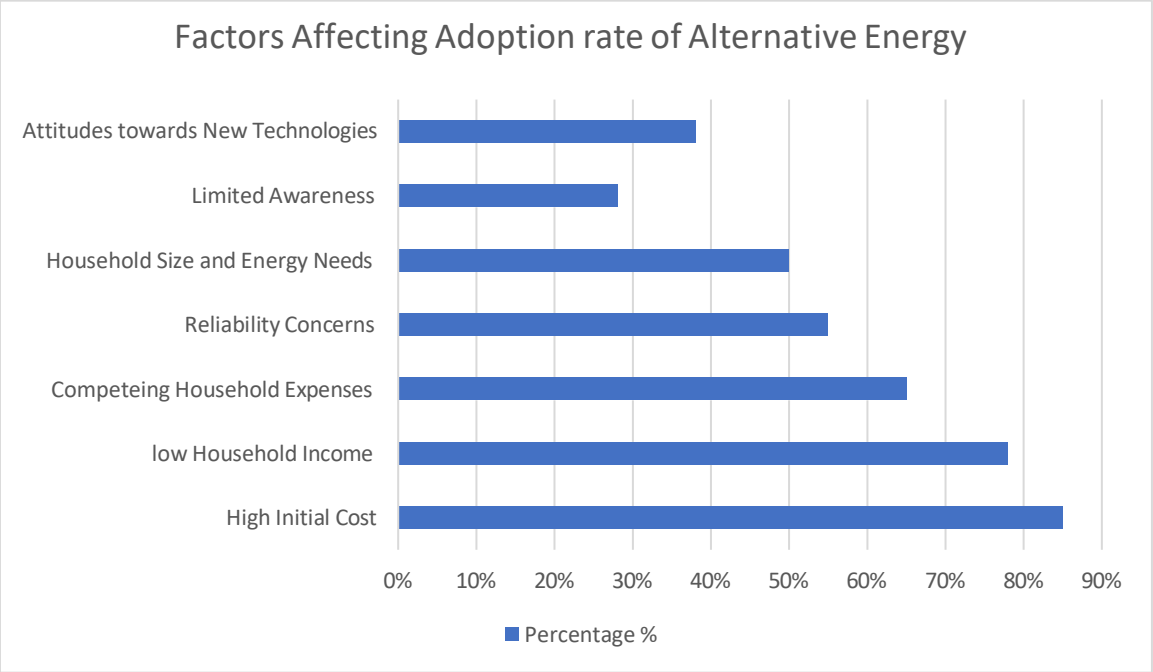

Figure 5: Factors Affecting Adoption Rate of Alternative Energy

Source: Field work (Author, 2025).

4.3.1 Economic Factors

4.3.1.1 High Initial Cost

80% the most often mentioned obstacle was the initial expense of purchasing alternative energy solutions, such solar panels or improved cookstoves. Respondent four, a formal employee, said, "*I work but I know that it would take more than half of my salary to just purchase a gas cylinder, that's why I've never bothered to purchase one."* Many respondents said that the initial cost was too large in comparison to their present financial capabilities, even if these technologies may save

long-term energy expenses. Households were deterred from switching to alternative energy by this high cost, which kept them dependent on less expensive but less sustainable traditional energy sources.

4.3.1.2 Low income Households

Households with low incomes were unable to invest in alternative energy sources. Many families did not have the money to pay for the expenses, even if they were aware of the advantages. Due to financial constraints, families were often obliged to put urgent requirements like food, rent, and school fees ahead of long-term investments in energy-saving equipment. Respondent six, a marketer, said "*Buying those technologies would be nice but I simply cannot afford them, I have an 11 year old daughter who need medical attention. If I used this little money on things of little importance I would be putting her in danger."* People often focus they're energy and attention to things they can't live without, things such as basic needs for instance, water, shelter and food.

4.3.1.3 Competing Household Expenses

Adoption of alternative energy sources has been hindered by households' many financial commitments. 65% of the responses highlighted how rent, food, medical costs, and school fees were often prioritized above energy technology investments. Respondent seven, a house hold head, had this to say "*I keep nine people including myself it makes ten, I'm barely able to pay rent from this small fritter business let alone be able to provide three meals a day. I wouldn't be able to afford any essential energy sources."* This aspect emphasizes that resource allocation within families is just as important to the adoption of alternative energy as cost. Similar to your findings about competing expenditures, families often prioritize short-term, immediate requirements like food, rent, and school fees above long-term energy solutions.

4.3.2 Social Factors

4.3.2.1 Reliability Concerns

Reliability issues accounted for 55% of the responses the respondents gave on why they hadn't adopted other energy sources aside conventional ones. Respondents voiced concerns over alternative energy systems' dependability and performance, some indicated how gas stoves have been the leading cause of houses getting burnt and others highlighted how solar is only well functional if there's adequate sunlight. Households were reluctant to abandon the traditional

energy sources they were familiar with and trusted because of these uncertainties, which decreased confidence in alternative energy alternatives. Households are reluctant to embrace renewable energy solutions if they believe the technology is unstable or difficult to maintain.

4.3.2.2 Household size and Energy Needs.

Adoption selections were impacted by the number of household members and their combined energy needs. For cooking, heating, and lighting, larger homes often demand more energy, and some alternative technologies may not be able to effectively supply these requirements. Because of this restriction, several families believe that alternative energy is not practical for their circumstances. 50% of the respondents believed that alternative energy sources had their advantages but just not in large households as the energy requirements are higher. Certain alternative energy technologies may not be enough for bigger homes with greater energy consumption, which would restrict their adoption.

4.3.2.3 Low Awareness

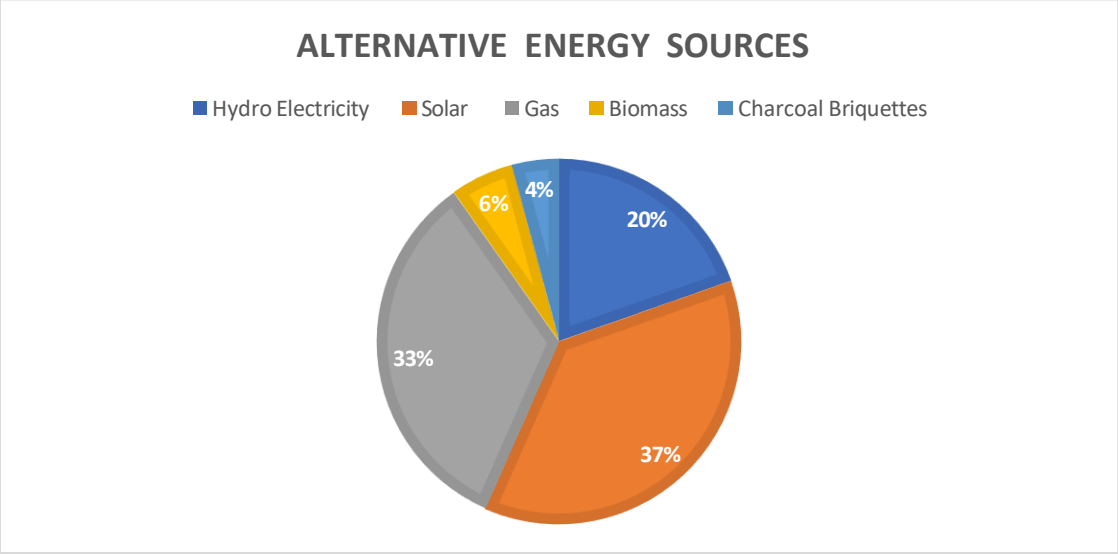

Figure 6: Awareness levels

Source: Field work (Author, 2025).

To understand the levels of awareness of alternative energy, respondents where given a list of various sources of energy and asked whether or not they were familiar with each. They're responses helped show how aware the community is of the topic being researched. The findings showed that a large number of people (37%) knew what solar energy was, they expressed great

fondness and relativity to it. (33%) of the respondents made up the second largest part of the sample, were able to explain and identify what gas energy was. 20% of the sample comprised of the people that knew what hydro electricity was and how it worked. Lastly the energy that was least known made up 4% (charcoal briquettes) and 6% (biomass) of the sample. This highlighted how little people were aware of other various sources of energy.

Some families are unable to accept alternative energy alternatives due to a lack of understanding about them. One example of limited awareness was not understanding which technologies were accessible, their advantages, or how to utilize them efficiently, like charcoal briquettes, 85% of the respondendts who took part in the research were learning about their existence for the very first time. That alone shows that many people only know about the common sustainable sources which are solar and gas, not all the other sources are known. Due to this knowledge gap, families are often unable to make well-informed choices on the transition to alternate energy sources.

4.3.2.4 Attitudes Towards New Technologies

Adoption is also influenced by cultural, individual, or behavioral views. Due to familiarity, mistrust of new technology, or apprehension about change, some families favored conventional energy sources. 38% of most respondent's kept on highlighting how some of these sources such gas have been the leading cause of house fires, this alone indicated a high level of mistrust and disregard for some alternative sources of energy. Respondent eight stated "*I know a man I used to work with, his daughter was left home with the helper, unknowingly she left the gas open and it exploded. Both her and the child died for extreme burn wounds. It was the highlight of the news. Some of things aren't safe to use just because my neighbor has it doesn't mean I should too."* Despite being less often mentioned than financial limitations, social and psychological aspects nonetheless had an impact on adoption choices by influencing households' receptivity to alternate energy sources.

4.4 How the adoption of alternative energy sources contribute to improved energy access.

This objective looked at the adoption of alternative energy sources as a crucial mechanism for improving energy access. Previous research has shown the importance of alternative energy sources, especially renewable technologies, in increasing energy access in peri-urban and low-

income populations (Bhattacharyya, 2013; IEA, 2022). The study's findings showed that although alternative energy sources improved household energy access, their total influence was still limited by low adoption rates.

4.4.1 Improved Access to Basic Energy Services

The results of the findings showed that homes in Garden Compound had better access to essential energy services, such as cooking, lighting, and phone charging, after implementing alternative energy sources, such as solar-based technologies and improved energy systems. Respondent nine, a small business owner, said, "*in my house, we use solar lights and a gas cooker, it helps a lot cause we don't stay in the dark or eat cold food when ZESCO takes their power away."* The availability and dependability of home energy services have been shown to be enhanced by renewable energy technologies in various developing settings, according to similar results (Bazilian et al., 2017). Alternative energy sources improved energy security and convenience for adopting families by reducing reliance on unstable grid power and conventional fuels.

4.4.2 Diversified Household Energy Options

Additionally, it was discovered from the findings of this study that by broadening household energy alternatives, the usage of alternative energy sources was proven to improve energy availability. According to earlier research, having access to clean, dependable, and reasonably priced energy for everyday family requirements is just as important as having a connection to electricity. Households in Garden Compound that used alternative energy technology were better able to reliably satisfy their energy demands, especially during times of power outages. Respondnet ten, a student, said " *I never used to be able to study at night cause of the power outages but its a lot better now cause the solar lamps help illuminate the house. Even if they're deam, im still able to read my school materials."* This enhanced family welfare and encouraged constructive pursuits like nighttime study and small-scale revenue-generating activities.

In summary, the research found that the usage of alternative energy sources improved Garden Compound's energy access, especially for homes who were able to get over technical, social, and economical obstacles. Adoption of alternative energy reduced certain elements of energy poverty

by improving the sustainability, affordability, and dependability of energy services. However, these advantages were not common due to the low level of acceptance. The results therefore indicated that in order to boost adoption rates and reinforce the significance of alternative energy sources in enhancing energy access in Garden Compound, specific policy initiatives, financial support systems, and awareness campaigns are required.

4.5 Discussion of Findings

By comparing the results with previous research, theoretical stances, and empirical data from related studies, this section offers a thorough analysis of the findings of the research. The objective is to provide context for the use of alternative energy sources in Garden Compound's efforts to reduce energy poverty and to show how the current research confirms, challenges, or expands upon existing knowledge. Although the raw data were reported in the sections before it, this discussion clarifies their significance, looks for underlying trends, and links them to more general discussions on energy vulnerability. The three distinct study objectives, each of which offers a more in-depth analysis of what the results show about the lived reality of families dealing with ongoing power outages, are used to organize the discussion.

4.5.1 How the adoption of alternative energy sources affects expenditure burden.

The first objective of the study's findings showed that Garden Compound families were still struggling financially as a result of lack of adoption of alternate energy sources. The results showed that the majority of families depended mostly on conventional energy sources including firewood, charcoal, and electricity from the national grid. These energy sources did not considerably lower family energy expenditures, despite being available in small quantities and being reasonably priced in the near term. As a consequence, families' total cost burden had not altered much. This result showed that families' ongoing financial hardship, especially in the setting of energy poverty, was exacerbated by the inability to adopt sustainable alternative energy sources.

This finding was in line with previous research, which has shown that low-income families are often exposed to inconsistent energy access and greater long-term expenses when they rely on conventional energy sources (Pachauri and Rao, 2013; World Bank, 2021). Rising conventional fuel costs and frequent power outages made households more vulnerable in peri-urban regions like Garden Compound. As a result, the research showed that families continued to be caught in a loop

of high costs and poor energy security in the absence of the adoption of alternative energy sources. The International Energy Agency (IEA, 2022) found similar findings, stating that families without access to sustainable energy often spend a higher percentage of their income on inefficient energy sources.

One of the other key insights showed that conventional energy sources were more costly over time because of their quick depletion, even if they were less expensive when bought in little amounts. According to the respondents, regular purchases of candles, firewood and charcoal raised their total monthly spending. Households that had switched to alternative energy sources, such solar and LPG, on the other hand, reported decreased long-term energy expenses. These families saw that, despite the high initial cost of purchasing alternative energy technologies, their energy expenditures gradually decreased when the systems were put into use.

This result demonstrated the long-term financial advantages of adopting alternative energy sources in suitable amounts. It was consistent with other studies demonstrating that, despite their substantial initial investment requirements, renewable energy solutions lower ongoing household energy expenses (Sovacool, 2012; UNDP, 2020). The results indicated that, in the context of Garden Compound, alternative energy sources would lessen the financial strain on households if obstacles like high upfront expenditures were removed. The International Energy Agency (IEA, 2021) observed similar results, noting that when backed by appropriate funding methods, renewable energy technologies enhance the affordability and dependability of energy supply for low-income families.

The third finding showed that how much money a household spent on energy depended on the type of energy source used, as well as the household's characteristics and the economy as a whole. The study showed that the size of the household and its energy needs had a big impact on how much they spent. Bigger households needed more energy for cooking, lighting, and other activities around the house, which raised energy costs no matter what type of energy was used. On the other hand, smaller households were better at managing their energy use and keeping their costs lower. Furthermore, it was shown that household energy spending was directly impacted by inflation. Households' capacity to invest in alternative energy alternatives was hampered by rising costs associated with energy sources and related technology. Adoption rates were slowed by inflation's impact on the cost of solar, gas, and other alternative energy technologies. Nonetheless, those using alternative energy sources spent less on energy than those depending only on conventional sources

during times of relatively stable pricing. These results were in line with the World Bank's (2022) assessment that low-income families are disproportionately affected by inflation since it raises the price of necessities like electricity.

Overall, the study showed that even though alternative energy sources might help households save money on energy in Garden Compound, how much they help depends on how big the household is, how much money they make, and what the current economic conditions are like. Many families were still unable to take on alternative energy sources in the absence of supporting measures including subsidies, awareness campaigns, and accessible finance choices. This result matched regional studies performed in Sub-Saharan Africa, which stressed that successful energy changes among low-income families require both technology access and helpful socio-economic policies (UNDP, 2020; World Bank, 2021).

4.5.2 **Factors influencing the adoption rate of alternative energy sources**.

The second objective examined the factors that affected the adoption rate in Garden Compound and found that a number of important factors that affected Garden Compound families' adoption rates of alternative energy sources. Eighty percent of respondents said that the upfront cost of purchasing alternative energy technology, including solar systems or gas equipment, was unreasonable, suggesting that high initial prices were the biggest obstacle. This result indicated that families' capacity to participate in sustainable energy solutions was directly restricted by financial limitations. It is consistent with the Sustainable Livelihoods Theory, which highlights the importance of families having access to financial resources in order to acquire assets that enhance well-being (DFID, 1999). Low-income households found it difficult to get funds for alternative energy investments, which increased their reliance on conventional energy sources and made them more susceptible to economic shocks.

According to 78% of respondents, poor household incomes were the second main reason why adoption was low. The adoption of alternative energy technology was treated as secondary to the urgent demands of low-income households, such as food, rent, and education. This result is in line with the Energy Poverty Theory, which defines energy poverty as a consequence of cost as well as a lack of access to energy (Bouzarovski, 2014). Low-income families often couldn't afford alternative energy sources, even when they were theoretically feasible, which perpetuated cycles of high energy costs and energy insecurity.

Concerns about reliability also came up as an important issue. Due to concerns regarding reliable performance, upkeep needs, and technology durability, several families were reluctant to switch to alternate energy sources. Unreliable systems, according to respondents, might make energy access worse rather than better. The Energy Poverty Theory, which emphasizes that for families to really benefit from energy services, they must be not only inexpensive and accessible but also dependable and sustainable, provides support to this conclusion (Sovacool, 2012).

Adoption rates were also shown to be influenced by household size and power needs. The expense and difficulty of implementing alternative energy sources rose because larger families needed more energy to satisfy their daily demands for cooking, lighting, and heating. Given that household composition affects resource allocation and the ability to mobilize funds for investments, this conclusion is in line with the Sustainable Livelihoods Theory. The initial cost of alternative energy solutions was comparatively more difficult for households with a large number of members due to their greater energy usage.

Additionally, the findings indicated that adoption was also greatly impacted by attitudes regarding new technology. Because of accounts of explosions and accidents, respondents expressed concern that certain energy sources, especially gas, were dangerous. Adoption faced social and psychological obstacles as a result of this notion. According to the Energy Poverty Theory (Bouzarovski and Petrova, 2015), perceptions of risk might keep families from using energy even when it is accessible and reasonably priced. This maintains energy insecurity. Therefore, addressing these issues by means of safety education and awareness campaigns may increase adoption rates.

Lastly, one obstacle mentioned was a lack of knowledge regarding alternative energy methods. The availability, potential advantages, and appropriate use of sustainable energy choices were unknown to many families. Adoption and informed decision-making were hampered by this ignorance. Both the Sustainable Livelihoods Theory and the Energy Poverty Theory apply here: families are less able to get and utilize resources that might improve livelihoods and lessen energy poverty if they lack sufficient knowledge (human and social capital).

Overall, the results show that a mix of social, and economic factors affect Garden Compound's adoption of alternative energy sources. Reliability, family size, attitudes, and knowledge influence

adoption choices, but high expenses and low income continue to be the biggest obstacles. The Energy Poverty Theory's application demonstrates how household energy security is influenced by energy service cost, accessibility, and attitudes. Concurrently, the Sustainable Livelihoods Theory highlights the relationship between energy adoption, financial resilience, and general well-being by showing how families' limited resources and conflicting demands impact their ability to invest in sustainable energy.

4.5.3 How the adoption of alternative energy sources contribute to improved energy access.

The results of the research showed that Garden Compound's use of alternative energy sources enhanced home energy access. First, the research demonstrated improved access to essential energy services for homes using alternative energy sources. For example, those who used gas or solar power reported more reliable access to cooking and electricity than those that only used conventional sources like firewood, charcoal, or irregular grid electricity. According to this research, alternative energy sources lessened the difficulties and limits associated with traditional energy sources by giving families dependable and easily accessible energy for everyday needs.

This finding is in line with research done in Sub-Saharan Africa, where households that were previously limited by unstable grid connections or costly fuel alternatives found that the use of solar home systems and liquefied petroleum gas (LPG) greatly improved their access to energy (IEA, 2021; Sovacool, 2012). Small-scale solar and upgraded cookstoves also boost family energy security, especially in low-income areas with limited access to conventional power, according to local studies conducted in Lusaka and other peri-urban settlements in Zambia (UNDP, 2020; Mwape et al., 2018). Alternative energy sources decreased the rate of energy shortages and improved families' ability to fulfill their daily needs by offering a reliable energy supply.

Secondly, the study revealed that the usage of alternative energy sources made it possible for families to have a variety of energy alternatives, giving them access to a greater range of energy services than those provided by conventional sources. For instance, gas-powered homes might cook more effectively and securely, while solar-powered homes could power minor appliances, lights, and phone charging. Households were able to become less dependent on a single energy source because to this diversity, which improved their adaptability and resilience against energy

shortages or price swings. The Sustainable Livelihoods Theory, which highlights the use of a variety of resources and tactics to increase household resilience, is likewise consistent with diversification (DFID, 1999).

The above finding is also supported by research conducted internationally. Studies conducted in Kenya and India showed that households using a mix of gas, solar, and upgraded cookstoves had better access to modern energy services, lower fuel costs, and more energy security than households using only traditional fuels (Pachauri and Rao, 2013; Barnes et al., 2011). Regionally, research conducted in Southern African peri-urban areas revealed that households utilizing a variety of energy sources were better equipped to deal with erratic fuel prices and unstable grid electricity, demonstrating that energy diversification enhances access, efficiency, and sustainability (IEA, 2021; UNDP, 2020).

Overall, the results show that Garden Compound's minimal usage of alternative energy sources increased the variety of home energy alternatives and provided more dependable access to basic energy services. These improvements have reduced reliance on costly and sometimes unreliable conventional energy sources while increasing home energy security. The data shows that including alternative energy technologies into home energy systems is a workable way to reduce energy poverty and encourage sustainable energy access, especially in peri-urban areas where conventional energy sources are inefficient or unreliable.

CHAPTER FIVE:

CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This is the study's last chapter, which simply summarizes the findings and then concludes and gives recommendations on the research results. The suggestions come when the researcher concludes the results in accordance with each of the three objectives.

5.1 Summary of the Findings

The study examined the adoption of alternative energy sources and their contribution to alleviating energy poverty among households in Garden Compound, Lusaka. A questionnaire on home energy sources, energy expenditure, adoption of alternative energy technologies, and factors affecting adoption was used to gather data from a selected group of families. Frequencies, percentages, tables, and bar charts were among the descriptive statistical methods used to analyze the data. This allowed for the identification of important trends and repeated trends connected to home energy access and usage.

The results showed that most Garden Compound homeowners' energy costs had not significantly decreased as a result of the use of alternative energy sources. This was due to the fact that many respondents had not embraced alternative energy technology and were still dependent on conventional energy sources like firewood, charcoal, and electricity from the national grid. The research revealed that these conventional sources were expensive over time because of frequent purchases and quick depletion, even if they were cheaper when bought in little amounts. As a result, families were still burdened with high energy costs and persistent financial difficulties. However, households that had adopted alternative energy sources, such as solar energy and gas, reported improved affordability in the long term, indicating that alternative energy adoption had the potential to positively influence household expenditure when implemented appropriately.

The research found that the biggest obstacles to the adoption of alternative energy sources were low family incomes and high initial prices. Many families placed basic needs like food, rent, healthcare, and education before investing in energy innovations, according to an analysis of the questionnaire replies. Competing family costs, worries about reliability of alternative energy

systems, household size and energy needs, unfavorable attitudes toward new technology, and a lack of knowledge about available alternative energy sources were among the other factors found. The adoption rate of alternative energy sources in Garden Compound was limited by social attitudes, economic limitations, and awareness limitations, according to a thematic grouping of these replies.

The results also showed that families who chose alternative energy sources had better access to energy. Even during times of power outages, these families reported having improved access to basics energy services like cooking, lighting, and phone charging. Additionally, families were able to widen their energy choices by using alternative energy sources, which decreased their dependency on a single energy source and increased their resistance to price fluctuations and energy shortages. Repeated response patterns were used to identify this range of responses, which was supported by a comparison of homes using alternative energy sources with those utilizing conventional ones.

5.2 Conclusion

The research came to the conclusion that using alternative energy sources might significantly reduce energy poverty and enhance Garden Compound households' access to energy. However, the results demonstrated that financial limitations—specifically, high upfront expenses and low family incomes—kept adoption rates low. Because of this, many homes continued to depend on conventional energy sources, which over time placed a huge cost burden even though they were inexpensive in little amounts. Households' capacity to get sustainable and secure energy access was hampered by this ongoing dependency, indicating that Garden Compound's energy problems went beyond supply to include concerns about long-term sustainability and cost.

In terms of household energy access and welfare, the study demonstrated that alternative energy sources contributed positively to improved access to basic energy services for households that had adopted them. These households experienced more reliable lighting, improved cooking options, and greater flexibility in meeting daily energy needs. The diversification of household energy sources reduced dependence on a single energy option and increased resilience to power outages and fluctuating energy prices. Despite these benefits, the impact of alternative energy adoption

remained uneven, as many households were unable to overcome financial, informational, and perceptual barriers.

Lastly, the results showed that low-income and bigger families suffered the most by the decreased usage of alternative energy sources, which worsened already-existing socioeconomic gaps. While lower-income families continued to be at risk of energy insecurity, those with higher incomes were better able to put money into alternative energy technologies and enjoy better energy access. In order to encourage broader use of alternative energy sources, the research emphasized the need of focused interventions, such as accessible finance channels, awareness campaigns, and supporting energy legislation. In addition to increasing home energy security, expanding access to sustainable energy technology will boost livelihoods and lessen vulnerability in peri-urban areas like Garden Compound.

5.3 Recommendation

The following recommendations are proposed for key stakeholders to mitigate energy poverty and the factors hindering the adoption of sustainable energy sources in Garden Compound, based on the findings of this study:

1. **Strengthen community awareness and education on alternative energy sources:** The study recommends developing confidence and increasing acceptability would be facilitated through community-based demonstrations, training sessions, and information sharing among local leaders. Raising awareness will stimulate the usage of sustainable energy solutions and enable families to make educated energy decisions.
2. **Introduce affordable financing and subsidy schemes for alternative energy technologies**: These measures would make solar energy, gas, and other sustainable solutions more widely available and lessen the initial cost stress on low-income families. Increasing affordability would put consumers in a better position to switch from expensive conventional energy sources to more dependable and sustainable options, lowering long-term energy costs and energy poverty.
3. **Promote reliable and context-appropriate alternative energy systems:** By introducing alternative energy solutions appropriate for the residents of Peri-urban areas which

includes large households that require more energy, the adoption rate increases, for instance, biomass.

4. **Support community-based and cooperative alternative energy initiatives:** The report suggests supporting cooperative or community-based energy initiatives including energy cooperatives, shared solar systems, and communal charging stations. Households might increase access to secure energy services while lowering individual expenses by pooling resources. Long-term sustainability, social cohesion, and communal ownership would all be strengthened by community-managed energy solutions.

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APPENDIX

UNIVERSITY of LUSAKA

SCHOOL OF EDUCATION, SOCIAL SCIENCES AND TECHNOLOGY.

RESEARCH QUESTIONNAIRE AND INTERVIEW GUIDE

Title:

Investigating the Adoption of Alternative Energy Sources in Alleviating Energy Poverty in Garden Compound, Lusaka.

Purpose of the Study:

This questionnaire is designed to collect information on household energy use, adoption of alternative energy sources, expenditure burden, and access to energy services in Garden Compound. The information collected will be used strictly for academic purposes and treated with confidentiality.

6.0 Section A: Demographic Information

1. Age:
2. Gender:
3. Marital status:
4. Highest level of education attained:

5. Occupation / main source of income:
6. Number of people in the household:

6.1 Section B: Current Household Energy Use

7. What are your main sources of energy for cooking?
8. What sources of energy do you use for lighting?
9. How often do you experience electricity outages in your area?
10. Which energy source do you rely on most and why?
11. How reliable do you consider your current energy supply? Please explain.

6.2 Section C: Energy Expenditure Burden

12. Approximately how much do you spend on energy per week or per month?
13. Which energy source costs you the most?
14. Has your energy spending changed over time? Please explain.
15. How do energy costs affect your household budget and daily life?
16. In what ways does energy poverty affect your livelihood activities (business, study, home activities)?

6.3 Section D: Adoption of Alternative Energy Sources

17. Have you adopted any alternative energy source (e.g. solar, gas, charcoal briquettes, improved cookstoves)? Please specify.
18. What motivated you to adopt or not adopt alternative energy sources?
19. What challenges prevent you from adopting alternative energy sources?
20. How affordable are alternative energy technologies for your household?
21. What attitudes do people in your community have toward alternative energy sources?

6.4 Section E: Energy Access and Impacts

22. How has the use of alternative energy affected your access to basic energy services?
23. Has alternative energy improved your business, study, or household activities? Please explain.
24. How does energy availability affect health, education, and income in your household?
25. What coping strategies do you use during power outages?
26. In your opinion, how can energy poverty be reduced in Garden Compound?

INTERVIEW GUIDE (HOUSEHOLDS & BUSINESSES)

1. Can you describe the energy sources your household uses daily?
2. How does energy poverty affect your life and work?
3. What made you choose your current energy sources?
4. Have you tried solar, gas, briquettes or other alternatives? Explain your experience.
5. What problems do you face when accessing reliable energy?
6. How do energy costs affect your household or business income?
7. What happens in your household during power outages?
8. What changes would you like to see in energy provision in Garden Compound?

E. FOCUS GROUP DISCUSSION (FGD) GUIDE

1. What are the common energy sources used in Garden Compound?
2. What challenges do people face with electricity and charcoal?
3. Are people adopting solar, gas, or briquettes? Why or why not?
4. How does energy poverty affect education, health, and businesses in the community?
5. What coping strategies are used during load shedding?

6. What attitudes do people have toward alternative energy?
7. What can government, NGOs, or the community do to reduce energy poverty?

A. PARTICIPANT CONSENT FORM

Title:

Investigating the Adoption of Alternative Energy Sources in Alleviating Energy Poverty in Garden Compound, Lusaka.

Introduction

You are invited to take part in a research study conducted for academic purposes. The study seeks to understand household energy use, adoption of alternative energy sources, and how these affect energy poverty in Garden Compound.

Your participation is voluntary. You are free to decline or withdraw at any time without any penalty. The information you provide will be treated with confidentiality and used strictly for academic purposes. Your name will not appear in the report.

There are no direct risks involved in participating in this study. The results will help improve understanding of energy challenges and solutions in peri-urban communities.

Consent Statement

I have understood the purpose of the study and agree to participate.

Participant's Name: _____

Signature / Thumbprint: _____

Date: _____