

UNIVERSITY *of* LUSAKA

SCHOOL OF SOCIAL TECHNOLOGY AND SOCIAL SCIENCES

**An Assessment of the Adoption Rate of Alternative Energy Solutions Promoted by
Development Partners: A Case of Chainda Compound, Lusaka.**

A DISSERTATION

**Submitted to the School of Technology and Social Sciences in partial fulfilment of the
requirements for the award of Bachelor of Arts in Development Studies.**

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ACRONYMS

AES	Alternative Energy Solutions
BGFA	Beyond the Grid Fund for Africa
BGFZ	Beyond the Grid Fund for Zambia
CDF	Constituency Development Fund
DFID	Department for International Development (UK)
DOI	Diffusion of Innovations (Theory)
EIB	European Investment Bank
ERB	Energy Regulation Board
IEA	International Energy Agency
LPG	Liquefied Petroleum Gas
LTDRP	Lusaka Transmission, Distribution and Rehabilitation Project
MECS	Modern Energy Cooking Services
NGO	Non-Governmental Organization
PAYG	Pay-As-You-Go
PV	Photovoltaic
RETs	Renewable Energy Technologies
SDG	Sustainable Development Goal (Affordable and Clean Energy)
SEforALL	Sustainable Energy for All
SHS	Solar Home System
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model


TPB	Theory of Planned Behaviour
UKAID	United Kingdom Aid (formerly DFID)
UNDP	United Nations Development Programme
UNILUS	University of Lusaka
WHO	World Health Organization
ZamStats	Zambia Statistics Agency
ZEDSI	Zambia Energy Demand Stimulation Incentive
ZESCO	Zambia Electricity Supply Corporation (national power utility)
ZMW	Zambian Kwacha (Zambian currency)

DECLARATION


Student's part

I **MAIMBO MUNENGE** do hereby solemnly declare that this dissertation represents my own work, except where otherwise acknowledged and that it has never been previously submitted for a degree at the University of Lusaka or any other university.

Date: 24TH DECEMBER 2025

Signature: 

Supervisor Part

I,  _____ guided, read, and approved this dissertation for submission. I am satisfied that this is the original work of the author under the name it is presented. I confirm that the work has been completed satisfactorily and ready for submission.

DEDICATION

This work is dedicated to the people who have held me up throughout this journey.

To my mother, Muleya Masempela, whose love never falters and whose strength knows no bounds.

To my father, Munenge Maimbo, whose quiet guidance and unshakable belief in me have been a compass.

And to my sister, Chipu Maimbo, whose friendship and encouragement have been constants in my life.

Without you, none of this would have been possible.

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To my family my mother Muleya Masempela, my father Munenge Maimbo, and my sister Chipso Maimbo I offer my deepest appreciation. Your love, countless sacrifices, and constant belief in me have been my anchor. I share this accomplishment with you.

Lastly, I recognize the important work of the scholars and authors cited in this study, whose research provided the groundwork upon which my own is built.

To all, thank you.

ABSTRACT

This research assessed the adoption of alternative energy solutions (AES) advocated by development partners in Chainda Compound, Lusaka. The study explored household experiences and usage patterns concerning specific AES; the socio-economic, perceptual, and cultural factors that influence adoption decisions; and community perceptions regarding the promotional strategies implemented by development partners.

Utilizing a mixed-methods framework within a descriptive cross-sectional case study design, the target population encompassed all households in Chainda Compound. A sample size of 100 households was determined, with 86 households successfully participating through simple random sampling techniques. Data collection was by semi-structured questionnaires administered to households. Quantitative and qualitative data was analyzed using descriptive statistics and thematic analysis, respectively.

The principal findings revealed that households predominantly engaged in energy stacking, opting for multiple energy sources such as bio-mass energy, fossil fuels and hydro-electricity concurrently, rather than fully transitioning to AES. There was prevalent dissatisfaction with the unreliability of national grid electricity service fueling interest in AES. Pay-as-you-go solar home systems were the most widely adopted AES. However, sustained adoption faced economic constraints such as low household incomes and substantial initial or maintenance costs. Additionally, a strong cultural inclination towards charcoal particularly for cooking and safety concerns regarding certain modern alternatives further hindered behavioral changes. While promotional strategies like door-to-door marketing effectively raised initial awareness, they proved less effective in mitigating post-adoption challenges, resulting in notable discontinuation rates associated with technical failures and financial hardships.

In light of these findings, the study proposes several recommendations: development partners and policymakers should enhance local after-sales service and maintenance networks for AES; financing models ought to be diversified to better accommodate the irregular income patterns typical of low-income households; enforcement of product quality standards is essential for fostering consumer trust; and awareness campaigns should be tailored to specifically address cultural norms and safety perceptions related to clean cooking and energy use practices. Furthermore, it is advisable to integrate AES planning into broader urban development strategies for informal settlements and conduct longitudinal studies to gain insights into the long-term sustainability of adoption.

CHAPTER ONE

INTRODUCTION

1.1. Introduction

This chapter provides the foundational aspects of the study with the purpose of establishing the context, rationale and framework regarding the problem of inquiry: household adoption of alternative energy solutions in Chainda Compound, Lusaka. The chapter is organised into subsections. The Background to the Study, outlines aspects of energy, the structure, challenges and related global, regional and national initiatives. The Statement of the Problem describes the major issue of persistent low adoption rates of alternative energy solutions. The chapter then brings out the General and Specific Objectives and the guiding Research Questions. It further outlines the Significance of the Study, the Scope of the Study, and acknowledges the Limitations of the Study.

1.2. Background to the Study

Access to appropriate, adequate and consistent energy sources is important for attaining and sustaining economic transformation; industry growth; provision of economic and social goods and environmental sustainability. Energy ought to be affordable and reliable in order for every sector of the economy to run efficiently, including activities on which households primarily depend such as cooking, lighting and use of appliances. Energy influences sectors of health, education, commercial services, agriculture and entrepreneurship (World Bank, 2022). Recent international discourse is increasingly focusing on alternative and sustainable energy under the United Nations Sustainable Development Goal 7 (SDG 7). The aim is to enhance accessibility to affordable, reliable, sustainable, and modern energy for all. While global commitments point at achieving set targets by providing avenues that can be taken to improve access to clean and affordable energy, Sub-Saharan Africa remains constrained in this respect (UNDP, 2024).

Statistics indicate that more than 600 million people in Africa do not have access to electricity with over 900 million still dependent on traditional energy sources, including firewood, charcoal and biomass for heating and cooking (IEA, 2023). These practices remain condemned and discouraged for their negative effects on the environment and population health. The challenges of deforestation, loss in biodiversity, air pollution and respiratory diseases are all attributable to unsustainable uses of energy (World Health Organization, 2022). Resource

depletion is a big challenge, especially in urban areas where biomass fuels are scarce and fast-depleting due to population pressures (Atteridge, Heneen & Senyagwa, 2013; Eberhard et al., 2021).

Zambia presents an example of an African country whose efforts at adopting alternative energy remains constrained. Over 50 per cent of the Zambian population have access to electricity. However, this is unevenly distributed with urban areas taking up 80 per cent while rural areas are under-supplied (ZamStats, 2023). Peri-urban areas are also at the peripheral of the electricity supply system, especially in the densely populated compounds of Lusaka. Many of these areas are unplanned, making electricity connection a challenge. Besides, connection fees are too high; supply is unreliable; load-shedding is frequent with less than five hours of supply by 2025. This forces households to adopt the nearest possible and cheap energy such as charcoal and firewood – a phenomenon describing households trading back to primary traditional energy sources (Energy Regulation Board, 2025). This presents a scenario of entire communities not adopting sustainable energy sources, adopting methods that deplete natural resources and affect public health (WHO, 2022).

While this scenario presents true, Zambia is among countries in Africa and the region which have shown commitment to promote alternative energy solutions, incorporating multi-stakeholder approaches with the government, community actors, private organisations, and international partners. In Zambia, access to alternative energy has been accelerated by various actors including development partners, particularly in underserved areas such as rural and low-income high-density urban settlements. Major areas of focus are financing, upgrading infrastructure, private sector support, innovation and demand stimulation. These partners are a significant contribution in the response to increase access to energy among low-income, peri-urban communities (SEforALL, 2025; European Union, 2024).

Since 2020, development partners in Zambia have developed community initiatives, building on the early Beyond the Grid Fund for Zambia (BGFZ), providing grants to off-grid companies providing energy solutions and to encourage domestic household solar systems and mini-grids among peri-urban and rural areas (BGFA, 2022). Among the companies which have actively participated are RDG Collective, VITALITE Zambia and Zengamina Power. These continue to offer low-cost PAYG technologies. The uptake of these has been growing steadily due to the flexible payment models (BGFA, n.d.). These efforts illustrate how performance-based grants can de-risk investment and increase adoption of alternative energy sources. Another initiative

is Zambia Energy Demand Stimulation Incentive (ZEDSI), which facilitates grants for productive-use energy services for refrigeration, power for schools and health centres (Rockefeller Foundation, 2024). ZEDSI initially disbursed US\$1.1 million to ENGIE Energy Access Zambia, OnePower Zambia, and Renwasol/Solar23, for them to expand operations in peri-urban settlements such as Chainda (Rockefeller Foundation, 2025).

Other development partners focus on grid connection programmes to reduce the cost of connecting households to the national grid. For example, the European Union's Lusaka Transmission, Distribution and Rehabilitation Project (LTDRP), by the Global Gateway programme targets high-density, low-income. A grant of €7 million aims to support 63,000 subsidised households (European Union, 2024). There are also parallel investments under the European Investment Bank and World Bank to further improve grid reliability and reduced outages (EIB & World Bank, 2024). Among the notable private-sector actors are ENGIE Energy Access, OnePower, and Renwasol (Rockefeller Foundation, 2025). Some of the commendable initiatives adopted in Zambian compounds, including Lusaka are solar solutions for households; improved brazier designs; Liquefied Petroleum Gas (LPG) and processed coal. These are available under various initiatives aimed at promoting cleaner and affordable energy to low-income households.

Various companies and institutions have come on board to facilitate alternative energy solutions among compounds in Lusaka. Some of the notable ones are Vitalite and SupaMoto which use pay-as-you-go (PAYG) models aimed at making renewable energies more affordable and accessible (UNDP, 2024). While these solutions are acclaimed as fitting for the high-density and low-income groups, adoption rates remain low (Glemarec, 2017; Eberhard et al., 2021). In the case of Lusaka compounds, the cost of charcoal, the major source of energy has gone much higher than before. An example is where charcoal in Chainda costs as much as ZMW700 per bag, a monthly rate higher than the cost of LPG. Households still pay a higher electricity charge for lighting and heating (for a few hours under the load-shedding schedule) than they would for alternative solar solutions. It is concluded that the overall monthly expenditure per household is still high for most households – yet few are switching to alternative energy.

Various factors are cited as contextually affecting adoption of sustainable energy solutions. Among them, Koomson and Danquah, (2022) mention affordability, household income, gender dynamics, technology adoption, education/awareness, safety perceptions and cultural factors.

This therefore reveals a significant gap in the understanding of how the adoption of alternative energy has not received correlated attention and acceptance among households in high-density compounds of Zambia, such as Chainda Compound of Lusaka. It is evident that both practitioners and researchers have not fully explored micro-determinants of energy adoption within informal urban settlements of Lusaka.

Chainda Compound is an informal settlement in Lusaka East facing a significant energy problem. While most of the area is connected to the national electricity grid under ZESCO, there is an increasingly poor supply of electricity, exacerbated by long hours of load-shedding; unresolved faults; poor connectivity and high cost of electricity. The only available alternative power source for the community is a diesel-powered generator which serves the local market. Chainda Compound has not benefited from any community-focused alternative energy solutions such as solar. This makes the area vulnerable to the use of unsustainable energy sources. The area has a high demand for charcoal which is supplied freely at many locations within the compound. There are notable itinerant traders selling oil lamps, kerosene and candles at low cost. Few households, if any have sustainable alternative energy solutions.

Chainda Compound has been an area of focus for alternative energy solutions suppliers, among them the PAYG Vitalite and SupaMoto. Evidence reveals that a number of households subscribe to these services with a slowly increasing adoption of clean energy technologies such as solar, improved cook-stoves, and LPG. For example, households and small businesses have benefited from the RDG Solar PRIME package. Beneficiaries have received RDG Refrigerators, Solar Water Pumps, Smartphones and Solar Home systems (SHS) on flexible payment terms. They are able to store their fresh foods, have lighting and work from home. Businesses are able to work day or night without interruption with increased customers and income (RDG, 2022).

The persistent energy deprivation in compounds such as Chainda underscores the urgency of the need to adopt context-specific measures to address the underlying socio-economic factors influencing adoption. Since the area is exposed to both traditional and better energy alternatives, it is important to understand the decision-making models that make a household adopt or reject alternative energy solutions. This is largely absent from policy, programs and other interventions. An evidence-based approach through research can adequately inform strategic decision-making, including local authorities, policymakers and development partners committed to accelerating Zambia's transition to sustainable energy, even under SDG7.

The status quo of Chainda Compound with regards adoption of clean alternative energy indicates that there are situational factors, perhaps unique to the area which necessitate or inhibit adoption. Being a low-income, high-density settlement, probable factors may include household income, awareness levels, perceived benefits, affordability cultural preferences, and safety concerns. These variables have been researched in the adoption of other services in health, education, sanitation, household technologies, commercial services and settlement.

Further, the problem of energy has been an active aspect of public concern for many years with its urgency exacerbated by the energy crisis facing Zambia where low-income households are most vulnerable. It is also a pressing challenge in the development of Zambia's urban areas requiring sufficient access to energy. While Chainda Compound is receiving significant Constituency Development Funding (CDF) in infrastructure, roads, drainages, health and education, there has not been related focus on alternative energy such as solar street lighting or household interventions. Available strategies are by private and non-governmental actors.

This study is therefore timely as it brings out the socio-economic and environmental factors affecting the adoption of alternative energy solutions among households in Chainda Compound, drawing upon the perceptions, behaviours and experiences of households amidst efforts by stakeholders to introduce alternative energy solutions in the area.

1.3. Statement of the Problem

Access to sustainable and affordable energy remains one of the critical drivers of socio-economic development in Sub-Saharan Africa (World Bank, 2022). Zambia's energy sector has been dominated by hydropower (providing 85% of total electricity generation, with 3,000 MW of installed capacity) and biomass, (providing over 70% of total household energy consumption) (IEA, 2023). In recent years, the Zambian government has engaged with various development partners in the promotion of alternative energy solutions. Various initiatives have come up to provide alternative clean energy solutions to peri-urban communities in areas such as Lusaka's compounds. Development partners have supported initiatives (such as RDG Collective, VITALITE Zambia, Zengamina Power, ENGIE Energy Access Zambia, OnePower Zambia, Renwasol / Solar23, SupaMototo) provide low cost pay-as-you-go (PAYG) solar home systems, improved cookstoves, and LPG distribution programmes. These aim at expanding access to cleaner, affordable, and reliable energy alternatives (BGFA, 2022; Rockefeller Foundation, 2025).

However, many households continue to rely on traditional energy sources. Chainda Compound presents a striking case of heavy reliance on charcoal, firewood and oil fuels as energy sources. It is of concern that despite the rising cost of charcoal, the adoption rate of seemingly cost-effective alternatives remains low (WHO, 2022; Eberhard et al., 2021; Koomson & Danquah, 2022).

The Energy Regulation Board, (2025) has noted slow adoption of AEES, suggesting that existing interventions have not adequately addressed community-specific barriers. Without consistent understanding and clarity of the micro-level factors driving adoption of alternative energy sources, any interventions may mismatch household realities and limit their effectiveness for a lasting solution. The need is for context-specific knowledge requiring an assessment of the household drivers influencing the adoption of alternative energy solutions offered by development partners in Chainda. This provides an empirical dimension towards Zambia's drive towards the attainment of SDG7.

1.4. Objectives

1.4.1. General Objective

To assess the adoption rate of alternative energy solutions promoted by development partners in Chainda Compound, Lusaka.

1.4.2. Specific Objectives

- i. To find out household experiences and patterns of use of specific alternative energy solutions in Chainda Compound.
- ii. To determine the micro-level socio-economic, perceptual, and cultural factors that influence households' decisions to adopt or reject alternative energy solutions.
- iii. To examine community perceptions of development partners' promotion strategies to improve the adoption of alternative energy solutions.

1.5. Research Questions

- i. What are the household experiences and patterns of use of specific alternative energy solutions in Chainda Compound?

- ii. How do micro-level socio-economic, perceptual, and cultural factors influence households' decisions to adopt or reject alternative energy solutions?
- iii. What are the Chainda community perceptions of development partners' promotion strategies to improve the adoption of alternative energy solutions?

1.6. Significance of the Study

Undertaking this study has multi-disciplinary reach, including academic, policy, and practice. Firstly, at the empirical level, the study will deliver evidence-based data which will drive the understanding the household and community dynamics influencing the adoption of alternative energy and related technologies among urban informal settlements. This information will be most useful to community actors, policymakers, providers of alternative energy solutions, development partners, and other private sector actors focused on improving energy access, sustainability, and equity. Community providers of alternative energy such as SupaMoto and Vitalite, can obtain insights that may help them in their engagement with government institutions like the Energy Regulation Board (ERB) and Ministry of Energy. This will strengthen coordination and monitoring of clean energy programs.

Secondly, the study has potential to provide findings which may guide the design and implementation of interventions to help communities and households desist from or reduce consumption of unsustainable energy and adopt cleaner energy solutions. This would arise from the identification of unique, contextual enablers and barriers of alternative energy adoption at household/community levels. This will help actors to redefine and refine their models to align with actual community variables and make their programs engaging, culturally appropriate and economically viable. The outcomes of this study may be helpful contribution to the solution of Zambia's commitments to SDG7 and related national policies promoting renewable energy.

Thirdly, this study is a significant contribution to research and literature on the energy transition discourse, taking the dimension of community-specific variables in the light of the Diffusion of Innovations Model (Rogers, 2003) and the Technology Acceptance Model (Davis, 1989). By localising and aligning this to a Zambian compound, the study is unique, contributing new knowledge to the emerging scholarly understanding of how social, economic, and behavioural factors influence clean energy adoption in low-income urban settings. This creates a basis for future studies and generalisation beyond Chainda Compound.

The findings of this study will contribute both theoretical and practical knowledge towards filling the gap in understanding informal settlements' alternative energy adoption patterns. At the practical level, it will inform targeted awareness campaigns, improve affordability mechanisms, and strengthen distribution networks for alternative energy solutions. At the theoretical level, the study will inspire interdisciplinary discourse on the behaviour of households in the process of energy transition, linking socio-economic, cultural, and environmental dimensions.

1.7. Scope of the Study

The study was conducted within a thematic, content, spatial, and temporal framework. Geographically, the study will be confined to Chainda Compound located within Lusaka East as a peri-urban settlement. The population of the study includes all households in Chainda, being actual or potential adopters of alternative energy solutions. This scope included community leaders, development partners' representatives and other stakeholders involved in clean energy initiatives within the area.

Thematically, this study is focused on adoption of alternative energy solutions – only those which are promoted by development partners in Chainda Compound. For example, home solar solutions, biogas digesters, improved cook stoves and other community-based renewable energy projects. Traditional energy sources such as charcoal, firewood, and kerosene were considered only as comparative baselines.

The time scope of the study is ten years from 2015 to 2025, although most alternative energy providers have come on board since 2020. This temporal scope captured both early, recent and ongoing practices and intervention around the promotion of alternative energy solutions in Chainda Compound.

1.8. Limitations of the Study

There are likely constraints which affected the execution of this study. Response bias had some respondents overstating or understating their usage of alternative energy, affected by social desirability or recall challenges. It was a challenge to access some households due to physical, weather, safety, social and timing barriers. Resource limitations (time and finances) limited the sample size, duration of the study and extent of data collection. This affected generalizability. Some institutional data may have been redundant, biased, incomplete, inconsistent or

unverifiable. The study findings may not be generalizable beyond Chainda Compound on the factors which are context-specific and don not relate to socio-economic and cultural variations across other communities.

1.9. Operational Definitions

Alternative Energy Solutions: Cleaner and renewable energy technologies designed to replace traditional biomass fuels such as charcoal and firewood (UNDP, 2024).

Adoption Rate: The proportion or percentage of households actively using alternative energy solutions relative to the total target population (Rogers, 2003).

Development Partners: Organizations such as Vitalite, SupaMoto, and international NGOs or donor agencies that fund or implement clean energy initiatives in Zambia (ZDA, 2024).

Diffusion of Innovations (DOI) Theory: Proposed by Everett Rogers (2003), this theory explains how new technologies spread within a social system over time. It categorizes adopters into innovators, early adopters, early majority, late majority, and laggards. Adoption is by five attributes — relative advantage, compatibility, complexity, trialability, and observability.

Technology Acceptance Model (TAM): Developed by Davis (1989), TAM posits that an individual's intention to use a technology is shaped by perceived usefulness and perceived ease of use. Within this study, TAM helps explain how household perceptions of affordability, usability, and mobile-based payment systems influence adoption of Pay-As-You-Go (PAYG) solar systems from providers like SupaMoto and Vitalite.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

The global energy transition toward renewable sources represents a critical pathway for achieving sustainable development, particularly in regions facing persistent energy poverty (United Nations, 2024). In Sub-Saharan Africa, where energy access remains limited despite abundant natural resources, alternative energy solutions promise significant socio-economic and environmental benefits. This literature review examines the multifaceted impacts of adopting alternative energy solutions, with specific focus on the Zambian context and Chainda Compound in Lusaka. The review structures its analysis across three contextual levels—global, African, and Zambian—to provide a comprehensive foundation for understanding the complex dynamics influencing household energy adoption and its consequences. The interplay of socio-economic factors with environmental outcomes creates a complex research landscape that requires careful examination to inform effective policy and intervention strategies, particularly in peri-urban settlements like Chainda Compound where multiple energy challenges converge.

2.2. Theoretical Framework

Understanding the adoption of AES requires grounding in established technology adoption theories that provide lenses through which to analyse household decision-making processes. Three theoretical models are particularly relevant for this study.

i. The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), posits that a user's adoption of a technology is primarily determined by two core beliefs: perceived usefulness and perceived ease of use. Perceived usefulness refers to the degree to which a potential adopter believes that using an AES would enhance their daily life, such as by providing better lighting for children's education, enabling entertainment through television, or offering cost savings over time (Davis, 1989). Perceived ease of use encompasses the extent to which an individual believes that utilizing the system would be free from physical and mental effort, including the simplicity of its operation and the convenience of associated payment systems like mobile money platforms integral to PAYG models (Venkatesh & Davis, 2000). The model suggests that these two factors directly influence attitudes toward usage, which in turn shapes

behavioural intention and actual adoption. The TAM has been extensively validated across various technology domains and helps explain why households might reject technically superior energy solutions if they perceive them as overly complex or difficult to maintain (Marangunić & Granić, 2015).

ii. **The Theory of Planned Behaviour (TPB)**

The Theory of Planned Behaviour (TPB) extends beyond individual perceptions to incorporate social influences and control factors (Ajzen, 1991). According to TPB, behavioural intention—the precursor to actual behaviour—is influenced by three components: attitude toward the behaviour, subjective norms, and perceived behavioural control. In the context of Chainda Compound, subjective norms represent the social pressure a household might feel from neighbours, community leaders, or extended family to adopt or reject an AES. Perceived behavioural control reflects the household's belief in its capacity to adopt and maintain the technology, encompassing financial resources, technical understanding, and access to necessary support services. Empirical studies have confirmed that TPB can effectively predict behavioural intentions in technology adoption contexts, sometimes offering a more comprehensive explanation than TAM by accounting for social dynamics (Sumak et al., 2011). This theory is particularly relevant for understanding how community networks and collective practices influence individual household energy choices in densely populated urban settings.

iii. **The Diffusion of Innovations (DOI) Theory**

The Diffusion of Innovations (DOI) Theory provides a macro-level framework for understanding how new ideas and technologies spread through a social system over time (Rogers, 2003). Rogers categorized adopters into five groups—innovators, early adopters, early majority, late majority, and laggards—each with distinct characteristics and influence within social networks. The theory identifies five key attributes of an innovation that influence its rate of adoption: relative advantage (the degree to which an AES is seen as superior to previous energy sources), compatibility (its consistency with existing values, past experiences, and needs), complexity (the difficulty of understanding and using it), trialability (the opportunity to experiment with it before commitment), and observability (the visibility of its results to others). In low-income urban settings, the observability of solar panels on neighbours' homes and the ability to trial a system on a short-term basis are significant factors influencing adoption patterns (Ulsrud et al., 2018). DOI theory helps explain the gradual dissemination of

AES through social networks in communities like Chainda, where early adopters can influence broader community uptake through visible demonstration of benefits.

2.3. Empirical Review

2.3.1. Impacts of adopting alternative energy solutions

There is a global trend to transition to alternative and renewable energies as a matter of sustainable development strategies. Extant literature has addressed the socio-economic and environmental implications of adopting AES at household level. Research by Mishra and Behera, (2016) point out that the triple benefits of adopting AE are environmental sustainability, socio-economic development, and improved living standards. Of these, the universal driver is environment factors, requiring a shift from traditional biomass and fossil fuels to clean renewable energy such as solar and biogas. It is understood that the transition contributes to improved environmental standards while enhancing household livelihoods. According to Omer (2010), it is important that the design and construction of buildings need to integrate renewable energy and energy efficiency, reducing primary energy consumption and preserving ecosystems.

Scholars have identified the socio-economic benefits of adopting AES. According to Mishra and Behera, (2016) this facilitates economic activities at household and community levels. Babalola et al., (2022) submits that it contributes to the improvement of various aspects such as educational outcomes and overall living standards. Adopting alternative energy technologies such as biogas improves household income and agricultural productivity and also reduces expenditure on traditional household energy sources (Yasmin & Grundmann, 2019).

Various factors have been identified as common barriers to AES adoption. At the economic level, costs associated with adoption have been particularly established among low-income households (Rathee & Kumar, 2025; Everlyne et al., 2013). Groups of scholars have identified that policy constraints and institutional challenges hinder the successful implementation of AES strategies. These have potential to delay procedures; delivery of subsidies; and hinder sustainability and the maintenance ecosystem (Mishra & Behera, 2016; Yasmin & Grundmann, 2019; Rathee & Kumar, 2025).

There are behavioural and socio-cultural factors which affect adoption. Households have been found reluctant to switch from their traditional sources of energy. Major determining factors

include the age, economic status and income level of the household head (Rathee & Kumar, 2025; Everlyne et al., 2013). Rathee and Kumar, (2025) acknowledge technical awareness challenges among households. Without appropriate technical know-how, AES may be considered too advanced for ordinary users and community perceptions may be negative.

In Africa, research on adoption of AES focuses on off-grid solutions within a framework of culturally embedded energy practices and income challenges. In Nigeria, Babalola et al., (2022) raise the challenge of insufficient electricity grid supply and the challenges among low-income, low demand communities in the rural. The emerging need is to develop sustainable off-grid systems of renewable energy such as SHS and mini-grids. However, achieving universal energy access requires extensive investments in AES which can unlock local economic potential and support business enterprises, create jobs and increase incomes.

In Kenya, similar to Pakistan, there have been persistent challenges of transitioning from traditional cooking methods to alternative cooking energy. While promotions for improved cook stoves have been ongoing, adoption is low, constrained by multiple socio-economic factors such as income, knowledge, access, and poor post-installation support. While these innovations are appropriate to the needs of the targeted communities, they are insufficient if broader socio-economic factors are not well addressed (Everlyne et al., 2013; Yasmin & Grundmann, 2019).

Chishimba, (2024) found that there were widely varied impacts of AES adoption among pan-Africanists. Off-grid energy solutions are better than no electricity at all. While grid electricity provides superior socio-economic outcomes, it has not been reliable across time and space. Further, the study shows that the benefits of all types of energy are non-linear as they depend on sustainability, durability, quality and cost. The current solar solutions are not promising enough to address a wide variety of uses beyond basic lighting. They do not adequately cater for cooking and heating, requiring users to install more systems or use other sources. This makes full adoption expensive.

From the Zambian perspective, literature highlights a variety of issues including national policy; energy usage patterns; predominance of solar energy solutions and local barriers affecting renewable energy adoption. Mulima et al., (2025) specifically established that there was a dual energy challenge affecting Zambia. On one hand is the heavy reliance of hydroelectric power and on the other climate change shocks. A combination of these factors has constrained the national grid, leading to long hours of load-shedding, faults and inadequate

connectivity. Further, the widely adopted use of traditional biomass in cooking is well associated with environmental costs. This research confirms that even the most urbanised, high-income areas with sufficient grid access still continue to use traditional charcoal. This is done as mitigation against the challenges of the national grid. It indicates that income and grid access are not standalone solutions for clean cooking transitions.

There are barriers to the deployment of AES among Zambian households. Kachapulula-Mudenda et al. (2018) established that there were significant market and institutional barriers. Policies were inadequate; potential opportunities for renewable energy remain unexploited and the national utility (ZESCO) is highly constrained. This status quo has created dissatisfaction and low confidence as households continue to grapple with the associated challenges of low support, technological acceptance scepticism, and affordability, among others.

Important insights emerged from Chishimba (2024) which have a bearing on gender and financing of AES. The willingness to pay for AES, especially solar systems, increased as households had more access to credit. An important consideration is that most of the available AES remain below market price. Gender was recognised as a major factor requiring women empowerment, employment status, education and enhancing their capacities to adopt improved cooking solutions which AES provide. With better cooking solutions, women are likely to experience profound health benefits such as less respiratory illnesses; shorter cooking time and savings arising from cleaner energy transitions. This underscores the need for gender-sensitive energy policies.

2.3.2. Barriers affecting the adoption of alternative energy solutions

Households transitioning to alternative energy face various barriers at all levels. Literature has considered this phenomenon to the extent that adoption rates at household level remain uneven across the globe. Researchers have endeavoured to understand the complexity of the barriers affecting even the design of effective interventions.

Global research has consistently identified that barriers are multi-dimensional, hindering the diffusion of renewable energy technologies (RETs). The barriers interact in varied ways and intensity considering that there are different locations, technologies and contexts. A universal barrier identified by multiple researcher is financing. Upfront costs can be high; affordability and access can be constrained; access to credit also poses significant hurdles for both developers and target consumers (Obuseh et al., 2025; Hesselink & Chappin, 2019).

Researchers have also established the compounding effects of lack of capital, competing household financial priorities, and perceived financial risk (Hesselink & Chappin, 2019; Wall et al., 2021).

Recent researchers such as Asante et al., (2020) and Obuseh et al., (2025) have documents institutional, regulatory and political barriers as capable of creating an environment that challenges adoption. Within this framework are factors such as bureaucracy, poor policies, complex licencing, corruption and low financing. The lack of stable, long-term, and harmonized policy frameworks deters investment and creates market uncertainty.

In other research, behavioural and socio-cultural barriers emerge as playing decisive roles in decisions for the adoption of AES. Behavioural factors include inertia, lack of knowledge, ignorance, distrust and scepticism concerning new technologies work to delay households' adoption even when the technologies are readily available and accessible (Hesselink & Chappin, 2019). Information asymmetry, low awareness of RETs; cultural resistance, aesthetics and social norms have significant effects (Heiskanen & Matschoss, 2017; Wall et al., 2021).

There are technical and infrastructure barriers affecting the adoption of AES. The push for renewable energy has concentrated on solar with less diversification into wind and other reliable smart grid infrastructure. Households are mainly required to own self-contained systems not connected to any grid. This leaves the entire cost from installation to maintenance and repair on the household. There exists a serious lack of technical skills in areas of AES installation, maintenance and repair among user communities (Obuseh et al., 2025). Heiskanen and Matschoss, (2017) reckons that the existing structure of buildings further makes it difficult to install suitable AES infrastructure without modification.

At the regional level, African countries face similar barriers shaped by structural challenges, including energy poverty, underdevelopment and low institutional capacity. In Ghana, Asante et al. (2020), found that the regulatory and political environment were major obstacles. The most critical sub-barriers were nepotism and corruption which led to 'undeserving' recipients of AES depriving the targeted populations. Governance challenges were isolated as capable of stifling market development and fair access. A study by Obuseh et al., (2025) identified economic barriers related to poverty and few service providers entering the market. Suppliers of AES were constrained in areas where the most affordable prices would be too low to cover costs – requiring development partner support. For the households, the initial costs, if too high,

prohibited access. Without easy access to consumer credit, many households cannot own available AES. This scenario creates a persistent affordability gap.

In their study, Asante et al. (2020) noted infrastructure deficits. The lack of established smart grids, most regions grapple with the unreliability of existing central grids, or the lack thereof. This complicates the environment within which renewable energy can be integrated with traditional grids. There is yet to be established a sustainable supply chain for quality alternative energy technology providing consistent brand names, quality assurance, after-sales services and dealers/suppliers.

While socio-cultural factors remain important, the African context often emphasizes trust as a pivotal variable. The market is plagued by low-quality products, which erodes consumer confidence in the technology itself and its suppliers, making households hesitant to invest their scarce resources.

Research from Zambia reveals an energy adoption dilemma as global and regional barriers manifest locally. Zambia is characterized by heavy dependence on hydropower with frequent load-shedding and a dissatisfied market. In Zambia, financial and economic constraints are the primary barriers facing households. A study in George Compound (Lusaka) and other national surveys have consistently documented the challenges of low household income and high AES costs, especially for solar devices. This is exacerbated by AES not providing accessible financing options at the early stages of adoption and during the usage and maintenance stages. Consumers are left to handle costs after they have finished paying for PAYGs (Kaambo, 2021; Zulu et al., 2022).

Various researchers in Zambia have identified regulatory, policy and institutional gaps as major barriers of AES adoption. There are bureaucratic bottlenecks that project implementors have to face. Policy support is promised but not well supported, especially for off-grid initiative. The regulatory environment is not always well aligned with private innovation and investment, often influenced by political preferences. This stifles market growth and consumer confidence (Mhango, 2024; Mhango & Mwanza; Kaambo, 2021).

There are significant socio-psychological factors within the Zambia context. Studies by Zulu et al., 2022; and Zulu et al., (2021) have confirmed by the Theory of Planned Behaviour. They note that attitude towards AES is influenced by perceived benefits and trust. Social pressure affects decisions of adoption. Further, Perceived Behavioural Control also directly influences

adoption intention. Similarly, Kaambo, (2021) affirms that trust in the technology and its suppliers, coupled with the perceived relative advantage of AES over traditional sources, are foundational to forming a positive attitude (Zulu et al., 2021; Kaambo, 2021). Kaambo, (2021) extends to identify how quality and safety concerns can be a major market barrier. Notable is that there has been a proliferation of low-quality solar products onto the market which are damaging AES technology reputation, potentially leading to financial losses for consumers, while creating safety hazards. This severely undermines trust for AES products, suppliers and promoters (Kaambo, 2021).

Mhango, (2024) identifies infrastructure and consumer awareness barriers. These include unreliable after-sales services and poor technical maintenance capacity. Although there is a growing awareness for AES, most is about solar without comprehensive public campaigns meant to educate and improve understanding of technology benefits, quality standards, and available options.

2.3.3. Household awareness, perceptions, and knowledge regarding AES Technologies

Successful transition to AES is contingent upon households understanding the inherent technologies before acceptance. Studies at the global level have consistently reported high levels of awareness with positive attitudes by households seeking renewable energy solutions. Awareness and perceptions are well embedded within the framework of environmental concerns and the need for energy security (Djurisic et al., 2020). The Eurobarometer, (2007) early noted that issues of energy were becoming prominent in public discourse as citizens recognise the challenges associated with dependence on fossil fuels and climate change. At the global level, green energy solutions are incorporated within the strategy for sustainable energy solutions. Research in Jordan and Montenegro found that most citizens and households were seriously considering AE as the future for energy with the belief that it could reduce energy costs (Zyadin et al., 2012; Djurisic et al., 2020).

Global literature reveals a distinction between awareness in general and possession of specific, actionable knowledge. While the public is known to possess common knowledge of AES such as solar and wind, they do not possess technical knowledge. Participants in the studies could not accurately distinguish between renewable and non-renewable sources and specific technologies. This indicates that knowing the basic terminologies is insufficient for proper decision making (Zyadin et al., 2012).

Global perceptions of AES adoption are impacted by environmental benefits. Consumers consider the factor of trust in the suppliers and the AES solutions they bring; the relative advantage of the technologies over the existing ones; and the influences of social networks. These strongly affect intention and attitude (Zulu et al., 2021; Djuriscic et al., 2020). Reviewing the literature by Djuriscic et al., (2020) reveals that at the global level, having a positive attitude towards AES does not always lead to adoption. There is a hoard of intervening factors such as trust, cost, perceptions and practicality.

Within the African context awareness and perceptions are best understood within the lived experiences of the leading users. This is mainly considered within the realities of unreliable electricity grids; energy poverty and economic pressures. Adoption of any energy system in Africa is closely related to the benefits provided for solving daily energy challenges at low or no financial cost. In urban areas, this is exacerbated by grid challenges of load-shedding and difficulties accessing traditional energy such as firewood (Okereke et al., 2023).

Studies in Kenya have demonstrated that there is high public approval for AES with strong affirmation that it can reduce the cost of electricity. The population is poised for transition to alleviate the persistent energy challenges affordably. Awareness and focused education strategies are considered most appropriate predictors of positive attitudes across the continent.

Other research has however noted significant disparities between knowledge and practice, especially in cooking. For example, Okereke et al., (2023) undertook a study in Nigeria and found that LPG was a preferred option in cooking. However, its actual adoption was very low, revealing a stark gap between positive perceptions overridden by high costs and other economic barriers, including access issues. This reveals that preferences are more aspirational than practical. The study further reveals that demographic factors were of significance in the adoption of AES. Factors of education, gender, household size and social capital predicted transition intentions. Awareness and perception are mediated by socio-economic empowerment, particularly for women

In the case of Zambia, household awareness of AES is shaped by the challenges of the national energy crisis. The solution-seeking mindset has been enhanced by Zambia's prevailing energy deficit. This is most pronounced in the hydropower sub-sector which has been the major source of power. Old infrastructure, climatic pressures, rapid population growth and low investment in alternative energy are well known to the public. Studies confirm that solar and other

alternative energy solutions are actively being sought as reliable alternatives. The relative advantage of AES, especially solar is high in Zambia (Zulu et al., 2021).

Zulu et al. (2021) found that adoption intention was significantly driven by individuals possessing knowledge of the available energy solutions. General knowledge did not inspire alternative-seeking behaviours. The study calls for more concrete campaigns, detailed product types, cost reduction initiative and relevance of products to the Zambian market. Research in Kitwe by Makashini et al., (2014) found that lack of knowledge of specific technologies were significant barriers, especially among households living in rented houses. These thought that the landlords had more responsibility over what AES to install than themselves. Further challenges related to accessibility and quality of solar products. This further eroded perceived trust, a critical mediator between awareness of benefits and the intention to adopt. Subjective norms were further recognised as strong determinants in the Zambian context. Adoption intentions among Zambians are significantly influenced by the perceived expectations of their social networks and community, indicating that diffusion happens through social channels (Zulu et al., 2021).

2.3.4. Literature Synthesis and Research Gaps

2.4. Conceptual Framework

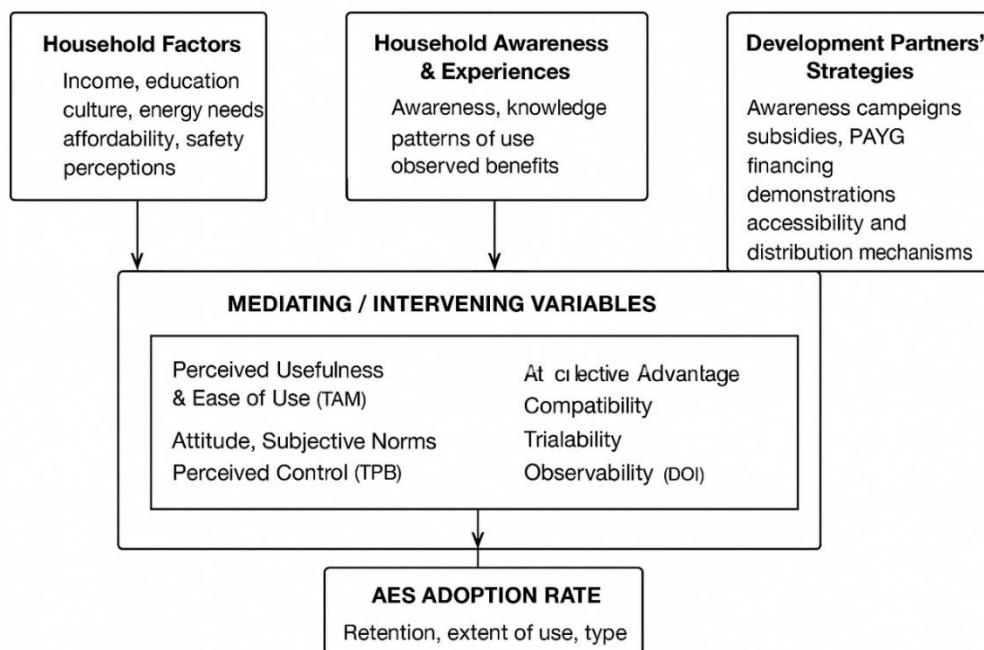


Figure 2. 1: Conceptual Framework

The conceptual framework presents that AES adoption in Chainda Compound is primarily driven by a combination of micro-level household characteristics, awareness and experiential factors, and promotion strategies implemented by development partners. Household socio-economic factors such as income, education, cultural norms, and perceived affordability directly shape the ability and willingness to adopt AES. These factors interact with household awareness and prior experiences, which determine how knowledgeable or confident households feel about AES options.

Development partners' promotional activities, including sensitisation campaigns, subsidies, PAYG financing, and product demonstrations, further influence adoption by shaping household perceptions and reducing perceived risk. However, the effect of these factors is not direct. Instead, they operate through perceptual mediators consistent with the Technology Acceptance Model (perceived usefulness and ease of use), the Theory of Planned Behaviour (attitudes, subjective norms, and perceived control), and the Diffusion of Innovations theory (relative advantage, compatibility, trial ability, and observability). These perceptual constructs translate socio-economic and promotional factors into behavioural intentions that ultimately determine adoption.

2.5. Gaps in Literature

The literature reveals several consistent themes across global, African, and Zambian contexts. First, renewable energy adoption generates interconnected benefits across socio-economic and environmental domains, including emissions reduction, health improvement, and economic opportunities. Second, effective adoption requires addressing both economic and behavioural barriers, with cognitive biases and social influences playing crucial roles in household decision-making. Third, contextual factors significantly shape adoption patterns and impacts, necessitating location-specific analysis rather than universal approaches. Finally, integration challenges persist in balancing multiple objectives—economic development, environmental conservation, and social equity—within energy transition initiatives.

Despite these important insights, significant knowledge gaps remain, particularly regarding the specific dynamics in Zambian peri-urban settlements like Chainda Compound. First, most Zambian energy studies focus predominantly on rural contexts or broad national analyses, creating a research void regarding peri-urban dynamics where urban and rural characteristics intersect. The specific socio-economic environment of compounds like Chainda—

characterized by informal settlements, high poverty levels, and limited formal services—remains underexplored despite its significance in Zambia's urbanization pattern.

Second, existing research emphasizes technical and economic dimensions of energy adoption while paying insufficient attention to behavioural factors and decision-making processes in specific Zambian contexts. The applicability of behavioural economics frameworks to Compound settings requires empirical investigation to identify context-appropriate interventions.

Third, the role of development partners in promoting alternative energy solutions lacks critical assessment in Zambian literature. While development organizations actively promote various energy technologies in compounds like Chainda, their effectiveness, implementation approaches, and alignment with household priorities remain understudied.

Fourth, the gendered impacts of energy adoption in Zambian households receive limited attention despite evidence that energy responsibilities disproportionately affect women and children. Understanding how alternative energy solutions specifically impact gender dynamics and women's empowerment in compounds like Chainda represents an important research gap.

Finally, the long-term sustainability of different alternative energy solutions remains uncertain, particularly regarding environmental trade-offs and maintenance requirements. The durability of technologies, availability of spare parts, and technical support networks in peri-urban Zambian contexts require further investigation.

These knowledge gaps highlight the need for context-specific research that examines the socio-economic and environmental impacts of alternative energy solutions in Chainda Compound, with particular attention to development partner interventions, household decision-making processes, and gendered dimensions of energy adoption.

CHAPTER THREE

METHODOLOGY

3.1. Introduction

This methodology chapter explains the research design, which according to Creswell and Creswell (2018) is important for guiding the research process by describing the research approach, research design, population of the study, sampling procedures and techniques; data collection tools, procedures and analysis techniques.

3.2. Research Approach

Research approach is the study adopted to facilitate the integration of the various components of the research in a coherent and logical manner (Creswell & Plano Clark, 2017). For this study, the mixed methods approach was adopted, combining the quantitative and qualitative techniques. The quantitative method enabled the researcher to collect numerical and objective (quantifiable) data which was subjected to direct statistical description and analysis. On the other hand, the qualitative method allowed the researcher to collect in-depth data on the perceptions, experiences, behaviours and opinions of the respondents regarding the study phenomena. It allowed the researcher to obtain deeper insights from a contextual perspective of Chainda Compound. Mixed methods approach is justifiable and recommended by researchers when studying multidisciplinary issues which require both the measurement and explanation of variables in order to obtain a comprehensive understanding of the study subject, in this case the household decision-making behaviours in Chainda Compound. Tashakkori and Teddlie (2010) affirm that mixed methods make a study more rigorous by integrating breadth and depth of evidence.

3.3. Research Design

Research design refers to the research framework for collecting and analysing data in order to achieve the research approach requirements (Kumar, 2019). A descriptive cross-sectional case study design was adopted for this study. This design involves the collection of data from a population at a specific time-point in a specific area. By this approach, the researcher can select a sample from which to obtain data about the household characteristics and their alternative energy solutions adoption behaviour as they are today. This cross-sectional aspect captures a

snapshot of conditions as they obtain in Chainda without any manipulation. As a case study, the study obtained in-depth data on the adoption within the context of Chainda Compound. This correlates with Yin's (2018) submission that case studies are suitable for investigating real-life phenomena embedded in specific settings.

3.4. Study Location

The study location is the physical geographical place where the research will be conducted (Kothari, 2014). Chainda Compound is located in Lusaka East. It is a high-density area, predominantly low-income with many households utilising traditional sources of energy despite the area being connected to the national grid. This location is justified for the study because it has been penetrated by a number of institutions providing alternative energy solutions. This makes the area ideal for studying the adoption of alternative energy solutions promoted by development partners.

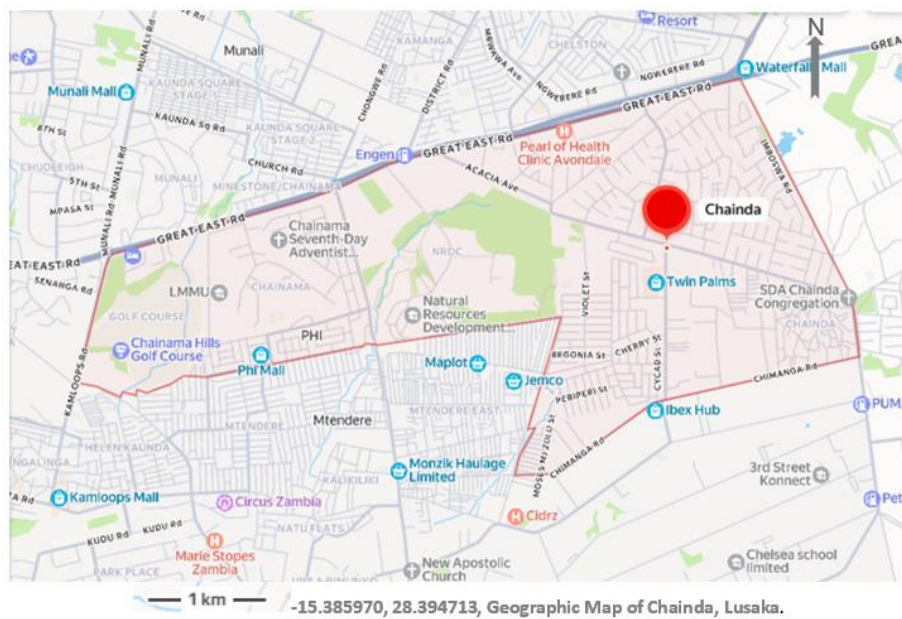


Figure 3. 1 Map of Chainda Compound

Source:

<https://yandex.com/maps/21196/zambia/geo/chainda/4559160694/?ll=28.377580%2C-15.388628&z=13.4> Date Retrieved: 27 December 2025

3.5. Study Population

The study population represents the entire group of units (people) who possess the characteristics that are to be studied and for whom the findings would be generalised (Bryman, 2016). In this study, all households of Chainda Compound with members aged 18 years and above were targeted. This is the most appropriate population because households are the primary decision-makers and users of energy at community level. Targeting the population of adult household members ensured that the study captures accurate, relevant, and decision-focused perspectives regarding AES awareness, perceptions, and adoption behaviours. Numerically, the population of Chainda Compound is 38,393 with an average of 7.6786 members per household (5,000 households). The population aged 16 years and above is 24,253 (City Population Data, 2025).

3.6. Sample Size

Sample size is the population's subset which the researcher selects to participate in a study (Kumar, 2019). For this mixed-methods study, a sampling frame of 5,000 was determined as the basis for calculating the sample size by the Yamane's (1967) formula:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

n = required sample size

N = 5,000 (The estimated household population targeted for AES)

e = margin of error (level of precision), set at 10% or 0.10. In regular research practice, 7–10% is applied to community-based social studies on large populations which are difficult to enumerate. 10% is regarded acceptable where the aim is descriptive (Israel, 1992).

By substitution into the formula:

$$n = \frac{5000}{1 + 5000(0.10^2)}$$

$$n = \frac{5000}{51} \approx 98.03$$

This study employed a minimum sample of 98, rounded of to 100 households. This sample size was sufficient for the study to generate reliable descriptive and inferential statistics in quantitative research, while obtaining sufficient in-depth qualitative data from selected informants. Further, 100 was representative enough to attain statistical accuracy, and ensure that different socio-economic segments of Chainda are captured.

3.7. Sampling Technique

Sampling technique refers to the methods employed in selecting the participants from the study population (Etikan & Bala, 2017). In order for each household to have an equal chance of being selected, simple random sampling was employed.

3.8. Data Collection Instruments and Procedures

Data collection instruments refer to the tools to be used for data collection from the participants (Creswell & Creswell, 2018). Since this study was a mixed methods, a semi-structured questionnaire was used for the quantitative and qualitative components. A semi-structured questionnaire with a mix of closed-ended questions (quantitative) and semi-structured questions (qualitative) was designed with Likert-scale questions and demographic variables. The combination of data facilitated the collection of measurable and verifiable data while capturing contextual nuances as a matter of triangulation.

3.9. Data Analysis

Data analysis includes all the techniques that the researcher employs to organize, interpret, and obtain inferences from the collected data (Miles, et al., 2020). Data were analysed according to its nature. The quantitative data from the questionnaires was summarised and coded using a computer in Microsoft Excel and the Statistical Package for Social Sciences (SPSS). This involved computing descriptive statistics of frequencies, percentages, means and standard deviations according to the variables. Thematic analysis was undertaken with qualitative data coding, categorizing, and identifying of recurring themes which was incorporated into the quantitative data analysis.

3.10. Reliability

Reliability is the level of consistency and stability of the research instrument (Heale & Twycross, 2015). Cronbach's alpha was used to assess internal consistency of the quantitative

Likert-scale items of the questionnaire. A threshold coefficient of 0.70 or was deemed acceptable. Reliability of qualitative data was by using questionnaire in a consistent manner across all participants, ensuring careful transcription, and maintaining an audit trail of coding decisions. These strategies ensured that the quantitative and qualitative data are trustworthy and repeatable under similar conditions.

3.11. Validity

Validity measures the extent to which the research instrument measures what it is meant to measure (Creswell & Plano Clark, 2017). In this study, content validity was undertaken by obtaining expert reviews of both the questionnaire and interview guide. Construct validity was done by carefully designing each research instrument in alignment with the study problem, objectives, theoretical constructs, conceptual framework variables, type of data (quantitative and qualitative) and the nature of the participants. Triangulation of quantitative and qualitative data strengthened validity by allowing for cross-verification.

3.12. Ethical Considerations

Ethical considerations are the steps taken to ensure that the research process is undertaken in a manner that protects the rights and welfare of participants (Resnik, 2020). The researcher obtained ethical clearance from UNILUS to allow data collection. All participants were included in the study by informed consent, explaining the purpose, procedure, rights, benefits and voluntary nature. As a matter of confidentiality, personal identities of the respondents were not collected, ensuring anonymity and data was securely stored in password-protected computer files. Participants retained the right to withdraw at any stage of the study without consequence. The findings are written and presented in a manner that reflects the true findings and in compliance with international ethical standards for social research and academic writing.

CHAPTER FOUR

PRESENTATION OF FINDINGS

4.1. Introduction

This chapter is the presentation of the study findings. In this study, a total of 86 households were samples in Chainda Compound. This represents 86% of the determined sample of 100 households.

4.2. Demographic Characteristics

The demographic data presents the characteristics of the study population of age, household headship structure, education, economic activities and income. This demographic profile was essential for the contextualization of the households' adoption of alternative energy solutions.

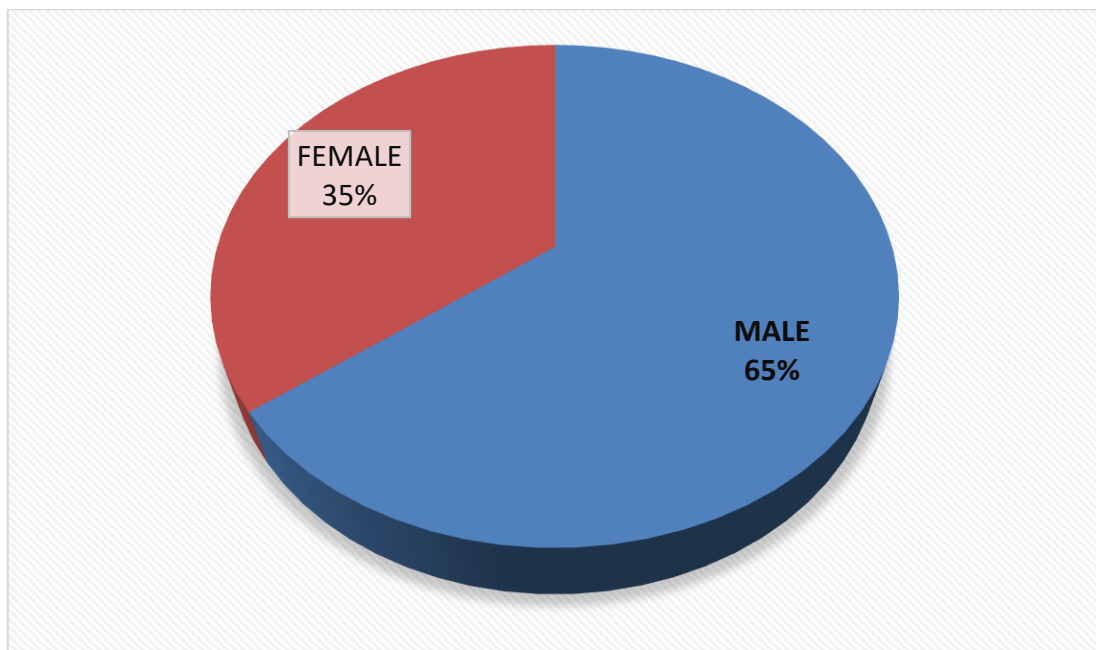


Figure 4. 1.Pie Chart Showing Respondents Disaggregated According to Sex

Figure 4.1. Is a presentation of the sex of the household heads who answered the questionnaire. The households were mainly male headed (65%) with females heading 35% of the households. This data shows the domination of male household headship structure within Chainda Compound. This further suggests male influenced decision-making regarding the adoption of alternative energy technologies.

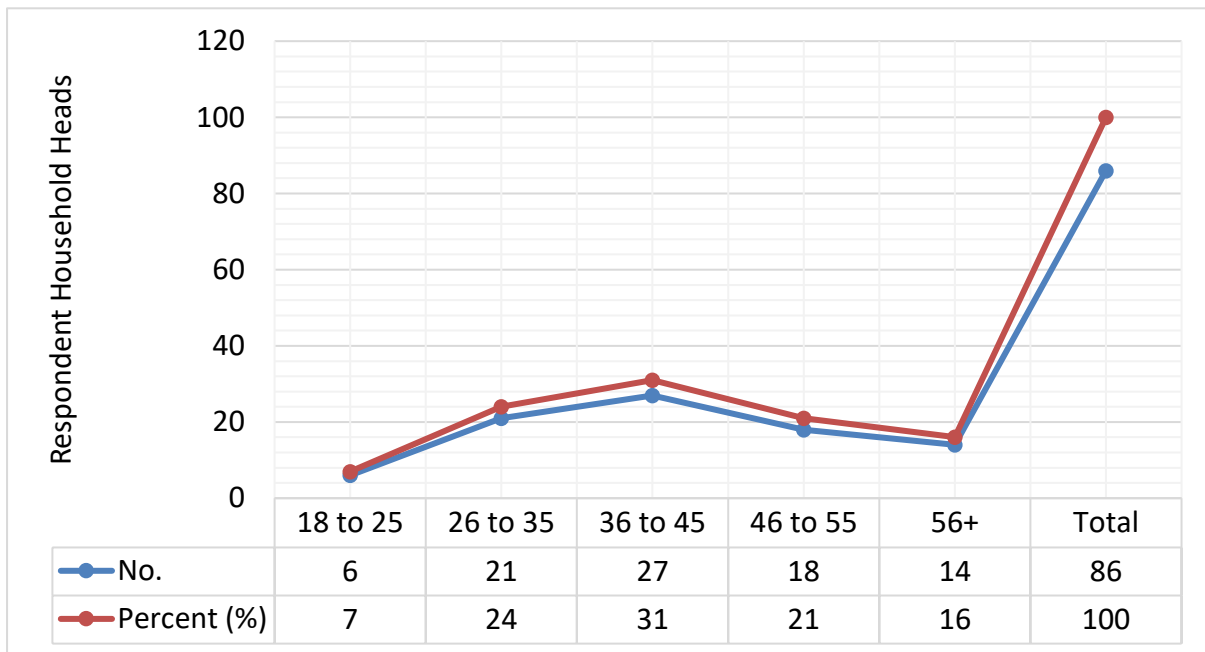


Figure 4. 2. Graph Showing Respondents' Age-Groups

Figure 4.2. . Presents the age groups of the household heads. The data shows that 55% of the respondents were within the age groups of 26 to 35 years and 36 to 45 years. Of these, the majority of 31% were in the 36 to 45 years age group. Respondents aged 46 to 45 years were 21% while 56 years and above were 16%. There was lower representation of the younger aged 18 to 25 years (7%). The data demonstrates that Chainda Compound has a relatively young and economically active population. This indicates households likely to adopt innovative technologies such as alternative energies.

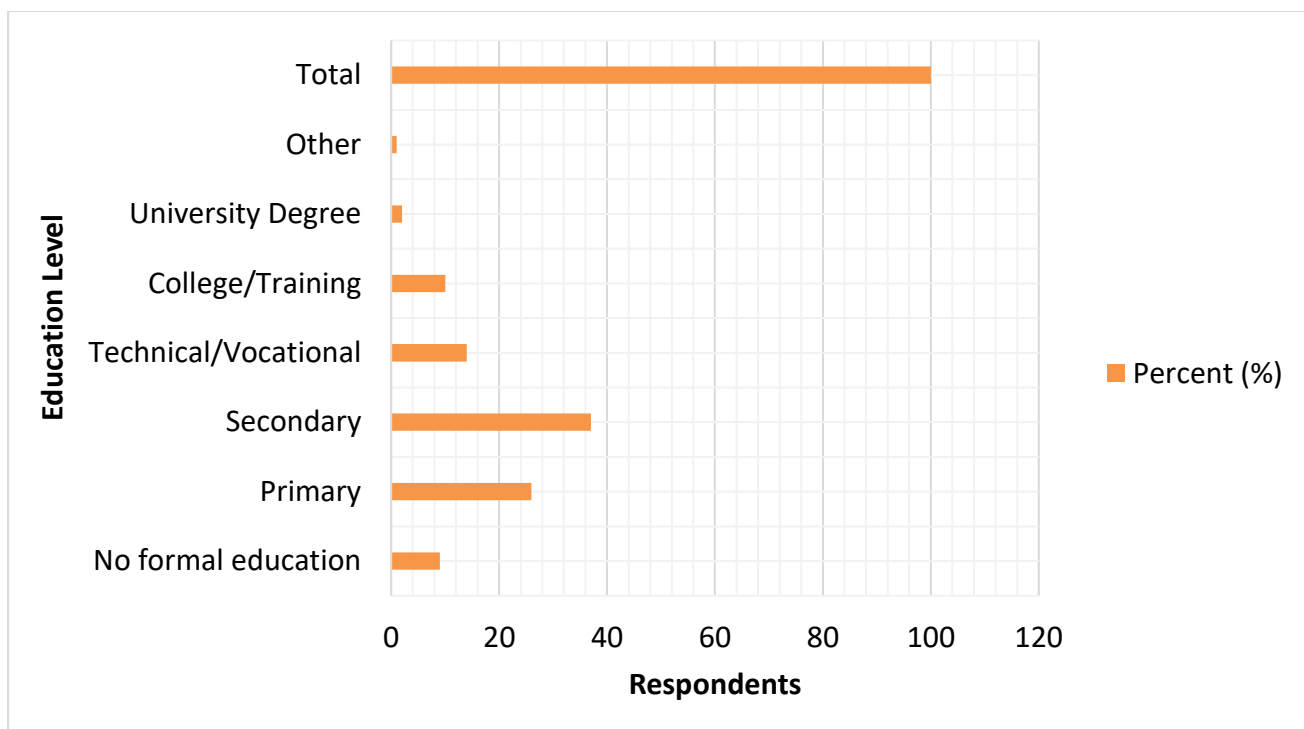


Figure 4. 3. Graph Showing Respondents' Levels of Education Completed

Figure 4.3. Shows the education levels completed by the respondents. The majority had completed secondary education (37%). Those with primary level education were 26%. A combined 24% had completed higher level tertiary education. Those without formal education were 9%. The data shows that the community had a moderate level of education, implying having capacity to comprehend matters relating to alternative energy and make sound decisions.

Table 4. 1: Occupation of the Household Head

Variable	Frequency	Percent (%)
Formal employment	31	36
Self-employed	17	20
Artisan/Skilled Labour	15	17
Casual labourer	11	13
Unemployed	8	9
Student	3	3
Other	1	1
Total	86	100

Table 4.1. Is about the occupation of the household head whereby the majority (36%) were in formal employment and self-employed (20%). Those employing their own skills as artisans were 17% with 13% being casual labourers. The unemployed were 9%. Others were students (3%) or were in some other unclassified employment (1%). The data suggests that across the population, income was irregular as the majority were in less formal employment – a phenomenon which could affect sustainable affordability of alternative energy financing models such as PAYG.

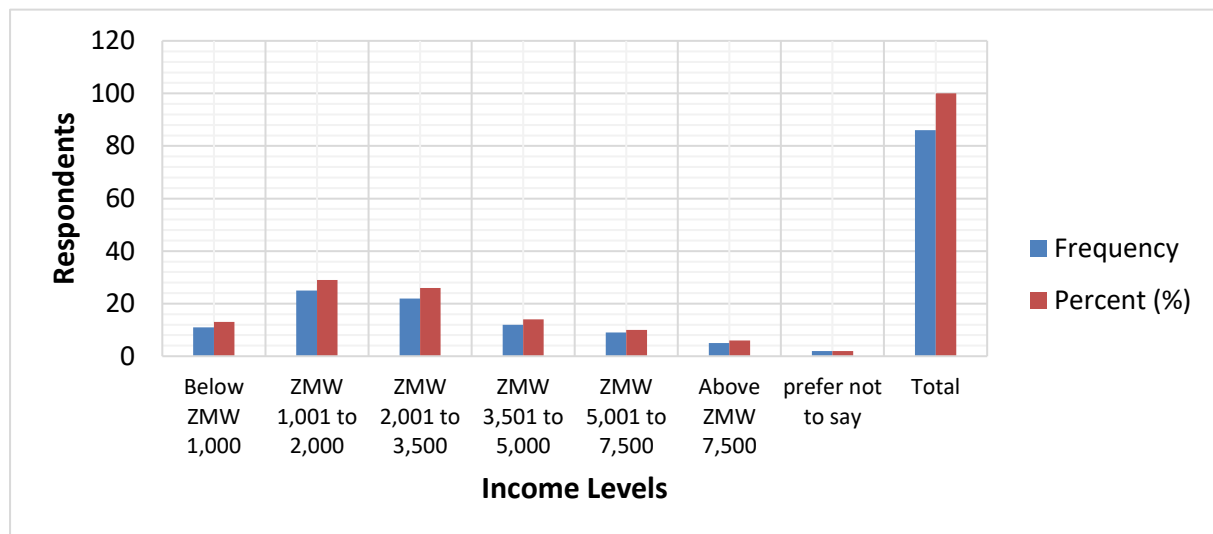


Figure 4. 4. Graph Showing Respondents' Estimated Monthly Household Income

Figure 4.4. Shows findings related to the estimated household income. In this regard, an aggregated majority of 68% earned below ZMW3,500 per month. Those with higher incomes of ZMW3, 500 to 7,500 or were and aggregated 24% while only 6% earned above ZMW7,500. This finding reveals that affordability could be a major determinant in the affordability of alternative energy especially that the population was highly concentrated in the lower income brackets.

Table 4. 2: Household Size

Variable	Frequency	Percent (%)
1 to 3	17	20
4 to 6	43	50
7 to 9	15	17
10+	11	13
Total	86	100

Table 4.2. Is of the variable of household size. It shows that most of the households are relatively large with 50% having 4 to 6 members while 30% have 7 or more household members. Those with 1 to 3 members were 20%. Household size has implications on energy demand, creating a potential need for alternative energy among large households. Of concern is that large households tend to spread resources across the members with lesser disposable income allocated to alternative energy.

4.3. Household Experiences and Patterns of use of Alternative Energy Solutions

The first research objective was to assess household experiences and patterns of use of specific alternative energy solutions in Chainda Compound.

Table 4. 3: Primary Energy Sources Used for Different Household Activities

Household Activity	Energy Source	Frequency	Percent (%)
Lighting	ZESCO Electricity	51	59
	Solar (SHS/Lantern)	29	34
	Candles/Kerosene	6	7
	Total	86	100
Cooking	Charcoal	36	42
	ZESCO Electricity	30	35
	LPG	14	16
	Firewood	6	7
	Total	86	100
Charging electronic gadgets	ZESCO Electricity	63	73
	Solar	23	27
	Charging Kiosk	0	0
	Total	86	100

Table 4.3. Is a presentation of the primary sources of energy the households used in cooking, lighting and charging gadgets. The most dominant source of lighting energy was hydro powered electricity supplied by ZESCO from the national grid (59%) and charging of gadgets (73%). At 42% charcoal was dominantly used in cooking. Solar energy is notably represented across all three activities. The data demonstrates that households in Chainda Compound combined other sources of energy apart from the grid electricity. Although ZESCO supplied hydroelectricity was the main source of energy, it was largely used for lighting as cooking was

largely by charcoal. The presence of solar, indicates the community’s potential for alternative clean energy adoption. It was further established that 69% acknowledged stable connection to the ZESCO national grid. However, a mean of 2.50 indicates that the households were dissatisfied with the ZESCO grid electricity services. This skewness towards dissatisfaction reflects challenges of load shedding, voltage fluctuations, power outages and unreliable supply and fault rectification. This may drive the demand for alternative energy solutions.

Table 4. 4: Households’ Use of Alternative Energy Solutions

AES Type	Frequency	Percent (%)
PAYG Solar Home System	57	66
Solar Lantern	36	42
Improved Cook stove	29	34
LPG Kit	12	14
Solar Refrigerator	4	5
Solar Water Pump	2	2

Table 4.4 is presentation of data on households’ usage of AES. It is shown that the most used AES was PAYG solar (66%). This is followed by usage of solar lanterns at 42% and improved cook stoves (34%). Other lesser common alternatives were LPG kits (14%); solar refrigerators (5%) and solar water pumps (2%). The findings show that solar-related AES were more common in Chainda Compound than others. Further, the majority of AES users (74%) affirmed that their systems were provided through established companies or development partners operating in the area. Regarding the status of AES usage, the majority of 79% reported that they were still in use while 21% reported that they were no longer in use. The 14 respondents who had discontinued AES usage advanced their reasons as given in table 4.10 below.

Table 4. 5: Reasons for Households’ Discontinued Use of Alternative Energy Solutions

Reason	Frequency	Percent (%)
System malfunction	6	43
High maintenance costs	5	25
Inability to keep up with payments	2	25
Insufficient power capacity	1	12.5
Total	14	100

Table 4.5 represents the reasons for the households' discontinuation of the usage of AES. The main reasons for the discontinuation of AES were system malfunction (43%) and high costs of maintenance and inability to keep up with the payments (25%, respectively). Others claimed insufficiency of power capacity (12.5%). This shows that technical, affordability and reliability factors affected the households' capacity to sustain the use of AES. In terms of monthly energy expenditure, the mean was ZMW 412, with a standard deviation of ZMW 185. Of concern is the high variation indicating significant differences in patterns of energy consumption among households. This suggests that there are other factors influencing expenditure on energy.

Table 4. 6: Experience with Alternative Energy Solutions

		<i>Statistics</i>			
		<i>Reliability</i>	<i>Affordability</i>	<i>Installation</i>	<i>Customer Service</i>
<i>N</i>	<i>Valid</i>	86	86	86	86
	<i>Missing</i>	0	0	0	0
<i>Mean</i>		3.62	3.22	4.02	3.41
<i>Median</i>		4.00	3.00	4.00	3.00
<i>Mode</i>		4	3	4	3
<i>Std. Deviation</i>		.92	1.01	.79	.89
<i>Minimum</i>		2	2	1	1
<i>Maximum</i>		5	5	5	5
<i>Sum</i>		311	277	346	293

Table 4. 7: Interpretation of Likert scale mean scores

Scale Point	Category/Interpretation	Mean Range	Interval
1	Very Low	1.00 to 1.80	0.8
2	Low	1.81 to 2.60	0.8
3	Moderate	2.61 to 3.40	0.8
4	High	3.41 to 4.20	0.8
5	Very High	4.21 to 5.00	0.8

Table 4.11. Shows the households' experiences with AES. Table 4.12 shows the critical values. A mean of 4.02 (mean range: high) indicates that there was significant ease of installation,

while a mean of 3.62 (mean range: high) suggests high reliability. Respondents were indifferent regarding customer service support (mean 3.41) and affordability (mean 3.22). Both were in the moderate mean range. These findings suggest that although the households of Chainda Compound found AES to be reliable and user-friendly, issues of cost persist. The detailed frequencies and tables for these variables are at Appendix ii.

The findings demonstrate that the households of Chainda employed a variety of alternative energy solutions to the national ZESCO grid. There was considerable charcoal usage and contemporary solar solutions. Although the compound has high electrification, consumers are dissatisfied with the service. The findings significantly support the adoption of AES to enhance household energy security.

4.4. Factors Influencing Households’ Adoption of Alternative Energy Solutions

The second research objective was to determine the micro-level socio-economic, perceptual, and cultural factors that influence households’ decisions to adopt or reject alternative energy solutions.

Table 4. 8: Factors Influencing Households’ Adoption of Alternative Energy Solutions

Socio-economic Factors	Mean
Affordability of available AES options	3.233
Household income affects AES adoption	4.209
Upfront cost of AES	3.512
PAYG models and AES accessibility	3.349
Awareness and Knowledge	
Information about available AES options	3.221
Long-term cost benefits of AES	3.663
AES demonstrations/advertising in Chainda	3.058
Perceived Usefulness and Ease of Use	
AES and improvement of household welfare	3.756
Ease of operating and maintaining AES	4.209
Reliability of solar systems for lighting/charging	4.442
LPG/improved cookstoves vs charcoal	3.686
Social and Cultural Factors	
Cooking culture making it difficult to stop using charcoal	4.186

People’s influence on household adoption of AES	2.349
Preference for the taste of food cooked by charcoal	2.256
Perceived Risks and Concerns	
Individual concerns about LPG safety.	3.756
Worry about solar systems breaking down	2.233

Table 4.8 is a presentation of data concerning factors influencing households’ adoption of alternative energy solutions (full data in appendix IV). Among the socio-economic factors, it was found that household income levels strongly affected the ability to adopt AES (mean 4.209). However, a mean of 3.512 indicates that the upfront cost of AES was too high. The respondents still acknowledged that PAYG models made AES more accessible (mean 3.349). Specific to Chainda Compound, it was found that the respondents were indifferent about the available AES options affordability to their households (mean 3.233).

In terms of awareness and knowledge, a mean of 3.663 indicates that the respondents understood the long-term cost benefits of AES. However, they did not all have enough information about other available AES options apart from the ones they knew (mean 3.221). The respondents had not had significant exposure to AES demonstrations/advertising in Chainda (mean 3.058).

The study assessed the factors of usefulness and ease of use of AES. It was found that solar systems were perceived to be reliable for lighting/charging (mean 4.442) and were easy to operate and maintain (mean 4.209). AES improved household welfare (mean 3.756) with sufficient evidence that LPG/improved cook stoves cooked faster and easier than charcoal (mean 3.686).

There were socio-cultural factors influencing the adoption of AES among households of Chainda Compound. It was observed that the prevailing cooking culture made it difficult to stop using charcoal (mean 4.186). The adoption of AES was not strongly influenced by other people (mean 2.349) neither was the taste of food cooked by charcoal more preferable (mean 2.256).

There were also perceived risks and related concerns. Among these, households were concerned about LPG safety (mean 3.756). The respondents were not worried about solar systems breaking down or be hard to repair (mean 2.233).

4.5. Community Perceptions of Development Partners' Promotion Strategies to Improve the Adoption of Alternative Energy Solutions

The third research objective was to examine community perceptions of development partners' promotion strategies to improve the adoption of alternative energy solutions.

Table 4. 9: How Respondents Heard about AES

Source of knowledge	Frequency	Percent
Door-to-door agents	62	72
Friend/Neighbour	60	70
AES promotion agents	58	67
Radio/TV	35	41
Posters/fliers	29	34
Community meeting/workshop	23	27
Local shops/market	18	21

According to table 4.9, the majority of respondents (63%) were aware of organisations promoting AES in Chainda Compound. The main sources of knowledge were door-to-door sales agents (72%); friends and neighbours (70%) and other promotion agents (67%). Radio and TV accounted for 41%; posters and fliers 34%; community meetings and workshops 27% and local shops and markets 21%. By a mean of 3.855, there was positive trust of the information that the promoters of AES provided.

The study found that the most preferred promotional strategies were free trials and demonstrations (75%); seeing the AER operational at the neighbours' houses (64%) and flexible PAYG without deposit (60%). By a mean of 3.965, it was admitted that AES were being made more accessible to poor households through the strategies of the development partners operating in Chainda Compound.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1. Introduction

The study was an assessment of the rate of adoption of alternative energy solutions among households of Chainda Compound of Lusaka. Particularly, the study focused on AES promoted by development partners. The discussion draws upon the findings presented in the previous chapter, relating them to previous research and implications to research and practice.

5.2. Household Experiences and Patterns of use of Alternative Energy Solutions

The first research objective was to assess household experiences and patterns of use of specific alternative energy solutions in Chainda Compound. The study found that the households in the study had grid electricity as the major source of energy for lighting and charging of electronic gadgets. Charcoal is still a dominant source of fuel for cooking. Among the emerging AES in Chainda Compound is solar energy, which is primarily used for lighting. Dissatisfaction with the ZESCO grid electricity appears to be an important factor influencing the adoption of AES. The challenges of load shedding, voltage fluctuations, power outages and unreliable supply and poor fault rectification remain.

These findings show that the households in Chainda do not demonstrate a linear transitioning the traditional methods of using energy to contemporary methods. This implies engagement in energy stacking. The findings align with previous research from other African countries such as Lay, et al., (2013) who found that in Kenya, household choice of alternative fuel fell within the options solar home systems (SHS). Similarly in Ghana, Asante et al. (2020) observed that household behaviour after dissatisfaction with electricity grid challenges focused toward solar PV adoption. In Zambia, Chishimba, (2024) observed that even the most urbanised and fully electrified households continued to use traditional methods such as charcoal in combination with electricity. The use of renewable energy such as solar has not replaced traditional biomass.

The findings of the current study significantly reflect the practices of energy usage across the globe. However, socio-economic and environmental factors by Mishra and Behera, (2016) show that the practices are influenced by environmental sustainability, socio-economic development, and improved living standards, while Omer (2010), points to building design and

construction. While this study recognises traditional variables affecting energy practices, Mishra and Behera, (2016) shows strong links to economic, community and household factors. Other scholars have mentioned policy and institutional factors (Mishra & Behera, 2016; Yasmin & Grundmann, 2019; Rathee & Kumar, 2025).

The study findings correlate with researchers in Zambia such as Chishimba, (2024) and Mulima et al., (2025) who also agree that prevailing energy challenges in Zambia have an influence on adoption of AES. The over reliance on charcoal as found in Chainda Compound is not significantly different from what obtains within the Zambian socio-cultural context (Chishimba, 2024). This is similar to literature suggesting that status quo bias led households to not take steps to discontinue the deeply embedded practices of using charcoal. This therefore underscores insights from the literature such as Rathee and Kumar, (2025) that undertaking purely financial and technical interventions are not sufficient unless deep-seated behavioural factors are addressed.

5.3.Factors Influencing Households' Adoption of Alternative Energy Solutions

The second research objective was to determine the micro-level socio-economic, perceptual, and cultural factors that influence households' decisions to adopt or reject alternative energy solutions. The major findings bring out various determining factors, including, reliability, and household income, ease of operating and maintaining AES and cooking culture. It was further, AES could be adopted for improvement of household welfare; improved cooking; long-term cost benefits of AES and accessibility of PAYG models.

The findings of this study concur with other researchers such as Asante et al. (2020), Kaambo, (2021) and Zulu et al., (2022) who affirm that problems with the national energy grid bring about the need for AES. The problems of load shedding, voltage fluctuations, and unreliable service have been recognised in previous research and stand out as major drivers for the adoption of AES. In line with this emerging phenomenon, the study by Mhango, (2024) found that problems with existing electricity grids created a market niche that providers of AES could take.

Cost factors as established in this study have been a major factor in previous research on the adoption of new technologies, including AES. The current study reflects extant literature on the facts that AES were cheaper to acquire, instal, utilise and maintain (Obuseh et al., 2025; Mhango, 2024; Hesselink & Chappin, 2019). This indicates that development partners have

innovated AES that are cost-effective, mitigating the perceived complexity barriers documented in the literature. The crucial role of development partners was established as focused not only on addressing the energy problem, but also make it less expensive for low-income households. Although not reflected in extant literature, the use of door-to-door promotions are an effective means, proven effective at building trust and overcoming information asymmetry. The findings of this study support the literature that peer testimonials and direct engagement are essential for building trust where households lack reliable product information.

5.4. Community Perceptions of Development Partners' Promotion Strategies to Improve the Adoption of Alternative Energy Solutions

The third research objective was to examine community perceptions of development partners' promotion strategies to improve the adoption of alternative energy solutions. Although the study established that there was success at the initial adoption stages, sustaining had significant hurdles. Respondents were concerned with system malfunctioning; discontinuation rates. Other studies have revealed that high maintenance costs and failure by users to keep up with payments are important inhibiting factors. This reveals potential bottlenecks that both development partners and households face in the post-installation period. Of significance to research are weak maintenance structures and the financial fragility of households.

Like this study, researchers like Okereke et al., (2023) have previously established that income levels are a great determinant of technology adoption. When upfront costs are high, adoption levels are lower. This study still maintains that PAYG models improved accessibility despite the failure by some households to keep up with payments. This also demonstrates that even financing mechanisms meant to address the needs of low-income users can potentially be unsustainable. This is much aligned with the findings from African research on alternative energy affordability barriers. These researchers have explained aspects of knowledge and perception such as insufficient supply (Babalola et al., 2022); knowledge and access (Everlyne et al., 2013; Yasmin & Grundmann, 2019). As Chishimba, (2024) submits that there are widely varied factors of AES adoption among pan-Africanists.

Scholars have identified that policy constraints and institutional challenges hinder the successful implementation of AES strategies. These have potential to delay procedures;

delivery of subsidies; and hinder sustainability and the maintenance ecosystem (Mishra & Behera, 2016; Yasmin & Grundmann, 2019; Rathee & Kumar, 2025).

The findings of this study reveal that the adoption of AES in Chainda Compound as led by development partners represents successes akin to the global realities. It confirms that challenges faced by households in terms of economic capacity are similar. The transition towards AES will be led by solar solutions into the long-term, driven by the common dissatisfaction with grid dissatisfaction and positive marketing strategies which continue to make such products more affordable and user-friendly. However, the persistent usage of traditional biomass will challenge development partners' initiatives in clean cooking. Indeed the findings demonstrate that development partners are leading the way and that community adoption of AES shall be a continuous process. For development partners, moving beyond dissemination to foster resilient, locally-embedded ecosystems for maintenance, financing, and cultural adaptation is essential for transforming initial adoption into lasting energy transition in Chainda Compound and similar peri-urban contexts.

5.5.Synthesis and Research Gaps

A comprehensive synthesis of the literature reveals that household adoption of alternative energy is a complex process shaped by four interconnected factors: economic affordability, institutional support, socio-cultural norms, and gendered decision-making. While the potential benefits for environmental health, economic productivity, and personal well-being are well-documented, they are not automatic and depend on sustained, high-quality access and productive use of the technology. The review establishes a robust global and regional framework, which in the Zambian context is defined by the specific realities of load-shedding, charcoal dependence, and institutional barriers. However, a critical research gap persists: a lack of localized, compound-specific studies within high-density, peri-urban settlements like Chainda in Lusaka, where unique socio-economic and environmental dynamics at the urban-rural interface remain underexplored.

The literature consistently identifies a multi-layered barrier system to adoption. While high cost is a universal and immediate hurdle, its persistence in contexts like Zambia is underpinned by deeper institutional failures, a crisis of trust due to poor product quality, and the powerful influence of social norms. Furthermore, a significant gap exists between generally positive awareness and actual adoption, as supportive attitudes are rendered non-actionable by a lack of

specific technical knowledge, overwhelming economic constraints, and context-specific issues like landlord-tenant dynamics. Consequently, future research must move beyond broad frameworks to diagnose the precise informational, perceptual, and trust-related bottlenecks in hyper-local settings. This shift is essential for designing integrated interventions—combining innovative financing, quality assurance, streamlined regulation, and targeted communication—that can convert positive perceptions into sustained adoption and tangible benefits.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The study sought to assess the adoption rate of alternative energy solutions promoted by development partners in Chainda Compound. The findings, as presented in Chapter Four, led to the following conclusions aligned with each specific objective:

1. Regarding household experiences and patterns of AES use (Objective 1): It was found that households in Chainda Compound did not demonstrate a complete transition to AES but rather practiced energy stacking. While ZESCO grid electricity was the main source for lighting and charging, its unreliability was a significant source of dissatisfaction. Charcoal remained the dominant cooking fuel despite the availability of alternatives like improved cook stoves and LPG. PAYG solar systems were the most commonly adopted AES, but a notable portion of users discontinued their use due to technical failures and cost-related challenges, as detailed in Sections 4.3 and 4.4.

2. Regarding factors influencing adoption (Objective 2): The analysis in Section 4.4 revealed that household income level was the strongest socio-economic factor affecting adoption ability. High upfront costs were a barrier, though PAYG models were acknowledged to improve accessibility. Cultural attachment to charcoal-based cooking was a significant hindrance, whereas AES were perceived as useful, easy to operate, and reliable for lighting. Safety concerns, particularly regarding LPG, also influenced perceptions. 3. Regarding community perceptions of promotion strategies (Objective 3): As shown in Section 4.5, awareness of AES was primarily spread through door-to-door agents and word of-mouth. The community expressed trust in the information provided by promoters and identified free trials, visible neighbour installations, and flexible PAYG terms as the most effective promotion strategies. However, these strategies were less effective in addressing post-adoption sustainability issues.

In summary, the study concluded that development partners had made notable progress in introducing AES to Chainda, but sustained adoption and a full energy transition were limited by intertwined economic, technical, and socio-cultural factors.

6.2. Recommendations

Based on the specific evidence gathered in this study, the following recommendations are made:

A. Policy-Focused Recommendations

1. **Strengthen Quality Assurance and Regulation:** Findings in Table 4.10 indicated that system malfunction was the leading cause of AES discontinuation. Therefore, it is recommended that the Zambia Bureau of Standards (ZBS) and the Energy Regulation Board (ERB) enforce stricter minimum quality standards for imported and locally marketed AES products to protect consumers and build market confidence.

2. **Incentivize Clean Cooking Transitions:** Given the strong cultural preference for charcoal cooking identified in Table 4.13 (mean score of 4.185), it is recommended that the Ministry of Energy design and implement targeted subsidy programs or tax incentives for LPG and high quality biomass cook stoves to make these alternatives more financially attractive for low income households.

B. Operational-Focused Recommendations for Development Partners & Implementers

1. **Develop Robust After-Sales Service Networks:** Since high maintenance costs and a lack of repair services were key reasons for abandonment (Table 4.10), it is recommended that development partners invest in training and supporting local technicians within Chainda to create sustainable maintenance ecosystems, ensuring the longevity of installed AES.

2. **Diversify and Adapt Financing Models:** The data in Table 4.6 showed that most households had low and irregular incomes. To address payment difficulties, it is recommended that AES providers develop more flexible PAYG schemes that align with irregular income streams, such as through seasonal payment plans or emergency payment pauses.

C. Future Research Recommendations

1. **Conduct Longitudinal Studies:** To move beyond the snapshot provided by this cross sectional study, future research should employ a longitudinal design to track the long-term sustainability, economic impact, and behavioural changes associated with AES adoption in peri-urban settlements over 3-5 years.

2. Investigate Gendered Dimensions of Adoption: Future studies should explicitly investigate the intra-household decision-making processes, workload impacts, and differing perceptions of AES between men and women in compounds like Chaiinda, to inform more gender-sensitive intervention designs.

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APPENDIX I: QUESTIONNAIRE

An Assessment of the Adoption Rate of Alternative Energy Solutions Promoted by Development Partners: A Case of Chainda Compound, Lusaka.

QUESTIONNAIRE

SECTION A: HOUSEHOLD DEMOGRAPHICS

A1. Sex of Household Head

- Male
- Female
- Prefer not to say

A2. Your relationship to the head of household

- Head of Household
- Spouse
- Child (18+)
- Other relative
- Non-relative

A3. Age Group of Household Head

- 18–25
- 26–35
- 36–45
- 46–55
- 56+

A4. Highest level of education completed

- No formal education
- Primary
- Secondary
- Technical/Vocational

- College/Training
- University Degree
- Other (specify): _____

A5. Primary occupation of household head

- Formal employment
- Informal business/Self-employed
- Artisan/Skilled Labour
- Casual labourer
- Unemployed
- Student
- Other (specify): _____

A6. Estimated Monthly Household Income

- Below ZMW 1,000
- ZMW 1,001–2,000
- ZMW 2,001–3,500
- ZMW 3,501–5,000
- ZMW 5,001–7,500
- Above ZMW 7,500

A7. Household size (number of people living in household)

- 1–3
- 4–6
- 7–9
- 10+

SECTION B: HOUSEHOLD ENERGY USE PATTERNS & EXPERIENCES

B1. Primary energy sources used for different household activities

(Tick *one* per row)

Activity	Grid Electricity	Charcoal Firewood	Solar System	LPG Gas	Kerosene	Candles Batteries	Other
Cooking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Appliances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

B2. Is your household connected to the ZESCO national grid?

Yes

No → Skip to B4

B3. If YES, rate your satisfaction with grid electricity (1 = Very Dissatisfied, 5 = Very Satisfied)

	1	2	3	4	5
Reliable (few outages)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Affordable monthly bills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficiency for household needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B4. Have you ever used any Alternative Energy Solutions (AES)?

Tick all that apply:

PAYG Solar Home System (e.g., Vitalite, SupaMoto, RDG, ENGIE)

Solar Lantern

Improved cookstove

LPG Kit

Solar Refrigerator

Solar Water Pump

None of the above → Skip to SECTION C

B5. For AES used, indicate:

Was it provided/promoted by development partner/NGO/company?

Yes No

- Current Status:
 - Still in use No longer used
- If no longer used, reason: _____

B6. Monthly household spending on all energy sources (ZMW)

Amount: ZMW _____

B7. Rate your experience with AES used (1 = Very Poor, 5 = Excellent)

Item	1	2	3	4	5
Reliability of power	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Affordability of payments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of installation & use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Customer service/support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION C: FACTORS INFLUENCING ADOPTION OF ALTERNATIVE ENERGY

(1 = Strongly Disagree ... 5 = Strongly Agree)

C1. Socio-Economic & Financial Factors

Statement	1	2	3	4	5
AES options available in Chainda are affordable to my household.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My household income affects ability to adopt AES.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Upfront cost of AES (e.g., solar deposit) is too high.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PAYG models make AES more accessible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C2. Awareness & Knowledge

Statement	1	2	3	4	5
I have enough information about available AES options.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I understand the long-term cost benefits of AES.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have seen AES demonstrations/advertising in Chainda.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C3. Perceived Usefulness & Ease of Use (Technology Acceptance)

Statement	1	2	3	4	5
AES improve household welfare.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AES are easy to operate and maintain.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Solar systems are reliable for lighting/charging.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LPG/improved cookstoves cook faster and easier than charcoal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C4. Social & Cultural Factors

Statement	1	2	3	4	5
Cooking culture makes it difficult to stop using charcoal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
People I know influence whether I adopt AES.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The taste of food cooked by charcoal is preferable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C5. Perceived Risks & Concerns

Statement	1	2	3	4	5
I am concerned about LPG safety.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I worry solar systems may break down or be hard to repair.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safety concerns reduce my willingness to adopt AES.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C6. Single biggest barrier preventing adoption of AES:

SECTION D: PERCEPTIONS OF PROMOTION STRATEGIES

D1. Awareness of organisations promoting AES in Chanda

Yes → Name(s): _____

No

D2. How did you first hear about AES?

(Tick all that apply)

Radio/TV

Community meeting/workshop

Door-to-door agents

Friend/Neighbour

Posters/flyers

Local shops/market

Never heard about them

D3. Trust in information from promoters

Do not trust at all

Slightly trust

Moderately trust

Strongly trust

D4. Preferred promotion strategies (Select up to TWO)

- Free trial or demonstration
- Discount/subsidy on initial cost
- Strong after-sales service/warranty
- Seeing it working at a neighbour's house
- Flexible PAYG with no deposit

D5. Rate the following promotion aspects (1 = SD, 5 = SA)

Statement	1	2	3	4	5
Development partners provide clear information.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sensitisation activities are visible in Chainda.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Payment models (PAYG) are attractive.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Demonstrations increase trust in AES.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safety concerns are addressed adequately.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AES have been made more accessible to poor households.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION E: OVERALL ADOPTION AND INTENTION TO ADOPT AES

E1. Have you adopted at least one AES?

- Yes (currently using)
- Used before, not currently
- Never used

E2. If NOT adopted, why? (Select up to 3)

- Too expensive
- Lack of awareness
- Not available nearby
- Safety concerns

- Prefer charcoal/traditional methods
- Not convinced of benefits
- Payment plans not suitable
- Low trust in suppliers
- Other: _____

E3. Likelihood of adopting AES in next 12 months

- Very unlikely
- Unlikely
- Not sure
- Likely
- Very likely

E4. Preferred alternative energy if cheaper/more available

- Solar Home System
- LPG
- Improved Cook stove
- Hybrid Solar + Grid
- Other: _____

E5. Any suggestions to improve AES adoption in Chainda?

END OF QUESTIONNAIRE

APPENDIX II: RESEARCH BUDGET

Category	Description	Unit Cost (ZMW)	Quantity	Subtotal (ZMW)	Total (ZMW)
Personnel	Research Assistant working for 5 days	100	5 Days	500	500
Travel & Logistics	transport for the researcher and assistant	60	20 Trips	1,200.00	1,200
Data Collection	Printing of questionnaires, digital tools, refreshments				900
	Software License:	1,000.00	1	1,000.00	1,000
	Transcription Services:	500	1	500	500
	Thesis Printing & Binding:	500	2 Copies	1,000.00	1,000
	Cost for printing and bindings				1800
	Miscellaneous	400	1	400	400
			TOTAL		7,300

APPENDIX III: DATA ON RELIABILITY, AFFORDABILITY, INSTALLATION, CUSTOMER SERVICE VARIABLES

		Statistics			
		Reliability	Affordability	Installation	Customer Service
N	Valid	86	86	86	86
	Missing	0	0	0	0
Mean		3.62	3.22	4.02	3.41
Median		4.00	3.00	4.00	3.00
Mode		4	3	4	3
Std. Deviation		.738	.758	.797	.831
Minimum		2	2	1	1
Maximum		5	5	5	5
Sum		311	277	346	293

Frequency Table

		Reliability			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	6	7.0	7.0	7.0
	Fair	28	32.6	32.6	39.5
	Very good	45	52.3	52.3	91.9
	Excellent	7	8.1	8.1	100.0
	Total	86	100.0	100.0	

		Affordability			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	13	15.1	15.1	15.1
	Fair	45	52.3	52.3	67.4
	Very good	24	27.9	27.9	95.3
	Excellent	4	4.7	4.7	100.0
	Total	86	100.0	100.0	

Installation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Poor	2	2.3	2.3	2.3
	Poor	2	2.3	2.3	4.7
	Fair	8	9.3	9.3	14.0
	Very good	54	62.8	62.8	76.7
	Excellent	20	23.3	23.3	100.0
	Total	86	100.0	100.0	

Customer Service

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Poor	1	1.2	1.2	1.2
	Poor	6	7.0	7.0	8.1
	Fair	46	53.5	53.5	61.6
	Very good	23	26.7	26.7	88.4
	Excellent	10	11.6	11.6	100.0
	Total	86	100.0	100.0	

Raw Data

RESPOND ENT	Reliability of power	Affordability of payments	Ease of installation & use	Customer service
1	4	3	4	4
2	3	5	4	4
3	4	2	5	4
4	4	5	4	4
5	4	3	4	3
6	4	3	5	5
7	5	5	5	5
8	3	3	4	3
9	3	3	4	3
10	4	4	5	5
11	2	2	3	4
12	4	3	4	5
13	3	4	4	3
14	3	3	3	4
15	4	3	3	3
16	3	3	4	3
17	4	2	3	3
18	4	2	2	4
19	4	3	3	3
20	4	4	4	3
21	3	4	5	5
22	2	3	4	3
23	5	3	4	4
24	4	3	4	4
25	3	3	4	3
26	4	3	4	3
27	4	3	5	5
28	4	4	4	2
29	5	4	4	3

30	3	4	4	3
31	4	3	5	2
32	4	3	4	3
33	3	3	4	3
34	4	4	5	3
35	4	2	2	3
36	4	3	4	4
37	4	4	5	4
38	4	3	4	4
39	3	3	4	3
40	3	3	4	3
41	3	2	4	4
42	4	2	5	3
43	2	3	4	3
44	3	4	4	4
45	3	4	5	3
46	3	2	1	4
47	4	3	4	3
48	3	4	4	3
49	4	4	5	5
50	4	3	4	3
51	4	3	4	3
52	4	3	5	4
53	3	3	4	3
54	2	3	5	2
55	5	2	3	3
56	4	4	5	3
57	3	4	4	3
58	4	4	4	4
59	4	3	4	3
60	4	3	3	3
61	5	4	4	3

62	3	4	4	3
63	4	3	4	4
64	4	2	3	2
65	3	3	4	3
66	4	3	4	3
67	2	3	4	3
68	3	3	4	3
69	3	3	5	5
70	3	3	4	4
71	4	4	4	3
72	4	3	1	1
73	4	4	4	4
74	4	4	4	3
75	4	5	4	4
76	4	4	5	3
77	3	3	4	4
78	2	2	4	3
79	5	2	4	2
80	4	3	4	3
81	3	3	5	5
82	4	3	4	2
83	4	3	5	3
84	3	4	4	4
85	5	4	4	3
86	3	2	5	5

APPENDIX IV: Factors Influencing Households' Adoption of Alternative Energy Solutions

Statistics

Factors Influencing Households' Adoption of Alternative Energy Solutions

		N		Mean	Median	Std. Deviation
		Valid	Missing			
Statistics	AES_Afford	86	0	3.23	3.00	0.929
	HH_Income	86	0	4.21	4.00	0.769
	AES_Upfront	86	0	3.51	4.00	1.015
	PAYG_Access	86	0	3.35	3.00	0.682
	AES_Info	86	0	3.22	3.00	0.621
	AES_LongBen	86	0	3.66	4.00	0.696
	AES_DemoAdv	86	0	3.06	3.00	0.772
	AES_Welfare	86	0	3.76	4.00	0.612
	AES_EaseUse	86	0	4.21	4.00	0.534
	Solar_Reliab	86	0	4.44	5.00	0.806
	LPG_vs_Char	86	0	3.69	4.00	0.801
	Cook_Culture	86	0	4.19	4.00	0.520
	Social_Influ	86	0	2.35	2.00	0.628
	Taste_Pref	86	0	2.26	2.00	0.598
	LPG_Safety	86	0	3.76	4.00	0.552
	Solar_Break	86	0	2.23	2.00	0.680

Frequency Table

AES_Afford

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY LOW	3	3.5	3.5	3.5
	LOW	16	18.6	18.6	22.1
	AVERAGE	29	33.7	33.7	55.8
	HIGH	34	39.5	39.5	95.3
	VERY HIGH	4	4.7	4.7	100.0
	Total	86	100.0	100.0	

HH_Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	1	1.2	1.2	1.2
	AVERAGE	15	17.4	17.4	18.6
	HIGH	35	40.7	40.7	59.3
	VERY HIGH	35	40.7	40.7	100.0
	Total	86	100.0	100.0	

AES_Upfront

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY LOW	3	3.5	3.5	3.5
	LOW	14	16.3	16.3	19.8
	AVERAGE	15	17.4	17.4	37.2
	HIGH	44	51.2	51.2	88.4
	VERY HIGH	10	11.6	11.6	100.0
	Total	86	100.0	100.0	

PAYG_Access

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	5	5.8	5.8	5.8
	AVERAGE	51	59.3	59.3	65.1
	HIGH	25	29.1	29.1	94.2
	VERY HIGH	5	5.8	5.8	100.0
	Total	86	100.0	100.0	

AES_Info

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	9	10.5	10.5	10.5
	AVERAG E	49	57.0	57.0	67.4
	HIGH	28	32.6	32.6	100.0
	Total	86	100.0	100.0	

AES_LongBen

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	AVERAGE	40	46.5	46.5	46.5
	HIGH	35	40.7	40.7	87.2
	VERY HIGH	11	12.8	12.8	100.0
	Total	86	100.0	100.0	

AES_DemoAdv

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY LOW	2	2.3	2.3	2.3
	LOW	10	11.6	11.6	14.0

AVERAGE	62	72.1	72.1	86.0
HIGH	5	5.8	5.8	91.9
VERY HIGH	7	8.1	8.1	100.0
Total	86	100.0	100.0	

AES_Welfare

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	7	8.1	8.1	8.1
	AVERAGE	8	9.3	9.3	17.4
	HIGH	70	81.4	81.4	98.8
	VERY HIGH	1	1.2	1.2	100.0
	Total	86	100.0	100.0	

AES_EaseUse

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	AVERAGE	5	5.8	5.8	5.8
	HIGH	58	67.4	67.4	73.3
	VERY HIGH	23	26.7	26.7	100.0
	Total	86	100.0	100.0	

Solar_Reliab

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	1	1.2	1.2	1.2
	AVERAGE	14	16.3	16.3	17.4
	HIGH	17	19.8	19.8	37.2
	VERY HIGH	54	62.8	62.8	100.0
	Total	86	100.0	100.0	

LPG_vs_Char

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	10	11.6	11.6	11.6
	AVERAGE	15	17.4	17.4	29.1
	HIGH	53	61.6	61.6	90.7
	VERY HIGH	8	9.3	9.3	100.0
	Total	86	100.0	100.0	

Cook_Culture

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	1	1.2	1.2	1.2
	AVERAGE	2	2.3	2.3	3.5
	HIGH	63	73.3	73.3	76.7
	VERY HIGH	20	23.3	23.3	100.0
	Total	86	100.0	100.0	

Social_Influ

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY LOW	2	2.3	2.3	2.3
	LOW	57	66.3	66.3	68.6
	AVERAGE	22	25.6	25.6	94.2
	HIGH	5	5.8	5.8	100.0
	Total	86	100.0	100.0	

Taste_Pref

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	71	82.6	82.6	82.6
	AVERAG E	8	9.3	9.3	91.9
	HIGH	7	8.1	8.1	100.0
	Total	86	100.0	100.0	

LPG_Safety

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LOW	5	5.8	5.8	5.8
	AVERAG E	11	12.8	12.8	18.6
	HIGH	70	81.4	81.4	100.0
	Total	86	100.0	100.0	

Solar_Break

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VERY LOW	6	7.0	7.0	7.0
	LOW	60	69.8	69.8	76.7
	AVERAGE	14	16.3	16.3	93.0
	HIGH	6	7.0	7.0	100.0
	Total	86	100.0	100.0	

Raw data

	AE S_ Aff ord	H H_ Inc om e	AE S_ Up fro nt	PA YG _A cce ss	A E S_ In fo	AE S_ Lon gBe n	AE S_ D emo Adv	AE S_ We lfar e	AE S_ Eas eUs	Sol ar_ Rel iab	LP G_ vs_ Ch ar	Co ok_ Cul tur e	So cia l_I nfl u	Ta ste _P ref	LP G_ Saf ety	Sol ar_ Br ea k
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