



SCHOOL OF POSTGRADUATE STUDIES

**Assessing the Factors Affecting the
Viability of PPP Solar Projects: The Case
of Luanshya District**

A Dissertation Submitted in Partial Fulfilment for the Award of Master of Sciences in
Accounting and Finance at the University of Lusaka

BY

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Declaration

I, *Josephine Mwansa Sing'andu*, declare that this research report titled "**Assessing the Factors Affecting the Viability of PPP Solar Projects: The Case of Luanshya District**" is my own work. It was prepared under the guidance of Dr. Avulundiah Phiri, whose support and advice have been invaluable in completing this research project.

The study is original and represents my independent research efforts. It is based on my findings and has not been submitted to the University of Lusaka or any other institution for any degree or diploma. I take full responsibility for the accuracy and honesty of this work and present it as a result of my hard work and commitment to the field of accounting and finance.



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Dedication

This research project is dedicated to my spouse, whose unconditional love, support, and sacrifices have provided me with the gift of life and the foundation to pursue my dreams. His guidance and encouragement have been a constant source of strength throughout my journey. I also dedicate this work to my brothers and sisters, who have been my pillars of inspiration, providing not only moral and spiritual support but also financial assistance that has enabled me to continue my studies at the University of Lusaka.

My classmates deserve special mention for their companionship and unwavering support during the course of my studies. The collaborative spirit we shared has enriched my academic experience and helped me navigate through the challenges of university life.

Above all, I dedicate this project to God Almighty, whose grace and blessings have brought me this far. It is through His divine guidance and provision that I have been able to complete this study. I am deeply grateful for the strength, wisdom, and opportunities He has bestowed upon me, making it possible to achieve this milestone.

Acknowledgements

I extend my heartfelt gratitude to everyone who contributed to the successful completion of my project titled “*Assessing the Factors Affecting the Viability of PPP Solar Projects: The Case of Luanshya District.*”

First and foremost, I express my sincere appreciation to Dr. Avulundiah Phiri, who served as my esteemed guide. His invaluable support, guidance, and encouragement were pivotal throughout this project. His expertise, patience, and insightful feedback profoundly shaped my work, and I am deeply grateful for his contributions.

I am also indebted to the management of various industries used in this study for granting me the permission to conduct my study at their esteemed institution. Their cooperation and assistance were crucial to the successful completion of my research.

Furthermore, I extend my thanks to all my colleagues and friends who provided valuable insights, feedback, and encouragement throughout this journey. Their support made this challenging process more manageable and enjoyable.

Lastly, I would like to express my profound gratitude to my family. Their unwavering support, understanding, and patience during this project have been a source of strength and motivation for me. Their belief in my abilities and constant encouragement have been instrumental in my academic achievements, and I am forever thankful for your love and support.

Thank you all for being an integral part of this journey and for your significant contributions to the successful completion of my research project.

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List of Acronyms

| Acronym | Description |
|----------------|---|
| CEC | Copperbelt Energy Cooperation |
| CEEC | Citizen Economic Empowerment Commission |
| ERB | Energy Regulation Board |
| PPP | Public-Private Partnerships |
| REA | Rural Electrification Authority |
| ZEMA | Zambia Environmental Management Agency |
| ZESCO | Zambia Electricity Supply Corporation |

Abstract

This research study explored the potential of Public-Private Partnerships (PPPs) in addressing Zambia's energy crisis by developing solar power projects in Luanshya District. Zambia, as a country at large, faced significant power shortages, which was largely due to reduced hydropower generation resulting from climate change. Therefore, this research study aimed to assess the viability of PPPs for solar energy projects in Luanshya District.

The research study used a phenomenological qualitative approach with convenience sampling to collect data from stakeholders involved in solar power PPP projects in Luanshya. The sample size, which comprised of 15 respondents, was determined by data saturation. The data was collected through Google form structured questionnaire.

The findings showed that 46.7% of the respondents believed the projects were not viable whereas 13.3% perceived viability. Financial issues were a significant barrier to solar PPP, with 71.4% of respondents citing high initial investment costs and 64.3% pointing to insufficient returns as key obstacles that could discourage private investors.

In conclusion, it was recommended that there should be attractive financial models to entice investors in PPPs as well as further research on appropriate electricity tariffs to ensure return on investments.

Keywords: *Public-Private Partnerships, Energy crisis, Solar power, Luanshya District, Financial feasibility, Regulatory frameworks, Technological barriers, Socio-economic impacts, Stakeholder collaboration, Chi-squared test, Spearman's correlation, Viability, Economic growth*

Chapter 1: Introduction

This chapter highlighted the basis for the study that was conducted to examine the viability of Public-Private Partnership (PPP) for Solar Power in Zambia's Luanshya District. The chapter advanced the background to the study, the statement of the problem, research objectives, research questions and definition of key terms. Chapter one also touched upon the scope of the study, the significance of the study and wound up with how this report has been organized.

1.1 Background

Electricity supply shortages and load shedding in Zambia began in June 2015, primarily due to the effects of climate change and the droughts experienced during the 2014/2015 rainy season (Mulongoti, Mugala, Kumwenda, & Louie, 2016). These conditions persisted and even worsened in the 2023/2024 rainfall season, with ongoing climate change effects causing significant droughts and dry spells. This placed immense strain on the Zambia Electricity Supply Corporation (ZESCO). This public sector-owned entity relies heavily on hydroelectric power for over 80% of its electricity supply (United Nations Environmental Program, 2019; Zambia Ministry of Energy, 2024). The resultant load shedding had far-reaching negative impacts on the economy, leading to severe operational disruptions for businesses when power cuts occurred unexpectedly (Bizimana, 2024). These disruptions resulted in substantial job losses, reduced revenue for businesses, and overall adverse effects on the country's gross domestic product.

To address the growing electricity demand and the insufficient supply from the national grid, Zambia has been exploring diversification within the power supply industry. Renewable energy sources, particularly solar power, have emerged as attractive alternatives to meet the increasing energy demands of both commercial and residential users (Fang et al., 2019). However, in developing countries like Zambia, power utility companies, which are often parastatals, face significant challenges in expanding their generation and supply infrastructure rapidly enough

to keep pace with rising energy demands. This issue is largely due to a substantial financing gap (ZDA, 2014). PPP have been identified as a potential solution to the energy crisis, offering a means to leverage the resources and expertise of the private sector. The government of Zambia, along with other nations in the sub-Saharan African region, has recognised solar energy as a crucial alternative to address the energy deficits caused by frequent droughts (Bowa, Mwanza, Sumbwanyambe, & Pretori, 2017).

A PPP is defined as a long-term contract between a private party and a government agency for the provision of a public asset or service, in which the private party assumes significant risk and management responsibility (World Bank, Public-Private Partnerships: Reference Guide, 2012). PPP enables governments to procure and deliver public infrastructure and services by utilising private sector resources and expertise through risk-sharing arrangements (Mohammed, Salem, Ibanez, & Lorenzo, 2023). There are 15 types of PPP, including build and transfer, build lease and transfer, build operate and transfer, build own and operate, build own, operate and transfer, build transfer and operate, contract add and operate, develop operate and transfer, rehabilitate operate and transfer, rehabilitate own and operate, build own operate and maintain, lease management, management contract, service contract, and supply operate and transfer (Chishika, nd).

The key benefits of PPP include the sharing of resources, risks, and rewards in the delivery of public services and facilities (Pâravu & Voicu-Olteanu, 2009). Through PPP, the public sector can harness private sector efficiencies, innovation, and financial resources to enhance public service delivery and infrastructure development. Despite these advantages, PPPs have not been fully utilised to alleviate Zambia's energy crisis. Therefore, it is crucial to conduct a comprehensive examination of the viability of PPP for solar power projects in Zambia, specifically in the Luanshya District of the Copperbelt Province. Exploring PPP in solar power can provide multiple benefits, such as increased investment in solar infrastructure,

faster implementation of solar projects, and improved management and maintenance of solar facilities. Additionally, PPP can foster innovation and the adoption of advanced solar technologies, reducing dependency on hydroelectric power and enhancing energy security (Awuku, Amar, Firdaus, & Nazmi, 2021). By engaging the private sector in solar power projects, Zambia can not only address its current energy challenges but also promote sustainable development, reduce greenhouse gas emissions, and create new economic opportunities for local communities. Given the persistent energy shortages and the need for sustainable solutions, it is imperative to assess the potential of PPP in developing solar power infrastructure in Luanshya District. This approach could significantly contribute to meeting the growing energy demands, ensuring a more reliable and diversified power supply, and supporting the overall economic development of Zambia.

1.2 Statement of the Problem

Climate change in Zambia is characterised by an increase in the frequency and severity of seasonal droughts, occasional dry spells, higher temperatures in valleys, flash floods, and changes in the growing season (United Nations Development Programme, 2024). These climatic changes have had a severe impact on the energy sector because Zambia relies heavily on hydroelectric power as its primary source of electricity (Zambia Ministry of Energy, 2024). As a result, the country has faced a significant electricity supply deficit.

In response to these challenges, Zambia has been actively working to develop decentralised sustainable financing programs aimed at investing in renewable energy sources, with a particular focus on solar energy (Stritzke & Prem, 2021). The rising demand for solar power, combined with the country's increasing debt, creates a substantial opportunity for private companies to collaborate with the government through PPP models to invest in solar power projects.

However, the successful implementation and scalability of solar power projects through PPP are hindered by several challenges. These challenges include financial and economic barriers, such as securing adequate funding and ensuring

economic viability; regulatory and policy challenges, including navigating complex legal frameworks and obtaining necessary approvals; risk management and dispute resolution, which involves identifying, mitigating, and fairly distributing risks and resolving conflicts; technical feasibility and innovation, ensuring that projects are technically viable and incorporate innovative solutions; sustainability and environmental impact, addressing the environmental effects of projects and ensuring long-term sustainability; and partnership dynamics and accountability, fostering effective collaboration, transparency, and accountability between public and private partners (Batjargal & Mengzhong, 2021).

Furthermore, there has been no study that has been conducted in Luanshya District to examine the viability of Public-Private Partnership (PPP) for Solar Power in Zambia's Luanshya District.

Therefore, to identify and address these challenges in the Luanshya District, it was essential to examine the viability of engaging in PPP models for solar power in this particular area. The researcher aimed to conduct a comprehensive examination of the local context to isolate specific barriers and opportunities.

By doing so, the researcher aimed to provide actionable recommendations for policymakers, financial institutions, and stakeholders to enhance the viability and success of PPP solar power projects. These recommendations focused on the following areas: financial and economic barriers, regulatory and policy challenges, risk management and dispute resolution, technical feasibility and innovation, sustainability and environmental impact, and dynamics and accountability.

In essence, given the persistent energy shortages and the need for sustainable solutions, the study highlighted the importance of exploring the potential of PPP in developing solar power infrastructure in the Luanshya District and Zambia at large.

1.3 Research Objectives

1.3.1 Main Objectives

Determining the Viability of Public-Private Partnership (PPP) for Solar Power in Zambia's Luanshya District.

1.3.2 Specific Objectives

- i. To assess the impact of regulatory environment and PPP policies on the sustainability of solar power projects in Luanshya District.
- ii. To establish how the financial and technological challenges affect the sustainability of solar power PPP projects in Luanshya District.
- iii. To determine how the local community, policymakers, financial institutions, and other stakeholders influence the long-term sustainability of PPP solar power projects.
- iv. To analyse the social-economic impacts that influence sustainability outcomes of solar PPP projects in Luanshya District.

1.4 Research Questions

The following are the research questions which the study aimed to address:

- i. How viable are PPPs for the development of solar power projects in Luanshya District?
- ii. What are the regulations and PPP policies that have the most impact on the sustainability of solar power projects in Luanshya?
- iii. How do the financial and technological challenges affect the sustainability of solar power PPP projects in Luanshya District?
- iv. How are the local community, policymakers, financial institutions, and other stakeholders influencing the long-term sustainability of PPP solar power projects?
- v. What are the social-economic impacts of solar power PPP on local communities, and how do they influence the sustainability outcomes of solar PPP projects in Zambia?

1.5 Scope of the study

The feasibility of the proposed PPP for delivering solar power in the Luanshya District in Zambia was assessed in this research. There was an examination of the relational and policy framework for the transport sector; a thorough cost-benefit assessment with accompanying funding strategies; and the assessment of financial, technical, regulatory and environmental risk management strategies. The technical aspect of this study included a study of the technical qualifications to install the solar power as well as the suitability of the site that was proposed investigated the environmental and the social effects of the project, and the identification of the stakeholders while analysing partnership structures and their roles. It also refined a concrete operational plan of the project and a projected calendar; recommendations to maximise the effectiveness of best practices and potential policies appropriate for the successful establishment and continuation of PPP solar projects within the region.

1.6 Significance of Study

Luanshya District in Zambia, especially its rural areas, has a low electrification rate. However, PPP projects in solar power can expand access to reliable and clean electricity and economic opportunities for rural communities (ZDA, 2019). Solar power projects through PPP projects can provide off-grid solutions essential for remote areas in Luanshya, reducing dependence on costly and unreliable grid extensions (International Renewable Energy Agency, 2017). Solar power can also offer a more stable and predictable energy supply for Luanshya, mitigating power shortages and load shedding that have hindered Zambia's economic growth (Zambia Institute for Policy Analysis and Research, 2018). The deployment of solar power projects can stimulate the local economy in Luanshya by creating jobs in the installation, maintenance, and operation of solar facilities. PPP projects can attract private investment that supports local businesses and workforce development (World Bank, Zambia Energy Sector Transformation: Integrated Strategy and Investment Plan, 2017).

Implementing solar power PPP projects in Zambia faces a lot of hindrances and challenges. The findings from this study are expected to help establish a framework for PPP projects in Luanshya to attract both domestic and international investments, fostering economic growth and enhancing the district’s renewable energy sector (African Development Bank, 2020). Luanshya, like the rest of Zambia, is vulnerable to the impacts of climate change, including erratic rainfall and droughts. Promoting solar power through PPP projects can reduce greenhouse gas emissions, contributing to environmental sustainability and resilience against climate change (Zambian Ministry of Energy, 2020). The study aligned with Zambia’s Vision 2030, which aims to transform the country into a prosperous middle-income nation by 2030. Renewable energy development, particularly through PPP projects, is a key component of this vision and can significantly benefit Luanshya (ZDA, 2019). Understanding the viability of PPP projects was essential for leveraging private sector expertise, efficiency, and capital for public projects. This focus ensured that solar power initiatives were sustainable, cost-effective, and capable of meeting long-term energy needs (World Bank, Zambia Energy Sector Transformation: Integrated Strategy and Investment Plan, 2017). Examining PPP viability identified potential risks, barriers, and success factors, enabling more informed decision-making and policy formulation that supported the broader adoption of renewable energy projects in Zambia (African Development Bank, 2020).

1.7 Definition of Key Terms and Concepts

| <u>Term</u> | <u>Description</u> |
|--------------------------|--|
| Case Study Design | A research method involving an in-depth, detailed examination of a subject (the case), such as a specific project or organisation, within its real-world context (Fusch & Ness, 2015). |

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| Convenience Sampling | A non-probability sampling technique where participants are selected based on their availability and willingness to take part in the study (Palinkas, et al., 2015). |
| Data Saturation | The point in qualitative research at which no new information or themes are observed in the data, indicating that sufficient data has been collected to understand the phenomenon (Palinkas, et al., 2015). |
| Energy Regulation Board (ERB): | A regulatory body responsible for overseeing and regulating the energy sector, ensuring compliance with policies, standards, and regulations (Energy Regulation Board, 2023). |
| Informed Consent | A process by which participants are fully informed about the study's purpose, procedures, risks, and benefits, and voluntarily agree to participate (Palinkas, et al., 2015). |
| Local Government Authorities | Municipal or district councils are responsible for local governance and administration, including infrastructure development and public services within their jurisdictions (Government of the Republic of Zambia, 2022). |
| Phenomenological Study Design | A qualitative research approach that focuses on understanding and describing the lived experiences of individuals regarding a particular phenomenon (Freeman, 1984). |
| Public-Private Partnership (PPP) | A cooperative arrangement between public and private sectors, typically of a long-term nature, aimed at financing, designing, implementing, and operating projects that provide public services or infrastructure (Creswell & Poth, 2018). |
| Purposive Sampling | A non-probability sampling method where participants are selected based on specific characteristics, roles, or expertise relevant to the research (Palinkas, et al., 2015). |
| Renewable Energy Initiatives | Programs or projects aimed at promoting the use of renewable energy sources, such as solar, wind, hydro, and biomass, to reduce dependence on fossil fuels and mitigate environmental impacts (International Renewable Energy Agency, 2017). |
| Rural Electrification Authority (REA) | A government agency tasked with extending electricity supply to rural areas to improve the quality of life and stimulate economic development (Rural Electrification Authority, 2023). |
| Solar Power | Energy derived from the sun's radiation, which is converted into thermal or electrical energy using solar panels or other solar energy technologies (Etikan, Musa, & Alkassim, 2016). |

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|---------------------|--|
| Stakeholders | Individuals, groups, or organisations that have an interest or concern in a project. In this study, stakeholders include government entities, private companies, regulatory bodies, and local authorities involved in PPP solar projects (Government of the Republic of Zambia, 2022). |
| ZESCO | Zambia Electricity Supply Corporation Limited, the state-owned power company responsible for generating, transmitting, and distributing electricity in Zambia (ZESCO, 2023). |

1.8 Organisation of the Rest of the Report

The rest of the dissertation is organised as follows: Chapter Two provides a detailed literature review, emphasising the significance of PPP in advancing solar power projects as a renewable energy solution. This chapter also explores key barriers and critical success factors influencing the adoption and sustainability of solar power initiatives within PPP frameworks.

Chapter Three delves into the theoretical and conceptual framework underpinning the study. It focuses on the dynamics of PPP in the context of stakeholder engagement and perceptions of success. The chapter includes a conceptual framework diagram that visually integrates the primary factors influencing PPP solar power projects, offering a clear connection between theoretical constructs and practical applications.

The study engaged a total of 15 participants, carefully selected to represent various stakeholders involved in PPP solar power projects. This sample size was determined by the principle of data saturation, ensuring the collection of rich and meaningful insights. Convenience and purposive sampling techniques were employed to capture a diverse and representative mix of perspectives from stakeholders across the PPP ecosystem.

The data analysis approach, discussed in detail in chapter five, describes the comprehensive strategy used to analyse the collected data. It outlines the methods employed for data cleaning, the application of appropriate statistical tests to

identify associations, and the steps taken to ensure the reliability and validity of the findings.

The research findings are presented in chapter six through a combination of frequency tables, bar graphs, and pie charts, providing a visual and descriptive summary of the data. These findings are further explored in chapter seven , where they are interpreted in the context of the study's objectives. This chapter bridges the findings with the research questions, offering a thorough discussion and insights drawn from the analysis.

Finally, chapter eight concludes the report, summarising the key findings and providing actionable recommendations aligned with the study objectives. This chapter also reflects on the broader implications of the findings for stakeholders and offers guidance for future research and policy development.

Chapter 2: Literature Review

This chapter outlines the literature review. It details empirical literature where similar studies were reviewed, theoretical frame that shows the models that are linked to the study and conceptual framework highlighting the diagrammatic representation of dependent and independent variables.

2.1 Empirical Literature

This literature highlights the potential and challenges of implementing solar power PPP projects in Zambia and globally. Successful models from developed and developing countries provide valuable insights into structuring effective PPP projects. Addressing regulatory, political, revenue, technical, financial, and operational barriers is crucial for the viability and sustainability of solar power PPP projects in Luanshya District of Zambia. Implementing best practices and mitigating identified barriers can significantly enhance the effectiveness of solar power PPP projects, contributing to Zambia's broader energy and socio-economic goals.

2.1.1 Overview of Solar Power Public-Private Partnerships

PPP are strategic approaches to promote solar power adoption. PPP projects involve cooperation between investment companies and the public sector or government (Fang et al., 2019). Typically, the public partner sets service standards, monitors performance, and determines service recipients, while the private partner raises capital and manages project construction and operation. This model leverages the strengths of both sectors, making PPP projects an attractive option for expanding renewable energy access, especially in rural and underserved areas (Sovacool, 2013).

Solar photovoltaics (PV) offer a promising method for achieving energy efficiency, environmental sustainability, and socio-economic development. According to the International Energy Agency (IEA), the global annual installed PV capacity

increased significantly in recent years, reaching at least 114.9 GW in 2019 (Xue, Carmel, & Alenka, 2021). This surge in PV adoption is driven by the need for diversified energy sources, particularly in countries with heavy reliance on hydropower such as Zambia, Brazil, Canada, and Sweden. Hydropower accounts for 83%, 70%, 62%, and 42% of these countries' total energy production, respectively, while Norway's hydropower industry produces 93% of its electricity (Zambia Ministry of Energy, 2024; Xue, Carmel, & Alenka, 2021). Despite these high dependencies, solar energy development offers substantial benefits, including enhanced energy security and reduced environmental impacts.

2.1.2 Solar Power Public-Private Partnerships in Developed Countries

Research across the European Union (EU) shows mixed results for PPP projects. From 2008 to 2016, the number and value of PPP projects reported in the EU-28 meetings decreased, although Italy saw an increase in PPP usage. This trend suggests varying effectiveness based on regional public finance conditions and highlights the need for tailored PPP strategies (Rossi, Giuseppe, & Gunardi, 2019). The European Commission has emphasized the importance of PPP in achieving energy and environmental goals, encouraging member states to adopt flexible and supportive regulatory frameworks to enhance PPP effectiveness (European Commission, Clean Energy for All Europeans, 2018).

In the United States, aging infrastructure and budget constraints have led policymakers to consider PPP as a viable solution for financing new projects. PPP projects have gained traction as they allow for leveraging private sector investment without relying solely on public funds (Yaniero, 2016). However, despite their potential, PPP projects are not fully utilized in the U.S. renewable energy sector, indicating a gap in research and implementation (Xue, Carmel, & Alenka, 2021). To bridge this gap, several states have initiated pilot programs to demonstrate the feasibility and benefits of renewable energy PPP, aiming to create scalable models for wider adoption (National Renewable Energy Laboratory, 2020).

2.1.3 Solar Power Public-Private Partnerships in Africa

Renewable energy sources like solar power offer clean, reliable, affordable, and sustainable energy, but high upfront investments pose challenges, especially for developing countries. PPP projects have become an attractive delivery method by combining private-sector technology, innovation, and capital with public-sector support (Othman & Rana, 2022).

South Africa's Renewable Energy Independent Power Producer Procurement Program (REIPPPP) exemplifies a successful PPP model. It promotes energy diversification, technology development, and socio-economic benefits through Independent Power Producer (IPP) projects (Nel, 2018). Since its inception, REIPPPP has attracted over \$14 billion in investments and added 6,422 MW of renewable energy capacity to the grid, demonstrating the potential of well-structured PPP in transforming the energy landscape (Eberhard & Naude, 2020).

In Ghana, the solar industry provides a useful case for examining PPP projects. Drawing lessons from South Africa and Morocco, Ghana, like most African countries, needs a detailed legal framework to attract private participation in its solar sector. Key factors may include creating a safe investment environment, resolving land disputes, and ensuring transparency and accountability (Awuku, Amar, Firdaus, & Nazmi, 2021). The Ghanaian government has introduced several initiatives to foster PPP in renewable energy, including tax incentives and guaranteed power purchase agreements, to boost investor confidence (Energy Commission of Ghana, 2021).

2.1.4 Solar Power Public-Private Partnerships in Zambia

Zambia has abundant renewable energy resources capable of providing essential energy services to its population. However, only 25% of Zambians have access to electricity and clean cooking facilities, leading to extensive wood energy use and forest strain. Zambia aims to achieve 90% urban and 51% rural electrification by

2030, necessitating policies that foster public and private sector partnerships to promote renewable energies (Lyambai, 2018).

One such policy supports solar mini-grids, which are crucial for providing sustainable electricity to rural areas. However, solar mini-grids face sustainability challenges due to unreliable rainfall patterns and dependence on hydropower, which has led to power crises and increased fossil fuel use. Effective solar mini-grids require proper technical management, structured tariffs, and consideration of low-income and payment capacities in rural areas (Kapole, Steven, & Prem, 2023). For the successful implementation of such projects, the country needs a more structured and clearer route to support private partnerships.

Zambia faces several challenges in implementing PPP solar power projects. Challenges in Zambia's PPP projects include bureaucratic hurdles, poor business environments, and inadequate policies. Current demand for PPP projects is driven by a stable business environment, necessitating improved procedures and policies to enhance the business climate (Zulu et al., 2023). The PPP Act in Zambia may require revisions to attract private investment, addressing issues like unclear frameworks, bureaucracy, inappropriate risk-sharing mechanisms, and insufficient private sector protection (Muleya, Sambo, & Petra, 2020). Moreover, enhancing the capacity of local institutions to manage PPP effectively is essential for ensuring long-term project sustainability (World Bank, World Bank Group - Public-Private Partnerships: Strengthening Institutions for Successful Implementation, 2022).

2.1.5 Barriers to Renewable Energy Public-Private Partnerships

Several barriers hinder the successful implementation of renewable energy PPP projects. These barriers include:

- i. **Regulatory barriers**

Complex bureaucratic procedures and unstable national regulations can delay project approval and implementation (Othman & Rana, 2022). Streamlining

regulatory processes and ensuring consistency in policy frameworks are critical for fostering investor confidence.

ii. **Political barriers**

Lack of governmental support and low political stability can deter private investment (Rossi, Giuseppe, & Gunardi, 2019). Governments need to provide clear and consistent policy signals to encourage long-term investment in renewable energy projects.

iii. **Revenue barriers**

Issues such as fraud, non-payment by users, market demand changes, foreign exchange risk, and inflation can impact project viability (Yaniero, 2016). Implementing robust financial mechanisms and risk mitigation strategies can help address these challenges.

iv. **Technical barriers**

Poor contract documentation, design deficiencies, poor quality assurance, and a lack of supporting infrastructure can impede project success (Kapole, Steven, & Prem, 2023). Ensuring high standards in project design and execution is crucial for achieving desired outcomes.

v. **Force majeure barriers**

Political events with low likelihood but high impact, such as wars and terrorism, can disrupt project operations (Othman & Rana, 2022). Developing contingency plans and insurance mechanisms can help manage such risks.

vi. **Financial barriers**

Foreign exchange and interest rate fluctuations and inflation can affect project financing (Xue, Carmel, & Alenka, 2021). Access to affordable financing and stable economic conditions are essential for project feasibility.

vii. **Construction barriers**

Coordination of risks, land acquisition issues, unforeseen geotechnical conditions, and physical obstacles can delay construction (Muleya, Sambo, & Petra, 2020).

Effective project management and stakeholder engagement can mitigate these risks.

viii. **Operational barriers**

Project and operation changes, organisational risks, and maintenance risks can affect long-term performance (Awuku, Amar, Firdaus, & Nazmi, 2021). Implementing robust operation and maintenance frameworks is vital for ensuring project longevity.

ix. **Market risks**

Market competition, unskilled parties, poor coordination, and poor risk allocation can impact project success (Nel, 2018). Building capacity and fostering collaboration among stakeholders can enhance market readiness.

x. **Technological barriers**

Non-availability of necessary technology and trained labourers can hinder project implementation (Othman & Rana, 2022). Investing in technology transfer and capacity building can address these challenges.

2.1.6 Success Factors for Solar Power Public-Private Partnerships

Key success factors for solar power PPP projects include:

i. **Government support**

Strong governmental support and stable political environments are critical for attracting private investment and ensuring project sustainability (Fleta-Asín & Fernando, 2021). Policymakers need to provide clear and consistent policy frameworks that support renewable energy development.

ii. **Clear regulatory frameworks**

Well-defined and supportive regulatory frameworks are essential for guiding project implementation and ensuring compliance (Rossi, Giuseppe, & Gunardi, 2019). Simplifying regulatory processes can help reduce project delays and costs.

iii. **Financial incentives**

Attractive financial incentives and risk-sharing mechanisms can enhance project viability and attract private-sector participation (Yaniero, 2016). Governments can offer tax breaks, grants, and subsidies to support project development.

iv. **Technical expertise**

The availability of technical expertise and robust quality assurance measures are crucial for ensuring high standards in project design, construction, and operation (Kapole, Steven, & Prem, 2023). Investing in capacity building and training programs can enhance technical capabilities.

v. **Community engagement**

Active community engagement and public awareness campaigns can build local support and ensure project success (Awuku, Amar, Firdaus, & Nazmi, 2021). Involving local communities in project planning and implementation can enhance social acceptance and ownership.

vi. **Infrastructure development**

The development of supporting infrastructure and supply chains is essential for project implementation and operation (Nel, 2018). Governments and private sector partners need to invest in infrastructure development to support renewable energy projects.

vii. **Private sector confidence**

Building private sector confidence through transparent processes and reliable partnerships is vital for attracting investment (Zulu, et al., 2023). Ensuring transparency, accountability, and fair risk allocation can foster trust and collaboration among stakeholders.

2.2 Theoretical Framework

The study is based on a theoretical and conceptual framework based on Stakeholder Theory and Stakeholder Success Perception. This segment, therefore, provides the general theory and interrelationships between the perceived dependent variable and the independent variables. The empirical literature reviewed was essential in arriving at the theoretical and conceptual framework governing this study.

2.2.1 Public–Private Partnership in the Context of the Stakeholder Theory

A strategic approach to stakeholder theory defines stakeholders as any individuals or groups who can affect or are affected by the organisation's objectives. The dynamic nature of stakeholders in long-term PPP projects implies that their mix and stakes may change over time (De Schepper, Doods, & Haezendonck, 2014). Stakeholders can be classified based on attributes of power, urgency, and legitimacy, with some having minor influence, others possessing potential influence, and definitive stakeholders having direct influence and urgent claims (Henjewele et al., 2013).

The public sector's role is to ensure that PPP projects deliver broad economic, social, and environmental benefits, aligned with sustainability goals, while the private sector focuses on profit through construction, financing, and operation (Grimsey & Lewis, 2004). PPP thus represents a coalition of powerful yet often conflicting interest groups. Stakeholders are defined as entities with an interest in the project and the ability to influence it, holding legitimate claims and moral responsibilities that are crucial for the project's operation (De Schepper, Doods, & Haezendonck, 2014). Additional stakeholders might include investment funds, institutional investors, public agencies, and multilateral institutions, with interests ranging from financial returns to regional development stimulation (Yescombe, 2014).

Debt financing for PPP is typically provided by commercial banks and bond investors, with additional support or guarantees available from public agencies and

multilateral development banks (Yescombe, 2014). Stakeholders in PPP also include unions, media, and ecologists, whose involvement and engagement can shift over time due to the long-term nature of these projects (Soomro & Zhang, 2015).

Multi-stakeholder consultation and management are vital for PPP success, although the exclusion of the public sector client can pose challenges (Henjewele et al., 2013). Cooperation is seen as a promising mechanism for managing stakeholder conflicts (Bjärstig, 2017), but conflicts of interest are a major driver of PPP failures (Soomro & Zhang, 2015). Effective stakeholder management requires balancing reactive and proactive approaches (De Schepper, Dooms, & Haezendonck, 2014) and ensuring that public and collective interests are harmonised (Guarini & Battisti, 2014).

Stakeholder theory contributes to PPP success by supporting the identification and classification of stakeholders, whose attributes influence project evaluation. The success of a PPP project is seen as the sum of individual stakeholders' successes. Evaluating PPP projects involves considering all stakeholders and recognising that higher public benefits often correlate with lower private surpluses (European Union, 2013). This dynamic raises questions about stakeholders' perceptions of success.

2.2.2 Public–Private Partnership Stakeholders' Success Perception

Success in PPP is perceived differently by stakeholders due to their diverse objectives and criteria. Private sector entities typically aim to maximise financial returns for their owners, evaluating success through the present value of investments or the rate of return (Ambler & Wilson, 1995). In contrast, public sector entities focus on maximising public value, which includes economic, social, and environmental benefits, reflecting their dependency on collective societal interests (Guarini & Battisti, 2014).

Evaluating PPP success is complex, encompassing various criteria. (Liang, Wu, Sheng, & Wang, 2018) classify evaluation criteria into financial strength, technical and management ability, relevant experience, credit level, government support, and risk-sharing. However, these criteria often overlook the input-output relationship. (Guarini & Battisti, 2014) propose a more comprehensive process-oriented approach, including environmental, financial, socio-economic, procedural, and technical criteria. This methodology, involving stakeholder participation through interviews, helps identify benchmarks for evaluation.

The (World Bank, Public-Private Partnership Units, Lessons for Their Design and Use in Infrastructure, 2007) and the (Project Management Institute, 2017) emphasize the importance of meeting output specifications for performance evaluation and monitoring. (Kumaraswamy, Anvuur, & Rahman, 2005) advocate for output-based payment approaches in publicly funded PPP projects, ensuring performance accountability.

Three primary concepts of success identified are:

- i. **European Commission's Evaluation Criteria:**
 - **Relevance:** The extent to which project objectives meet identified needs.
 - **Effectiveness:** The degree to which project outputs are achieved.
 - **Efficiency:** The relationship between resources used and project outputs.
 - **Utility:** The benefits to target groups.
 - **Sustainability:** The durability of the project's effects.
 - **Community Added Value:** The additional benefits resulting from the project intervention.

(European Commission, Measuring Structural Funds Employment Effects, 2007)

- ii. **Dalcher's Four Levels of Project Success:**
 - **Level 1:** Project management success, focusing on profitability and performance measures.
 - **Level 2:** Quality and acceptability of project output relative to stakeholders.

- **Level 3:** Creation and delivery of internal value from a business perspective.
- **Level 4:** Future gains and opportunities, including the development of new skills and competencies

(Dalcher, 2009)

iii. **Hodge & Greve's Five Levels of Public-Private Partnerships Project Evaluation:**

- **Project Level:** Providing value for money.
- **Delivery Level:** Ensuring goods or services are provided on time, within budget, and within scope.
- **Policy Level:** Infrastructure provision without increasing public debt, risk transfer, application of flexible private law, and private business support.
- **Governance Level:** Improving accountability and transparency.
- **Cultural Context:** Innovation and Other Cultural Benefits

(Hodge & Greve, 2016).

The PPP's success is perceived differently by stakeholders depending on their interests and expectations. Effective stakeholder analysis is essential for establishing benchmarks to measure PPP performance and stakeholder satisfaction.

2.3 Conceptual Framework

The conceptual framework for studying the viability of PPPs PPP for solar power in Zambia's Luanshya District integrates various elements essential for understanding and examining the feasibility and effectiveness of PPP in this context. It involves examining the interplay between stakeholders, financial and technical feasibility, regulatory frameworks, socio-economic impacts, and sustainability outcomes as shown in Figure 2.1 below.

Independent Variable

Dependent Variable

Regulatory Framework

Policies and Regulations
Permits and Licensing
Compliance and

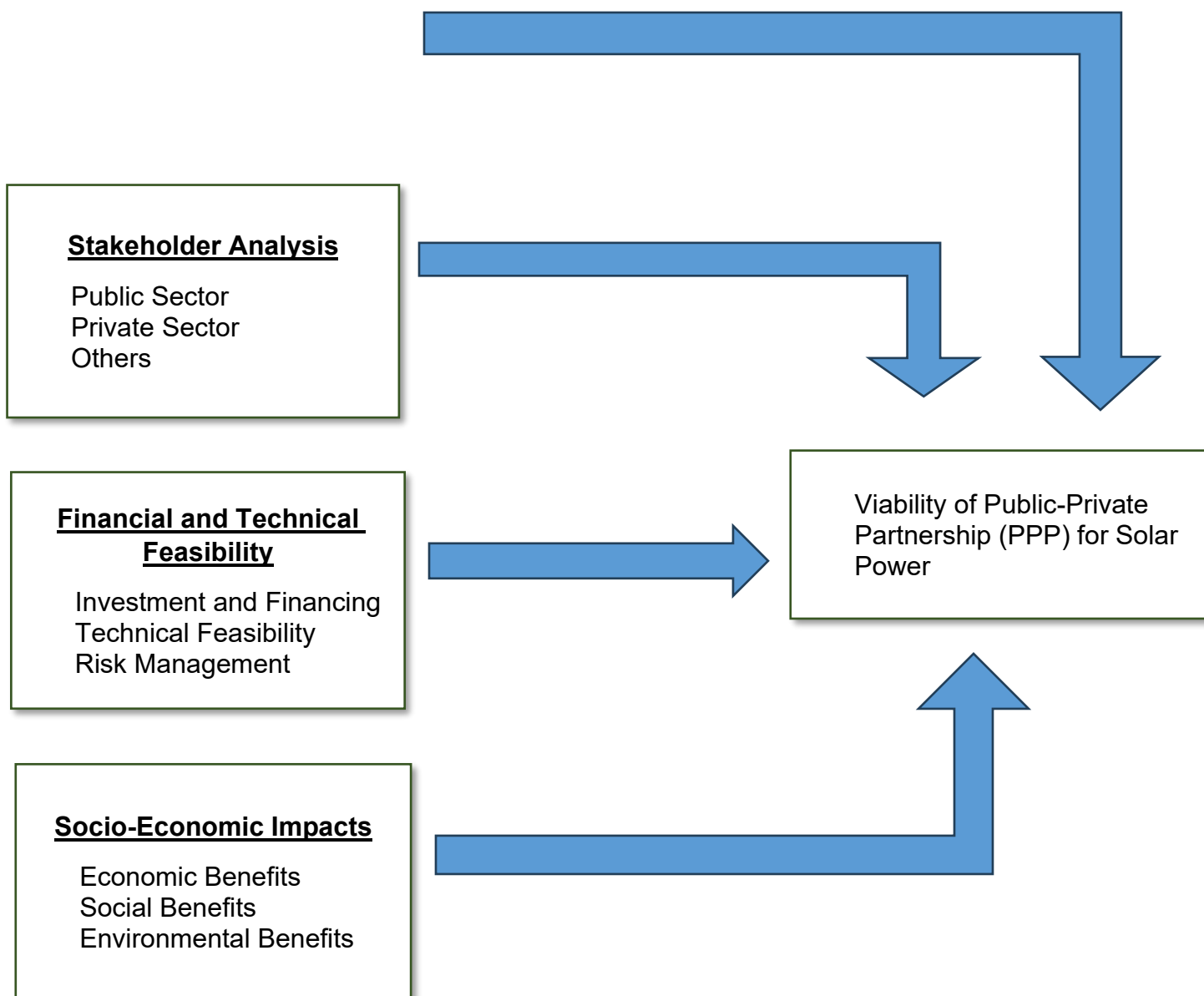


Figure 2.1: Conceptual Framework

This conceptual model visually represents the interconnectedness of financial, technical, regulatory, socio-economic, and Viability of Public-Private Partnership (PPP) for Solar Power, ensuring a holistic assessment of the project's potential success. It provides a comprehensive approach to analysing the viability of PPP for solar power in Zambia's Luanshya District.

2.4 Research Gap

| Study Area | Key Findings | Research Gap |
|----------------------|---|---|
| Regulatory Framework | In Ghana, it was found that detailed legal framework should be tailored in such a way as to attract private participation in the solar sector (Awuku, 2021) | There has been limited studies on regulatory framework and how it affects private participation in solar sector in Luanshya, Zambia |

Chapter 3: Methodology

This chapter outlines the research approach, research design, study population, sample size, sampling design, data collection, data analysis, study variables and ethical considerations that provided a clear roadmap for answering the research questions. It details the systematic procedures used that ensured the study's reliability and validity.

3.1 Research Approach

The study employed a qualitative research approach to examine the viability of Public-Private Partnership (PPP) for Solar Power in Zambia's Luanshya District. Qualitative research is particularly suited for studies aiming to understand the phenomena and underlying processes (Creswell & Poth, 2018).

3.2 Research Design

A phenomenological research design guided the study. This design was ideal for exploring how individuals experience and made sense of a specific phenomenon, such as the viability of Public-Private Partnership (PPP) for Solar Power (Smith, et al., 2012). Phenomenology emphasizes capturing the essence of participants' lived experiences without imposing pre-existing theories or hypotheses (Van Manen, 2016).

Data was collected through structured interviews that ensured consistency across participants and allowed for in-depth responses from ZESCO, the Ministry of Energy, Rural Electrification Authority (REA) officials, the Energy Regulations Board (ERB), local government authorities, private solar energy companies like Copperbelt Energy Cooperation (CEC), and financial firms. Participants were required to be involved in the solar power PPP project in Luanshya that possess relevant knowledge or experience.

Recruitment was conducted through emails, phone calls, letters, and in-person visits, with both online and paper surveys used for data collection. Data were

gathered through structured interviews. Follow-up communications were utilised to increase response rates.

3.3 Study Population

The study population included ZESCO, the Ministry of Energy, Rural Electrification Authority (REA) officials, the Energy Regulations Board (ERB), local government authorities, private solar energy companies like Copperbelt Energy Cooperation (CEC), and financial firms.

3.3.1 Inclusion Criteria

- Participants must be involved in or have a stake in the solar power PPP project in Luanshya District.
- Participants must be located in or have significant relevance to the Luanshya District of Zambia.
- Individuals must have relevant knowledge or experience with PPP projects, solar power projects, or both.
- Participants must be able to understand and respond to the survey in English.
- Participants must provide informed consent to participate in the study.

3.3.2 Exclusion Criteria

- Individuals or organisations not involved or having no direct relevance to the solar power PPP project in Luanshya District.
- Participants located outside of Zambia or those not directly associated with the Luanshya District.
- Individuals without relevant experience or knowledge about PPP, solar power, or the specific project in Luanshya District.
- Participants who are unable to understand or respond to the survey in the available English.
- Individuals who do not provide informed consent or are unwilling to participate in the research.

3.4 Sample Size

In this study, the sample size of 15 participants was used. According to (Creswell, 2021) is considered adequate as it allows for a good depth of understanding.

To achieve an unbiased representation for a variety of stakeholder samples, a convenience random sampling method was employed. To get an in-depth insight into the subject matter, a purposive sampling method to select were participants based on their expertise, role, and involvement in PPP solar projects. To recruit the participants for this study, several methods were used, including sending e-mails, making telephone calls, sending official letters or making in-person visits. Online survey platforms (e.g., SurveyMonkey, Google Forms) were utilised for the collection of data in order to have the widest possible reach in an efficient manner. There may even be paper surveys in and underdeveloped regions where participants, citizens, or other permanent residents have no access to the web, or some will require a physical completed copy.

3.5 Data Collection

The data collection process for this study involved multiple methods to gather comprehensive and reliable data from various stakeholders. It began with the development of a comprehensive list of potential participants from each stakeholder group based on the inclusion criteria. A framework for case studies was established, including criteria for selection and data points to be collected. Invitation emails or letters explaining the study's purpose, importance, and participation details were then shared with potential participants. Follow-up phone calls or additional emails were made to encourage participation and address any questions.

3.6 Data Analysis

The qualitative data from the interviews was analysed using thematic analysis, a widely used method in qualitative research for identifying, analysing, and reporting patterns (themes) within the data (Braun & Clarke, 2019).

3.6.1 Data Cleaning

Data was transferred from different data capture sources to the Microsoft Excel spreadsheet 2021 edition. Data was checked for incompleteness responses, removal of duplicates, and correcting any inconsistencies.

3.6.2 Descriptive Statistics

Frequencies, percentages, means, and standard deviations for demographic variables were calculated with the help of statistical software STATA version 14.4. The researcher then analysed the distribution of responses for each survey question, using charts and graphs for visualisation. Thematic analysis was used to understand the responses provided by the respondents of all the study factors or variables. Open-ended question responses were explained in paragraphs to link all responses provided by respondents to give insight on the responses provided.

3.7 Study Variables

3.7.1 Independent Variables

These variables represent the factors that influence the viability and sustainability of PPP solar power projects. They are grouped into the following categories:

i. Financial and Technical Factors

The variables determined the affordability and long-term economic feasibility of the project as well as assessed the capability to implement and sustain advanced solar technologies.

Examples: investment costs, funding availability, financial risks, and the cost-effectiveness of the project, technology availability, infrastructure readiness, and maintenance challenges.

ii. Regulatory Frameworks

Define the institutional and legislative support necessary for the project's success.

Examples: Government policies, legal requirements, tax incentives, and approval processes.

iii. Socio-Economic Factors

Used to gauge the project's impact on local livelihoods and its acceptance by stakeholders.

Examples: Community acceptance, employment opportunities, and social equity.

iv. Stakeholder Involvement

Highlighted the extent of collaboration and influence on decision-making and implementation.

Examples: Participation by policymakers, financial institutions, local communities, and private investors.

3.7.2 Dependent Variable

The dependent variable was the outcome that the study aimed to measure or assess, which is:

i. Viability of PPPs Solar Power Projects

This variable represented the overall success and feasibility of the PPP solar power initiative.

3.8 Timeframe of Research Activities

The study will take about five to six months duration from the time of ethical approval will be granted. A detailed breakdown of the work plan has been outlined in Table 3.1 below.

Table 3.1 – Research Activities Timeframe

| Period / Activity | Jul-08 Jul-19 | Jul-22 Aug-2 | Aug-5 Oct-31 | Nov-04 Nov-8 | Nov-11 Nov-15 | Nov-18 Dec-13 |
|--|------------------|-----------------|-----------------|-----------------|------------------|------------------|
| Planning and Preparation | | | | | | |
| Proposal Writing and Ethical Approval | | | | | | |
| Data Collection | | | | | | |
| Data Processing and Preliminary Analysis | | | | | | |
| Detailed Data Analysis | | | | | | |
| Reporting and Dissemination | | | | | | |

Chapter 4: Presentation and Analysis of Results

This chapter discusses the data presentation and thematic analysis that was used in the study. It also highlights the study findings in a graphical and tabular approach.

4.1 Data Preparation

The data collected through a structured questionnaire survey was carefully transferred into a data capture tool developed using Microsoft Excel 2021. This tool systematically organised the dataset into seven distinct sections: Participant Information, Stakeholder Interplay and Collaboration, Financial and Technical Feasibility, Regulatory Frameworks, Socio-Economic Impacts, Sustainability and Long-Term Viability, and Future Outlook and Recommendations.

To ensure the dataset's integrity and readiness for analysis, thorough data cleaning processes were implemented. Missing or inconsistent data entries were identified and removed, while entries that did not meet the predefined inclusion criteria were excluded. Data verification was conducted to confirm the accuracy of each variable, and certain entries were standardised for uniformity. Initially, the dataset included responses from 20 participants; however, five respondents were excluded due to failure to meet the inclusion criteria. The final dataset, comprising responses from 15 participants, was then subjected thematic analysis and skewness and kurtosis by Stata Package for Social Science Version 21.

4.2 Thematic Analysis

Thematic analysis was conducted to identify recurring themes related to factors influencing the sustainability and viability of solar power PPP. Key themes emerged from the study variables and were presented in frequency-percentage tables to provide a clear overview of patterns in the data. Responses to open-ended survey questions were analysed qualitatively and discussed in detailed paragraphs, offering insights and contextualising the findings. This approach

ensured a comprehensive understanding of participant perspectives and provided depth to the quantitative data.

4.3 Participants' Information

4.3.1 Participants' Organisation

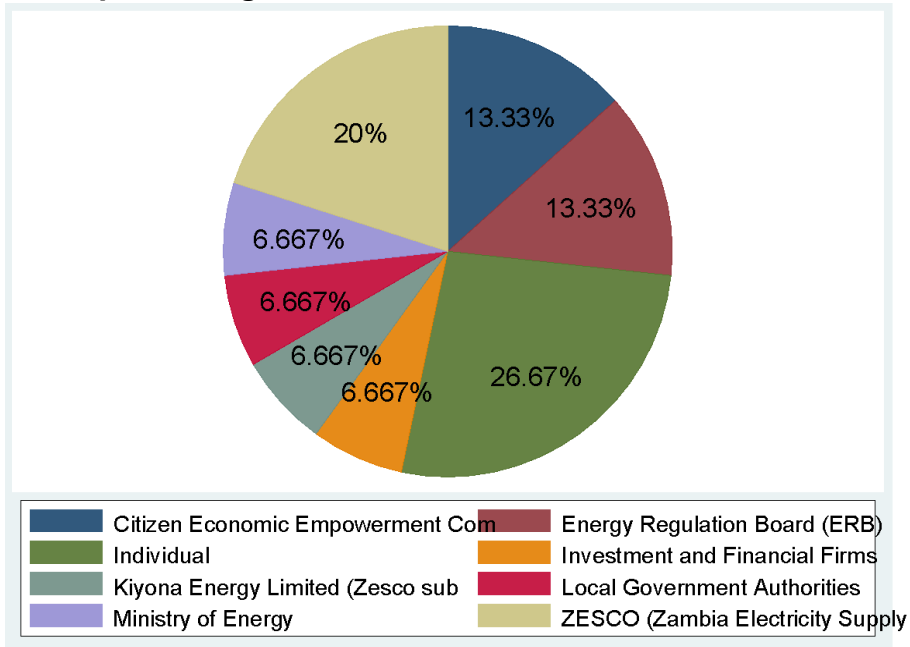


Figure 4.1: Study Participants' Organisation

Out of 15 respondents, a notable 26.67% of the participants chose to stay anonymous and did not reveal the organisations they worked for. Of those who shared this information, 20% said they were employed by ZESCO, and 13.33% each reported working for the Energy Regulation Board (ERB) and the Citizen Economic Empowerment Commission (CEEC). Furthermore, 6.67% of respondents mentioned being affiliated with the Ministry of Energy, local government offices, Kiyona Energy Limited, or various investment and financial companies, as shown in Figure 4.1 above.

4.3.2 Role in Solar Public-Private Partnerships

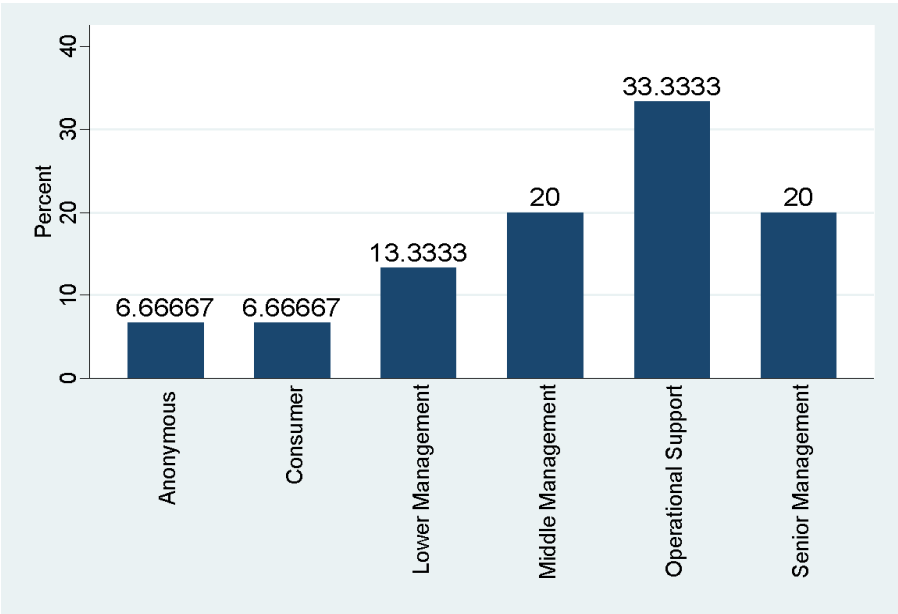


Figure 4.2: Participants Role in Solar Public-Private Partnership

Figure 4.2 shows that the respondents had various roles in Solar Power PPP projects. Out of 15 respondents, total of 53.3% were in management positions, 33.33% worked in operations support, 6.67% preferred to stay anonymous, and another 6.67% described themselves as consumers.

4.3.3 Experience in Solar Power Projects

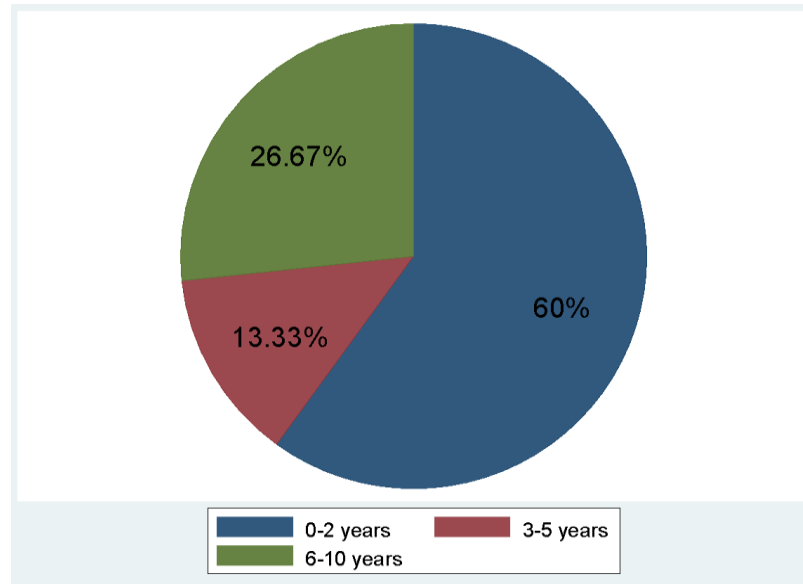


Figure 4.3: Study Participants' Solar Power Projects Experience

As shown in Figure 4.3, out of 15 respondents most participants (60%) had less than 0three years of experience in solar power projects, while only 26.67% had five years or more of experience. This pattern could be linked to Zambia's traditional dependence on hydroelectric power as its main energy source, with solar energy being a relatively new advancement in the country.

4.3.3 Experience in Public-Private Partnership Projects

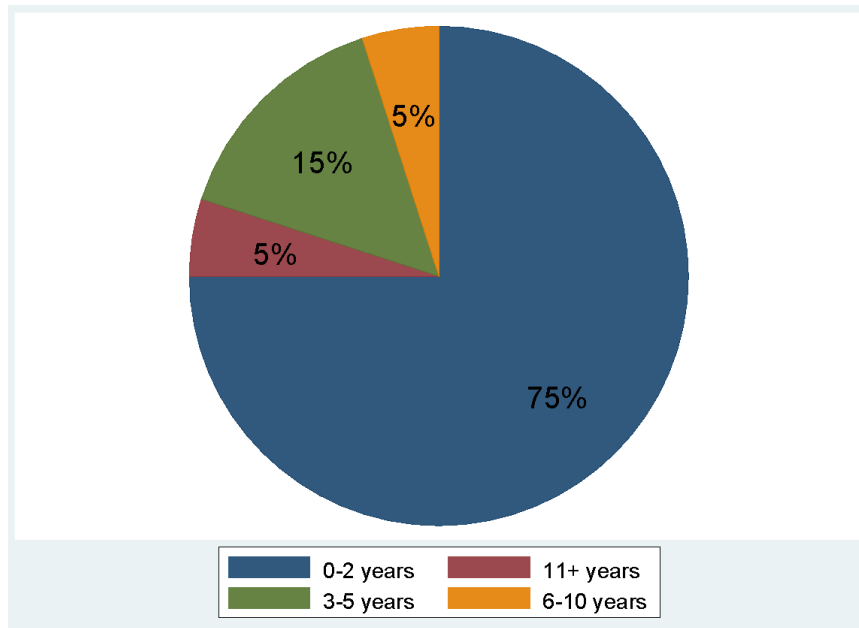


Figure 4.4: Study Participants' Public-Private Partnership Experience

As shown in Figure 4.4, a similar trend to the one in Figure 4.3 was observed regarding experience with PPPs. Most participants (75%) had less than three years of experience in PPP engagements, and only 5% had over five years of experience out of 15 respondents. This could be because the concept is relatively new in the country.

4.4 Distribution of Participants' Experience in Solar Power and Public-Private Partnerships

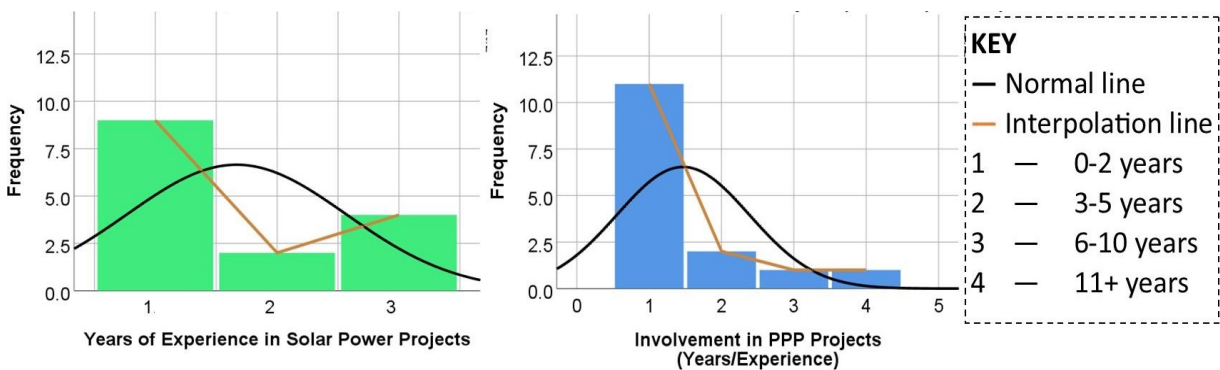


Figure 4.5: Participants Solar Power and Public-Private Partnership Distribution

Figure 4.5 shows that the study population was not normally distributed, with the majority of respondents having 0-2 years of experience in both solar power and public-private partnership. This distribution was studied for Skewness and Kurtosis as shown in the table 4.1 below. The statistics indicate that the respondents generally had moderate experience in solar power projects, as shown by the slight right skewness (0.780) and light-tailed distribution (kurtosis = -1.347). However, involvement in PPP projects is highly skewed (2.046) and sharply peaked (kurtosis = 3.646), reflecting that most respondents have little to no PPP experience, with only a few having extensive involvement. This disparity suggests a knowledge and experience gap in PPP frameworks, which could influence stakeholders' readiness to implement PPP-based solar power initiatives.

Table 4.1: Years of Experience in Solar Power and PPP Projects Skewness and Kurtosis

| | Years of Experience in Solar Power Projects | Involvement in PPP Projects (Years/Experience) |
|-------------------------------|---|--|
| Skewness | 0.780 | 2.046 |
| Std. Error of Skewness | 0.580 | 0.580 |
| Kurtosis | -1.347 | 3.646 |
| Std. Error of Kurtosis | 1.121 | 1.121 |

4.5 Stakeholder Interplay and Collaboration

Table 4.2: Participants Perceived Level of Collaboration between Public and Private Sector Stakeholders in Public-Private Partnership Power Projects

| | Frequency | Percent (%) |
|------------------|-----------|--------------|
| Excellent | 1 | 6.7 |
| Good | 5 | 33.3 |
| Fair | 5 | 33.3 |
| Poor | 4 | 26.7 |
| Total | 15 | 100.0 |

According to Table 4.2, most respondents (60%) rated the current collaboration between public and private stakeholders in solar power projects as fair or poor. Meanwhile, 33.3% considered the collaboration good, and only 6.7% rated it as excellent. The responses also showed that government entities were the most involved stakeholders (100%), followed by private investors (80%) and financial

institutions (73.3%), as illustrated in Figure 4.6. Other stakeholders mentioned include local communities (33.3%) and energy regulators (20%). This data suggests mixed opinions about the effectiveness of the collaboration, with many feeling that current partnerships were not as strong as they could be.

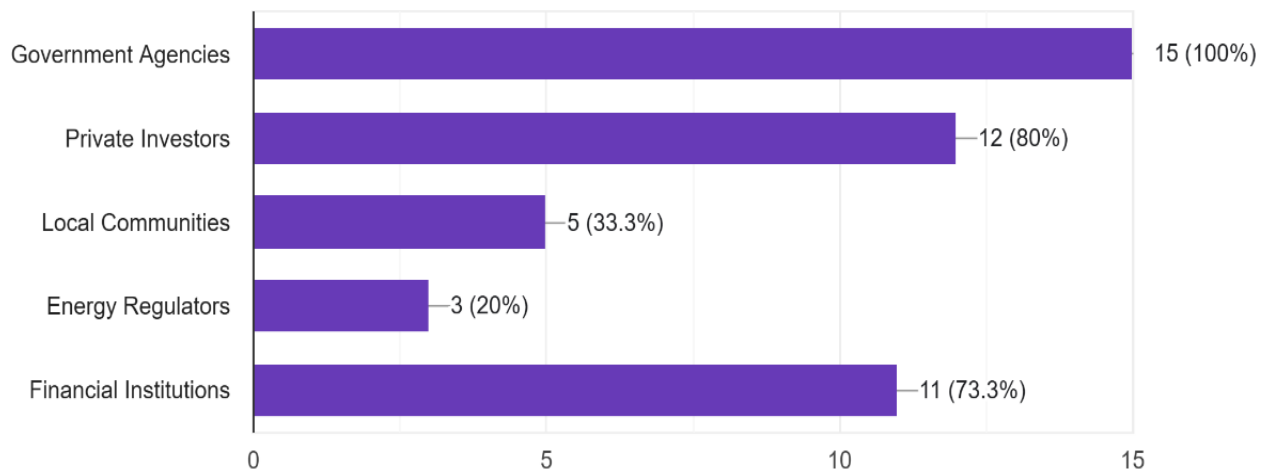


Figure 4.6: Critical Stakeholders for Solar Power Projects Public Private Partnerships

Table 4.3: Effectiveness of Stakeholder Engagement in PPPs Solar Projects Experienced

| | Frequency | Percent (%) |
|-----------------------------|-----------|--------------|
| Highly Effective | 3 | 20.0 |
| Moderately Effective | 4 | 26.7 |
| Slightly Effective | 2 | 13.3 |
| Not Effective | 3 | 20.0 |
| Too Early to Assess | 3 | 20.0 |
| Total | 15 | 100.0 |

As shown in Table 4.3 above, 60% of respondents thought that stakeholder engagement in solar power PPP projects has been effective. On the other hand, 20% felt it was ineffective, and another 20% were uncertain about its effectiveness at this time.

To improve collaboration, respondents suggested several strategies which focused on stronger engagement and cooperation among all parties involved. Many emphasized the need for more government support, such as offering incentives, adopting flexible regulatory policies, and implementing cost-reflective offtake tariffs to make partnerships more appealing. Other suggestions included

introducing better electricity tariffs and giving private companies more independence to generate and supply solar power, without relying solely on ZESCO. Some respondents stressed the importance of creating collaborative frameworks that aligned with the profit-oriented goals of private entities, ensuring mutually beneficial partnerships. However, a few participants either found the question irrelevant or expressed uncertainty, indicating varying levels of awareness or understanding of the issue. Ultimately, the responses highlighted the need for a mix of regulatory, financial, and engagement strategies to improve collaboration in solar power PPP projects.

4.6 Financial and Technical Feasibility

Table 4.4: Assessment of Financial Feasibility of PPPs Solar Power Projects in Luanshya District

| | Frequency | Percent (%) |
|----------------------------|------------------|--------------------|
| Highly Feasible | 1 | 6.7 |
| Moderately Feasible | 5 | 33.3 |
| Slightly Feasible | 5 | 33.3 |
| Not Feasible | 3 | 20.0 |
| Unsure | 1 | 6.7 |
| Total | 15 | 100.0 |

Table 4.4 shows that respondents had mixed opinions about the financial feasibility of PPP solar power projects in Luanshya District. Only 6.7% rated the projects as highly feasible, while 33.3% saw them as moderately feasible, and another 33.3% viewed them as slightly feasible. Meanwhile, 20% believed the projects were not feasible, and 6.7% were uncertain about their financial viability.

Figure 4.7 illustrates below the main financial challenges, with high initial investment costs and difficulties in securing funding being the most commonly reported, both reported by 71.4% of respondents. Additionally, 64.3% raised concerns about insufficient returns on investment, emphasizing the financial risks and uncertainties tied to PPP solar projects. These findings pointed out the need for tackling these financial challenges, such as identifying funding solutions, offering better investment incentives, and ensuring more favourable returns on investment to improve the feasibility and appeal of PPP solar projects in the district.

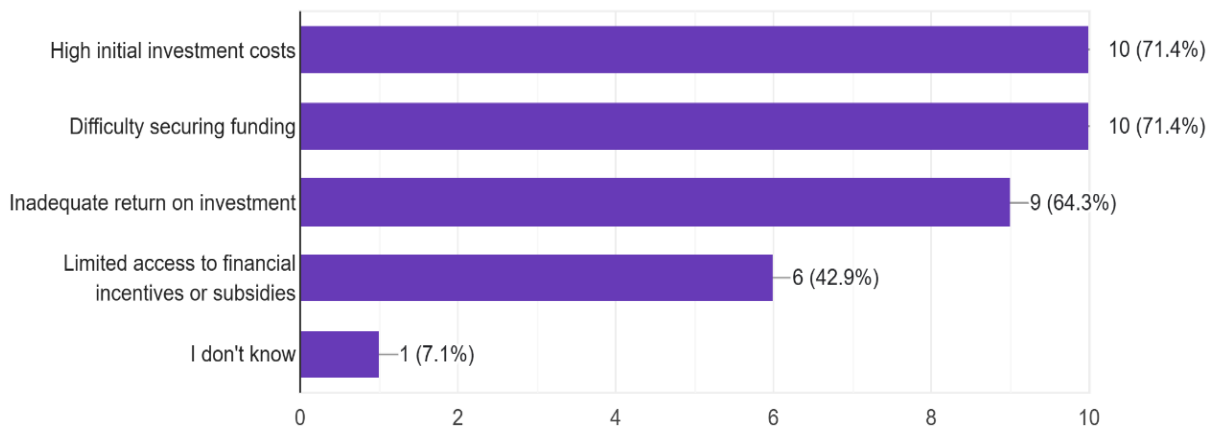


Figure 4.7: Biggest Financial Challenges for Public-Private Partnership Solar Power Projects

Table 4.5: Viability Belief in Current Financial Models for Public-Private Partnership solar projects

| | Frequency | Percent (%) |
|-----------------|-----------|--------------|
| Yes | 2 | 13.3 |
| No | 7 | 46.7 |
| Not Sure | 6 | 40.0 |
| Total | 15 | 100.0 |

Table 4.5 revealed that many respondents were doubtful about the viability of current financing models for PPP solar projects. Only 13.3% believed these models were sustainable, while a larger group, 46.7%, disagreed, questioning the long-term viability of these options. More, 40% were unsure about their viability, showing a lack of confidence or clarity on the subject. This suggests widespread concerns about the strength and effectiveness of the current financing structures for PPP solar projects.

Responses by participants to the open-ended question on the technical challenges faced in implementing PPP solar projects raised several issues. Some respondents mentioned problems with energy storage, pointing out the high costs of storage technologies used in solar systems. Others noted a lack of skilled workers, stressing that “limited technical expertise is a major barrier to successful implementation.” There were also concerns about insufficient research, suggesting that innovation in solar power solutions is being slowed by a lack of studies or advancements on solar power technology and management. Additional challenges

reported included outdated solar panel technology and the lack of more modern, efficient, and cost-effective solutions. Some respondents either did not mention any barriers or were uncertain, indicating that these issues may not be universally recognised or that some participants lacked knowledge or experience with the projects. Ultimately, the responses highlighted a mix of outdated technological, unskilled workforce, and lack of resource as challenges that need to be addressed for the successful implementation of PPP solar power projects.

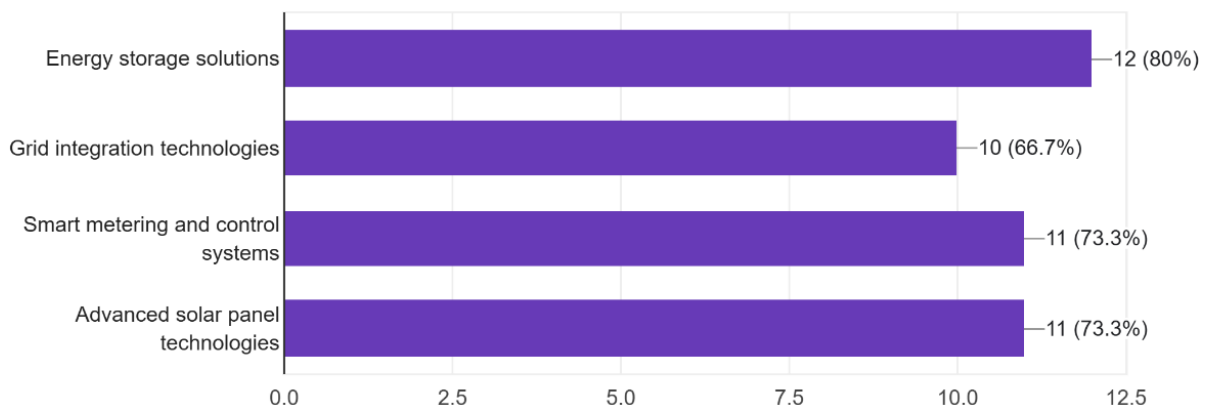


Figure 4.8: Technological Innovations that Could Improve the Feasibility and Performance of Public-Private Partnership Solar Projects

Figure 4.8 shows respondents' preferences for technological innovations to improve the feasibility and performance of PPP solar power projects. Energy storage solutions were the most popular, selected by 80% of respondents, highlighting the need for efficient energy management and reliability. Smart metering and control systems, along with advanced solar panel technologies, were each chosen by 73.3%, showing a shared understanding of the importance of precision, efficiency, and better energy production. More, 66.7% supported grid integration technologies, emphasizing the need for smooth connections between solar power systems and existing energy infrastructure to improve overall performance. These findings reflected a strong agreement on the most important role of advanced technologies in ensuring the success of PPP solar projects.

4.7 Regulatory Frameworks

Table 4.6: Rating of Current Regulatory Frameworks for Solar Power Public-Private Partnership Projects in Luanshya District

| | Frequency | Percent (%) |
|------------------|-----------|--------------|
| Excellent | 1 | 6.7 |
| Good | 1 | 6.7 |
| Fair | 6 | 40.0 |
| Poor | 6 | 40.0 |
| Very Poor | 1 | 6.7 |
| Total | 15 | 100.0 |

The evaluation of the current regulatory frameworks for solar power PPP projects in Luanshya District, shown in table 4.6, revealed a range of opinions. A small number of respondents gave positive ratings, with 6.7% considering the frameworks as excellent and another 6.7% rating them as good. However, a larger group, 40%, described the frameworks as fair, indicating moderate satisfaction but also room for improvement. Another 40% rated the frameworks as poor, highlighting concerns about their effectiveness, while 6.7% described them as very poor, showing serious dissatisfaction. These results suggest that while some people viewed the frameworks to have been positive, most believed significant changes were needed to improve the environment for PPP solar power projects in the district.

Figure 4.9 shows the main regulatory issues identified by respondents that needed attention to support successful solar power PPP projects in Luanshya. The biggest challenge, cited by 80% of respondents, was delays in permits and approvals, which caused major delays in starting and completing projects. Another issue which was highlighted by 73.3%, was the complexity of licensing procedures, showing a need for simpler processes to reduce administrative challenges. A lack of policy incentives, which was mentioned by 60% of respondents, pointed to the need for supportive measures that would attract investment and encourage participation. Inconsistent regulations, which was reported by 53.3% of respondents, suggested the need for more consistent and predictable rules to build trust among partners. Additionally, 6.7% raised of

respondents were concerns about trade restrictions affecting the solar power energy industry. However, interestingly, 6.7% of respondents felt that there were no regulatory barriers that needed to be addressed, suggesting that they considered the current framework to have been sufficient for PPP solar power projects. Nonetheless, all these respondents made emphasis on areas where policy and regulatory changes were needed most to improve the success of solar power PPP projects in the district.

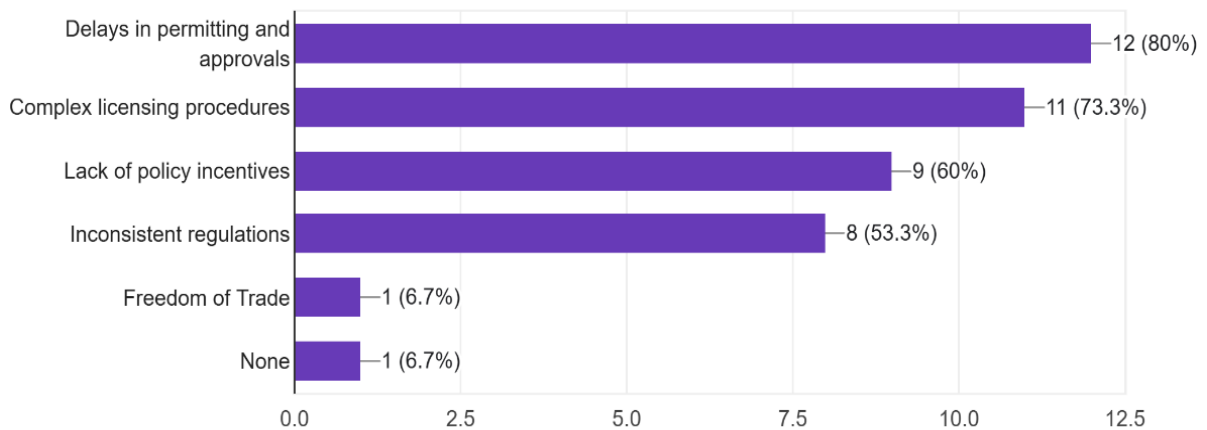


Figure 4.9: Regulatory Barriers that Need Addressing to Facilitate Solar Power Public-Private Partnerships in Luanshya District

The answers from respondents to the question about improving the regulatory framework for a better and successful PPP solar power projects clearly showed a demand for more efficient and supportive policies. Many participants stressed the need for simpler regulatory procedures and faster licensing and approval processes, especially from more important agencies like Zambia Environmental Management Agency (ZEMA) and the ERB. They also highlighted the importance of transparency and accountability, suggesting that clear and reliable systems were essential to building investors trust. Some respondents recommended creating a more supportive and flexible policy environment with strong regulatory support, which would make the framework more attractive for private sector involvement. Additionally, a few participants suggested allowing private investors more opportunities for direct trade and enhancing collaboration between stakeholders to strengthen PPP projects. However, a small number of respondents

either found the question irrelevant or were unsure, indicating a lack of understanding or experience with current regulatory challenges. All these responses given emphasizes the need for reforms that would streamline processes, build trust, and promote cooperation to ensure the successful implementation of PPP solar power projects.

4.8 Socio-Economic Impacts

Table 4.7: Perceived Socio-Economic Impact of Public-Private Partnership Solar Power Projects on Local Communities in Luanshya District

| | Frequency | Percent (%) |
|---------------------------|-----------|--------------|
| Extremely Positive | 10 | 66.7 |
| Neutral | 4 | 26.7 |
| Extremely Negative | 1 | 6.7 |
| Total | 15 | 100.0 |

The information in table 4.7 shows how respondents perceived the socio-economic effects of PPP solar power projects on local communities in Luanshya District. Most respondents, 66.7%, saw the impact as extremely positive, believing the projects would bring benefits like better energy access, job creation, and economic growth. This suggested that PPP solar power projects were generally viewed as drivers of community development and viability. On the other hand, 26.7% of respondents were neutral, possibly because they haven't been directly involved in the projects or were unsure about their long-term effects. Only 6.7% of respondents rated the impact as very negative, indicating that there were some concerns, possibly due to unmet expectations, limited community involvement, or potential environmental or social related issues. In general, the feedback was mostly positive, but it also pointed to the need to address any negative view and ensure wider community support.

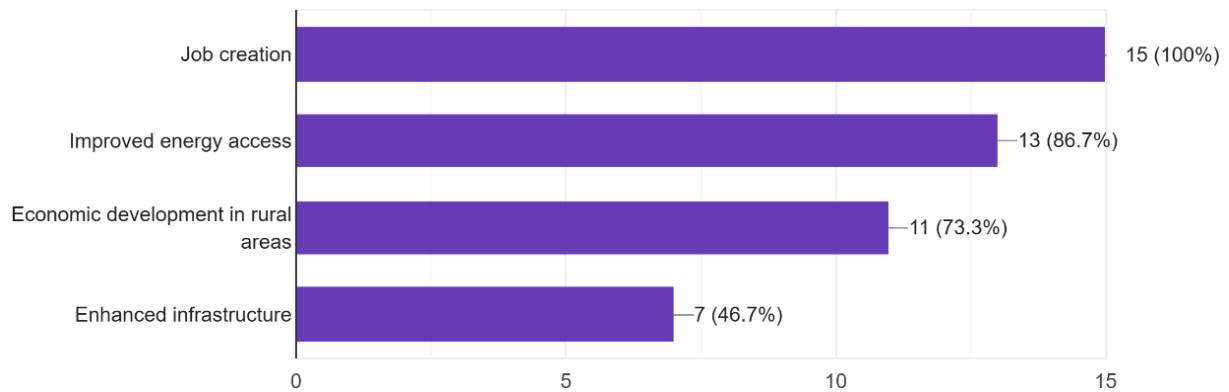


Figure 4.10: Specific Socio-Economic Benefits Realised from Public-Private Partnerships Solar Power Projects

Figure 4.10 illustrates the socio-economic benefits of PPP solar power projects and their significant positive impact on local communities. Job creation was highlighted by 100% of respondents, emphasizing the important employment opportunities these projects could provide during both the construction and operational stages. Improved energy access was mentioned by 86.7% of participants, reflecting how essential these projects were in delivering reliable and sustainable electricity to areas with limited access. Economic growth in rural areas, noted by 73.3% of respondents, shows the positive effect solar power projects could have on local economies, production industries, and small businesses. In addition, 46.7% recognised improvements in infrastructure, such as better roads, buildings, or transmission systems, linked to the development of solar power plants. These findings demonstrated that PPP solar power projects offered numerous benefits beyond just energy supply, contributing to the socio-economic advancement of rural and underserved communities.

Regarding potential negative effects, some respondents were unsure or did not mention any issues, possibly due to a lack of awareness or direct experience with the challenges these projects could bring. However, others raised valid concerns, such as the possibility of needing to relocate people or communities, which could disrupt local livelihoods and social ties if not handled carefully. The idea of relocating farming activities suggested potential conflicts between solar power projects and agricultural use of land, highlighting the need for thoughtful site

selection. Concerns about poor planning and execution also surfaced, pointing to the risks of inadequate preparation, which could lead to inefficiencies or negative outcomes for the community. Participants stressed the importance of educating stakeholders about the benefits of the projects to ensure their support and suggested that measures to prevent vandalism should be put in place to maintain project viability. In general, the responses stressed the need for careful planning, effective communication, and strategies to address potential challenges while maximizing the benefits for the local community.

4.9 Viability and Long-Term Sustainability

Table 4.8: Viability of Current Public-Private Partnership Solar Power Projects in Terms of Long-Term Operation and Maintenance

| | Frequency | Percent (%) |
|-------------------|-----------|--------------|
| Highly Viable | 2 | 13.3 |
| Moderately Viable | 3 | 20.0 |
| Slightly Viable | 2 | 13.3 |
| Not Viable | 7 | 46.7 |
| Unsure | 1 | 6.7 |
| Total | 15 | 100.0 |

Table 4.8 shows how respondents perceive the viability of current PPP solar power projects regarding their long-term operation and maintenance. The results reveal that almost half of the respondents (46.7%) believe the projects are not sustainable, highlighting serious concerns about their ability to last and function properly over time. These concerns could have been due to issues like poor maintenance plans, lack of funding, or insufficient technical skills.

A smaller group, 20%, thought the projects were somewhat viable, while 13.3% believed they were highly viable, suggesting that a few stakeholders see a chance for long-term success, though this view was not widely held. Another 13.3% of respondents considered the projects slightly viable, showing doubt about their future viability. In addition, 6.7% were unsure, likely because of limited knowledge or involvement with the projects' ongoing operations.

4.10 Respondents' Organisation and Perception on Viability of Current PPP Solar Sower Projects in-Terms of Long-term Operation and Maintenance

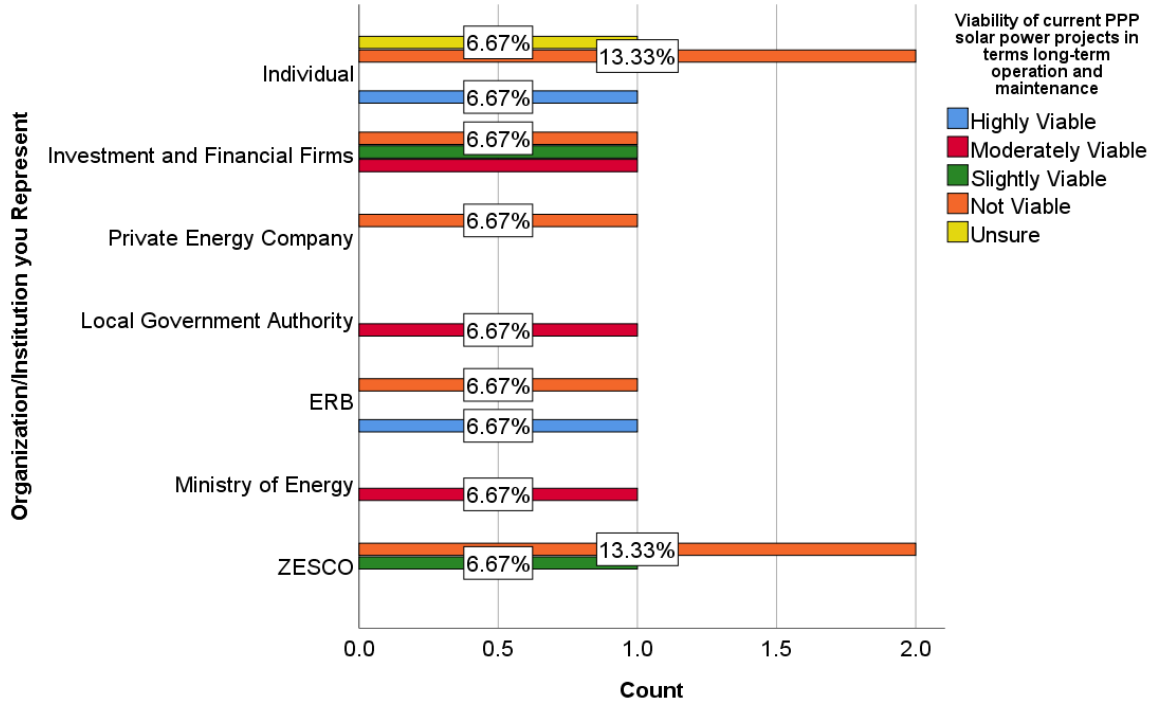


Figure 4.11: Respondents' Organisation and Perception on Viability of Current PPP Solar Sower Projects

The figure above illustrates how respondents from various organizations perceive the viability of current PPP solar power projects in terms of long-term operation and maintenance. Among the 15 respondents, most (46.7%) viewed the projects as "Not Viable," with notable doubts from organizations like ZESCO (13.33% respondents) and individuals (13.33% respondents). A small number (13.33%) considered the projects "Highly Viable," including one respondent each from ERB and individuals. "Moderately Viable" was chosen by 3 respondents, including one from the Ministry of Energy, a local government authority, and an investment/financial firm. Few respondents viewed the projects as "Slightly Viable" (13.33%) or were "Unsure" (6.67%). The findings highlight a general lack of confidence in the long-term viability of PPP solar power projects, particularly among respondents from key energy and financial institutions.

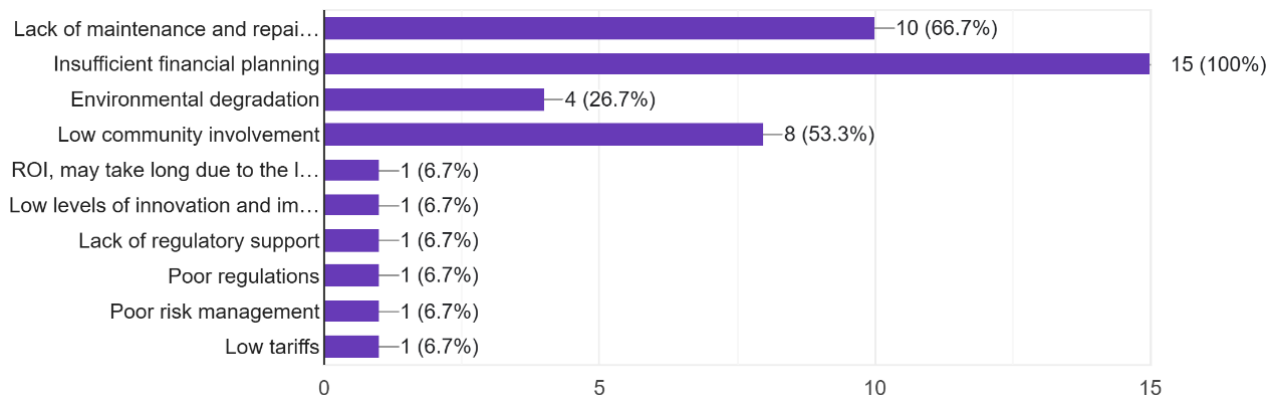


Figure 4.12: Most Critical Viability Challenges Facing Public-Private Partnership Solar Power Projects

Figure 4.12 highlights the main challenges affecting the viability of PPP solar power projects, according to respondents. The bigger concerns that were mentioned by 66.7%, was the lack of maintenance and repair, showing worries about the ability to keep solar power infrastructure working in the long term. The most urgent issue, however, was the lack of proper financial planning, which all respondents (100%) pointed out, stressing the need for better budgeting and funding strategies to ensure the projects last. Low community involvement, mentioned by 53.3%, showed the need to involve local people more to gain their support and make sure the projects succeed in the long run.

Other concerns included environmental damage (26.7%), indicating possible clashes with environmental protection efforts, and problems like low tariffs, poor risk management, lack of regulatory support, weak regulations, low innovation, and concerns about returns on investment, all cited by 6.7% of respondents. Though less frequently mentioned, these factors still showed worries about the financial stability, regulatory framework, and technological progress of the projects. Ultimately, these challenges pointed to the need for strategies that would address financial, technical, environmental, and social aspects to ensure the success of solar power PPP projects.

The suggestions for improving the viability of these projects in Luanshya District focus on a broad approach. A more important recommendation was for more

government support and incentives, emphasizing the important role public policies played in creating a favourable environment for these projects. Respondents also stressed that “there was a need for better cooperation between all involved parties to achieve shared goals.” Many recommended improving financial structures, such as removing ZESCO as an intermediary to allow investors to directly benefit from their investments, offering flexible policies for accessing both local and international funds, and ensuring enough financial resources to support long-term operations. Some suggested making partnerships more profitable and attractive to private investors, as financial success was crucial for ongoing private sector participation. Furthermore, there were calls to improve tariffs and invest in new technologies, recognising the importance of fair pricing and modern solutions to ensure long-term success. Last but not the least, increasing investment to address climate change reflected how solar power could contribute to environmental protection and global climate goals.

4.11 Future Outlook and Recommendations

Table 4.9 Future Prospects for Public-Private Partnership Solar Power Projects in Zambia’s Luanshya District

| | Frequency | Percent (%) |
|-----------------------------|-----------|--------------|
| Bright and promising | 9 | 60.0 |
| Slow progress | 5 | 33.3 |
| Uncertain | 1 | 6.7 |
| Total | 15 | 100.0 |

Table 4.9 shows respondents' opinions on the future of PPP solar power projects in Luanshya District, Zambia. Most respondents, 60.0%, were optimistic and believed that the prospects were bright and promising. This suggested that many saw great potential for these projects to grow and succeed, likely due to factors like increased energy demand, government support, and the positive impact on the local community. However, 33.3% felt progress would be slow, pointed out concerns like regulatory issues, financial challenges, or infrastructure problems that could slow down development. Only 6.7% of respondents were unsure,

suggesting that a small number of people either didn't have enough information or lacked confidence in predicting the future of solar power PPP projects.

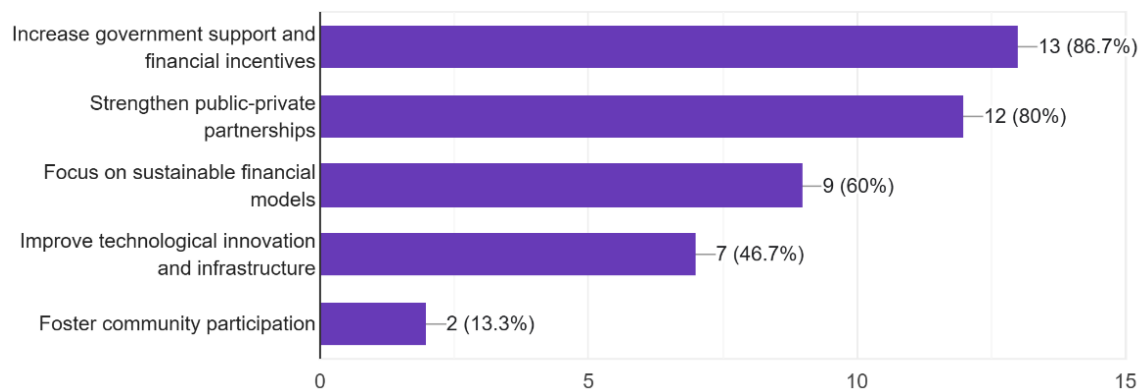


Figure 4.13: Steps that can be Taken to Ensure the Long-Term Success of PPP Solar Power Projects

Figure 4.13 above outlines several important actions which could ensure that the long-term success of PPP solar power projects. A large majority, 86.7%, stressed the importance of more government support and financial incentives, recognising that government support is more important to attracting private investment and keeping projects sustainable. Furthermore, 80% of respondents highlighted the need to strengthen partnerships between the government and private sector to ensure success. 60% of participants emphasized the importance of using sustainable financial models to ensure long-term viability through smart funding and resource management. 46.7% pointed out the need for ongoing technological improvements and better infrastructure to keep projects efficient and meet future energy demands. Lastly but not the least, 13.3% suggested involving local communities in the planning and implementation of solar power projects to ensure better outcomes and greater local support.

In response to improving the financial, technical, regulatory, and socio-economic aspects of PPP solar power projects, many participants recommended that increased government support such as offering subsidies or grants to attract investment and ease financial challenges. They also called for relaxing regulations by ERB and removing ZESCO as a middleman to encourage competition, foster

innovation, and create more business opportunities. Many stressed the importance of investing more in solar power and new technologies to ensure financial and technical stability. Improving bankability, especially for ZESCO (the main off-taker), was highlighted as necessary for the financial success of projects. Participants also mentioned the importance of raising awareness through publicity and community sensitisation to build local support for PPP solar power projects. Furthermore, improving supply chain management and investing in green energy were seen as very important to strengthening the infrastructure and regulatory frameworks supporting solar power growth.

Chapter 5: Discussion and Interpretation of Results

This chapter discusses the findings from the study under the following sub-headings; viability of PPP for solar power development in Luanshya District, financial and technological challenges affecting the sustainability on PPP for solar power development, stakeholder influence on the long-term sustainability of PPP solar power projects and socio-economic impact that influence sustainability outlook.

5.1 Viability of PPP for Solar Power Development in Luanshya District

The feasibility assessment into the use of public-private partnerships (PPPs) to develop solar power projects in Luanshya District was important, especially as Zambia continued to explore renewable energy solutions. From the research findings, it was clear that while there were some positive aspects, several challenges needed to be addressed to ensure the success of these projects.

Respondents, 46.7%, believed these projects are not viable in the long run and most of the issues regarding viability could be addressed with better financial planning, ongoing maintenance, and stronger community engagement. Only 13.3%, 20.0% and 13.3% saw high viability, moderate viability and slight viability respectively with 6.67% not being sure. A solid strategy that included clear maintenance plans and active stakeholder involvement could have increased the likelihood of long-term success.

5.2 Financial and Technological Challenges Affecting the Sustainability on PPP For Solar Power Development

A major concern was the financial feasibility of solar power initiatives. According to 71.4% of respondents, the high initial investment costs and difficulty in securing funding were more important obstacles. Furthermore, 64.3% of respondents mentioned that “insufficient returns on investment could discourage private investors from getting involved in PPP solar power projects.” Only 13.3% of

respondents thought the current financial models would be sustainable, highlighting the need for better financial planning. That suggested that alternative funding models, such as blended finance or greater public sector involvement, could make these projects more attractive to private investors.

Technically, the research revealed challenges related to the high cost of energy storage, a lack of technical expertise, and outdated solar power technology. These factors could impact the efficiency and long-term success of solar power projects. About 60% of respondents stressed the importance of advanced technologies like energy storage solutions and grid integration to ensure that these projects are both economically and technologically viable.

5.3 Stakeholder's Influence on The Long-Term Sustainability of PPP Solar Power Projects

The regulatory environment was another major issue. A significant 80% of respondents pointed to delays in permits and approvals as a major challenge. Furthermore, 73.3% mentioned complicated licensing processes, and 60% noted the absence of clear policy incentives. This suggested that regulatory reforms were urgently needed. Simplifying procedures, reducing bureaucratic barriers, and offering clearer policy incentives could make these projects more appealing to private investors.

5.4 Socio-Economic Impact That Influence Sustainability Outlook

On a socio-economic level, 66.7% of participants saw positive outcomes from PPP solar power projects, such as improved energy access, job creation, and economic growth. These benefits are important for garnering public and government support. However, concerns were raised about the lack of community involvement (53.3%) and potential land use conflicts, which could hinder social acceptance of solar power projects. To mitigate these issues, it was perceived by respondents that it was important to involve local communities through public media early in the

planning and implementation stages to ensure equitable distribution of benefits and avoid opposition.

Chapter 6: Conclusions and Recommendations

This chapter discusses the conclusions from the findings of the study and the recommendations that were made in relation to the results.

6.1 Conclusion

This study explored the viability of Public-Private Partnerships (PPP) for solar power development in Luanshya District, Zambia. The findings indicate both opportunities and challenges that impact the long-term success of these projects.

Financially, the high initial investment costs and difficulties in securing funding were identified as more important obstacles. A significant 71.4% of respondents highlighted the challenge of securing adequate funding, while 64.3% expressed concerns over insufficient returns on investment. Only 13.3% believed the current financial models would be sustainable, suggesting a need for better financial planning and alternative funding models, such as blended finance, to attract private investors.

Technologically, 60% of respondents emphasized the need for advanced technologies, such as energy storage solutions and better grid integration, to ensure the viability of solar power projects. The lack of technical expertise and outdated solar power technology were additional barriers to success.

Regulatory challenges also emerged as a major concern. A significant 80% of respondents pointed out delays in permits and approvals, while 73.3% indicated that complex licensing processes hinder progress. Furthermore, 60% of participants noted the absence of clear policy incentives, underscoring the need for regulatory reforms to streamline approval processes and create a more attractive environment for private investors.

The socio-economic benefits of solar power projects, such as improved energy access, job creation, and economic growth, were recognised by 66.7% of participants. However, concerns about a lack of community involvement (53.3%)

and potential land use conflicts were raised, indicating that early engagement with local communities was essential for project success.

6.2 Recommendations

i. Improve Collaboration among Stakeholders

There is a need for stronger partnerships between public institutions, private companies, regulatory authorities, and local communities. This will require setting up a structured platform where stakeholders can meet regularly to exchange ideas, share expertise, and address challenges.

ii. Create Financially Attractive Models

To tackle financial challenges, it will be important to develop innovative financing options. These could include loans, tax reliefs, and government-backed assurances to minimise risks for investors.

iii. Improve the Regulatory Environment

The regulatory framework should be restructured to make processes simpler and quicker. Delays caused by bureaucracy can be minimised by introducing clear and consistent guidelines for solar power energy projects.

iv. Invest in Advanced Technology and Skills Development

Significant investment in research and development is required address technological challenges, like the high cost of energy storage systems. Workforce training programmes are also important to equip local workers with the skills required to support the solar power energy sector.

v. Engage Local Communities

Involving local communities in planning and implementing solar power projects was very important. There is need to include local communities in decision-making processes because this would foster trust, reduce opposition, and ensure that the socio-economic benefits of these projects.

vi. Ensure Consistent Policy and Government Support

Government support and a stable policy framework for solar energy are required. These could include offering financial incentives, facilitating access to funding for

private investors, and committing to energy diversification. The government should also advocate for solar energy at both regional and international levels to attract foreign investments and further strengthen the solar energy sector.

vii. Further Research on Electricity Tariffs that ensures Return on Investment

There is need for further research on appropriate electricity tariffs that ensures that there is return on investment on solar power projects.

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Appendices

Appendix 1: Ethical Clearance



SCHOOL OF POSTGRADUATE STUDIES

Plot No. 37413, Off Alick Nkhata Mass Media, P. O Box 36711, Lusaka.
Phone: +260211258505, 258409 Fax +260211233409; Cell +260976075850,961917862,
E-mail: unilus@zamnet.zm, ictar@zamnet.zm

UNILUS-RESEARCH ETHICS COMMITTEE

Ref no: FWA00033228-5912/24

Date: 1st December 2024

STUDENT NAME: Josephine Mwamsa Singandu

EXAMINING THE VIABILITY OF A PUBLIC-PRIVATE PARTNERSHIP FOR SOLAR POWER IN LUANSHYA

The above research was submitted to the research ethics committee for review. The study has no major ethical problems and is approved subject to the following:

1. The study cannot be changed without express permission of the UNILUS research ethics committee.
2. Approval from the necessary authority should be sought.

The committee wishes you success in your work.



Professor Kasonde Bowa

MSc(Glasgow), M.Med(UNZA), FRCS(Glasgow), FACS, FCS, DPH(LSTMH), MPH(UCL)

Chairman- UNILUS REC

Professor of Urology and Consultant Urologist

Deputy Vice-Chancellor – Research and Innovation

Executive Dean - School of Medicine and Health Sciences

Appendix 2: Permission to Conduct Research



Stand No. LUSAK/LN_ 15087/2, Great North Road
Post Net Box 349, Private Bag E891 Lusaka

Tel: +260 211 241296/8, +260 966 862 081
E-mail: info@rea.org.zm, www.rea.org.zm

REA/101/4/30
3rd December 2024

Ms. Josephine Mwansa Singandu
House No. 6 Ndungu Street
Bedrock
LUSAKA

Dear Madam,

**REF: APPROVAL TO CONDUCT DATA COLLECTION – JOSEPHINE
MWANSA SINGANDU**

Reference is made to the above subject and letter dated 12th November 2024 requesting approval to collect data from the Rural Electrification Authority (REA) as part of your research study.


The Authority wishes to extend its support and approval for your research project which involves assessing the viability of powering Luanshya District on solar energy using a Public-Private Partnership (PPP) model.

REA acknowledges the importance of academic research in advancing innovative solutions in the renewable energy sector and is committed to supporting your academic endeavors. Thus, we are pleased to grant permission to access the necessary data for your study.

However, be informed that the information collected should be treated with utmost confidentiality and used for academic purposes only. Further, the Authority requests a copy of the final document.

Yours faithfully,

RURAL ELECTRIFICATION AUTHORITY


ADRINE MUCHIMBA (Ms.)
DIRECTOR HUMAN RESOURCE AND ADMINISTRATION
FOR/CHIEF EXECUTIVE OFFICER

All Correspondence should be addressed to the Chief Executive Officer



National Pension Scheme Authority

Levy Business Park,
Corner Church and Kabelenga Roads
P.O. Box 51275
Lusaka - Zambia

HEAD OFFICE

Tel: (260) 211 395000
(260) 211 395677
E-mail: info@napsa.co.zm
www.napsa.co.zm

NAPSA 9/1E Vol. 1

13th November 2024

Ms. Josephine Mwansa Singandu
C/O University of Lusaka
P.O.Box 36711
LUSAKA

+260-979047852
Email: jsingandu1@gmail.com

Dear Ms. Singandu


RE: REQUEST TO CARRY OUT A RESEARCH

Reference is made to the letter from the **University of Lusaka** dated **14th October 2024** regarding the above captioned subject in which the school requested for permission on your behalf to collect data from the Authority for your research on "**Assessing the Viability of Powering Luanshya District on Solar Energy Using a Public-Private Partnership Model.**"

We wish to advise that your request to collect data has been approved and you have been granted permission to go ahead with data collection. This is on condition that the information gathered is used for **academic purposes only** and that you **strictly maintain high levels of confidentiality**. In this regard, find attached an Oath of Secrecy Form which should be signed and submitted to the undersigned before the commencement of your data collection from the Authority.

Additionally, you may submit a copy of your Report to the undersigned once you have concluded your research.

Yours sincerely,
NATIONAL PENSION SCHEME AUTHORITY


Mwila M. Bwalya
ACTING SENIOR HUMAN RESOURCE MANAGER

cc: Director Human Resource and Administration
Acting Training and Development Manager

Be smart, secure your future

13th November, 2024

Ms. Josephine Mwansa Singandu
House No. 6 Ndungu Street
Bedrock
LUSAKA

Dear Ms. Singandu,

RE: REQUEST FOR AUTHORITY TO CONDUCT DATA COLLECTION: YOURSELF

Reference is made to your letter dated 12th November, 2024 on the above subject.

2. I am pleased to inform you that authority has been granted for you to collect data at the Ministry of Energy.
3. You may wish to note that the information to be collected during your research, should be used for academic purposes only.
4. For any inquiries, kindly get in touch with the Acting Senior Human Resource Management Officer, Ms. Beauty C. Katebe on 0978709400 or Beauty.Katebe@moe.gov.zm.

Yours sincerely,



Grace M. Tonga (Mrs)
Acting Director – HRA
For/Permanent Secretary (A)
MINISTRY OF ENERGY

8.4.3 Appendix 3: Questionnaire

Section 1: Participant Information

- 1. Organization/Institution you Represent:**
 - ZESCO (Zambia Electricity Supply Corporation)
 - Ministry of Energy
 - Rural Electrification Authority
 - Energy Regulation Board (ERB)
 - Local Government Authority
 - Private Energy Company (e.g., Copperbelt Energy Corporation)
 - Investment and Financial Firms
 - Other (specify)
 - Individual
 - Citizen Economic Empowerment Commission (CEEC)
 - Kiyona Energy Limited (Zesco subsidiary)
- 2. Your Role in PPP Solar Power Projects:**
 - Board Member
 - Senior Management
 - Middle Management
 - Lower Management
 - Operational Support
 - Other (specify)
 - Consumer
 - Anonymous
- 3. Years of Experience in Solar Power Projects:**
 - 0-2 years
 - 3-5 years
 - 6-10 years
 - 11+ years
- 4. Involvement in PPP Projects (Years/Experience):**
 - 0-2 years
 - 3-5 years
 - 6-10 years
 - 11+ years

Section 2: Stakeholder Interplay and Collaboration

- 1. How would you describe the level of collaboration between public and private sector stakeholders in PPP solar power projects?**
 - Excellent
 - Good
 - Fair
 - Poor
 - Very Poor

2. **Which stakeholders play the most critical role in the success of PPP solar power projects?** (Choose all that apply)
 - Government Agencies
 - Private Investors
 - Local Communities
 - Energy Regulators
 - Financial Institutions
 - Other (please specify)
3. **In your experience, how effective has stakeholder engagement been in PPP solar projects?**
 - Highly Effective
 - Moderately Effective
 - Slightly Effective
 - Not Effective
 - Too Early to Assess
4. **What strategies can improve stakeholder collaboration in solar power PPPs?**

Section 3: Financial and Technical Feasibility

1. **How would you assess the financial feasibility of PPP solar power projects in Luanshya District?**
 - Highly Feasible
 - Moderately Feasible
 - Slightly Feasible
 - Not Feasible
 - Unsure
2. **What are the biggest financial challenges for PPP solar power projects?** (Choose up to three)
 - High initial investment costs
 - Difficulty securing funding
 - Inadequate return on investment
 - Limited access to financial incentives or subsidies
 - Other (please specify)
3. **Do you believe the current financial models for PPP solar projects are sustainable?**
 - Yes
 - No
 - Not sure
4. **What technical barriers have you encountered in the implementation of PPP solar projects?**
5. **Which technological innovations could improve the feasibility and performance of PPP solar projects?** (Choose up to three)
 - Energy storage solutions

- Grid integration technologies
- Smart metering and control systems
- Advanced solar panel technologies
- Other (please specify)

Section 4: Regulatory Frameworks

1. **How would you rate the current regulatory frameworks for solar power PPP projects in Zambia?**
 - Excellent
 - Good
 - Fair
 - Poor
 - Very Poor
2. **What regulatory barriers need to be addressed to facilitate solar power PPPs in Luanshya District?** (Choose up to three)
 - Delays in permitting and approvals
 - Complex licensing procedures
 - Lack of policy incentives
 - Inconsistent regulations
 - Other (please specify)
3. **What improvements in the regulatory framework would enhance the success of PPP solar power projects?**

Section 5: Socio-Economic Impacts

1. **How do you perceive the socio-economic impact of PPP solar power projects on local communities in Luanshya District?**
 - Extremely Positive
 - Moderately Positive
 - Neutral
 - Moderately Negative
 - Extremely Negative
2. **What specific socio-economic benefits have been realized from PPP solar power projects?** (Choose all that apply)
 - Job creation
 - Improved energy access
 - Economic development in rural areas
 - Enhanced infrastructure
 - Other (please specify)
3. **What potential negative impacts on local communities should be mitigated in future projects?**

Section 6: Sustainability and Long-Term Viability

1. **How sustainable are current PPP solar power projects in terms of long-term operation and maintenance?**
 - Highly Sustainable
 - Moderately Sustainable
 - Slightly Sustainable
 - Not Sustainable
 - Unsure
2. **What are the most critical sustainability challenges facing PPP solar power projects?** (Choose up to three)
 - Lack of maintenance and repair programs
 - Insufficient financial planning
 - Environmental degradation
 - Low community involvement
 - Other (please specify)
3. **What recommendations would you make to improve the sustainability of solar power PPP projects in Luanshya District?**

Section 7: Future Outlook and Recommendations

1. **What do you see as the future prospects for PPP solar power projects in Zambia, particularly in Luanshya District?**
 - Bright and promising
 - Moderate growth
 - Slow progress
 - Uncertain
 - Decline
2. **What steps can be taken to ensure the long-term success of PPP solar power projects?** (Choose up to three)
 - Increase government support and financial incentives
 - Strengthen public-private partnerships
 - Focus on sustainable financial models
 - Improve technological innovation and infrastructure
 - Foster community participation
 - Other (please specify)
3. **What additional recommendations do you have for enhancing the financial, technical, regulatory, and socio-economic aspects of PPP solar power projects?**

Appendix 5: Submission of Dissertation for Examination



SCHOOL OF POSTGRADUATE STUDIES
SUBMISSION OF DISSERTATION FOR EXAMINATION

Name of student: Josephine Mwansa Sing'andu..... Student

number:.....MSCAFIN22114823..... Programme of

study:.... Master of Science in Accounting and Finance.....

Dissertation title: ...Examining the Viability of Public-Private Partnership (PPP) for Solar Power in Zambia's Luanshya District.....

Signature  of student:

..... Date:
... 14/01/2025.....

Supervisor's Comments:

I recommend/ do not recommend this dissertation for submission for examination (If you do not recommend, kindly provide a written report and attach hereto).

Name of Supervisor: Dr Avulundiah Phiri

Signature of Supervisor:

Date: 23 January 2025



Appendix 6: Dissertation Clearance Form



SCHOOL OF POSTGRADUATE STUDIES

DISSERTATION CLEARANCE FORM

TO: SCHOOL OF POSTGRADUATE STUDIES

FROM: AVULUNDIAH PHIRI (DR)

DATE: 20/03/2025

RE: CORRECTION OF COMMENTS BY EXAMINERS

I submit that I have checked and ensured that: **Josephine Mwansa Singandu.....**
(Student No.) MSCAFIN22114823..... has addressed all the corrections which were
requested by the examiner and the final copy of the dissertation is now ready for final

binding. Supervisor's signature: 

Cc Dean – Postgraduate

HOD – Postgraduate