Understanding energy justice through lived experiences in Zimbabwe

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Dedication

I dedicate this body of work to my father, Lovemore Chirara, who is losing sight due to diabetes, hoping that this thesis will also be audio recorded for his benefit. My mother, Catherine Chirara, Sister Clara Chirara and Brother-in-law, Vitalis Mamhende, for supporting and nursing me back to health when I was severely ill. I also dedicate this work to those whose life was cut short because of the devastating Covid-19 pandemic, which baffled even the most accomplished scientist at its peak. RIP, Gillian Tariro Noni Gapare; you were here when this journey started, but Covid-19 snatched you away from us. The pain is still raw. I also dedicate this work to all the individuals who live a life of misery due to poverty worsened by energy poverty and to the participants of this study; this work is for you too. In my mother language (Shona), I say Ndinorwadziwa nemi (I share your pain).

Acknowledgement

I thank God Almighty for the graces received. It has been possible only because God was with me throughout this journey. Thank you, Lord. Amen.

I would like to, first of all, give a word of thanks to my parents, Lovemore, and Catherine Chirara. My parents were the first people to inspire me with the importance of education and not only being educated but being a strong individual through all the challenges of life. My father is headstrong, a man who lives by his truth. As such, I learned from him in his words, "Munhu gara pachokwadi nguva dzose" (live with your truth all the time), and I live with that principle. Thank you so much, Dad. Mum, you are loved and appreciated. You have always been there for me and thank you for nursing me back to health when I had to learn to walk, talk and live again. I am indebted to you, Doctor Mum. To both of you, I know it was never easy when I did not make the right decisions in my life, but you never left my side but instead made sure I could start again, and here we are from a once-young pregnant 18-year-old to a mum of a 24-year-old (almost graduate); thank you for your continuous prayers.

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List of abbreviations

BPS	British Psychological Society
BBC	British Broadcasting Corporation
COPD	chronic obstructive pulmonary disease
CRGE	Climate Resilient Green Economy
ESKOM	Electricity Supply Commission
IRENA	International Renewable Energy Agency
IEA	International Energy Agency
MDGs	Millennium Development Goals
ZETDC	Zimbabwe Electricity Transmission Distribution Company
ZESA	Zimbabwe Electricity Supply Authority
UN	United Nations

Abstract

The study aims to understand energy justice through the lived experiences of householders from Harare Metropolitan Province. In addition, the study further explores the energy services and drivers of energy poverty rarely accounted for within energy poverty indicators in Zimbabwean settings and Africa as a whole. The study addresses this gap in knowledge by exploring the underlying mechanism and implementation of Zimbabwe's renewable energy and energy policies, which govern energy supply and demand.

The study adopted a mixed methodological approach using semi-structured interviews, householders' self-recorded videos and surveys, to characterise the socio-economic and cultural challenges experienced by Harare Metropolitan Province communities affected by energy poverty and energy insecurities. The study utilises data from 99 online householder survey responses, and householders recorded 27 short video clips. In addition, 13 semi-structured interviews with householders and nine semi-structured interviews with stakeholders were conducted. The research presents insights into limiting factors towards effective communication between energy company and communities such as disengagement and lack of trust between energy consumers and suppliers when accessing fuel sources. The energy sector monopoly and poorly maintained energy plants were also noted as factors contributing to energy poverty and causing energy-related public health issues such as poor sanitation and physical and psychological health issues. The study highlights the importance of spatial perspectives when considering implementing clean energy access. The study also contributes to the crucial knowledge to understanding the unique contextual differences in energy poverty and energy insecurities and behaviours. The research recommends that the government implement policies that advocate for a fair, collaborative, sustainable, clean energy system

Acknowledging the impact of COVID-19 on the postgraduate research programme

This statement provides an overview of the ways in which the Covid-19 pandemic affected the experience of researching and writing my PhD. Before the Covid-19 lockdown, I had submitted my ethics applications. However, changes implemented by the university impacted the processing time. The applications were taking longer to be approved. Due to those delays, by the time of my internal evaluation assessment, which is the second formal assessment point during the PhD journey, I had only collected the pilot survey data, which was presented in a report. The final results analysed in the research were collected after the internal evaluation. It would have been encouraging, and I would have preferred to have had an internal evaluation report with some of the interview and video data analysis.

Year two of my PhD journey was the most challenging. We were in the middle of the pandemic, and I lost very close family members who died following contracting Covid-19, which severely impacted my well-being. It was also a time of uncertainty, and I felt isolated from some of the researchers with whom I had formed relationships when I started the PhD in May of 2019.

Initially, ethnography was the data collection method of choice; however, the research method had to be redesigned to allow virtual data collection. The change in data collection methods was primarily due to the overall rating of Zimbabwe, as per the Drum Cussac website, which rated the country as high risk at 4.00. This meant I was unable to travel to Zimbabwe to conduct the fieldwork as the University of Salford would not allow staff or students to travel to countries rated 4.00 or above. Before the lockdown, I decided to conduct the data collection virtually since I

could not travel. However, Covid-19 still impacted the collection of data virtually because of the restrictions, which saw stakeholders having to work from home, making it difficult for me to contact the stakeholders as they had no outside-of-the-office contact numbers. This meant I had to use the website's email; however, arranging the interviews and some of the responses took longer, delaying the process of collecting data.

To mitigate these circumstances, the university offered researchers extensions of up to six months which were applied to my study time to accommodate the above challenges and in case other issues arose.

1 Chapter One: Introduction to the study.

1.1 The Exploration Journey of energy poverty

This section will outline the researcher's interest in the field of energy poverty for the reader to understand the journey that led to this research. My concern for energy justice and the implications of the transition towards clean energy, most notably understanding energy justice and lived experiences, can be traced back to 2012. The journey started in the UK in 2012 when I was bedridden, needing help 24 hours a day and constant warmth due to my health issues. Sadly, in November 2013, I moved into a house where the boiler constantly broke down. As a result of my poor health, my housing officer had to find funding for a new boiler to be installed in my new accommodation. During this period, I became concerned with the plight of others with similar health conditions and living in cold homes with unreliable boilers.

Although I had no knowledge of fuel poverty or what it entailed, I realised that living in a home with inadequate energy was not good for my health and that of others. However, my housing officer had indicated that it was a public health issue and that not everyone qualified for energy grants. In 2015, I was a founding member of a charity organisation with the primary objective of social inclusion for people with chronic health conditions. From being a charity board member, I later progressed to my second postgraduate degree in Public Health in 2017.

In 2017, unbeknown to me, the University of Salford became instrumental in my journey to understanding fuel poverty or energy poverty through the Research and Professional Practice (MSc Module). Through group work, we had to work with Bury Council, a borough in Greater Manchester. We evaluated a Boiler Fund project implemented within the Bury area. Private

landlords had access to funding to install new boilers in their households if they met the conditions, such as having a pre-90s boiler considered energy inefficient.

The MSc project equipped me to understand the impact of fuel poverty in households and the environmental factors causing fuel poverty. Within my role as part of a team of other MSc students, I grappled with the multiple barriers faced by householders in the Bury area. The barriers, which included poor funding and mistrust, would hinder the transition to low-carbon energy, such as solar, hydro and wind power, which are sustainable and are low-carbon emitters. I became curious and wanted to find barriers causing fuel poverty in Manchester. Therefore, for my thesis in MSc, I investigated: The effects of fuel poverty and cold homes on pre-existing health conditions: a case study of people in central Manchester. The research sought to determine whether energy costs, services and environmental factors impacted those with existing health conditions, such as respiratory health issues.

At the end of my MSc programme, I travelled to Zimbabwe in 2018 to visit my family. I realised they had their fair share of energy poverty issues, as it is known in the global south, mostly presented through continuous power cuts and load shedding. This led to me wanting to understand the causes of those power cuts and load shedding. I was intrigued and wanted to understand further who was affected by the issue of energy poverty and what was being done to mitigate the challenges. I was also interested in understanding the households' perceptions of these occurrences or if they knew what energy poverty was.

During my next visit to Zimbabwe in 2019, when I visited my family and did preliminary research on a water sanitation charity project I was spearheading, I started documenting the power cuts and load-shedding occurrences by observing householders. With what I observed, I applied for and was admitted to a PhD programme at the University of Salford.

As I started the PhD journey, I realised it was challenging to control the direction of the research. The Covid-19 pandemic brought many challenges as the research trajectory had to be shaped around many organisations' new rules and regulations. The listing of Zimbabwe as a Category 4 Risk by the University of Salford meant it was unsafe for the researcher to travel to the country. This dilemma, therefore, meant that other methods of collecting data had to be employed. Although the methods could make for impactful research, they also came with their challenges. As the researcher, I still needed to learn remote data collection methods, such as recording participants' self-recorded videos. Despite this, I have enjoyed this PhD, explored the field of fuel or energy poverty, and pursued my interests in understanding energy justice through lived experiences of householders in Zimbabwe. Having given the background of my journey into the energy field from the UK to Zimbabwe, the next section will introduce and define energy poverty.

1.2 Introduction to Energy Poverty

In recent years, according to Butler (2022), energy poverty has included issues associated with access to energy, deprivation, and energy under-use within daily life. Butler (2022) highlighted that energy poverty negatively impacts populations' wellbeing. Butler (2022) brought a different angle to understanding energy poverty by focusing on the broader range of issues, scope, and dynamics, which are more important in understanding energy poverty than earlier works, which focused on cost, building efficiency and affordability. One of the critical areas of focus and development by Butler (2022) expanded the earlier work of Bouzarovski (2018) to understand energy poverty as a constant state that a person is or is not experiencing, which could lead to energy vulnerability, which may have been caused by structural and social processes that cause energy poverty. Churchill and Smyth (2020,2021) added that energy poverty occurs when a household cannot stay connected to the

energy sector utilities and thus lacks sufficient energy for heating and cooking. Additionally, according to Hernández and Siegel (2019), energy insecurity is a multidimensional problem comprising three factors: physical housing conditions, the cost of household energy and energy-related coping strategies.

Another issue to note is the impact of Covid-19 on energy poverty and meeting the Sustainable Development Goals (SDGs) to have affordable and clean energy by 2030. The existing literature that has measured the impact of Covid-19 on energy poverty, such as the study by Schislyaeva and Saychenko (2022), highlighted that Covid-19 worsened energy poverty. Schislyaeva and Saychenko (2022) highlighted that energy poverty has become a global problem among developed and developing countries primarily because most countries were impacted by failing to meet their targets as stipulated by the United Nations SDGs to have affordable and clean energy by 2030. The set targets were not met, and those who could have benefited from the process will remain in energy poverty longer than anticipated. According to Hadi et al. (2022) and Schislyaeva and Saychenko (2022), Covid-19 caused further econometric constraints due to rising energy prices, while trading between countries is essential for enhanced energy accessibility. Schislyaeva and Saychenko (2022) further elaborated that rising energy costs affected the poorest citizens, as noted during Covid-19 in poor European households. Their study also suggested the importance of practising bilateral trading and thus making sure that the energy demand is met, thus working towards meeting the targets of the SDGs.

However, in much of the literature from previous years before Covid-19 within the UK and broader contexts, energy poverty is defined broadly as occurring when a household does not have access to adequate domestic energy services for cooling, heating, cooking, and information technology (Bouzarovski, 2018; Moore, 2012. While fuel poverty focuses on the affordability of energy services (Bacon, 2010. It is essential to highlight

that researchers interchangeably use the terms energy poverty, energy insecurity and fuel poverty, depending on the context, geographical location, or argument (Bouzarovski, 2018; Ismail & Khembo, 2015). Recent studies (Bouzarovski, 2018; Zaakirah & Patrick, 2013) have indicated that there are other forms of energy poverty, energy insecurity and fuel poverty measures used in different countries.

In sub-Saharan Africa, the term energy poverty, regardless of cost, applies to the issue of not having adequate energy production and clean energy sources; thus, the term energy poverty is suitable for this research (Bacon, 2010; Bouzarovski, 2018; Moore, 2012). Furthermore, the term fuel poverty, as opposed to energy poverty, is used mostly in the global north to reflect a combination of expensive energy and poor conditions of residential buildings from the aspect of affordability and poor household retrofits (Robinson et al. 2018; Fabbri,2019; Boardman, 2010). Most importantly, despite the use of different terms to define problems surrounding energy vulnerability, the issue of energy affordability and precariousness is still heavily embedded in sub-Saharan Africa (de Greef, 2019; Jack & Smith, 2016). The critical point in sub-Saharan Africa is to address energy production, implementation of renewable clean energy and energy distribution to householders who may not have access to the grid (Bhattacharyya, 2012; Morrissey, 2017).

Energy poverty is one of the most significant challenges facing modern civilisation because of the increasing demands for energy and fuel across the globe (Aristondo & Onaindia, 2018; Bacon, 2010; Simcock, 2018). Globally at least 1.4 billion people are affected by energy poverty (IEA, 2019) and have no access to electricity, 85% of whom live in rural areas, mainly South Asia, Sub-Saharan Africa, and Latin America (Almeshqab & Ustun, 2019; IEA, 2019 Quinn et al., 2018). Internationally, fast-growing cities have seen growth due to the movement of people from rural to urban areas in search of better living standards and increasing pressure, primarily in high-density cities (Ritchie & Roser,2018; Congedo et al., 2015). Though,

it is essential to note that when people migrate from rural to urban areas, the urban areas will become overpopulated, leading to high energy demand (D'Agostino et al., 2015). Statista Research Department (2023) and IEA (2021) highlighted that some parts of the Sub-Saharan African countries, respectively Kenya, Senegal, Rwanda, Ghana, and Ethiopia, have shown that the number of people gaining access to electricity has increased. Nevertheless, there is still a difference between Africa and Asia. Asia is ahead of Africa concerning the amount of people gaining access to electricity (IEA, 2021). The difference is primarily due to Asian countries' rolling of grid connections and having solutions supported by robust policies and funding (IEA, 2021). A more in-depth discussion on energy poverty will be presented in chapter two, the literature review., while now the research's problem statement will be introduced in the next section.

1.3 Introducing the research problem

Due to the challenges of energy poverty and insecurity in sub-Saharan Africa, Zimbabwe will be the case study. While Zimbabwe and other sub-Saharan countries such as South Africa and Namibia are facing an electricity crisis, Zimbabwe is one of the African countries that rely on importing a significant portion of its energy needs, contributing to the country's energy insecurities and poverty (Al-Ghussain et al., 2020; Mukeredzi, 2019). Thus, the poor energy supply has impacted Zimbabwe's economic growth compared to other developing countries in sub-Saharan Africa (Al-Ghussain et al., 2020). Failure to pay for adequate power imports, lack of funding, and poor infrastructure have worsened the energy crisis (Mukeredzi, 2019).The issues of lack of funding, poor energy infrastructure and limited access to energy also worsened during the pandemic as most bilateral trading was stopped between countries, thus slowing universal access to affordable and clean energy (IEA, 2021).

Literature in the field highlights that energy poverty and energy insecurities are still significant issues in most countries. Researchers agree that Zimbabwe is among African countries affected by poor energy distribution infrastructures, poor energy plant conditions, and poor energy policies and that inadequate contextual energy frameworks for Africa have led to more power cuts, as well as load shedding (Jack & Smith, 2015; Kazmi et al., 2019; Larson & Yezer, 2015; Ndaguba, 2018). Despite the fact that other nations are facing an energy poverty crisis, as highlighted above, Zimbabwe's electricity supply authority [ZESA] does not have sufficient energy and cannot afford to import enough energy to meet the demands of the communities in Zimbabwe. This results in unprecedented 18 hours on most days without electricity, either due to load shedding or power cuts. Load shedding is caused by an inadequate supply of energy from the primary grid, resulting in failure to meet the energy demands of households connected to the primary grid (Eskom, 2018). Also, compared to power cuts which can be caused by a technical fault, load shedding is an intentional response. As a result, households will have no lighting or access to energy for several hours or days at a time (Eskom, 2018).

Considering the challenges with energy in Zimbabwe, firstly, the study will aim to characterise the socioeconomic and cultural problems experienced by Zimbabwean communities who are affected by energy poverty and energy insecurities. Secondly, the study will understand factors that limit access to fuel sources using the bottom-up approach of participants' experiences. Thirdly, the study will contribute to the ongoing debate on the meaning of energy poverty and the understanding of energy behaviours in the contexts in which energy poverty exists. Lastly, the research will add to the debate around energy justice mechanisms in the global south and propose policy recommendations to help tackle energy insecurities and energy poverty in the Zimbabwean context. Following the literature review, this research will examine some household drivers of energy poverty or energy precariousness in southern Africa, as

well as energy insecurities and energy services that are rarely accounted for within African indices and existing energy frameworks (Bouzarovski, 2018; Holstenkamp, 2019; O'Sullivan & Barnes, 2007).

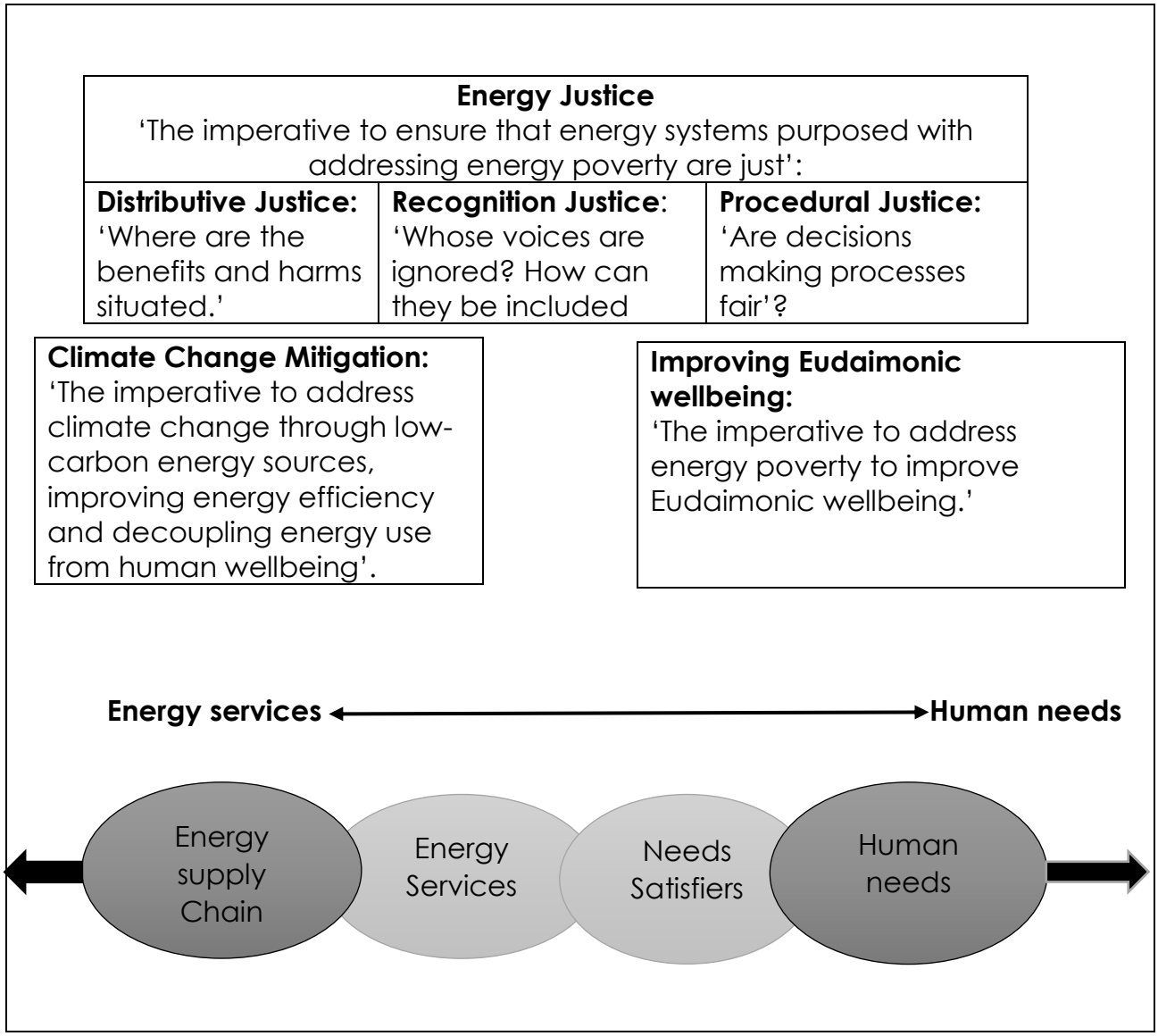
The first critical focus of the research can be attributed mainly to the arguments and evidence put forward by multiple researchers (Behera & Dash, 2017; Miescher, 2016; Murenya, 2017; Showers, 2011). They highlighted that access to energy in Africa was mostly for industrial development and was not universal or for domestic purposes (Behera et al., 2015; Barandiarán et al., 2022; Showers, 2011). Previous studies by Showers (2011) and recent studies by Castán Broto et al. (2018) highlighted that no agenda was pushed forward for Africa, and unlimited energy access was never prioritised pre- or post-colonialism. Furthermore, in 2015 the new Electrify Africa Act reintroduced by the United States indicated that at least 600 million Africans still had no access to electricity (Corker, 2015). According to Corker (2015), the Electrify Africa Act highlighted the continuous need to improve access to power, which will, in turn, have a positive impact on public health, education and economic growth.

Before highlighting the second focus of the research, it is crucial to point out the measurements of energy poverty in Zimbabwe. According to Chipango (2018), the unequal distribution of energy in Zimbabwe between rural and urban communities cannot measure energy poverty alone. However, including the government's agenda is critical in understanding energy poverty, as the government is responsible for distributing energy. The energy sector in Zimbabwe has primarily focused on the efficient use of energy for carrying out economic activities over domestic use and promoting fuelwood over coal (Chipango, 2018; Nachman, 2015). Furthermore, Chipango (2021) highlighted that energy poverty in Zimbabwe is mainly measured on the basis of external factors such as the impacts of the sanctions, poor infrastructure, and poor funding, which have caused the low uptake of renewable energy.

Turning now to the second critical focus of this research, it is driven by improvements to the existing framework proposed by Samarakoon (2019) and energy justice-centred frameworks for separating satisfaction of human needs from energy services adapted from the Brand-Correa and Steinberger (2017) model (see figure 1). Figure one highlights some of the critical areas of the energy justice framework considered in this study, which aim is to apply these principles with the interest of people's well-being and allow communities to be part of the goals when energy poverty is being addressed. The theory of powering Eudaimonic well-being in the Global South aims to ensure that the existing energy systems facilitate a just transition towards eliminating energy poverty by assessing and addressing human needs separately from energy needs.

Figure 1 Powering Eudaimonic Wellbeing in the Global South.

Source: (Samarakoon, 2019, p4 adapted from the Brand-Correa and Steinberger,2017)



As mentioned above, in relation to energy systems, engaging the communities and understanding their lived experience is crucial to understand their energy and human needs. Therefore, in line with the work of Samarakoon (2019), the critical argument for the study is to understand the actual lived experiences of Zimbabwe's energy-poor communities. Additionally, Samarakoon (2019) indicated that the bottom-up narrative might work better in the global south, especially towards understanding provision of energy services for basic energy needs and identifying the

specific needs of communities. In line with Samarakoon and to add to the focus of the study, Aristondo & Onaindia (2023) indicated the importance of highlighting different variables which may cause energy poverty based on different contexts.

However, evidence gives us insight that Africa and the rest of the global south are profoundly affected by energy poverty due to a range of confounding factors such as other inequalities, poor understanding of energy needs and poor infrastructure planning. The literature evidence further highlights that energy poverty cannot remain a single-factor problem but that the energy and fuel poverty issues remain attributed to political, socio-economic, and structural issues (Bouzarovski, 2018; D'Agostino et al., 2015; Showers, 2011). Some households cannot afford to pay for their electricity using new metering technology such as smart meters. Having highlighted the research problem area, the next section will discuss the significance of the study.

1.4 Significance of the Study.

There are numerous studies of reviews of energy justice, energy distribution, energy poverty, energy policy and energy costs in households worldwide. Additionally, a few studies have focused on understanding socio-economic factors that can cause energy poverty in African communities, cultural factors that can contribute to energy poverty, and how energy poverty and precariousness are measured in most African households. This means there is a need for more research in this area. Furthermore, literature research highlights issues associated with energy poverty or insecurities, such as poor health, a poor economy, inadequate energy policies, energy behaviours and high energy prices.

Having highlighted gaps which need to be addressed in the literature, innovative methods, the specific Zimbabwean case study, and the nature of the investigation of the energy poverty gaps, this study contributed meaningfully to the current existing body of knowledge and filled in the literature gaps. This study will address the experience of Zimbabwean communities affected by energy poverty and energy insecurities. In addition, the research will give information on gaps in the current energy framework. The information and recommendations put forward in this thesis will guide policy recommendations in Zimbabwe and the academic arena. In addition, Zimbabwe, as the case study, will bring an academic understanding of the contextual element of sub-Saharan African energy poverty and energy insecurities to inform the development of a global energy justice framework.

1.5 Research questions

1. What are the key factors limiting access to energy and causing energy injustices?
2. What is the lived experience of communities in Harare Metropolitan Province, Zimbabwe, affected by energy poverty and energy insecurities?
3. What role do the private and public energy sectors play, and how do they inform the development of a global energy justice framework?

1.6 Research objectives

1. **Objective 1**: To identify whether there are energy poverty and energy insecurity challenges that may be associated with infrastructure and regulatory systems.
2. **Objective 2**: To characterise the socio-economic and cultural challenges experienced by Zimbabwean communities affected by energy poverty and energy insecurities.
3. **Objective 3:** To understand experiences and factors that limit access to fuel sources using a bottom-up approach based on participants' experiences in different demographic and geographical locations.
4. **Objective 4**: To contribute to the ongoing debate on the meaning of energy poverty and energy justice.
5. **Objective 5**: To propose policy recommendations to help tackle energy insecurities and poverty in Zimbabwe by referring to the current global energy justice framework.

1.7 Thesis structure

Chapter 1: Sets the context for the research's background and focus and presents the research justification, significance, research questions, and objectives. The research focus presented in this chapter draws particular attention to the absence of energy justice considerations in the energy poverty landscape. Additionally, the chapter's focus indicates that some concepts within the existing energy justice framework may need to be added in some countries affected by energy poverty.

Chapters 2: Chapter two presents an overview of global energy poverty and Africa and draws specifically on the Zimbabwe energy poverty background, and chapter three will focus on broad literature. The impact of COVID-19 on the energy poverty arena at a global level is presented, and the economic factors which are contributory factors to energy justice in the study context are noted. Chapter two concludes by reiterating the importance of energy justice and how it can be neglected in the existing transitional models for energy for all.

Chapter 3: Reviews the academic literature. Overall, it aims to investigate and highlight the conceptual aspects of energy justice. Energy poverty and the study's theoretical background are also presented. Firstly, the chapter introduces the technical term for energy poverty, energy justice as a whole, and the three-energy justice tentative principles which will be applied in this study. Following the review of the global energy poverty and energy justice academic literature and the identification of developing research gaps from the study of Samarakoon, the aspect of inclusiveness is indicated in the overall conclusion of the chapter, and the role of the three tentative frameworks in this study is explained.

Chapter 4: Sets out the methodological approach taken. It explores the adoption of a constructivist philosophical approach and a relativist ontological stance research design. The methodology chapter also introduces the approaches used to collect data in the study context. The outline of the mixed methods used, and data analysis is also presented.

Chapters 5,6 and 7: Present the results of the data analysis. The chapters draw upon the emerging themes from the interviews. The survey and video data are incorporated within the findings and presentation of the interviews. The results are from all the participants, respectively, private, and public stakeholders and householders. The data analysis highlights the causes of energy poverty and gaps which cannot be presented or considered within the existing energy justice framework due to the needs and characteristics of the study context. The emerging themes for the data are presented guided by the three-energy justice tentative principles.

Chapter 8: Consolidates the results from Chapters 5, 6 and 7 and parallels the broader literature and the literature presented in Chapters 2 and 3. The discussion chapter documents the study's contributions to knowledge specific to the research questions and objectives and the broader literature. Those areas of findings that are in contrast to, or similar to, the literature or signal new research avenues are noted. The three tenet principles are implemented within the discussion to highlight areas of lack, which can be addressed using the principles, or advance the energy justice framework to suit some of the contexts that may be affected by energy poverty as a result of factors that the existing energy justice framework may not fully capture. The three central themes which emerged from interviewees' experiences: disengagement, gender disparities and lack of trust will be discussed.

The thesis presents a bottom-up framing of the understanding of energy justice through the lived experience of households. The novel aspects of the thesis are noted in chapter eight: Highlighting that regardless of gender and in different factors such as health, income, cultural and psychological health, all household members were impacted by energy poverty. The study reveals disengagement in energy issues is caused by different underlying factors similar to those mentioned above, including day-to-day demands for householders to survive. Another significant factor included poverty due to a poor economy and high inflation. Another issue causing disengagement to energy issues was poor sanitation due to water shedding caused by power cuts affecting the water plants. Water shedding would then demand householders to spend time sourcing water from local boreholes and working during unsocial hours when householders had access to electricity—a lack of trust due to being affected without solutions over a long period and a monopolised system. The study brought a theoretical understanding of the contextual element of Zimbabwe's energy poverty and energy insecurities. Overall, the discussion chapter reflects on the critical all-encompassing themes presented as the outcome of the results and research.

Chapter 9: The research is evaluated in terms of whether the research answered the overall research questions and achieved the objectives. In closing, the critical contributions to the literature on energy policy, more comprehensive energy transitions, and gaps that can be addressed with future research are noted. By adding to the body of knowledge and situated in the energy poverty agenda of energy for all and energy justice principles, this study addressed the experience of Zimbabwean communities affected by energy poverty and energy insecurities. In addition, the novel findings will inform recommendations which may guide policy in Zimbabwe and the academic arena.

2 Chapter Two: Literature Review

2.1 Introduction

This chapter situates itself within the relevant academic literature as it presents the theoretical, as well as the contextual, background of the study. The literature sources were selected from scholarly articles, case studies of communities affected by energy poverty and primarily academic sources. Firstly, the chapter introduces the different definitions of energy poverty. Most researchers agree that energy poverty is the inability to meet the cost of energy bills and access to energy sources due to structural issues and poor housing stock. Secondly, the energy justice framework will be critically reviewed from the existing literature. Energy justice theories highlight that energy justice seeks to achieve equitable access to a fair energy system.

Also, the tenet framework will be introduced in the chapter. The tenet framework works as a backbone to identify and analyse problems related to energy poverty. Three tenets, namely, distributional justice, justice as recognition and procedural justice, are principles and part of the whole energy justice framework, which includes environmental justice. According to Banzhaf and Timmins (2019) highlighted that the environmental justice is a principle which support the fair treatment and meaningful involvement of all people. The environment justice tenet expands to fair distribution of land and to avoid inequalities in land distribution. Although environment justice is intricately linked to the three tenets, multiple researchers further developed the three tenets to characterise the ethical debate of energy inequalities (Heffron, McCauley & Sovacool (2015) and Jenkins, 2018a). Though there may be other issues in the study context, the three-tenet framework does not identify the economic and pollical factors which may add to the energy injustices (Lee & Byrne, 2019). The research will still characterise socio-economic and cultural challenges experienced by Zimbabwean

communities affected by energy poverty and energy insecurities. Additionally, the impact of COVID-19 will be considered in this thesis. According to WHO (2020), the world went into lockdown, with 690 million affected by poverty. Sovacool et al. (2020) highlighted that the pandemic has significantly impacted societies, affected many systems worldwide and affected energy and climate policy. Analysing the tenet framework and reading the broader literature will also reflect upon underexplored characteristics within current energy justice research, especially in the global south, and help understand the issues associated with distributional justice, justice as recognition and procedural justice. With a specific focus on this research, the tenet framework guiding the analysis will help understand the problems associated with energy poverty and dilemmas associated with a just transition from fossil fuels to renewable energy technologies in the study context.

2.2 Understanding the global problem of energy poverty

The review of the Millennium Development Goals (MDGs) in 2015 by the United Nations (UN) highlighted the importance of improving global energy services, including, but not limited to, access to electricity and modern cooking fuels (United Nations [UN], 2015). Firstly, in 2005 the MDGs target for 2015 was to provide global access to electricity to all schools, health facilities and community facilities that relied on alternative electric power (UN, 2015). In 2015, the UN 7th Sustainable Development Goal (SDG7) focused on access to affordable, sustainable, modern, and reliable energy for all. A lack of access to electricity and clean fuels for basic needs such as cooking meals for some families can hinder the provision of good living conditions for everyone. Therefore, the UN's goals are crucial, especially with regard to tackling the issues associated with energy poverty and clean energy sources, even though there are some debated issues that need to be addressed first and understood in some parts of the world.

Despite the need to achieve the SDG7 target, the issue of energy access remains significant. In 2016, 59% of the world's population had access to clean fuels and technologies for cooking. The United Nations Statistics Division (2018) estimated that 41% of the world's population had unreliable access to electricity (including solar panels and biogas lamps). According to the World Bank database, in 2018 at least 90% of the world had access to electricity. However, instead of using clean fuel sources, some populations still use polluting sources such as gasoline lamps, kerosene/paraffin lamps, candles, and open fires (World Health Organization, 2021).

Additionally, Roser (2021) reported that three billion people have no access to modern fuels, such as electricity, for basic needs, such as cooking and heating. Examples of clean fuels and technologies are solar, electric, biogas, natural gas, liquefied petroleum gas (LPG), and alcohol fuels, including ethanol, which is regarded as clean for health at the point of use. Fuels or technologies such as biomass are regarded as clean energy if they meet emission rates as per (2014) WHO guidelines for indoor air quality: household fuel combustion.

WHO (2006) had set guidelines for global air quality, noting that clean air is a basic need for human health and well-being. Despite these guidelines and a later version (2014) WHO guidelines for indoor air quality: household fuel combustion, air pollution continues as a cause of health concern. In the later years' WHO (2021) emphasised the importance of clean fuels and technologies to attain the particulate matter levels per the 2005 WHO air Quality Guidelines revised in 2021. Clean fuels and technologies should maintain carbon monoxide (CO) air pollution levels according to 2010 WHO Guidelines for selected countries' pollutants. In North America and the European Union, 100% had access to electricity, while only 48% of sub-Saharan Africa had the same access (World Bank, 2018). To add to the 2020 published figures, sub-Saharan Africa accounts for three-quarters of the 568 million people without electricity access (IEA,2022). Though there

is better access to electricity in North America and Europe, improving access to clean fuels and technologies in some regions is still necessary. Though these issues are highlighted, there are concerns that the SDG7 2030 target may not be achieved due to slow progress in some countries with a significant deficit in Southern Asia and sub-Saharan Africa (IEA,2022). It is also clear that sub-Saharan Africa faces more energy challenges in terms of access to clean fuels and technologies for cooking. Therefore, it is essential to focus more on the electrification of some parts of the global south and invest more in developing facilities for providing access to electricity. Access to clean energy will help improve communities' lives in areas such as health, education, and sound welfare systems. Owing to the multiple definitions of energy poverty mentioned in section 1.1, it is difficult to provide solutions without enough information or research to understand the specific needs of communities.

Because of the use of polluting energy sources, some trends have been observed in the global south and north, with some countries investing in renewable energy, although Covid-19 has slowed down progress on the renewable energy agendas (Bloomberg-NEF, 2020). According to the IEA (2021), the 2030 Roadmap to Net Zero partial target to provide around 785 million people who have no access to electricity and 2.6 billion who have no access to clean fuels for cooking with energy for all will cost US$35–40 billion annually. The roadmap to Net Zero will help reduce indoor pollution and reduce premature deaths by two and a half million per year (IEA, 2021). However, the amount of funding required will need governments to come together for the agenda to be successful, with changes in financial investments.

Over the last two decades, global access to electricity has improved owing to investment in renewable energy technologies such as solar energy (Balachandra, 2011; IEA, 2018; Meisen & Krumpel, 2009; Timilsina & Narbel, 2013; Timilsina, Van Kooten, & Narbel, 2013). Bloom (2020) reported that in 2019 the global south invested a large amount of money

in the renewables industry. In the case of Bolivia, as reported by the World Bank (2020), access to electricity was improved between 2014 and 2019. At least 4,300 households were connected to the energy grid, and approximately 20,000 people gained access to electricity.

2.3 Definitions of energy poverty

Energy poverty can be defined as a lack of sufficient, affordable, consistent, high-quality, and environmentally safe fuel sources (Padmanaban,2022). It is important to note that the precise interpretation of energy poverty differs based on the geographical context being studied. The difficulty of having different definitions of 'energy poverty' has led to different methods of measuring and identifying those affected by energy poverty, with household income mainly used as an energy poverty indicator. To add to the existing energy poverty definition Sovacool (2012) highlights that energy poverty is complex to conceptualise and challenging to define. Bazilian and Yumkella (2015) agree with Castaño-Rosa et al. (2020) that energy poverty is a multidimensional problem comprising different factors such as physical housing conditions and the cost of household energy. Halkos and Gkampoura (2021) added that energy poverty occurs when a household lacks warmth with other associated complex issues. Those on low incomes are mainly affected by energy poverty because of the cost of heating their homes, which are not energy-efficient and are burdensome to heat. As a result, low-income households struggle to pay their energy bills owing to high energy prices (Bouzarovski & Petrova, 2015; Howden-Chapman et al., 2012; Novacheck & Johnson, 2015). Karpinska and Śmiech (2021) highlighted that because of the many clusters of issues associated with energy poverty, the need to improve energy policy and employment and social assistance policies is paramount. Due to multiple definitions of energy poverty, the following section will now discuss the implications of the definition and how research has highlighted some theoretical

concepts drawn from energy poverty's definition: broadly defined as occurring when a household does not have access to adequate domestic energy services for cooling, heating, cooking, and information technology (Jessel et al., 2019; Bouzarovski, 2018, 2015).

2.4 The implication of the energy poverty definitions

The section will now review and consider literature broadly researched outside the primary definitions of energy poverty, which focus mainly on low incomes, high prices, and residential energy efficiency (Bouzarovski & Petrova,2015). Though the existing notion of defining energy poverty has been used in earlier research on energy poverty, it brings us to research by Bouzarovski et al. (2021), Thomson et al. (2019), Bouzarovski (2018), and Petrova (2018), which went beyond the most documented energy poverty causes and started researching further by incorporating concepts such as energy insecurity and vulnerability. Energy insecurity is caused primarily by factors such as policies, access to new technologies, housing conditions, household energy expenditures and strategies used to cope with energy-related problems (Hernandez,2016). Energy vulnerability is a condition that may be affected by severe economic, future energy issues, social, governmental, and environmental issues (Hearn et al., 2022).

2.4.1 Theories of energy poverty definitions

Butler (2022) highlighted energy poverty has been identified as a multifaceted phenomenon that is recognised through interaction between socio-political dynamics. These factors and socio-political dynamics shape the experiences of the household that lacks adequate domestic energy services for cooling, heating, cooking, and information technology and policy. Also, as mentioned above, Bouzarovski et al. (2021) noted that energy poverty research has expanded well beyond cost, housing, and income due to the reasoning that energy poverty is not static. Energy poverty can be further investigated by understanding other

factors not limited to cost, housing and income that cause its emergence. These may include conflict and environmental exploitation and fall under the energy insecurity and vulnerability umbrella (Bouzarovski & Petrova,2015). The study by Hearn et al. (2022) added that understanding and identifying energy vulnerabilities requires a comprehensive approach, thus arguing for adding the factors not previously covered by the energy poverty definition. Research by Petrova and Simcock (2019); Butler and Sherriff (2017) emphasised pushing forward and understanding different causes or vulnerabilities which cause energy poverty, also considering the differences in lived experiences across people and places when energy advice is being given or considered.

2.4.2 The energy definition and global south context

Having defined energy poverty above and highlighted the theories of energy poverty, this section will review the literature on sub-Saharan Africa and the applied energy poverty definition. In sub-Saharan Africa, energy poverty is defined as insufficient energy production, cost and supply, poor services, and a lack of clean energy sources (Moore, 2012; Robert, 2010). Given the above energy sub-Saharan Africa energy poverty key determinants, energy poverty in the global south disproportionately affects those who have never been connected to the primary grid.

Poor infrastructure is a significant issue in some parts of the global south. The literature on the global south highlights that energy poverty is exacerbated by poor grid infrastructure, low energy supplies, constant blackouts, increasing energy prices and low electrification rates in some areas (Jain & Prabhash, 2014). However, in some European countries, for example, Spain, Germany, Belgium and Greece, energy poverty is associated with energy-inefficient dwellings, low incomes, and a need for more information on understanding sustainable and working methods towards eradicating energy poverty. (Bouzarovski & Petrova, 2015; Papada & Kaliampakos, 2016; Schulte & Heindl, 2017).

Households in some countries in the global south are in energy poverty because they rely on scarce biomass fuels for cooking and heating because of their inefficient homes (Hussein & Filho, 2012). The difference to be noted is that the global south and global north are centred on similar drivers of energy poverty, such as unaffordability and the difference in problems associated with low electrification rates in the global south, which is not as common in the global north. In the global south context, it is clear that different measuring tools should be used in different places when energy poverty is being defined. Finally, within the complex definitions of energy poverty, according to Morrissey (2017), in sub-Saharan Africa, the binary measure of energy poverty was centred on whether a household is connected or not connected to the primary grid. Sy and Mokaddem (2022) agree that many countries in the global south need a more consensus agreement on understanding the essential required energy services. Understanding energy needs may lead to a better understanding of energy poverty and an applicable definition per contextual needs. In addition, what can be drawn from the Sy and Mokkaddem (2022) study is that most developing countries have different energy needs, household preferences and cultural beliefs, making defining energy poverty challenging. As such, despite some similarities in energy needs, energy needs are relative to contexts rather than comparable to others. Thus, having an all-encompassing energy poverty definition may leave other contexts' needs not catered for.

2.4.3 Sustainable energy transitions and energy poverty

Energy poverty will continue to worsen if governments, mainly in the global south, do not address the complex challenges of energy poverty requiring multiple solutions, including finance to improve infrastructure, new green technologies, and changes in policies (Belaïd,2022; IEA, 2022 and Irena 2022). Research by Karpinska and Śmiech (2021) had interesting results, indicating the importance of incentives for financial support. Financial

incentives to install solar systems will aid as another way to escape energy poverty by helping those who are not employed (or low-income families) and those living in inadequate housing. Although the research was conducted in Poland, researchers cannot ignore common ground in the portrayal of energy poverty between the global south and the global north. This is predominantly characterised by low-income families that are more affected and those who do not have enough income to improve their energy-poor situation.

Adding to the energy poverty problem of the global south, it is evident how difficult it would be to phase out fossil fuels to bring about improvements in the environment. To add to the debate about stopping using coal, which is used to produce electricity for their communities, more needs to be done to first assist those deep in energy poverty. Furthermore, it will cost a considerable amount to implement renewable technologies and use cleaner fuels other than coal.

Globally, the energy sector needs to reduce the use of fossil fuels despite some countries' energy poverty and reliance on such fuels. According to (Healey, 2013; Kelly et al, 2020) fossil fuels use cause threat to the environment causing pollution and calls for reducing their use thus to enable the reduction of the emissions. Additionally, the drive to stop using traditional fuels constitutes an energy policy that fairly disseminates equitable energy systems for all (Kuzemko, et al, 2016; Healy & Barry, 2017). The use of fossil fuels brings us to the debate on energy justice, and most of our energy systems are determined by the current use of fossil fuels, be it coal, oil, or gas. Energy poverty comes into play as the energy sector needs to find a way to stop using fossil fuels but by applying methods that will not cause more energy poverty.

According to Westphal et al. (2017), there is a shift happening in the global south with the scaling-up of renewable energy. Considering the above, distributing solar PV can address the need to provide electricity access for those not already connected to the grid. Not all householders can afford solar systems, but there are also proposals for community-owned and community-shared solar systems, such as that proposed in the Rwanda refugee camp using a bottom-up innovation which included the refugees and other stakeholders (Nixon et al. 2021). Nixon et al. (2021) highlighted community initiatives that were comparable between the Rwanda refugee and the study context. Nixon et al. (2021) highlighted that the usage of solar-generated power was low but can help reduce energy costs with benefits such as producing affordable and reliable energy and control of energy production. However, this research is not looking at the challenges of solar-energy intervention as per the Nixon et al. study. The following section will consider other energy poverty drivers to be considered in this study.

2.4.4 Global economy and energy poverty

This section considers how and why renewable energy will aid economic development. A recent study by Bouzarovski and Petrova (2015) maintained that electricity is required to improve the economy. Monyei and Adewumi (2017) noted that improving people's quality of life is crucial if more sustainable energy measures are implemented. Petrova, Simcock, and Thomson (2018) highlighted that energy demand increases despite new sustainable energy technologies and energy prices are expected to continue to increase.

Bouzarovski (2010) and Bouzarovski and Tirado Herrero (2017b) agreed that fuel costs should be at the top of the political agenda. Some householders have to go without heating and cooking fuel because of expensive energy tariffs. Recently, Gillingham (2018) highlighted the importance of evaluating energy-efficient policies which will aid towards

alleviating emissions. As a result, energy poverty will remain an area of concern within the energy sector in the coming decades, but with heterogeneous aspects, especially in the global south, hindering economic progression (González-Eguino,2015; Monyei, Obolo & Sajou, 2018; Palit et al., 2013 & Wishanti, 2015). In other words, in the fight against energy poverty, researchers have to be cautious with contextual problems, especially in countries.

2.4.5 Recognition of socio-economic factors and energy poverty

Amin et al. (2020) brings a crucial point for understanding the impact of poor energy access on economic benefit. Amin et al. (2020) noted that the global south, especially poor communities, are affected economically by energy poverty (Halkos & Gkampoura, 2021). González-Eguino (2015) highlighted that, although energy poverty is a complex issue, it is generally linked with overall poverty owing to inadequate access to necessary energy infrastructure, resulting in limited independent development and increased poverty. Energy poverty impacts economies, resulting in poor employment, which extends to neighbourhoods. Both urban and rural areas will be poorly developed, with evident inadequate infrastructure, poor access to energy and a lack of sound education systems (Sy & Mokaddem,2022; Xiao et al., 2021; Karpinska and Śmiech (2021) supported the interaction between energy poverty and overall poverty within the complex nature of energy poverty. González-Eguino (2015) noted that the eradication of energy poverty is crucial for societal and economic progress and aids the development of modern communities where communities are self-sufficient. In addition, lighting, and modern technologies such as the Internet are also essential for economic development, such as global transactions. Energy is, therefore, an economic requirement that can generate employment, increase production efficiency, and promote manufacturing.

The above-identified areas of research into defining energy poverty and theories of energy poverty, energy insecurity and energy vulnerability bring us to Zimbabwe's economy, which relies primarily on farming, with 70% of the population relying on farming for employment and income generation (Food and Agriculture Organisation [FAO], 2023). Understanding the socio-economic needs of the communities would be crucial.

In Zimbabwe, some communities whose livelihood is based on farming and rely on the primary electricity grid are affected significantly, with some farmers asking the government to consider their business and spare them from constant power cuts and load shedding (Ayaaz, 2022). Most farming machinery that requires energy will not be used due to power cuts and load shedding due to a lack of off-grid electricity or solar energy facilities (Folk, 2020). Therefore, productivity is lower, making further development challenging.

Chiteka and Enweremadu (2016) highlighted that despite Zimbabwe having, on average, 7 hours of sun per day, more research is required in Zimbabwe to understand the accurate solar radiation data for the design and sizing of solar thermal and solar PV systems. Having accurate solar radiation data will help will, in turn, manufacturers to supply solar PV cells and panels for communities based on available solar radiation in specific areas to ensure good solar system performance (Chiteka & Enweremadu, 2016).

2.4.6 Environmental and health factors

Despite the differences in energy poverty consequences noted above between the global South and North. Households in the GS and the GN may be affected by extreme heatwaves and weather changes due to climate change which can be exacerbated by energy poverty (Füssel & Jol, 2012; Jessel, Sawyer, & Hernández, 2019). Akizu et al. (2017) argue that the GN and GS face some similar disparities in tackling climate change;

despite the differences in geographical location, the problems a far worse in the GS. In addition, households in the GS are struggling to achieve adequate levels of indoor cooling, with adverse consequences for their health, well-being, and productivity. According to Mastrucci, Byers, Pachauri, and Rao (2019), health risks are growing in the global south owing to the lack of adequate indoor air conditions and cooling, which is seen as a dimension of energy poverty and human well-being. Despite specific factors related to dwelling and household characteristics, such as indoor heating, research on cooling in the global north and global south has paid little attention to other domestic energy services (Thomson, Simcock, Bouzarovski, & Petrova, 2019). Arguably, even though some similarities in energy poverty dynamics between the global south and global north are noted, the global south has its own set of problems that include, but are not limited to, off-grid electrification and projects that encourage clean energy use (Monyei, Jenkins, Serestina, & Adewumi, 2018).

Another important aspect is that the European Commission (EC) (2021) brings forth the health component of energy poverty, which is a diverse form of poverty with many adverse consequences for people's health and well-being. Furthermore, they add that energy poverty impacts more on those with pre-existing health conditions such as respiratory, heart and mental health conditions. The EC (2021) add that energy poverty indirectly affects multiple policy areas, such as health, the environment and productivity. When a household does not have access to modern forms of energy, affected communities depend on traditional biomass such as wood, charcoal and animal waste for cooking and heating. In many rural areas, poor people still depend on wood for most of their household and income-generating activities, with no other choices (Kaygusuz, 2011). Kaygusuz (2011) added that the use of biomass has serious health consequences when burned indoors, with the risk of respiratory and lung diseases, as mentioned earlier. Research by Jessel

(2019) and Kontokosta et al. (2020) added that living without sufficient access to power can negatively impact health and well-being. Jesse and Kontokosta et al. noted that these multiple problems associated with energy poverty could be separated as some households are only affected by the cost of energy bills and will have energy-efficient homes.

The additional complex issues and drivers that worsen energy poverty, as Halkos and Gkampoura (2021) identified, include health, socio-economic and environmental impacts. Understanding contextual definitions of energy poverty can also be linked to environmental impacts, as poor households require trees to be cut down, leading to deforestation in some areas. However, according to Kaygusuz (2011), deforestation varies by area, meaning that biomass fuels can be a renewable energy source, not entirely neglecting the environment. On the other hand, most fuels used by poor communities are fossil fuels that can impact the environment, increase carbon footprints, and cause air pollution, affecting people's health (Boamah, 2020; Carley & Konisky, 2020).

2.4.7 Summary

Although energy poverty is a global phenomenon, based on the above 2.3 sections, it is evident that the literature has various definitions of the term 'energy poverty' and energy poverty indicators depending on the geographical context, the authors' research, and multiple causative factors. However, broad literature highlights the complex factors affecting households, such as affordability and reliable and sustainable energy supply. This research will use the following energy poverty definition used in the global south, which suggests that energy poverty is when there is insufficient energy production and supply and poor services (Moore, 2012). Also, factors drawn from energy insecurity and vulnerabilities will be theoretically applied in this study as they, in turn, can explain some of the causes of energy poverty, which may be related to the study context. These concepts would help understand the causes of energy poverty by using and encouraging the terms such as energy insecurity and energy vulnerability.

Overall, electricity is used for many purposes, such as air conditioning, cooking, heating, and industrial processes at different scales ranging from minor domestic uses to extensive industrial usage (IEA, 2014; IEA, 2017). Researchers cannot dismiss the fact that energy poverty is a significant problem globally, not just in Africa (Bouzarovski & Petrova, 2015; Jain & Prabhash, 2014). Owing to the rise in global energy poverty, researchers report widening inequalities in what constitutes sufficient access to energy (electricity) between the global north and the global south, such as sub-Saharan Africa. The energy narratives of the global south and global north are comparable in terms of energy security, energy affordability issues and sustainability of clean energy supplies. In the global south and global north, energy poverty is mainly found among poor or low-income households and those who are not connected to the primary grid and live in energy-inefficient homes (Bouzarovski & Petrova, 2015; Bouzarovski &

Tirado Herrero, 2017a). Research highlights that further injustice is exacerbated owing to the energy access gap between grid-connected and off-grid households in Africa (Monyei, Adewumi, & Jenkins, 2018). In addition, energy poverty in sub-Saharan Africa faces various challenges, including ecological impacts, inefficiencies, corruption and spatial injustices due to centralised power generation and distribution (Boamah, 2020).

2.5 Energy justice: a conceptual review

The Initiative for Energy Justice [IEJ] (2019) defined energy justice as a goal to achieve equity in the energy system. Energy justice is integral to a just transition as it considers different factors such as social, health and economic factors. The IEJ further highlights that the energy justice framework incorporates and champions collaboration and redevelopment that feature in the just transition frame. Furthermore, energy justice is interlinked with different goal dimensions, which are outlined in the table1.

Table 1 energy justice is interlinked with different goal dimensions.

Energy Justices	
Dimensions	Definitions
Energy burden	Refers to a household's overall energy costs (Ontokosta et al. 2020)
Energy insecurity	Refers to multiple issues which cause energy insecurity, such as housing conditions, household energy expenditures and strategies used to cope with energy-related problems (Hernandez,2016)
Energy Poverty	Refers to a lack of access and energy deprivation (Butler, 2022)
Energy democracy	The idea is that communities should be involved in energy decisions and input in shaping a just energy future. Overall engaging communities in energy issues and understanding some of the immediate and long-term benefits (World Future Council 2021; Stephens et al. 2018)

There are two definitions of energy justice that incorporate universal applicability and the energy burden, which can be shared globally (LaBelle, 2017). The definition of energy justice has been a point of debate amongst researchers, with two similar definitions of energy justice. According to Sovacool and Dworkin (2015), the definition of universal energy justice is:

> A global energy system that fairly disseminates both the benefits and costs of energy services and one that has representative and impartial energy decision-making' (Sovacool & Dworkin, 2015, p. 436).

Sovacool and Dworkin (2015) define global energy justice as aligned with political and economic systems. This definition is founded on the historical procedural judicial system philosophical foundations, namely, (a) procedural justice, (b) distributional justice and (c) cosmopolitan justice, and a universal level of energy justice (Heffron, McCauley, & Sovacool, 2015; Sovacool & Dworkin, 2015). According to Sovacool et al. (2014, as

cited in Delina, 2016), the procedural judicial system is the structure whereby the delivery and protection of energy services are ensured, which encapsulates human rights such as education and health, including access to energy services (Heffron & McCauley, 2014; Walker & Day, 2012). International procedural justice signifies the essential need to encourage global change, especially communities' industrial energy behaviours (such as implementing policies that encourage reducing greenhouse gas emissions) and attitudes, and extending the narrative to future generations, enabling long-term economic thinking (Heffron et al., 2015; Jenkins, McCauley, Heffron, Stephan, & Rehner, 2016; Sovacool & Dworkin, 2015).

According to Sovacool and Dworkin (2015), the definitions of particular forms of energy justice focus on grievances within the standard energy systems. Internationally, countries face energy injustice. Castán Broto, Baptista, Kirshner, Smith, and Neves Alves (2018) argue that having a uniform solution to energy justice can help scale up some forms of energy development. For the energy framework to be used effectively, it is crucial to note that different communities, such as those experiencing different forms of energy poverty, need different solutions fitting their environments, which may cause more injustice (Samarakoon, 2019; Schlosberg, 2004). Some energy systems need certain economies of scale and scope to be implemented properly.

According to Cock (2019) and Velicu and Barca (2020), the urgency of the transition from fossil fuels to cleaner, low- to zero-carbon sources has been emphasised in recent reports. Researchers highlighted that the energy transition should be fair and just (Carley & Konisky, 2020; Ramirez & Böhm, 2021). Bickerstaff, Bulkeley, and Walker (2013) and Bombaerts, Jenkins, Sanusi, and Guoyu (2020) agree that energy justice is one of the most critical yet least developed concepts. Energy justice has, in recent

years, emerged as a global research agenda for social science. Arguably, and in accordance with the literature, energy justice plays a vital role in making energy decisions or changing policy (Forman, 2017). However, in Zimbabwe, it has been noted that there is a need for suitable approaches which will inform a well-balanced energy policy and procedures (Chipango, 2021). Elmallah et al (2022) indicted that understanding energy justice has prompted the realisation that the whole structure of the energy system requires widespread reform globally and growing interest in how to help communities transition in a just way towards the eradication of energy poverty. Globally, communities are affected by energy issues every day, and some communities are affected more than others (Rose,2020). Without enough evidence available in diverse geographical contexts, one can imagine the impact on the well-being of those who have to walk miles to fetch energy sources, including firewood and animal deposits. Some have never used electricity in their lives (Cadwell, 2013; Clancy,2019). Therefore, a broader understanding of experiences of energy poverty by context is key to the energy arena, specifically, the needs of communities and how the current energy justice framework fits with the underlying energy issues. The questions that arise include:

More research is required to bring forth contextualised energy poverty issues to inform a practical energy justice framework. To understand the needs of a community, an entire assessment will be required to ascertain the specific areas that require much help. Only a few studies have considered specific energy needs in some parts of the global south (Almeshqab & Ustun, 2019; Matamanda, 2021; Monyei, Adewumi, et al., 2018; Samarakoon, 2019). Additionally, the research will therefore allow us to better inform the energy justice framework and tailor energy policy to the specific needs of the affected groups.

Monyei, Adewumi and Jenkins (2018) suggested that while researchers debate the possibility and cost-effectiveness of going green, the current proposals to transition to clean energy fuels and technologies highlight

the need for a fair energy justice framework to help individuals and communities through the transition. The help will require local governments and energy companies to help communities with solar installation by providing access to government grants and loans. It is essential to note that the United Nations Development Programme [UNDP] (2022) mobilised a 1.5 million dollar grant to support Zimbabwe in accelerating access to clean, affordable, and sustainable energy, mainly in rural areas. However, some poor communities may also have poor credit capacity for loans, and the grants may not cater to everyone. In addition, this can heavily impact poor communities. Research is crucial in developing a conceptual energy justice framework to consolidate the green energy agenda and ensure that there will be principles that consider assessing an individual's or community's capacity to be taken out of energy poverty (Jenkins et al., 2016).

According to Goldthau (2013) and Sovacool and Drupady (2012), energy justice debates have gained momentum by providing a critical understanding of production and consumption issues across the whole energy system, including environmental and climate issues. Many countries have opted for and advocated for an energy-just world by sharing the energy burdens of energy production and consumption and fairness in treating people and communities in energy decision-making (Samarakoon, 2019; Sovacool & Dworkin, 2015; Williams & Doyon, 2019). With reference to procedural justice, section 2.6.3 will give more details of the important role that community members play in renewable energy systems and the impact on understanding key energy developments.

Energy justice, therefore, places renewed emphasis on the human dimensions that are often marginalised in energy studies and global environmental change (Castree et al., 2014; Jenkins & McCauley, 2015). Bickerstaff et al. (2013) highlight that there is still a gap in the theoretical distribution of energy justice information, which has yet to be developed to conceptualise a universal energy justice framework. A more substantial

approach to energy justice can be found in studies by Sovacool, Roman and Sidortsov (2014), Sovacool and Dworkin (2015), and Fuller and McCauley (2016) supporting the idea of having a uniform energy justice narrative at an international level to tackle climate change and ensure access to energy. Understanding energy justice through lived experience is where this research will highlight knowledge to understand the global south's needs better, using Zimbabwe as a case study. Most importantly, it is worth noting that other principles, such as environmental and food security, are interlinked within the index of energy justice framework. The relationship between environmental and energy justice includes the implications of fossil fuels causing pollution and its relationship with spatiality's, especially understanding who will be affected most (Lee & Byrne,2019). Therefore, it is crucial for a just transition for all and to have policies which consider all environmental, procedural, distributional and justice as recognition—energy poverty results in food insecurities due to poor food and agricultural production. According to Murrell (2022), Food insecurities cause inequalities and disparities in most communities.

Though Bickerstaff et al. (2013) highlighted that the energy justice framework is a benefit and works by ensuring that energy is distributed with fairness to communities, developing a suitable framework from this study's findings will act as a guide for addressing energy poverty and transitioning to the use of renewable energy. Mccauley et al. (2013) proposed the dominant approaches used in the energy justice literature, further developed by another researcher (Sovacool & Dworkin,2015; Heffron & Jenkins, 2013), by introducing the three tenets of energy justice. As mentioned in section 2.1, the three-tenet justice has three principles: distributional justice, procedural justice, and recognition justice. McHarg (2020) labelled the shift in the energy policy and law landscape as an ethical turn. The ethical turn entailed emphasising and improving the energy justice trajectory by integrating the question of justice, including fair distribution of cost and benefits and risks associated with energy, also

recognising the rights, interests and values of individuals and social groups in the process of energy decision making.

Most importantly, this study argues that incorporating similar findings from existing applied knowledge, such as the tenet framework to be used as a comparative guide to what has or has not worked in other contexts, can save some time and resources when developing the framework. Nonetheless, understanding many countries' energy behaviours is essential before a universal framework is designed and implemented. A universal framework should leave room for tailoring to geographically specific energy needs, thus improving people's well-being and quality of life. This research will aim to recommend some energy justice principles that might need to be included within, or excluded from, a Zimbabwean contextual energy justice tool using the three-tenet framework.

Crucially, a fairer transition to clean energy will help ensure that society's energy needs for lighting homes, cooking meals, and heating will be available (Sovacool et al., 2014). In this instance, it is emphasised further that the rationale for investigating the understanding of energy justice is assessing the energy experiences of communities in Zimbabwe using a bottom-up narrative, which researchers have paid limited attention to. Given the brief description of the tenet framework in this section, it will be explored further in section 2.6. The principles will also aid the review of the lived experiences of the Zimbabwean communities. Reflecting on the work of (Heffron, McCauley and Sovacool, 2015; Samarakoon, 2019;), the research attempted to fill gaps in knowledge of areas of lack by measuring them against the principles, namely, distributional justice, justice as recognition and procedural justice. The core principles of the three tenets are indicators that give a clear starting point regarding whether it is necessary to refine the energy justice framework in this particular context of Zimbabwe. The core principles of the three tenets comprise the following energy principles: distributional justice, justice as recognition and procedural justice.

According to Heffron, McCauley and Sovacool (2015) and the World Energy Council (2020), all three core dimensions of the energy trilemma must be balanced to have a productive and economically competitive country. In addition, the World Energy Council (2020) adds an overview that sustainability is based on three primary core elements of the energy trilemma: energy security, energy equity, and environmental sustainability of energy systems. The energy trilemma is when the energy sector faces a dilemma of having a balance between the principles: of security, affordability, and sustainability in the population's access to and using energy daily (Hartwig,2023). Each of these three points is now analysed in turn.

2.5.1 Energy security

Energy security occurs when energy sources are continuously available at affordable prices. Furthermore, according to the IEA (2020), energy security has numerous facets. Long-term energy security is related to providing energy investments to have the available energy for economic developments and environmental needs (IEA, 2020). Secondly, short-term energy security is centred on an adequate energy system that supplies energy when a change in supply occurs to keep the energy supply chain uninterrupted (IEA, 2020). Chester (2010) highlighted that, owing to the many facets of energy security, which include but are not limited to political, economic, environmental, social, and technical issues, it is difficult to define energy security. So many factors can hinder an understanding of how *and why* a country can face energy insecurity, as well as who can be energy insecure. In countries in the global south, most governments have a monopoly on energy companies and determine energy prices. This energy monopoly can leave communities vulnerable to having less choice of who provides their energy and at which price. Therefore, having an adequate energy supply does not mean that

everyone can afford energy, resulting in households not being able to secure energy sources.

The multidimensional element of energy security is also defined differently by Sovacool et al. (2012), as well as how the economic structure of any country and cultural aspects shape the prioritisation of energy security. Energy security is a concept that is inextricably linked with multiple elements (Chester, 2010; Jakstas, 2019; Sovacool & Saunders, 2014). It is also essential to provide national security, human rights, and individual security. With all the available literature, the understanding of energy security is a complex and context-dependent issue rather than a uniform issue.

2.5.2 Energy equity

Mormann (2019) argued that energy equity had been overlooked in clean energy policies, which prioritised efficacy and efficiency. Energy inequity is the unfair distribution of benefits and burdens from energy production and consumption, whereas the opposite is true of energy equity (Xu & Wang, 2017). Because energy production causes air pollution, the burden of electricity production, while already deadly, is not spread equitably. Most of those who are affected are from vulnerable groups and on low incomes. According to Xu and Wang (2017), equity involves a fair distribution of resources and negative environmental impacts such as pollution and poverty, and it does exist in the field of energy. Energy equity is also drawing attention to many organisations as universal energy access, energy efficiency, and renewable energy may lead to reliable energy services that achieve energy equity. Energy equity will remain embedded in the energy trilemma connected to energy security and environmental sustainability, and all aspects are essential to energy policy and legislation. Improving energy equity can also be valuable to communities. Given the example of communities that have never been connected to the grid, there will be some form of fairness as

one element of their energy poverty would have been addressed. It is essential to note that having access to energy may not fully take them out of energy poverty when other elements of energy poverty include unaffordability and the types of energy sources. The following paragraph will now explain the environmental sustainability of energy systems.

2.5.3 Environmental sustainability of energy systems

Santoyo-Castelazo and Azapagic (2014) highlighted that environmental sustainability in the development of energy systems necessitates three dimensions of sustainability: environmental, economic, and social. Globally sustainable development of energy systems is becoming a topic of discussion for governments regarding policy and decision-makers. According to Velicu and Barca (2020), change and transformation can be complicated, and there should be consideration of all aspects, from climate justice to labour politics. The call to reduce carbon emissions globally, with the conflicting ideas of how the shift to sustainable energy systems will be made justly, will raise questions about sustainable resources. Making the transition and moving away from fossil fuels may lead to even more energy poverty. Cock (2019) highlights that fossil fuels are used by those who might not have the resources or finances to implement sustainable energy systems. This research, in part, will aim to put forward an argument based on the findings from the data collected regarding how effectively some communities can be supported when moving away from environmentally unfriendly resources (Monyei & Adewumi, 2017).

2.6 Energy justice and the tenet framework

Lee and Byrne (2019) highlighted that even though energy justice has grown in popularity, the conceptual and analytical frameworks used in the field have remained limited. For this study, the three-tenet framework of energy justice, which has guided the energy justice discourse on the basis of the three dimensions—distributional, procedural and recognitional justice—will be applied to understand Zimbabwe's energy issues. The foregrounding of the three tenets will be used to better understand how effectively fairer energy is perceived to shape energy-related problems in the Zimbabwe context. The tenets will guide the argument presented in this discourse when exploring the emergence of energy justice, what it means and how the three core tenets fit into the Zimbabwe context.

Utilisation of the energy justice tenets is increasing globally in energy production and consumption, energy security, the political energy arena, climate change and policy reviews (Jenkins et al., 2016; McCauley, 2015). Energy justice has gained dominance in both the academic arena and the political arena. Sovacool and Dworkin (2015) argued that the concept of energy justice had impacted many discourses and even engaged policymakers and lawyers who represent communities regarding their rights against pollution caused by energy companies when they build power plants.

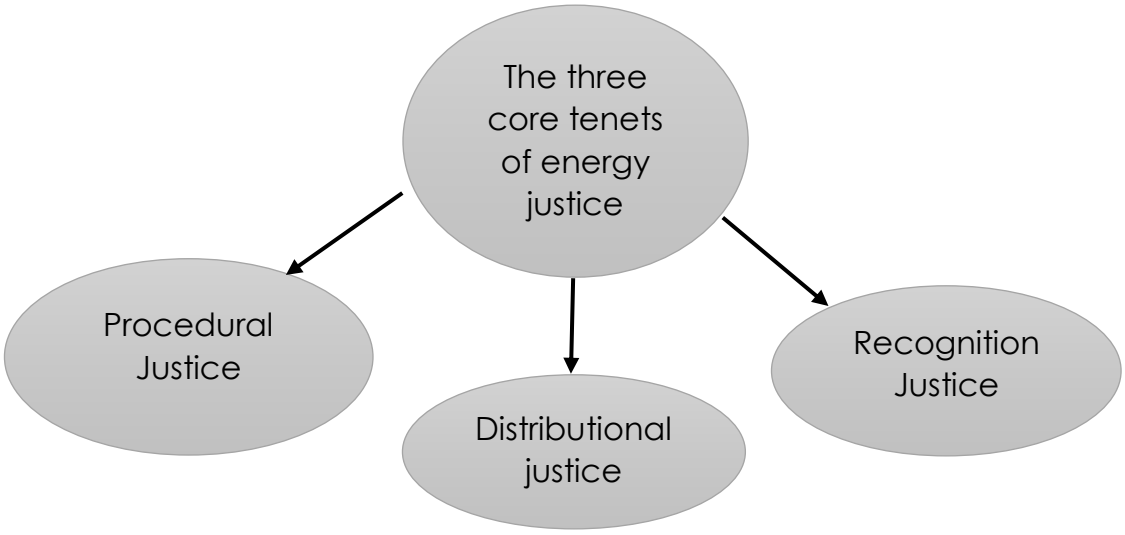
Sovacool and Dworkin (2015) highlighted the importance of the tenet framework as an analytical tool for those who investigate energy problems and strive to understand how to resolve common energy problems. The tenet framework will be adopted to understand who can support the raising of energy concerns and what can be achieved, and how to use energy justice. This solution-oriented framework can highlight and exemplify injustices while tackling them. The energy justice protocol can also be used as an evaluation tool and a prescriptive method.

Contributing to the research agenda on energy justice problems, this research makes a case using the tenets in a context that has not been investigated in the past. Therefore, the following sections will detail the tenet framework and how the dimensions will play a role in this research.

2.7 The tenet framework

This research will follow in the footsteps of Heffron and McCauley (2017) and Jenkins et al. (2016) by using the three-tenet justice framework to contextualise. According to Lee and Byrne (2019), the three-tenet framework is used in studies to analyse and review the ethical debates about energy. The three-tenet justice framework originated from environmental justice research, and the tenets principles are distributional, procedural and recognitional justice (Heffron & McCauley, 2017). Figure 2 summarises the three tenet Framework principles.

Figure 2:Summarising the three tenet Framework principles. Adapted from Heffron and McCauley (2017)



The three tenets concepts have been used in a study by Feenstra and Özerol (2021) to develop and apply concepts that incorporate elements such as gender approaches in energy policies. Feenstra and Özerol (2021) study used a systematic review, and one of their aims was to establish the applicability of energy justice for analysing energy policy through the

gender lens. They noted that their study was the first to elaborate and operationalise the framework to have policies that integrate gender and energy justice perspectives. Though this research used a systematic review, it highlights the need to access social inequalities not covered within energy policies. Therefore, using the three-tenet justice framework can guide researchers to highlight some challenges of social inequalities that need to be addressed in the current energy justice policy (Pereira, Sena, Freitas, & Silva, 2011).

If areas of need are not identified within a framework and not covered within energy policy, it can cause more social groups to be marginalised and increase energy poverty. When all areas of need are explored per context, countries can have a working framework that can be adjusted as per need or change to technologies. Because the area of study is new in the context of Zimbabwe, the three-tenet justice framework will be employed instead of using the eight analytical concepts of 'energy justice' used by Sovacool and Dworkin (2015), which aim to resolve global energy dilemmas and energy burdens. Energy justice analytical applications to energy problems by Sovacool and Dworkin (2015) have selective concepts, outlining the application of energy and then highlighting injustices and suggested solutions that may not suit this research.

Giving more detailed information, Sovacool and Dworkin (2015) reframed the energy justice concept by applying eight analytical applications of energy justice to energy problems. Fundamentally, this requires researchers to examine energy justice from a different viewpoint (Sovacool & Dworkin, 2015). The analytical framework connects energy policy and technology. The categories are based on eight major philosophical concepts, influences, applications, injustices, and solutions in the field of energy. The eight concepts are divided into two groups as shown in the table two below:

Table 2 Reframed the energy justice concept by Sovacool & Dworkin

Classical theorists' categories	**Modern thinkers**
Virtue	Welfare
Utility	Freedom
Human rights	Posterity
Procedural justice	Responsibility

Sovacool & Dworkin, 2015

Fuller and McCauley (2016) added that transforming society requires, and can be achieved through, a universal recommendation to use the energy justice analytical framework, which understands all of a community's needs, not a one-size-fits-all framework. In support of this research and knowledge from the literature, Samarakoon (2019) highlights inequalities in access to power due to the inadequacy of energy frameworks to assess and combat energy poverty. Energy poverty has led many researchers to reflect upon understanding the effectiveness of the energy justice framework in the global south (Jain & Prabhash, 2014; Kruger & McCauley, 2020). However, there are noticeably different ideas regarding the current energy justice framework, with other researchers arguing that the framework does not cover all the needs of the global south (Monyei, et al., 2018; Sovacool & Dworkin, 2015).

Monyei, Adewumi, & Jenkins, (2018) further highlighted the importance of outlining the poor distribution of electricity in sub-Saharan Africa as an issue of energy justice and that it was crucial to address the failings by understanding the needs of communities and then developing suitable energy systems. Though the study by Monyei et al. focused on solar home systems, it resonates with this study as it examined the efficacy of the solar home systems, identifying their failings and then developing alternative systems that are aligned with the energy justice framework. In addition,

their study identified a gap in developing sustainable energy for off-grid communities that ethically incorporates energy justice values.

2.7.1 Distributional justice

Concerning distributional justice, most researchers investigate where energy injustices emerge worldwide (Jenkins,2015). Distributional justice is connected to environmental justice, as some of the locations of energy plants using coal to produce electricity, for example, may be close to communities causing pollution (Bridge et al., 2018; Tong et al., 2019; Zhang,2015). Studies by Hartwig (2023) and Bridge et al. (2013) highlight other factors within the distributional tenet, including geography, affordability, accessibility, and sharing risks.

Bouzarovski and Simcock (2017) noted that a large amount of energy needs to be generated; however, there is a need to consider the clean and sustainable generation of energy to be distributed fairly, but some areas that are poor in energy resources are significantly affected. Alldred and Shrader-Frechette (2009) noted a case in the USA of environmental injustice in siting nuclear plants, which primarily affected poor people living near radioactive waste storage facilities. The environmental effects primarily affect those who might otherwise have no voice in decision-making owing to the top-down narratives in energy decision-making. In addition, the communities affected will be on low incomes and disadvantaged, and these communities are disproportionately exposed to environmental hazards.

The global south and global north face different challenges, and the energy resources are unequally distributed. According to Chipango (2018), Zimbabwe has the potential and access to resources to improve energy needs. However, inequalities and unequal access to electricity have impacted more rural households in Zimbabwe (Chipango,2018,2021). Furthermore, the impact does not only affect the

rural households but also the local urban community households, meaning that the inequalities in energy access are countrywide.

There are further arguments in the literature that distributional justice does consider that some places might have an abundance of resources, such as coal or wind power; therefore, natural resources can be unevenly distributed (Monyei et al., 2018). Therefore, inequalities can be spread widely regardless of location. Bridge et al. (2013) added that spatial inequalities can be considered at a local or international level and on whatever scale energy inequalities occur.

The place-specific principles are used to try to understand what is causing the inequalities, whether fossil fuels or inadequate alternative energy-producing systems. Fuller and McCauley (2016) highlighted the political nature of energy production and consumption, suggesting that for enough energy to be produced, it is dependent on pre-existing energy facilities and the development of new energy infrastructures. Therefore, energy researchers must be sensitive to understanding the place-specific history and context needs. If the energy infrastructures are developed, it may lessen the energy burden and produce enough energy to supply communities with electricity and heating thus avoiding energy injustices.

In countries where energy poverty is prominent, the distribution of energy sources becomes essential, especially for the elderly and those in poor health who are likely to face injustices. Anderson et al. (2012) and Bouzarovski and Simcock (2017) illustrate that distributional justice becomes an issue when those with health conditions need heat and the use of medical equipment that requires electricity. In some communities in the global south, unfairness in the process of energy distribution can extend to impacts on the health system, such as rural clinics that are forced to operate without light or refrigeration for medication. A report by Welland (2017), which focused on electrification in rural clinics, also noted that further research was needed to identify the energy needs by area.

Some of the clinics vary by location, from small to medium and large clinics. The goal of the Smart Villages Initiative was to guide policymakers, donors and development stakeholders who deal with rural electrification in developing countries (Welland, 2017). The Smart Village initiative was not only at the local government level but as part of the Sustainable Development Goals to end energy poverty and provide the benefits of sustainable and clean energy European Academies' Science Advisory Council (EASAC) (2018). Thus, having energy access will also give opportunities and empower people experiencing poverty. The energy provision will, in turn, yield better services such as health care, education, clean water and sanitation. The recommendations included giving the stakeholders an insight into the barriers to energy access in villages and how they could be overcome. A lack of reliable access to electricity for health facilities was found in at least, on average, one in every four health facilities in the region of sub-Saharan Africa (Welland, 2017).

2.7.2 Justice as recognition

According to Jenkins et al. (2016), recognitional justice involves fair representation of communities highlighting that individuals should be free from physical threats, including equal political rights. Fraser (1997), in part, emphasises the need to understand the vulnerability, cultural recognition, social equality and specific needs associated with energy services among marginalised social groups. Nilsson (2008) continued with the argument and concepts drawn from Fraser's work that researchers may agree with her theoretical ideas on redistribution and recognition. Fraser's argument mainly distinguished between two kinds of injustice, namely, socioeconomic, and cultural injustice. However, Nilsson (2008) argued that Fraser's concept of redistribution and recognition is problematic. It is centred on collective injustices rather than categorising classes of people who are affected, whereas it is essential to consider that redistribution and

identity collectives should demand recognition. The concept of recognition must identify those most affected, such as the elderly and possibly stigmatised, such as those who rely on the welfare state or are without recourse to public assistance. There is also a political dilemma associated with combating injustices among the economically disadvantaged. Walker and Day (2012) added to the argument that social injustice is ingrained in a failure to give some groups of people equal respect and equal rights to others. From the work of Fraser, despite other theorised opinions, recognitional justice is now treated as a distinct tenet. In this thesis, justice as recognition is considered to comprise the critical question of who is to benefit from energy 'justice' *and* who is responsible for its provision. Thus, all communities should have fair access to energy services without discrimination due to socioeconomic status.

In work by Fraser (2001), the recognitional approach focused on the distributional approach to comprehending differences and accommodating particular needs. Some ideas that others could consider as special considerations in society are essential to achieve an equal society. The following points were raised in Fraser's work as critical issues to be put forth towards achieving recognitional justice. To achieve equality in social practices: (a) cultural domination should be considered, followed by (b) highlighting patterns of non-recognition (invisibility of people and their concerns) and (c) Minimising disrespect through stereotyping and disapproving language, namely, misrecognition. The following subsections will now be analysed.

Cultural domination may be considered as one group within a community being superior to others. In some communities, domination based on identities can be viewed as a problem when decisions are made (Martin et al.,2014; Zarycki et al.,2017). In some contexts, domination can cause some groups to be unable to benefit from some essentials. Recognitional justice aims to reinforce and note differences in communities and bring respect regardless of one's status within the community. Martin et al.

(2014) noted that the misrecognition of cultural domination is also prevalent in large societies. At times, problems and solutions can be addressed unjustly owing to the structuring of these societies. According to Walker (2012), environmental justice and cultural recognition are linked together. Some respect cultures and self-determination can prevent people from changing their ways of doing things or using alternative ways, such as continuing to do things because of the domination of others. In some cultures, domination extends to different perspectives, such as ethnicity, race, and gender differences.

Non-recognition refers to the invisibility of people in a community, and their concerns are classed under specific needs and vulnerabilities. Their needs can remain hidden and neglected in the formulation of policy interventions, which is evident in the issues of energy poverty. Carley and Konisky (2020), in their exploration of the justice and equity implications, highlight the disparities in benefits between communities and socioeconomic groups that suffer the adverse consequences of an energy transition. These disparities can be translated into the issue that most of the opportunities for engagement in energy decisions between local communities and top leadership are lacking. Although most of the literature on the topic of justice and equity implications is related to the global north, energy transitions and non-recognition of groups are noted in the low-income communities of the global south (Carley & Konisky, 2020; Cock, 2019; Velicu & Barca, 2020). Therefore, justice equals a fair, systematic way of considering those who might otherwise be forgotten within community groups. However, the recognition of a fair system does not equate to equity and energy for all, such as in the case of Zimbabwe, where energy poverty affects the poor and rich, a problem for the country, not just the poor communities (Chipango, 2021). However, Zimbabwe's energy sector needs first to recognise the energy deficit and needs of the country, prioritising those communities yet to be connected to the primary grid or alternative to the energy.

Misrecognition occurs when there is a failure to recognise that some community leaders' views may be inappropriate when taking charge of communities' needs. According to Smith and Deranty (2012) and Sayer (2011), misrecognition of people's efforts and contributions can cause an unequal division of labour, resulting in unequal opportunities for self-development. This type of injustice is rarely noted but can cause further division in an already unjust society and disrespect peers. In some instances, information on how the distribution of resources can impact the environment can be lost in translation depending on who is driving the message and who benefits. Lack of recognition can cost the community its reputation for future investors and existing investments, leading to further distributional injustices.

2.7.3 Procedural justice

Procedural justice is the last element in the three-tenet energy justice framework. According to Carley and Konisky (2020), it demands equitable and democratic involvement of all stakeholders in energy decision-making. Disclosure of all information, different essential elements, and robust policy mechanisms to encourage communities' participation are essential to achieve procedural justice (Day, 2010; Day, Walker, & Simcock, 2016).

According to Ross and Day (2022), in most countries speeding up the transition to clean energy is primarily initiated by central and local governments with bilateral trading. It is crucial to note that, despite how the energy agenda is set and decisions are made, the distribution of clean energy occurs at a grassroots level. The renewable energy transition requires communities to access technical expertise and assistance concerning planning and managing the energy transition. However, it is not always the case that community members are involved in making decisions about their community's energy needs. Lennon, Dunphy, and Sanvicente (2019) noted that energy transitions have their implications. Some are winners, and some are losers depending on whose voice was considered when implementing new renewable energy technologies. Lennon et al. (2019) further clarified a point

crucial to this research: a clear governance structure needs to support participatory inclusiveness and consider local people's lived experiences when implementing renewable energy projects. Involving the community does not only help support an increase in local knowledge and informed changes in policy. Before highlighting the importance of the tenet framework in this study, the following paragraphs will examine the role of the tenet framework in this research.

2.8 Role of tenet framework in this study

In line with the above analysis of the tenet framework for this research, the framework will be used during the data collection process, discussion, and conclusions. The three areas of the tenet framework will help understand whether these are the areas where communities in Zimbabwe are affected. Justice as recognition is used to understand the communities that are marginalised and why. The tenet justice framework will also help identify and acknowledge the key actors within the Zimbabwean energy sector. Investigating the three areas based on the tenet framework may inevitably reveal some new emerging areas, which will be noted and included during the development of the new framework. Most importantly, the tenets have been covered in the broader literature that considers how energy justice can be understood in different contexts. According to Jenkins et al. (2016), there are many different concepts drawn from the tenets and based on the area of study. As supported by McCauley et al. (2013), the concepts can interlink and overlap as they may share similar features owing to some similarities in causes of energy poverty, such as unaffordability.

Therefore, this research will continue with the three tenets to measure energy issues in a geographical location less studied in the justice literature. The research findings will effectively help make a case for which principles of the energy justice tenet framework explicitly exist and which are missing in the study context.

Finally, the study considered other frameworks, including the eight principles identified by Sovacool and Dworkin (2015), which have been considered to be unnecessary for this study. They use the eight concepts, which are divided into two groups of four based on classical theorists' categories (virtue, utility, human rights and procedural justice) and those of modern thinkers (welfare, freedom, posterity and responsibility (Sovacool & Dworkin, 2015). In any case, future research may apply the Sovacool and Dworkin (2015) eight principles as a supporting framework as opposed to the tenet framework applied for the studied context.

Also, without dismissing the eight principles completely, caution needs to be taken. Some of the eight concepts may apply to the area being studied but are too broad, requiring more areas to be studied and more study time. For example, the four principles based on modern thinkers' categories (welfare, freedom, posterity, and responsibility) will possibly require a different research design that focuses on those principles, such as investigating posterity, which centres on an obligation of energy suppliers to minimise resource consumption and ensure adequate reserves for future generations. However, the principles based on classical theorists' categories (virtue, utility, human rights, and procedural justice) can be applied at a later stage of the framework development, given the objections and studies questions. The classical theorists' principles can be used and can serve as comparative literature-based framework principles against the three-tenet principles used in this study.

The broadness of the eight principles led this study to use the three-tenet principles—distributional, procedural and recognitional justice—to serve as a basic understanding and assessment of energy justice and draw out problematic energy areas that might need to be addressed by tailoring them to the context. The broadening scope of the three tenets has also had a notable impact on the analytical tools for energy researchers seeking to understand energy systems before making energy decisions and reframing them (Jenkins, 2018b). The concepts of Sovacool and

Dworkin (2015) aim to improve fair energy production, energy consumption and the involvement of communities in energy decision-making. The concepts can be used at a later stage when a foundational understanding is established. The energy justice framework is there to help communities transition to fairer and just sustainable energy systems. The following section will outline importance of the community and its importance to this research in particular.

2.9 Summary

This chapter started with the conceptual determination of energy poverty and the energy justice literature. Within the abundant literature on definitions of global energy poverty, four major drivers of energy poverty have received prominence: energy prices, low incomes, inefficient homes, and a lack of energy sources (Boardman, 2010; Bouzarovski, 2018; Moore, 2012; Robert, 2010; Samarakoon, 2019). These definitions and the importance of research on energy poverty fit within the context of the global north and global south. However, there should be a greater focus on how the definitions can be applied depending on the context and bridge the gaps due to not having definitions of universal energy poverty and energy justice frameworks when transitioning towards clean energy for all. Energy poverty is a multidimensional problem that includes failures in policy to recognise the implications of the three energy justice tenets (Castaño-Rosa et al., 2020; Samarakoon, 2019; Sovacool & Saunders, 2014).

Building on this argument, section 2.4 describes the global problems of energy poverty. Section 2.5 presents an introduction to the concept of energy justice, an exploration, and an overview of its three core tenets: distributional justice, procedural justice, and justice as recognition. Section 2.5 to 2.8 then critiques the energy justice framework and states that energy 'justice' is morally and ethically crucial for all to transition towards fair energy. It does so according to the core elements of the energy justice

tenet framework, namely, (1) distributional justice, (2) procedural justice and (3) recognitional justice (Jenkins, 2018a). The application of the energy procedures will be reflected throughout the results chapters. It concludes that all the energy justice framework tenets are not explicit enough in the current energy justice discourse and both this and future research. Finally, the section also advocates for a reconceptualization of energy justice that includes a whole-systems perspective at its core and in multiple contexts.

3 Chapter Three: Positioning Africa's energy poverty and Background of case study

3.1 Introduction

This chapter provides background information on global energy poverty, energy poverty in Africa, and the impact of the global pandemic on the progress in line with Sustainable Development Goal 7, with the agenda of addressing access to clean and affordable energy for all and, most importantly, energy poverty in Zimbabwe. The case study described in sections 3.7, 3.8 and 3.9 offers specific detail alongside an introduction to potential energy justice concerns based on events such as load shedding and power cuts. In addition, it gives some background, such as problems with energy sources and Zimbabwe's renewable energy policy. The policy analysis, in particular, also allowed the identification of relevant energy industry problems and increased the understanding of Zimbabwe's communities and how the energy policy implemented by the government is assisting in improving the community's energy issues, especially those of people with no access to energy. The divide between policy and the energy industry and the community may bring an assumed starting point for better understanding of energy decisions that result in a fairer distribution of affordable energy. It can be argued that understanding policy in a research context will help support background knowledge of how, where and from whom to access information in the decision-making processes of the given case study.

In addition, explaining the background of the study's context permits insights into how the energy justice tenet framework will be applied to this study. As discussed in section 3.7, the role of the energy justice tenet framework will be explained and how distributional justice, justice as recognition and procedural justice will be applied in the study's findings. Additionally, the energy justice tenets will act as measures of the energy issues and highlight whether the tenet areas exist in the Zimbabwean

context in a just way. In doing this, this chapter will present information and an in-depth analysis of the picture globally, then in Africa, with a final narrowing down by proceeding to understand Zimbabwe's energy issues. In addition, introducing the context, especially Zimbabwe, the subject of this study, will help these energy issues to be appropriately appreciated. The chapter will highlight some statistics for those affected by energy poverty using different geographical areas, populations, and political backgrounds to influence energy policy and provisions. In the end, this is to meet the final need worldwide to find ways of eradicating energy poverty. Before the context and owing to the way in which this work is presented, the research questions and objectives are presented in sections 1.4 and 1.5 to serve as reminders of the areas investigated in this study.

3.2 Overview of Africa

In sub-Saharan Africa, at least 600 million people are without access to electricity (IEA, 2019). Owing to a lack of electricity, at least 585 million people worldwide rely on biomass as a primary fuel source, including firewood, charcoal, manure, and crop residues, which result in pollutants, especially when burned indoors (Gasparatos et al., 2015; IEA, 2019). At least 3 billion people use wood, crop waste, charcoal, coal, dung, and kerosene and use inefficient stoves for cooking, contributing to health-damaging indoor air pollution (Stoner et al, 2021; World Health Organization [WHO], 2018, Quinn et al, 2018).

Additionally, living in poorly insulated homes can cause acute respiratory infections or long-term health conditions such as chronic obstructive pulmonary disease, which can be further exacerbated by poor indoor air quality (Jiang, Mei, & Feng, 2016; Martin Ii et al., 2013; Zhang & Smith, 2003). According to Anderson and Fergusson (2006), biomass sources impact the environment owing to their effects on biodiversity, causing a scarcity of fuels such as wood. Biomass fuels require large areas of land

and finance for their production; therefore, low-income families may not be able to afford to produce them in large amounts (Anderson & Fergusson, 2006; Thomson et al., 2019). There are adverse effects of the demand for wood as an energy source for those affected by energy poverty and energy insecurities. Most of the households are poorly ventilated, and the air is polluted with small soot particles that affect the lungs upon entering the body. It is clear that more needs to be done in the global south concerning energy. Most affected are low-income countries and those living below the poverty line. The literature paints a picture that more work needs to be conducted in energy development for basic human needs.

Exposure to pollutants is exceptionally high in the global south among women and young children, who spend the most time in and near the household, and it affects eyesight (Chockalingam, Tolunay, Prabhakaran, & Narula, 2012; West et al., 2013). The UN (2018) gave figures for the impact of the toxins emitted from biomass sources, resulting in at least 3.8 million reported premature deaths yearly. In relation to exposure to toxins emitted from biomass sources, the literature starts to address the detrimental implications of toxins that affect a particular group and result in health problems and death in some extreme cases. See table two illustrates the diseases such as pneumonia and chronic obstructive pulmonary disease (COPD)caused by indoor pollution (see table 3). These diseases are caused when using inefficient solid fuels and kerosene for cooking (Chenari, Dias Carrilho, & Gameiro da Silva, 2016; Micallef, Caldwell, & Colls, 1998; Van Tran, Park, & Lee, 2020).

Table 3 the diseases caused by indoor pollution Adapted from WHO (2018)

Diseases	Percentages of the Global population
Pneumonia	27%
Stroke	18%
Ischaemic heart disease	27%
Chronic obstructive pulmonary disease (COPD)	20%
Lung Cancer	8%

Revisiting the history of Africa's energy reforms has always had its issues. Wamukonya (2003) highlights the aspect of mismatched agendas within the energy sector worldwide and in Africa. Wamukonya (2003) notes that, although the power sectors of Africa implemented energy reforms, there is no competition regarding energy utility companies; instead, most energy companies are government-owned, which can lead to energy security implications. The earlier reform model faced some challenges in meeting its goals (Wamukonya, 2003). Goldthau (2013) supports the above by highlighting the complexity of the intertwined dimensions of global energy poverty. Goldthau (2013) notes that it is essential to assess global energy poverty to work effectively for a comprehensive energy policy. Although the earlier energy reforms within the African energy sectors had their fair share of issues, it appears from the literature that mismatched agendas are still evident in comparison with other countries. Although the narrative based on the literature continues with the emphasis of leaving no one behind, possibly more needs to be done by utility companies owned by the government or governments to allow more private investments for justice and an equitable transition.

According to Novacheck and Johnson (2015) and Bouzarovski and Petrova (2015), energy shortages in the global south and the lack of sustainable energy are significantly greater than in developed countries.

In addition, energy poverty in most African countries is exacerbated by poor grid infrastructure, low energy supplies, constant blackouts, increasing energy prices and low electrification rates in some areas (Bouzarovski & Petrova, 2015; Jain & Prabhash, 2014). Poor grid infrastructure is the case and is the predominant issue in the case study area, as mentioned above.

Additionally, Adewumi and Jenkin (2018) investigated these disparities in South Africa using the energy justice framework, which indicated a significant mismatch in policy or procedural injustice, distributional injustice and injustice affecting community groups. Unsurprisingly, since it is one of the key determinants, energy poverty disproportionately affects those who are off-grid owing to low energy supplies, constant blackouts and increasing energy prices. Without good energy services, they are more likely to be energy-poor. According to Gebreegziabher and van Kooten (2013), Africa is one of the continents with inadequate access to energy, leading to reduced economic production and an increase in poverty.

Despite having problems with access to electricity, Africa has many renewable energy sources, including decentralised and off-grid energy sources such as wind, solar and geothermal energy (Zenebe & Kooten, 2013). Historically, it has been noted that Africa also has biomass sources such as palm, soya and sunflower that can be utilised or processed into biodiesel, and sugarcane can be prepared for bioethanol production (Anderson & Fergusson, 2006). However, a recent study by Fisher et al. (2021) highlighted a gradual that there is a gradual decline in pollution in Africa, and householders from many African countries were the most affected by pollution. Therefore, governments need to develop robust plans and better renewable energy policies and implement clean energy.

Some countries have been implementing renewable energy projects to tackle the existing energy poverty problems in Africa. The Africa Low Emission Development Strategies (LEDS) Partnership, European Union and UN Environment Programme have been working together to advance LEDS in Africa (UN, 2021). Under the Latin America and the Caribbean and Africa LEDS partnerships, priorities have been set to engage communities in promoting low-carbon, climate-resilient development, job creation to alleviate poverty and environmental management in Africa (Africa LEDS Partnership, 2021). One of the objectives of the Africa LEDS Partnership towards enabling environmental sustainability is giving communities courses on mini-grids to help them plan strategic methods and have sustainable mini-grid programmes within their communities (Africa LEDS Partnership, 2021).

Ethiopia launched the Climate Resilient Green Economy (CRGE) strategy to reduce carbon emissions and improve its electricity system by generating more energy from renewable sources (The Federal Democratic Republic of Ethiopia, 2011,2019). The Ethiopian government highlighted that it would be providing more energy to the energy-poor with such improvements, and regional marketplaces would gain significantly through the CRGE strategy (The Federal Democratic Republic of Ethiopia, 201, 2019).

3.3 Impact of the global pandemic (Covid-19)

Having mentioned the above literature on energy poverty, it is crucial to note that many families have been thrust into further poverty because of the pandemic, which has exacerbated energy poverty globally (Emilio, 2020; Klemeš, Fan, & Jiang, 2021). According to Edomah and Ndulue (2020) and Sovacool, Furszyfer Del Rio, and Griffiths (2020), in April 2020, at least half of the world's population was in lockdown. According to the WHO (2020), Covid-19 has affected the world economically and socially and caused unprecedented demands on public health, and 690 million people were predicted to fall into extreme poverty. In support of the WHO, Sovacool et al. (2020) noted that the pandemic has significantly impacted societies, affected many systems worldwide and affected energy and climate policy. Ambrose et al. (2020) highlighted that the UK's policies to address the impact of Covid-19 focused on low-income energy consumers and considered the resulting energy bills, particularly in the context of confinement to home and increased energy consumption. Overall, there is still a need for policies to improve home standards (Ambrose et al., 2020). Comparing Europe and Africa, there is still a need to discover how the pandemic has affected the energy sector's responses and the energy policy framework in these regions (Sovacool et al., 2020). The Covid-19 pandemic has, however, caused more long-term and complex problems for the global targets to eradicate energy poverty. It is noted that some governments did respond effectively to support those in energy poverty and working from home to have access to energy.

There was a noticeable change in the demand for domestic electricity in Nigeria during the pandemic (Edomah & Ndulue, 2020). This was possibly due to the fact that most people were working from home. As the literature has noted, the impact of the pandemic on energy programmes is not yet evident or manifested fully; therefore, countries cannot fully mitigate the delays to energy projects due to the impact of the

pandemic. The global lockdown has affected the solar energy industry, whose production lines had to be put on hold during the lockdown, which has consequently affected the transition towards sustainable economies (Hosseini, 2020).

Owing to the pandemic, most governments had to divert funds from other resources to fight Covid-19, with less money available for renewable energy incentives (Sovacool et al., 2020). In Europe, giving the UK as an example, most renewable energy technology suppliers had no choice but to place staff on leave, thus reducing their production levels. In the United States, residential solar installations saw a fall of 48% during the second quarter of 2020, which is supported by the International Renewable Energy Agency (IRENA) data for 2020 for the off-grid renewable energy sector and affected the SDG7 for 2030 for electrification by all strategies (Hosseini, 2020; Madurai Elavarasan et al., 2021). In this respect, this illustrates that it will be necessary to address the impact of the pandemic at a global level and find a unified way forward for all governments when addressing the delays to energy targets.

China, the world's largest supplier of renewable energy supplies, suffered the most significant hit during the pandemic and could not deliver renewable energy systems, including solar panels and wind turbines, to its intended buyers (Akrofi & Antwi, 2020). However, most of the energy sector provisions during the pandemic were short-term in developing countries, especially in Africa. Akrofi and Antwi (2020) stated that some African countries supported their communities by providing free electricity and suspending energy bill payments; this was not the case for Zimbabwe. It was last reported in 2013, not in recent years; for example, the Zimbabwe government was reported to have delayed the directive to cancel the householder energy debts to lessen their household energy burden (Bulawayo24,2013). Despite Zimbabwe's inability to cancel energy debts for its consumers during the Covid-19 pandemic, cancellation of energy debt may be regarded as a short-term measure.

Some African countries, such as Nigeria and Kenya, faced broader economic issues during the pandemic, which made them implement specific interventions for their renewable energy sectors (Akrofi & Antwi, 2020). Akrofi and Antwi (2020) caution that the pandemic is expected to have more impact on the African continent as a whole because its lack of progress towards fighting energy poverty will worsen and increase poor energy access. At the same time, the IEA (2020) reported that, despite Covid-19, renewable technologies globally have grown by almost 4%. The IEA (2020) highlighted some disruptions caused by the pandemic in the first half of 2020, which did slow the progress of some projects. Nonetheless, the construction of energy systems did not halt entirely during the total or partial lockdowns. As soon as some borders were opened, most companies ramped up the development and installation of new renewable technologies. The following section will now draw on the literature related to the research case study.

3.4 Political background

This section will introduce the political background of Zimbabwe as it will help to understand some of the problems and why Zimbabwe is facing economic strife post-colonialism. The political challenges of Zimbabwe are inherently embedded in the development of the country, with no exception for the energy sector.

Zimbabwe has been going through social, economic, and political instability following Robert Gabriel Mugabe's 37 years in power. He resigned from the government in 2017 after being in office from 1980 when Zimbabwe gained independence from British colonial rule. Matamanda (2021) and Matamanda, Chirisa, Kanonhuhwa, and Mhlanga (2021) highlighted that Mugabe's government was heavily rooted in corruption, clientelism, patronage, state capture and sanctioning of opponents. According to King (2005), corruption led the country into chaos and socio-spatial segregation based on class, not race, in contrast to the colonial

era. The people of Zimbabwe continued to suffer under Mugabe's perpetuated dictatorship of his people. Despite the need to empower and indigenise its citizens, they were denied democracy. The government gained more than its citizens using its funds, leading to the country's collapse, and development was poor. In addition, there was also an issue of ambiguity and lack of consistency in policies and their implementation; thus, resource allocation was unjust unless one had close ties to the government. According to Matamanda (2021), the treatment of the Zimbabwean people by so-called Mugabeism draws significantly on the concepts of power and poor treatment. In 2002 and 2003, the United States and European Union imposed sanctions on travel visa facilities and non-humanitarian government-to-government assistance. The sanctions were, however, imposed on selected government officials (Lester & O'Kane, 2021). Nonetheless, non-humanitarian government-to-government assistance affected the whole of the Zimbabwean population, and sanctions thus brought the economy further to its knees. This, therefore caused unimaginable suffering to the Zimbabwean economy, which struggled to develop its infrastructures further with no financial assistance or borrowing from international banks. This then caused further impacts on services such as improving electrification for those who had never been connected to the grid. People continued to suffer from the great world recession of 2007–2009. Zimbabwe had the highest hyperinflation rate globally and struggled to trade imports and exports with other countries, especially those in the global south.

Emmerson Mnangagwa became the president of Zimbabwe in 2017 and re-elected in 2023 (Burke, 2017; Reuter ,2023). Zimbabwe is still under sanctions that are subject to review, even with the new dispensation and promises by Mnangagwa's government in 2017 to unite Zimbabwe and repair the economy. Productivity is one of Mnangagwa's economic development drives and is in line with the National Development Strategy 1 and the nation's Vision 2030 (Helliker & Murisa,2020). This initiative focuses on farming, animal husbandry, poultry, aquaculture, apiculture, and the manufacture of many different consumable products, amongst vital agribusiness initiatives (Paganga, 2023). The information mentioned in this paragraph does involve agriculture, and for some of these programmes to be successful, a requirement for energy to run machinery is essential. For any economy to be progressive at its core, energy plays a role from production to exports.

The sanctions are still in place to encourage the new government to refrain from human rights abuses, comply with the democratic principles of law and not implement policies or actions that affect civil society. The new government has promised Zimbabwean people better services, such as improved civil rights, including good government services, rights to public education, roads, rights to good public facilities, good water facilities, renewable energy, and rural electrification. For better success economically, most governments work together to improve their economies; however, for the new Zimbabwean government to revive the economy, it has to start repairing its relationships with the global south and global north. Davies (2017) notes that the progress of Zimbabwe requires the new Zimbabwean government to review its policies that are not pleasant to foreign investors, which can be related to Zimbabwe's renewable energy policy. This policy indicates that cash injection is needed to meet the electricity targets for Zimbabweans using renewables such as solar energy. If policies are improved to favour foreign investors, there will even be a likelihood that the renewable energy industry will

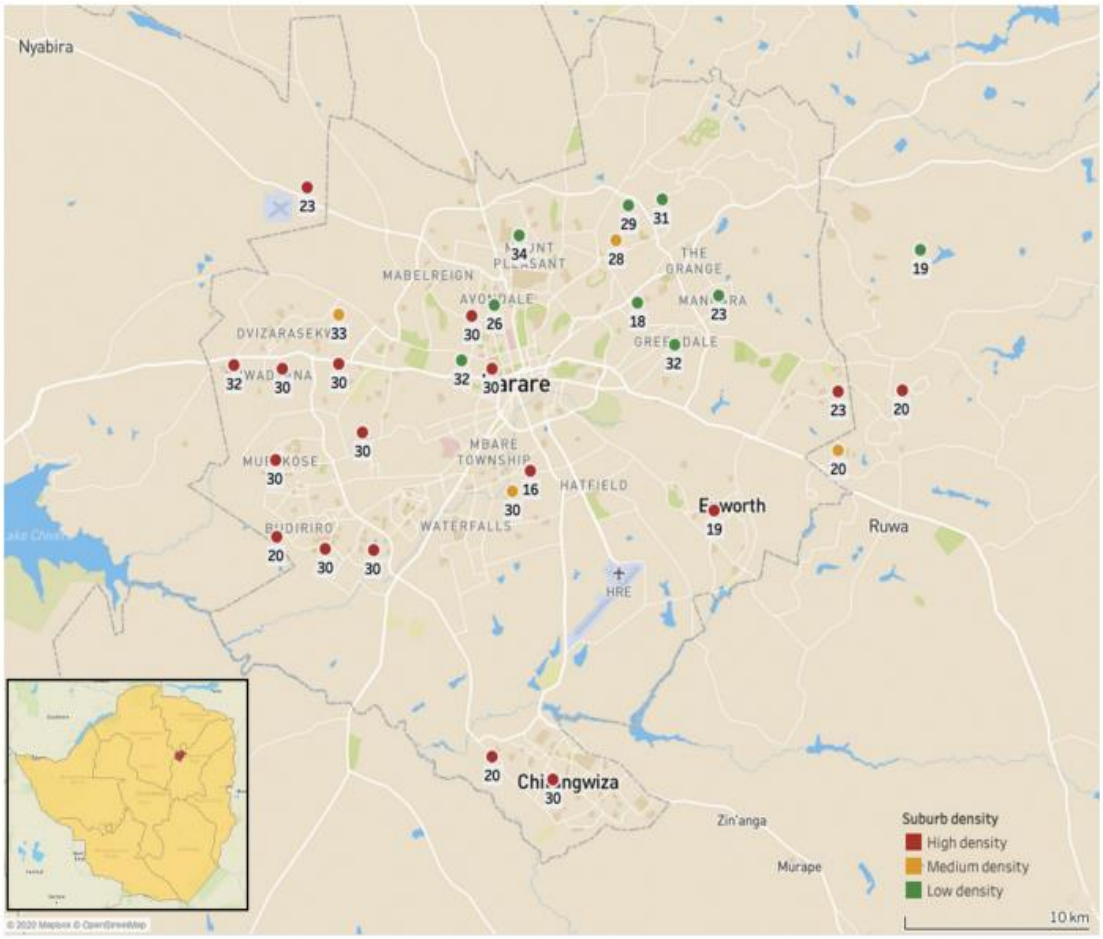
attract outside investors to open companies in Zimbabwe. Lastly, at this stage, the Zimbabwean government is still experiencing some problems with foreign investors, as the current government is still associated with the old Mugabe regime. With respect to this study, political considerations will play a role in the progress of the energy sector with much-discussed renewable technologies. The following section addresses the specific issues that the Zimbabwean energy sector is facing and clarifies what was inherited from the previous government to serve the interest of Zimbabweans at large.

3.5 Understanding Zimbabwe's energy issues: load shedding

The Republic of Zimbabwe is a landlocked country in Southern Africa between the Zambezi and Limpopo rivers. Zimbabwe has ten provinces, including two metropolitan cities: Harare (see figure 3) and Bulawayo. Zimbabwe is one country that has historically suffered load shedding. Load shedding is when electricity or the energy supply is interrupted in some households or communities to avoid the total failure of a power station or energy-generating plant (Eskom, 2018). There is a gap in knowledge as only a few studies have been conducted to understand the community experiences due to load shedding which is why this research will be essential to fill the gap in knowledge.

As stated in section 1.3, other countries are facing challenges due to the energy crisis due to old infrastructure and renewable energy sources. In addition, Zimbabwe relies on energy imports but, in most cases, has failed to pay for adequate power imports. Lack of funding and poor infrastructure have worsened the energy crisis (Mukeredzi, 2019). Though it is crucial to note that this study will focus on the Harare Metropolitan Province as shown in the figure below.

Figure 3 Map of the Harare Metropolitan Province.



Spargo et al (2021)

A report by Banya (2019) stated that some Harare residents are going without power for several days, even during cold weather. The impact of load shedding will result in some local businesses and health facilities being unable to serve their communities fully. The load shedding is primarily due to Zimbabwe producing half its 1,700 MW peak demand and power cuts due to malfunctioning old power plants and substations. However, the Zimbabwe Electricity Supply Authority (ZESA) blamed the blackout on a lack of diesel imports (ZESA, 2018). The blackout experienced by communities has its fair share of negative impacts on their well-being and quality of life. Most residents will have no choice but to rely on other energy sources, such as wood and charcoal, for cooking. For the industries affected by the power cut, production and income will be lost,

mostly affecting small businesses that might not have access to facilities such as generators. Some large industries may have backup generators but are not able to use them because of the high cost of diesel to run them during power cuts.

A recent report by the British Broadcasting Corporation (BBC) (2019) highlighted that Zimbabwean communities have to go long hours without electricity owing to the government and consumers not paying their bills. ZESA reported owing US$83 million (£66.4 million) to its energy suppliers in South Africa and Mozambique (BBC, 2019). Owing to the harsh economic climate in Zimbabwe and the high unemployment rate, most households cannot pay their utility bills because they earn inadequate income or no income at all (Zimbabwe Electricity Transmission Distribution Company [ZETDC], 2016). Energy poverty in itself can lead to job loss, which then becomes a vicious cycle in the nation of Zimbabwe. It is a case of energy insecurity, causing an inability to supply an adequate supply of energy and prevent industries from shutting down.

ZESA opted for commercialisation in 2000 owing to Zimbabwe's growing demand for electricity (ZESA, 2012). Although commercialisation brings financial gain for the utility company, the company faces many challenges, including poor service delivery and customer service. Many customers reported having demonstrated against ZESA for soliciting bribes to attend to faults (The Herald, 2010). Poor service delivery can have a negative impact, leading to customers not trusting the service provider because of their poor experience.

According to Madya (2023), Zimbabwe's renewable energy policy has set a drive to reduce coal use and carbon emissions. However, previous reports highlighted that Zimbabwe faced an unprecedented energy crisis caused by ageing power plants and poorly maintained substations (ZESA, 2012). Energy transmission and distribution networks have been receiving little or no maintenance over the years (African Development Bank, 2016; Ministry of Energy and Power Development, 2016; Southern African Power Pool, 2016; ZESA, 2016; ZETDC, 2016). The Zimbabwean renewable energy sectors have received little funding and are not performing well owing to poor management and a lack of robust policies (ZETDC, 2016). According to Zhou (2012), changes in energy demand and technological reforms such as prepayment meters are not entirely satisfactory, and customers oppose power disconnections. Therefore, Zimbabwe needs to set an agenda to restore and improve the structures of the ageing power plants.

In 2012 ZETDC installed over 19,000 prepayment electricity meters in Zimbabwe. ZETDC proposed prepayment electricity meters as an innovative solution to facilitate affordability and arrears collection, with 20% of the electricity purchase automatically deducted until the debt is cleared and reduced utility costs are (ZESA, 2012). This mechanism essentially requires that the users pay in advance for the units they need to access electricity. However, as noted above, some residents had a smart meter installed because of existing debt, and they will not be able to afford to top up to get energy for domestic purposes.

Additionally, as stated above, the utility company also aimed to gain more financial revenue through innovative technologies (ZESA, 2012). However, there was a leakage of revenue, a similar scenario to that seen in Nigeria (Fulbright, 2012). For such reforms to work, ZETDC had to supply enough power to ensure maximised revenue collection from its customers, which so far seems fruitless because inadequate electricity is generated (ZESA, 2012). In most instances, development is hindered by households with old infrastructure that need electrical wiring updating and new

households, which will require a more substantial electrical load (Kaseke & Hosking, 2013). In Zimbabwe, both old and new buildings have issues with electrical overloads when using a power supply meant for smaller loads (Kaseke & Hosking, 2013). An overload occurs when a household connects more gadgets than can be sustained by the existing system (ZESA, 2019). Therefore, it is crucial to address load shedding and electrical overloads and implement new policies to enable fair use of energy once available to households.

3.6 Zimbabwe's energy resources and policy

This section will examine the importance of expanding the energy grid and implementing renewable energy technologies in Zimbabwe. Zimbabwe's renewable energy policy, published in 2019, stated that one of its objectives is sustainability with the Zimbabwean population in mind to ensure a healthy and productive life (Zimbabwe Energy Regulatory Authority [ZERA],2019). Therefore, the policy aims to develop sustainable, clean, and affordable energy resources for the country, which will benefit the current generation and create a sustainable future (ZERA, 2019). The renewable energy policy also highlighted further development of existing regional renewable energy sources such as large-scale hydropower and starting up projects such as small-scale hydropower projects to supply communities, although they may not significantly impact the national requirements (Zimbabwe Ministry of Energy and Power Development, 2012; ZERA, 2019). Although most governments encourage reductions in the use of coal because of its impact on the environment, the Zimbabwean national energy policy highlighted that coal as an energy source is being used to generate power in the short to medium term (Zimbabwe Ministry of Energy and Power Development, 2012, 2019).

Additionally, the policy emphasised that coal as a resource can benefit the country's economy, facilitate employment creation, enhance energy self-sufficiency, and increase trading power within the regions (Surridge, 2007; Zimbabwe Ministry of Energy and Power Development, 2019). Zimbabwe's use of wood fuels, poor energy policy, high energy prices and load shedding mean that it will need to balance the three elements of the energy trilemma to deliver the best outcome for its population. The energy trilemma concepts have been discussed in detail under the energy justice sections 2.3.1, 2.3.2, and 2.3.3. According to Mzezewa (2017), the barriers to renewable energy in Zimbabwe have led the country to continue using fossil fuels such as coal to power the grids for supplying electricity. Coal is the most carbon-intensive fossil fuel and causes climate change and health problems. Fossil fuels have been favoured over the years because of their capacity to deliver concentrated energy (Harrison, 2016).

Owing to the poor state of the electricity grid, inadequate investment in the sector leads to power cuts and load shedding. As a result, the country's electricity supply cannot meet the energy demand. According to the Zimbabwe National Energy Policy (2012, 2019), there are significant differences between urban and rural electricity access. Only 13% of rural areas, in comparison with 83% of urban areas, have access to electricity. In addition, electricity is not used by a large population, with only 30% of the population using electricity and 65% of households depending on firewood (Zimbabwe National Statistics [ZIMSTAT], 2014). Therefore, the Zimbabwean government argues that small-scale hydropower projects will aid the development of skills and speed energy access for communities not connected to the primary grid. According to the IRENA (2020), Zimbabwe has biomass resources in the form of bagasse, agricultural and municipal waste, forest residues and other forms. In addition, Zimbabwe can generate energy from other sources, such as solar energy, small-scale hydropower, and geothermal and wind energy

(IRENA, 2020). Despite all these resources for producing renewable energy, the growth in installing renewable energy systems has not been growing owing to the absence of a renewables policy, which was later published in 2019 (Zimbabwe National Energy Policy, 2019). China and Old Mutual Investment Group Zimbabwe are scaling up on the existing solar energy project, which is expected to remedy the existing energy deficit (Kemp,2023; Chingono,2023).

South Africa's energy policy also highlights its new efficient, clean coal technology via carbon capture (Hanto, 2022; Yoro & Sekoai, 2016). Carbon capture and storage (CCS) from coal-fired power plants is attracting increasing attention as an alternative approach to reducing carbon dioxide emissions (Yoro & Sekoai, 2016). However, as noted in research by Yoro and Sekoai (2016), there is still room to upgrade the strategies, and process optimisation of CCS systems is essential to improve the process efficiency of this technology in South Africa. According to Singh, Strømman and Hertwich (2011), the carbon capture method effectively captures CO_2 from power plants using post-combustion capture. An efficient carbon capture method can decrease greenhouse gas emissions by 64–78% (Singh et al., 2011).

Regarding the available sources of the electricity ZETDC has to supply to its customers, Zimbabwe has five power plants available. Despite having five power stations (one hydropower plant and four coal-fired generators), the country still has an energy deficit, and only 45% of the energy demand is being met (ZESA, 2014). In addition, the power stations are not operating at full capacity, and some need upgrading to yield more output (ZESA, 2014). Zimbabwe has seen its fair share of energy shortages. As reported by Eskom (2019), from 2018, South Africa has faced coal shortages that have caused load shedding.

Furthermore, Eskom supplies energy to 90% of South Africa's electricity users (Eskom, 2019). Eskom (2019) reported that its debt was over 419 billion rands. The company is also struggling with poorly maintained plants that do not always produce enough power to meet demand (Eskom, 2019). South Africa is one of the countries that supply energy to Zimbabwe, yet it also has energy problems (BBC, 2019; Monyei & Adewumi, 2017). Such energy inefficiencies are likely to cause significant issues for both countries, especially Zimbabwe, which depends on South Africa to meet its energy demands (Eskom, 2019; ZESA, 2014). The South African government and research services have called for policy reforms and restructuring to transform the energy company into a sustainable business (Monyei & Adewumi, 2017). Government officials have called for improvements in electricity plants to start selling energy to residents and other countries (Eskom, 2019; ZESA, 2014). However, a more recent trend has revealed that the energy poverty gap is broader than that indicated by SDG7 (Mastrucci et al., 2019). In accordance with the works of Monyei, Adewumi and Jenkins (2018), many communities affected by energy poverty, such as those that are off-grid, are using solid fuels. Monyei, Jenkins, et al. (2018) highlighted that the global south has prevalent problems with energy access and energy mobility.

Still, according to recent studies, Todd, and McCauley (2021) highlighted that post-COVID-19, South Africa, as an example, still faces barriers towards a just energy transition due to socio-cultural issues, government regulations, structural issues, and licencing issues. Similarly, Madya (2023) added that in Zimbabwe, infrastructure and energy regulatory frameworks for energy distributions still need to be set up and aligned to renewable energy systems. Most of the infrastructures are still based on the old system for fossil fuel-based energy supply systems (Madya,2023).

3.7 Summary

Section 1.4 introduces the contextual background of global energy poverty concerning the core issues globally. The section begins by giving some statistics on the population groups that are more affected and how they are mostly affected, the global problem of energy poverty and the roots of energy poverty. There is also literature-based information that outlines which solutions the world is aiming to achieve in the eradication of energy poverty. The section also highlights the anticipated impact of the Covid-19 pandemic on the progress of the renewable energy systems that aim to reduce carbon emissions. Identifying the delays and their impact on those who are already energy-poor may form part of the core challenges of the energy justice framework and its current informed approaches across the whole energy system. There is an evident desire across the globe for work that has already been done in the energy sector. However, there is still evidence that the global south has more issues, from resource extraction to waste.

Through this research, understanding the experiences of communities using a bottom-up approach by engaging the communities will help inform policy and better frame the energy justice framework. Section 3.7 starts with understanding the case study (Zimbabwe), its political background, Zimbabwe's problem with sanctions and its relationship with other countries. This is continued in sections 3.8 and 3.9 with a more in-depth exploration of load shedding, Zimbabwe's energy sources and the concept of global energy issues to date.

4 Chapter Four: Research methodology and methods

4.1 Introduction

This chapter will outline the appropriate methodology for the study. Research can be viewed and understood using multiple methodologies; therefore, it is crucial to describe the precise research design. This chapter starts by providing a research philosophy that will help establish knowledge and where and how to find and explore new knowledge. Thereafter, the research design and the selection of the case study approach are discussed. Then the chapter outlines the approaches taken to collect data in all three main data collection phases: survey, interviews, and self-video. Issues concerning the survey's design, the survey's distribution and the interview process are all covered. Finally, data analysis methods are given, followed by ethical considerations, reflections, and the conclusion.

Recalling the research questions and key objectives

4.2 Research questions

1)What are the key factors limiting access to energy and causing injustices?

2)What is the lived experience of communities in Harare Metropolitan Province, Zimbabwe, affected by energy poverty and energy insecurities?

3)What role do the private and public energy sectors play, and how do they inform the development of a global energy justice framework?

4.3 Research objectives

Objective 1: To identify whether there are energy poverty and energy insecurity challenges that may be associated with infrastructure and regulatory systems.

Objective 2: To characterise the socioeconomic and cultural challenges experienced by Zimbabwean communities affected by energy poverty and energy insecurities.

Objective 3: To understand experiences and factors that limit access to fuel sources using a bottom-up approach based on participants' experiences in different demographic and geographical locations.

Objective 4: To contribute to the ongoing debate on the meaning of energy poverty and energy justice.

Objective 5: To propose policy recommendations to help tackle energy insecurities and poverty in Zimbabwe by referring to the current global energy justice framework.

4.4 Research philosophy

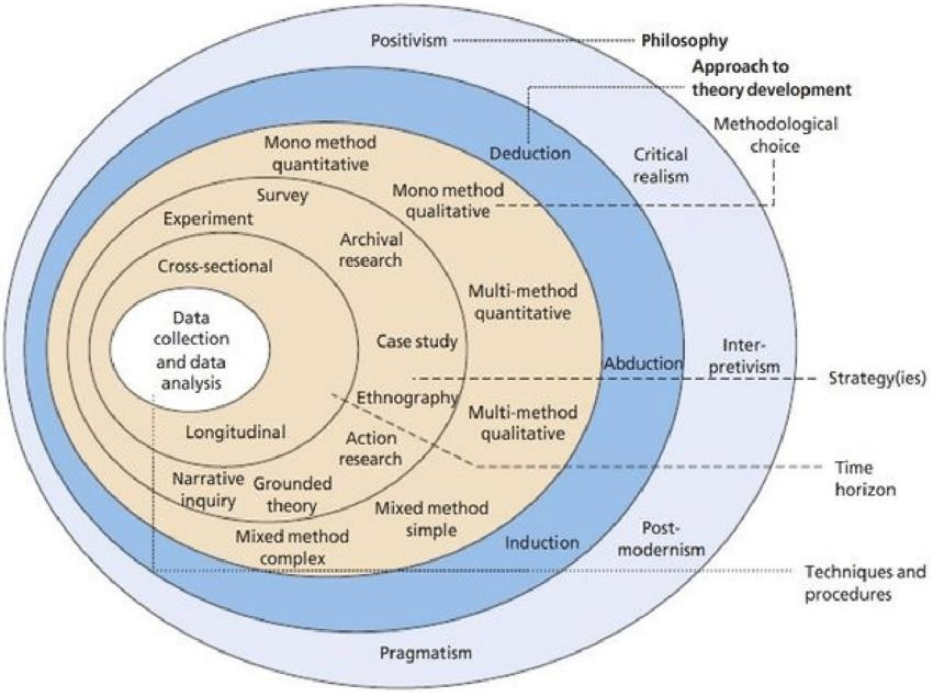
According to Schmidt (2011), real-world research problems are usually complex and require interdisciplinary or transdisciplinary research: this research is interdisciplinary. According to Robert (2014), philosophers have given much thought to how researchers position themselves during research. Robert (2014) stated that epistemology is a philosophy of knowledge and justification, and researchers should start with self-awareness. Epistemology gives us knowledge concerning our model of the world and methodologies to use to understand the world. It is crucial that researchers position themselves to consider their philosophy towards truth and knowledge and where and how to find and explore the truth. Therefore, this research will adopt a constructivist philosophical approach and a relativist ontological stance. The following paragraphs will discuss the selected philosophies in detail.

According to Crotty (1988), ontology is the study of being and is concerned with what establishes reality and what is considered accurate in the world (Denzin & Lincoln, 2011). According to Grix (2010), an ontological philosophy can be achieved once researchers have devised their epistemological and methodological approaches. The positioning looks at multiple truths, taking different directions, instead of absolutism (Carter, 2007).According to Saunders et al. (2012), the pragmatic viewpoint answers the research question by understanding that no one viewpoint can provide the entire picture. Shannon-Baker (2015) suggested that the pragmatic approach uses quantitative and qualitative approaches to exemplify research objectives. Jean Piaget's theory of development is one of the well-formulated constructivist models that use qualitative and quantitative methods (Carey et al., 2015).

The focus of constructivist philosophies is on specific contexts in which communities live and work. The constructivist philosophy of focusing on contexts will also help to understand why something is happening in a phenomenon, and it does not deny that the physical world exists (Shannon-Baker, 2015). Agius (2009) and Creswell and Creswell (2018) noted that the constructivist philosophical approach emphasises that reality is made by people in social contexts and with mutual understanding.

In addition, the constructivist philosophical approach is preferred as it understands that the truth is flexible depending on who your participants are and not relying on one method during the research. Therefore, due to the limited evidence on energy poverty in this setting, this study uses qualitative and quantitative mixed methodological approaches by adopting the critical elements of mixed methods adapted from the research options proposed by Saunders and Thornhill (2019, p. 164) (see figure 4).

Figure 4: Research options.



Source: Saunders and Thornhill (2019, p. 164)

4.5 Research methodology

Habib et al. (2014) define the research methodology as the approach taken by the research process from the foundation of theory to the collection and analysis of collected raw data, and research objectives may be established. The research process is crucial, and any methodology used should follow and provide information that is coherent and presented systematically. In addition, this also involves paying attention to the techniques and tools used to collect the data. The research methodology will assist in achieving the research objective (Adesola & Baines, 2005; Matusiak, 2017). Still, objectives need to be clear in all research so that when the appropriate methodology is selected, it will be much easier and clearer to achieve the objective goals. As noted by Esser and Vliegenthart (2017), there is no universal scientific

methodology as a result of the varying objectives of many researchers; therefore, research can employ different research methods.

4.6 Research approach

This study employed qualitative and quantitative research methods. First, it is essential to highlight that the research centred on a case study (Zimbabwe) that has not been studied in detail in terms of energy justice and sought to investigate the participants' subjective experiences related to their problems with energy inside the home and stakeholders' professional views. Due to the virtual recruitment of participants, the research employed quantitative survey methods to help recruit the participants. The data were analysed using descriptive statistics from collected survey data, which informed the interview schedule questions used during the semi-structured interviews. An inspection of histograms was done to check the assumptions of normality and in line with the Shapiro-Wilk tests.

Halcomb and Hickman (2015) highlighted that mixed research methods have become commonly used in recent years. Using qualitative and quantitative research methods provides a complete and comprehensive data collection to achieve the research objectives and answer the research question (Tashakkori, Teddlie, & Johnson, 2015). Mixed methods have four types of design: triangulation, embedded, explanatory and exploratory (Creswell et al., 2003; Mertens & Hesse-Biber, 2013). This research uses multiple methods of collecting data, including qualitative and quantitative methods. The explanatory research will also help explain why there is an issue with energy in Zimbabwe, and the exploratory research will help the understanding of energy justice in the Zimbabwean energy industry in general, in the whole energy system from production to distribution. The following sections will discuss the qualitative, quantitative, and mixed methods.

4.7 Qualitative approach

Qualitative research is interpretive. Qualitative research will aid the investigation of new areas and gain in-depth knowledge of people's personal experiences (Davies & Dwyer, 2007; Freimuth, 2014; Potter, 2006; Robson & McCartan, 2016). Researchers use a qualitative approach to conduct interviews and observe participants, thus capturing the human experience (Potter, 2006). Also, qualitative research aids in-depth social or psychological theory (Robson & McCartan, 2016). Frasso et al. (2018) added that qualitative research can serve as a bridge for researchers to build relationships with communities and understand community needs, and the process can empower communities. According to Robson and McCartan (2016), using multiple methods can have disadvantages; it can lengthen the duration of research. The research has a timetable and different action plans in case of an unforeseeable problem. When data were collected during the research, timelines had to be set according to the university's assessment deadlines, and when possible, granted extensions were taken.

4.8 Quantitative approach

Quantitative research has been limited to statistical tests and analysis when research is being conducted. Punch and Punch (2003) and Punch (2014) observed that quantitative research is empirical work where gathered data are presented as numbers. Collis and Hussey (2014) highlighted that while numbers are measured, the variables of a particular phenomenon are measured, and the relationship between variables is analysed. This approach is used mainly for testing objective theories (Collis & Hussey, 2014). In contrast, qualitative research is interpretive and reflects on the deductive approach to theory development. Quantitative data results can be generalised and reproduced (Creswell & Creswell, 2018). Types of quantitative research designs include surveys and experiments (Creswell & Creswell, 2018). According to Chen (2012) and Jones et al.

(2013), quantitative methods using surveys will enable the research to reach a more significant sample and provide much-needed flexibility for understanding relationships between variables. Jones et al. (2013) added that surveys are valuable tools when data are collected from large populations through surveys.

4.9 Mixed-methods approach

Quantitative and qualitative data collection use specific designs, including theoretical constructs and philosophical assumptions (Hesse-Biber & Johnson, 2015). Mixed-methods approaches help to generate questions during research, and they can also generate different types of data and bring different perspectives when data are generated. Explanatory sequential mixed methods, convergent mixed methods, concurrent triangulation designs and exploratory sequential mixed methods are all types of mixed-methods research designs (Creswell & Creswell, 2018). For this study, a concurrent triangulation design was selected, which meant that quantitative and qualitative research might inform each other during data collection. It also allowed the study to offset disadvantages and draw on the advantages of both methods. Sampling using one approach, such as the survey,

facilitated the selection of interview participants. Both methods will bring out a balanced understanding in this research field. The survey did not answer all questions, but the interviews and self-recorded videos provided a contextual understanding of the study's location by gaining more information in addition to the survey questions, which may require further explanations and the participants' viewpoints.

4.10 The rationale for choosing a mixed methods approach.

Hurmerinta-Peltomäki and Nummela (2006) and Heyvaert et al. (2013) highlighted that qualitative and quantitative research elements are frequently used in multiple areas of social, behavioural, health and human sciences, and this brings added value to these fields and this research. McKim (2017) indicated that the value of mixed-methods approaches is that they increase the validity of the research findings and information collected from primary and secondary data sources and assist in knowledge creation.

A mixed-methods approach is well suited to this study because the research focuses on understanding complex social phenomena and real-life situations associated with energy. Therefore, it was decided that the data collection would include qualitative analysis, which is dependent on the researcher's and participant's experiences. Wellington and Szczerbiński (2007) indicated that, as opposed to using quantitative data alone, qualitative data analysis allows researchers to use analytical and integrative skills and the knowledge of the context where the data are collected.

To add to the rationale, studies that use a mixed-methods approach gain a broader, more profound understanding of phenomena than research that does not use both quantitative and qualitative approaches. Other examples in which methods are reviewed, and the following advantages are given include the study by O'Cathain et al. (2007), which carried out a systematic review of how mixed methods are used in health services. The study found that both methods compensate for the gap left by either qualitative or quantitative methods. Another value of a mixed-methods approach is that it gives confidence to the reader when looking at the results and conclusions of the research.

Additionally, according to O'Cathain et al. (2010) and Richards et al. (2019), another advantage of mixed-methods approaches is the integration of data collection, which gives researchers more assurance in the results and the assumptions they draw from the study. In addition, mixed-methods approaches assist in building and highlighting gap areas for future research. Creswell and Creswell (2018) and Creswell and Plano Clark (2011) highlighted that mixed research could be evaluated by looking at both methods as being rigorous and setting research within philosophical assumptions, as has been done in section 4.4.

In addition to the survey and interviews in this study, the researcher employed a novel idea of collecting data rarely used in the study area and context whereby participants collected data by self-recording their energy use and what they understood to be energy-related tasks. Over the years, the use of mixed research methods has increased. Combining two distinct methodologies can bring more value and exploration to the research area. Given enough resources, time and expertise, mixed methods can be adopted to investigate multiple areas simultaneously, such as collecting data from a large population using a survey and then using the same population to investigate other areas that the survey did not clarify by using interviews (Engel et al., 2015; McKim, 2017). A survey allows the collection of different types of data, including data that can be counted and data that need to be interpreted. For the study, the survey will aid the statistical analysis of data, minimise the researcher's bias, and the data will also inform the interview question to expand on areas that need more exploration.

Mixed methods have some disadvantages and present challenges. According to Čížek (2009) and Creswell and Plano Clark (2017), mixed-methods research is time-consuming because of the process needed to collect and analyse different types of data. Survey uptake might also be an issue, as well as the requirement for participants to write an explanation on surveys, which can later be interpreted.

Since this study explored a complex phenomenon via remote methods, it lent itself to a mixed-methods approach using qualitative and quantitative methods. The approach used in the study, which includes surveys, interviews, and video recording techniques, can enhance collaborative working from the grassroots and understanding the experiences from the lens of the community itself. According to Saunders et al. (2015), because qualitative methods involve social constructivism, they allowed the study to explore an area of study that has received little or no attention within the research field. Both quantitative and qualitative methods are crucial to providing evidence. Some researchers may need to engage professional expertise in both quantitative and qualitative methodologies; however, the researcher understands both methodologies adopted for this research, leaving room for learning, and reviewing any areas that may appear to be complex within the methodologies.

4.11 The rationale of method 1: Survey

McDonald et al. (2017) state that a survey strategy is one of the popular and commonly used approaches in social research. One of the main advantages of using population surveys is capturing a representative sample of a given population. It is a disadvantage if data are collected at centres such as clinics and schools; this may miss a more significant, representative portion of the population. However, since Harare Metropolitan Province consists of more than 26 suburbs, this research included the whole Harare urban area by calculating the sample, as shown in section 4.16.1.

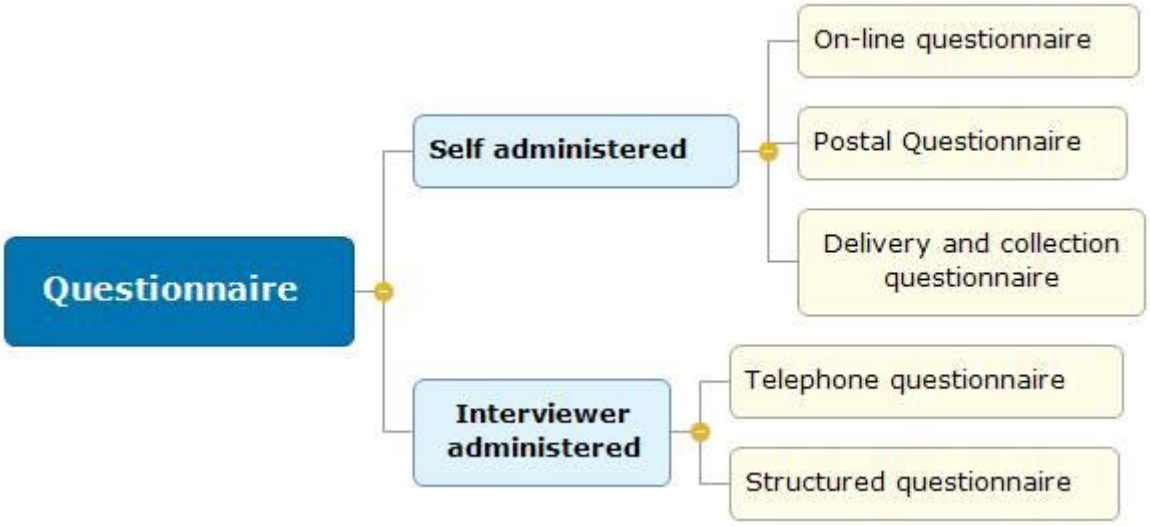
Denscombe and Denscombe (2010) highlighted that a survey strategy could be implemented using multiple methods: questionnaires, interviews, documents, and observations. Some businesses and companies have grown and improved their customer services by using surveys. Usually, businesses use surveys to conduct market research by asking customers

to complete surveys online or in hardcopy form. According to Nardi (2016) and Collis et al. (2003), a survey is used as a methodology with a positivistic stance. It involves collecting data from a sample of any given population studied to gain knowledge and make inferences about the entire population.

For this research, the survey was selected strategically for the following reasons. The survey was used as a recruitment instrument and owing to the limited time and targets within the PhD journey, an online survey strategy was a suitable method. In addition, Zimbabwe is a level 4 risk area because of political instability, which meant that it was unsafe for the researcher to travel to Zimbabwe and conduct research in person. Therefore, the target audience was reached virtually using online surveys, interviews, and self-recording videos.

Returning to the justification for the use of a survey in this study. Saunders et al. (2015) highlighted that a precise formation and outline could minimise issues with the survey's response rate, validity and reliability. Saunders et al. (2012) distinguished survey questionnaires by categorising them into two distinct groups: Self-administered and Interview administered. Figure 5 show the categorisation.

Figure 5: Types of questionnaires based on the categorisation of questionnaires by Saunders et al. (2012).



In this study, self-administered was followed via the online survey. Online surveys were suitable for the study as the other methods could have been time-consuming, and due to travel restrictions, this method was suitable for the study. However, access to the internet was a concern and could have hindered the participants' participation in the study due to the cost of internet services in Zimbabwe. However, during the ethical application process, the researcher considered that participants who did not have credit for internet bundles or services would receive an allowance from the researcher; thus, no participant would feel pressured to use their resources for the study.

Fitzpatrick (1991) and Jenn (2006) suggested that a questionnaire is used as an instrument for collecting information to answer the research question, and this research used an online survey, although some surveys can be distributed using postal services and telephone interviews. Owing to the distributional methods and different designs, each survey will need to be designed differently. Sekaran and Bougie (2017) stated that a questionnaire is a preformulated written set of questions used to record participants' answers to the research questions. Lau and Kuziemsky (2017), in a similar way to Sekaran and Bougie (2017), added that the survey technique asks each individual in the research sample to answer the same questions in a predetermined order. The primary purpose of surveys is to draw correct information from the participants. The methodology relies on trusting the participants for the correct information.

Nevertheless, there are disadvantages to note when using questionnaires, and the researcher has no control over how the participants complete the questionnaire. It is also difficult for the researcher to ascertain if the participants are responding by themselves or if someone else is completing the questionnaire on their behalf. This process can cause some of the questions not to be answered accurately. Another disadvantage is that the researcher cannot be present when participants complete a questionnaire such as an online questionnaire. When the researcher is not present, the participants may not have the opportunity to ask questions when confusion arises when answering the questions. According to Szolnoki and Hoffmann (2013), online questionnaires also have a low response rate when compared to face-to-face questionnaires. However, Saleh and Bista (2017) argue that online survey responses are influenced by how the survey is structured, how it is distributed and clear communication. Participants respond better to surveys that are clear on confidentiality. In most cases, researchers can have more responses from participants if they perform follow-ups and provide incentives for participants, such as rewards.

4.12 The rationale of method 2: Semi-structured interviews

Interviews are one of the methods used to collect qualitative information. Saunders et al. (2012) added that interviews further give the researcher a platform to explore areas not covered by surveys. An interview is regarded as a conversation between the researcher and the participant, which can be done face-to-face or remotely over the phone (Lavrakas, 2008; Schober, 2018). In this study, interviews were conducted online. The participants were selected by going through the list of participants who completed the survey questionnaire and left their details for the interview phase, as mentioned in section 4.13. According to Lewis-Beck et al. (2003) and Given (2008), it is essential to consider participants' schedules; they might be busy, and rescheduling should be considered.

DiCicco et al. (2006) highlighted that using semi-structured questions allows research to be more flexible and makes it possible for prompts to be used by researchers during the process. During the interviews, participants may be asked to clarify unclear points, and the interviewer can ask for more information, which is made possible when using semi-structured questions (Bowling, 2014). Kallio et al. (2016) and Rubin and Rubin (2012) highlighted that the development of semi-structured interviews is not standard across the board and can be formulated according to the study area. Interview questions can be developed using other types of structure, such as focus groups or group interviews. Researchers can also use structured, unstructured and semi-structured interviews (Göras et al., 2020; Vaughn et al., 1996). Ingrid (2006) and Robson and Poole (2003) added that the researcher can modify the questions throughout the interview by adding prompts. Modifying the questions will help the researcher probe the participants for more information in the area of interest and answer the research question. Moreover, this will help shape the interviews that will follow.

Unstructured interviews are conversations between the researcher and the participant where the questions are open-ended, and the researcher will encourage a natural flow of the interview (Robson & Poole, 2003). According to Robson and Poole (2003), they are, at times called informal interviews. Semi-structured and unstructured interviews are both used to collect qualitative data. Therefore, this study employed a semi-structured interview schedule with open-ended questions.

It is also important to highlight that interviews are subjective and may lead to possible biases due to how the researcher the interview process. At times, the researcher's attitude when asking questions can affect the participant's responses to the questions. In addition, biases can also be extended to when the data are being analysed and presented. Althubaiti (2016) added that it is also essential that the researcher's opinions about the subject matter do not influence the interviewee, as this can also cause leading and bias. It is, therefore, essential that the researcher conducts the interviews with a clear frame of mind.

The researcher should develop rapport with the participant regardless of the intended goal. Interviews are also a way for researchers to learn how participants feel and their attitudes, which is a skill learned through the interview process. Though this research was done remotely, it was crucial for researchers to notice any discomfort that may arise because of the nature of the interview and be able to stop the interview when necessary.

Energy poverty has a negative impact on people's lives; therefore, when interviewing participants during research, some of the questions about their health and education might cause discomfort for the participants and how energy poverty impacts them, or their health can cause participants' distress. Rapport was developed by doing pilot interviews using the same group of participants, which will allow for any refinement of questions that may arise.

Because of the amount of data collected during interviews, typing the transcriptions can be time-consuming. Audio recordings can be unclear, which can also cause loss of data, and it might not be possible to ask the participants or ascertain what they were saying. However, clarity can be gained from asking another participant for the response but yielding different information. Rutakumwa et al. (2020) suggested that researchers should always take notes during and after interviews, although this can lengthen the interview time.

An Olympus digital voice recorder and a small microphone were used. The researcher knew that some of the conversations might be inaudible because of external noise, wind, and other sounds. Therefore, where there was interference, the researcher took additional notes. Spare recorders such as an iPhone were used in case of malfunction of other recorders.

Although residents in all the countries in the southern African region speak their native language, most residents speak English as a second or primary language. The study could have recruited a local language translator to support interview participants who would not be comfortable being interviewed in the English language, and this was due to the different languages spoken in Zimbabwe, such as Shona and Ndebele. The translator would have been selected according to qualifications, speaking different languages in Zimbabwe and previous work as an interpreter. However, recruiting a translator for this research was unnecessary as the participants spoke in languages known to the researcher.

4.13 The rationale of method 3: Self-video recording

Video recording also helped identify areas that interviews could not capture, primarily because this research was conducted remotely. Vez and Bertani (2017) highlighted that technology has improved in the last 20 years and significantly impacted education and other industries. Different equipment is used to record videos, such as smartphones, cameras, laptops and pad and desktop computers. According to Rich and Patashnick (2002) and Ledema et al. (2006), researchers have depended on observing communities and their behaviours, and the use of modern technologies is evolving. Modern technologies include video recording, using existing information such as documentaries from YouTube, Facebook and audio recording. Susoy (2015) highlighted that video recording is used by pre-service teachers to self-record their teaching in the practicum. However, in this previous study, the teachers had to report their experiences, reactions, and perceptions of using self-video recording during the teaching session.

4.13.1 Application to the study

In this study, the participants were self-recording using their mobile phones. They were not asked to watch and give feedback on their self-recording. Susoy (2015) noted that the teachers became aware of the classroom atmosphere and understood students' learning experiences after watching their self-recorded videos. This research indicated that it is possible to gain knowledge from video recording and discuss and comment on essential areas. Wang and Lien (2013) supported video data collection, as the researchers can capture participants' interactions in their environment. Videos also capture non-verbal cues. Wang and Lien (2013) highlighted that a limitation of video recording is that the investigators can interpret the same video differently, and this can cause ambiguity in data and thus lessen its validity. The triangulation in this study, however, helped establish reliability and validity.

All participants needed to make sure that anyone appearing in the videos had signed a consent form so that the data could be analysed for the study. According to Sanjari et al. (2014), participants might face issues with privacy and presenting data with openness and honesty; thus, data can become unreliable. Confidentiality also played a role, and all the details were given to the participants on the information sheet. The videos collected were only used as research data, not for others to view.

Due to time limitations for the study, only ten participants or householders agreed and were asked to self-record videos of their day-to-day activities in their homes over five days. However, data saturation was reached for the context being studied, though it would benefit future research to employ the same data collection methods in the rural settings of Zimbabwe.

The participants were selected on the basis of location in Harare Metropolitan Province and experiences of energy poverty, as well as from the survey respondents and those who were interviewed and willing to participate in the self-video recording. The participants were above 18 years of age, as in Zimbabwe, the Legal Age of Majority Act 1982 states that anyone under the age of 18 years is a minor. The age guidelines were important because the law in Zimbabwe had to be followed to avoid any consent issues, especially when video footage was involved.

Gender was also used as a selection criterion by including both males and females doing separate or joint household video recordings. The participants recorded activities such as cooking, ironing and other daily routines linked to energy use over the five days. The videos were 15-minute recordings, even if the participants were recording throughout the day where possible. The short video clips helped when the data were being transferred to the UK. The participants submitted the video recording data to the researcher via the researcher's University of Salford email. Once the videos arrived, they were stored in a password-protected OneDrive folder

in accordance with the principles established in the GDPR and the Data Protection Act 2018. The context of Phase 4 was semi-structured interviews with 12–15 stakeholders who work within the energy sector in Harare Metropolitan Province. The stakeholders would be recruited from different sectors; therefore, the number was predetermined.

Due to COVID-19 restrictions and limited time for the research, I could not contact a more significant number of stakeholders to gain a broader overview of the energy sector. Time limitations caused a limitation in gaining more detailed information about the Zimbabwean energy sector's regulatory processes and structure from the perspective of the energy sector players. However, the following stakeholders from different sectors were selected to participate in the study: four participants from private energy, three from non-governmental and two from public energy sectors. The stakeholder's contribution would answer the research objectives one, four and five, giving a balanced argument based on each sector's experience within the energy sectors. In addition, to gain more knowledge and overview of the regulatory processes of the energy sectors between the licensees and the public sector.

4.13.2 Other considered methods

Different methods have been proposed for this study but were not appropriate. Participatory approaches will create knowledge and use that knowledge for action or social change (Minkler & Wallerstein, 2008; Minkler & Wallerstein, 2010). According to Israel et al. (2012), participatory approaches continue to emerge and are widely used to support equitable participation and address community health problems collaboratively. But due to the study's design and the requirements of the participatory approaches, which include involving the participants from the research design to the results of the study, the method was deemed inappropriate.

4.14 Pilot survey

This study undertook a pilot study to ensure the feasibility of the full-scale study and try out the questionnaire, and changes were made accordingly following feedback from participants. A pilot study was defined by Arain et al. (2010) as a mini-study that is designed to test numerous aspects of a full-scale study. The primary purpose of a pilot study is not to answer the study's question but to prevent researchers from wasting time and money by launching a large-scale study without knowing if the proposed methods will work (Hill, 2010; Timmins, 2013). Lowe (2019) added that pilot testing includes testing the instrument with different types of data for quality and appropriateness.

According to Hull (2010), a pilot study done with due diligence can help identify confounding factors not previously known before designing the study. Teijlingen and Hundley (2002) highlighted that a researcher could collect preliminary data by conducting a pilot study, determining the sample size, and revealing logistical issues that the researcher might not have known. To conclude on pilot testing, testing a research instrument is an exercise that cannot be overlooked in research, especially when using an instrument designed to communicate with an ordinary population (Burns & Kho, 2015; Hunt et al., 1982; Memon et al., 2017). Hulland et al. (2018) supported the need to test an instrument before collecting the primary data to establish any critical issues. In addition, Sekaran (2010) emphasised that testing the research instrument ensures that the survey questions are clear to the participants and that they understand what they are being asked to answer.

According to Allen (2017), the researcher should also avoid leading questions when designing survey questionnaires. The researcher should also consider and ensure that the survey questions will not upset the participants, though it can be difficult to predict what could potentially affect participants. Researchers should include details of counselling that will mitigate if participants are affected during the completion of the survey and interviews (Kelly et al., 2003). This study provided details of counselling services on the information sheet to those who may have been affected by the research questions.

According to Peng (2014), researchers use closed questions so that the respondents answer the survey quickly, which makes completing the questionnaire less tasking and uses less time. Saunders et al. (2012) supported Peng by highlighting that fixed alternative questions can ask about beliefs, behaviour and attributes. Willig (2013) and Parker (2005) pointed out that questions relevant to the study population are crucial, as participants are more inclined to answer questions that resonate with their experiences.

A Likert scale can measure responses, and the numbers on the scale can range from 1, representing the lowest impact, to 10, representing the highest impact. Researchers decide which scale to use for measuring and what the limit is when responding to questions. The four-point Likert scale encourages respondents to make an easy choice (Iarossi, 2006). Therefore, in this research, most of the questions were closed questions to ease completion. The questions required two or more answers (defined choices), and participants would respond using a Yes or No answer. Closed questions were coded in a numerical format for statistical analysis. Open questions were asked to establish if participants were willing to participate in the research, and they had to leave their contact details if they wished to participate in the next phase of interviews.

4.15 Stages in survey preparation and distribution

This section justifies and outlines the survey stages which were followed in this study. Lavrakas (2008) highlighted that conducting a survey involves more than designing the survey questions and collecting data. Regmi et al. (2016) in their research highlighted three stages necessary to have a clear and concise survey. The three stages comprise: (1) clear and detailed questions; (2) the implementation should be adequately calculated in some cases: older participants might prefer paper surveys to an online survey, which the younger generation may prefer; and (3) consideration of designing the questionnaire by giving thought to the formatting and relevant questions for understanding the phenomenon and selecting the survey instrument, which was a Jisc online survey in this case. In contrast, Burgess (2001) recognised six stages in the process of creating a survey. The Burgess (2001) six stages are listed below, from which this study adapted the stages when designing the questionnaire as listed below.

Burgess's six stages in the design of questionnaires

1. Defining the objectives
2. Determining the sample group
3. Writing the questionnaire
4. Pilot study
5. Administering the main questionnaire (main study)
6. Interpretation of the results

4.16 Selection of case study: Survey

There are different factors that prompted and influenced the decision to conduct this research in Zimbabwe. Firstly, as stated in section 3.5 Harare Metropolitan Province was selected as the case study due to the challenges with load shedding and power cuts. The power cuts have been noted on world news and presented as severe, affecting

communities and the economy. Secondly, I was born in Zimbabwe in 1980, shortly after Zimbabwe's independence. This was the time when Zimbabwe was thriving economically. I then migrated to the UK in 2001. During my visits to see my family, I noticed a difference and change in energy supply, primarily long hours at times of day with no electricity compared to when I lived in Zimbabwe. Before I migrated to the UK, power cuts were averaging maybe two a month at least where I grew up, mainly when an electrical fault was caused by rain or the electricity supplier ZESA was doing maintenance of the substation. Nowadays, long spells of power cuts and Load shedding are a phenomenon that started a few years after I migrated to the UK and has become a widely used method to mitigate Zimbabwe's energy deficit.

Returning to the study location, the Harare Metropolitan Province neighbourhoods were a selected mixture of high-density and low-density suburbs. In Zimbabwe, the high-density suburbs consist of buildings built closely together, mainly for the working class, and most households are poor or live below the poverty line. The low-density suburbs are built on sprawling lands and are mainly owned by the middle class, upper middle class, and upper class.

On the 16th of April 2020, the University of Salford travel office checked the overall rating of Zimbabwe using the Drum Cussac website and noted that Zimbabwe was rated high risk at 4.00. Therefore, the university's travel and fieldwork policy does not allow staff or students to travel to countries rated 4.00 or above. A decision was then made to conduct the research remotely. Since the researcher could not travel to Zimbabwe, the researcher collected the data via surveys and conducted interviews virtually via TEAMs and phone calls.

4.16.1 Selection of the survey sample

It is impossible to collect data from the whole population; hence, a sample is usually taken, and a survey is then distributed. Brereton (2015) highlighted that a population is a large group of people with interests that researchers may wish to investigate, and Saunders et al. (2012) noted that a population is where researchers can collect sets of cases or different variables from a sample.

In this study, participants from Harare Metropolitan Province comprised the study sample. Within the sample, there were householders and stakeholders representing the energy companies. It was predicted that the number of participants in this study's survey would reach 385 (from the total population of 1.5 million in Harare Metropolitan Province). This group of people would include employed people, students and those affected by load shedding. While the Harare Metropolitan Province suburbs are spread out across Harare, they share similar energy-related problems.

Probability sampling was employed for selecting the study's sample from the Harare Metropolitan population; according to Clark and Steel (2022), it is selecting a specific group of research participants from a large population. Novosel (2023) added that though this method is time-consuming and costly, it is considered when selecting a sample, which should be considered to understand a population and variances in understanding the means and totals of a given population. Therefore, despite the time restrictions for this study and consideration of literature, probability sampling was considered due to its efficiency in accurately representing the population.

This section presents the study sample calculations. According to the Zimbabwe National Statistics Agency (2012), Harare Metropolitan Province has 1.5 million residents. Therefore, using the sample formula and considering the total population of 1.5 million at a 95% confidence level and a 5% margin of error, the size of this study's expected survey sample

was 385. A sample size was deemed sufficient for the study context and to address the research questions and objectives. An online survey was used to collect data in Phase 1, and the link was shared on the WhatsApp social media platform and by recommendation.

4.16.2 Responses Pilot survey

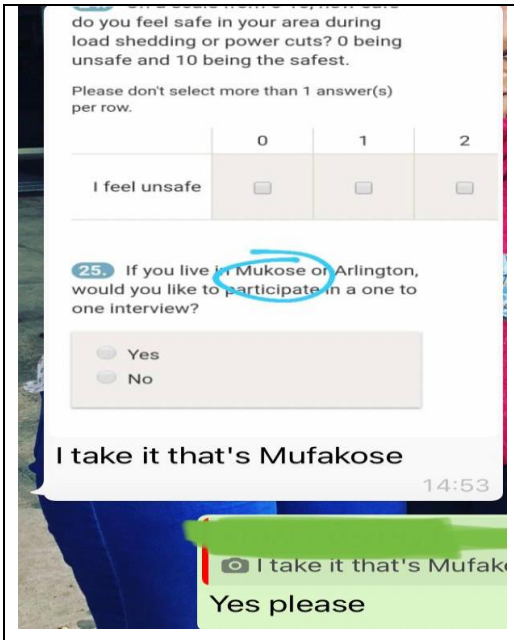
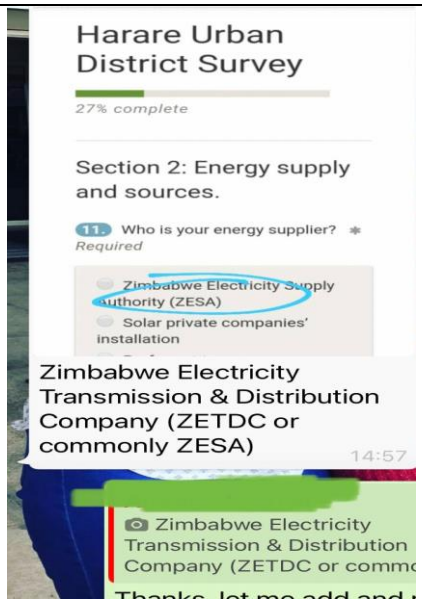
This section outlines the pilot survey responses only. A pilot survey for this study assessed the reliability of the measuring tool and whether the delivery method was suitable for the population. At least 39 residents were needed to answer the pilot survey, to make up 10% of the study sample. For example, 10% of the 385-sample size highlighted in the above section of the primary sample (10/100 × 385 in the primary sample = 38.5, rounded to the nearest whole number = 39 residents).

Connelly (2008) argues that for a sample size between 300-500, a minimum of 10-30 participants would be the appropriate size for a study. Johanson and Brooks (2010) argue that a small sample should be considered with caution depending on the factors the research may be investigated. Considering the literature from the pilot survey,83 (22%) participants responded and met the location criteria and completed the survey.

All the participants who completed the pilot survey were asked to feedback to the researcher in any case, and they identified difficult questions, language vagueness and any other mistakes within the survey. The participants were also asked to give feedback on the time it took them to complete the survey and if they thought it was reasonable. The researcher then corrected all the mistakes and continued to assess the questions to achieve the research objectives.

The researcher received some positive feedback that the survey was easy to complete, and some participants pointed out some corrections. For example, Table 5 shows a participant pointing out errors in questions 11 and 25 of the survey. Mistakes were identified, and issues were corrected as soon as feedback was given. The participants' corrections were not significant changes. Therefore, it does not hinder using similar questions to collect all the studies, integrating the data gathered through the initial pilot survey as valid as part of the primary survey data. According to Malmqvist et al. (2019), if the pilot study questions are modified by rewording and shortening questions before the final version, the pilot results and results of the finalised questionnaire should not be mixed. However, for this study, only minor changes were made to the survey, and therefore the data could be combined with the final collected data.

Table 4 Participant's comments on the correction of the survey.

4.16.3 Responses to all survey data

This section will give an overview of the final survey data. Because there were no significant changes to the survey questions following the pilot study, pilot data were integrated with primary survey data results.

Following the pilot results, the survey remained open, and when it closed. The survey reached 115 participants, including the abovementioned pilot responses. Through the survey, the participants had to indicate if they resided in Harare Metropolitan Province to meet the study's criteria. Therefore, of the 115 reached participants, only 99 met the location selection criteria, and the data was analysed, and findings presented in the results chapters. Including the pilot results, 16 more participants responded after; therefore, 83 + 16=99 participants.

Thus, 99 participants (26%) of the targeted sample of 385 met the selection criteria based on their location and completed the survey. The responses to the survey provided an overview of householders' views of energy services, sources of energy they use and the cost of energy. In addition, the findings from the survey helped develop the interview questions to understand other areas not covered by the survey and evaluate the feasibility of recruitment on a larger scale. In addition, the target sample was not reached as the survey was closed due to the research schedule and the need to commence the interviews.

Table 5 Participant's Gender

Gender	**Participants responded**	**Percentage**
Male	42	42.4%
Female	57	57.6%
Total	99	100%

Table 5 shows that out of the 99 participants who responded to the survey, 42 (42.4%) were male, and 57 (57.6%) were female. These results are based on the 99 participants who met the location criteria. The participants had to reside in the Harare Urban District to meet the criteria.

Table 6 Location of participants

Location	**Frequency**	**Percent**
High-density	49	49%
Low-density	50	51%
Total	99	100%

This section presents the details of the respondents in terms of their location. The overall results are displayed in Table 6, showing that of the total sample, 49% indicated that they live in high-density suburbs, and 51% live in low-density suburbs.

4.17 Consistency in measurement

For this study, Cronbach's alpha or coefficient alpha was used to test the reliability or internal consistency of a set of scale or test items—Cronbach's alpha tests to see if multiple-question Likert scale surveys are reliable. The questions measure the latent variables, which are unobserved variables, such as a person's dependability and openness. These are very difficult to measure in real life.

4.17.1 Cronbach's alpha

Cronbach's alpha will inform researchers if the test you have designed accurately measures the variable of interest. It is used to assume that you have multiple items measuring the same underlying construct. According to Pallant (2016), if you have less than ten items on a scale, it isn't easy to get a high alpha, and on a scale that has anything less than 0.5, it would be a concern. For exploratory research, a reliability coefficient of 0.6 is acceptable; however, in social science, the reliability coefficient should

be 0.7 or above (Taber, 2018; Griethuijsen et al.). According to Eisinga (2013), using a measure composed of two items is an appropriate indicator of scale reliability. Michal et al. 2010 agree that Cronbach's coefficient alpha is frequently used in research to test reliability statistics and that a two-item measure is reported in research. However, some researchers disagree that a two-item scale is appropriate for coefficient alpha and that researchers should use Pearson's correlation (O'Brien et al., 2008; Cramer et al., 2006). However, a two-item scale was used to calculate the alpha in this study. Eisinga (2013) further supports that Cronbach's alpha can be used as an appropriate estimate of reliability when the assumptions are restrictive.

4.17.2 Cronbach alpha results

Below are the results of the reliability analysis using Cronbach's alpha are shown in tables 7.

Table 7 Reliability Statistics: consistency in measurement

Cronbach's Alpha	N of items
.652	2

Table 6 shows the value of the coefficient alpha for the 2-item scale. The value of the coefficient is 0.70, which indicates a high degree of internal consistency among the items on the scale.

4.18 Selection of the interview participants

Firstly, through the online survey consenting householders were selected according to their location. Only those who lived in Harare Metropolitan Province completed the survey and participated in the semi-structured interviews and self-video recordings. The researcher had to contact the

participants via telephone to arrange interviews. During the interviews, the researcher would ask those who consented to video recording to start the recording as per the instructions on the information sheet. As discussed in section 4.13, video recording done by householders also helped identify areas that interviews could not capture, primarily because this research was conducted remotely. Secondly, the participants who were selected were those who were directly affected by load shedding and gave full consent, with a balance of males and females and across age groups. Lastly, when the participants were selected according to the criteria, the interviews began, and questions were refined during the interview process to gain answers. The process was done virtually, either via teams or telephone.

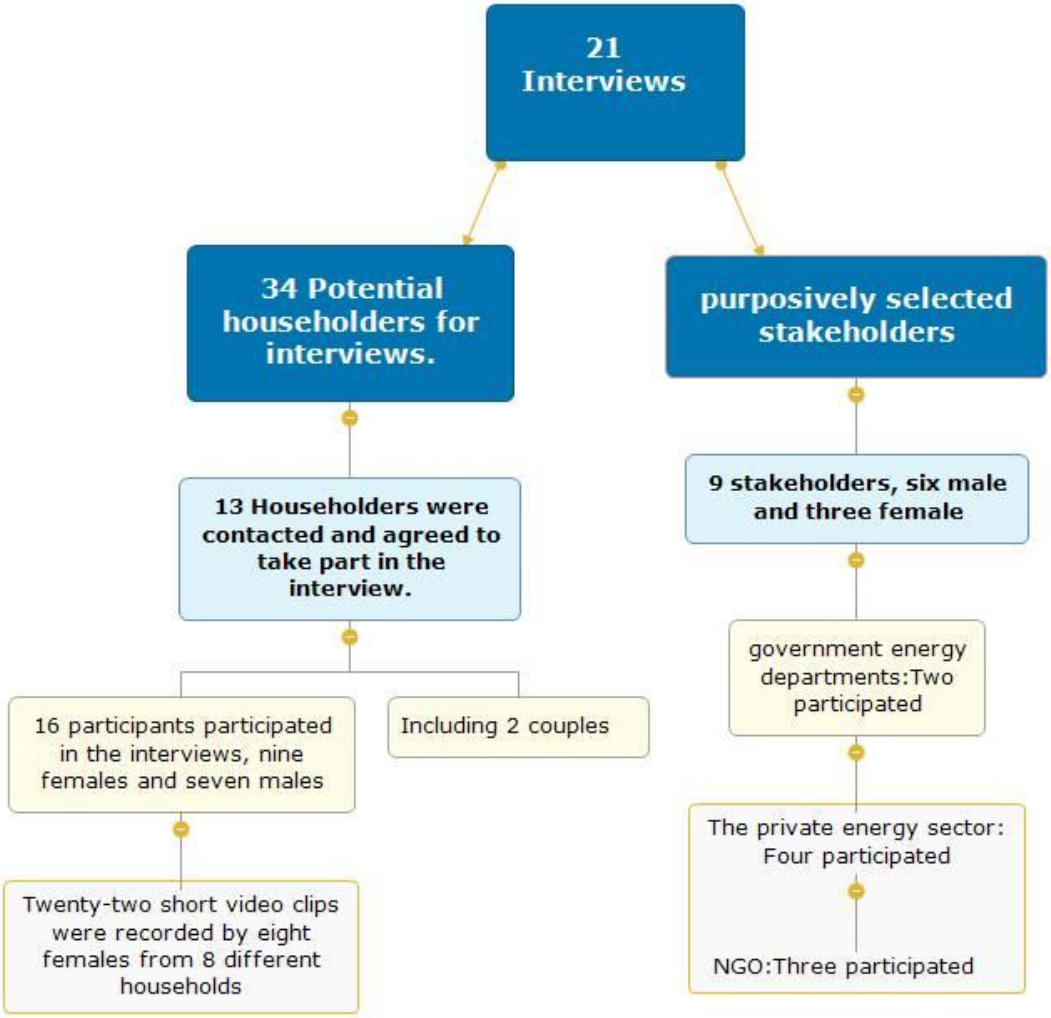
The stakeholders were recruited using purposive sampling. Purposive sampling is flexible when selecting participants. In this case, the stakeholders were from the public and private energy sectors; hence, the sampling had to be specific. The stakeholders' companies were selected from Harare Metropolitan Province and were also involved in renewable energy. Private sector companies are registered through the Department of Companies and Intellectual Property in Zimbabwe.

According to Creswell and Plano Clark (2011), purposive sampling allows the researcher to recruit participants on the basis of their experiences. Palinkas et al. (2015) also noted that using this sampling method will enable the researchers to gain rich information from participants. Despite the benefits of purposive sampling, Sharma (2017) highlighted that purposive sampling could also lead to biases based on the researcher's judgemental selection. As a result, researchers should clearly describe why they chose their sampling strategies and provide the rationale for the strategies (Palinkas et al., 2015). Researchers use this method when they have already thought of selecting participants according to pre-planned selection criteria (Creswell & Plano Clark, 2011; Denzin & Lincoln, 2011).

4.18.1 Responses from interviews and video recording

As per the outline in Figure six, 21 online interviews were conducted in the study's second phase included, including householders and stakeholders. Firstly, and in line with Figure six, 34 household volunteers who responded met the survey criteria and left their contact details to participate in one-to-one interviews and self-video recordings. Due to the delay in ethical approval and research timelines, only thirteen households were contacted, and 16 householders participated in the interviews, nine females and seven males. The Twenty-two short video clips were recorded by eight females from 8 households while doing day-to-day tasks such as cooking. Another part of the second phase included purposively selected stakeholders who participated in the interviews; Nine stakeholders, six male and three female, were interviewed from the government energy departments, the private energy sector, and NGOs.

Figure 6 shows the interviews outline.



To understand the experiences of the participants fully, the findings in this phase combined the survey results, the interviews, and the videos. The purpose of highlighting the quantified data and specific quotes from the qualitative data is to indicate the experiences with power cuts and load shedding of the participants in different locations of Harare Metropolitan Province, according to their household conditions.

4.18.2 Summary

Considering the literature above, the research adopted the online questionnaire approach, efficiently reaching the target audience. When participants complete an online survey, they may also complete the questions informatively and reveal their problems compared to an interview, where some participants may be embarrassed to reveal all the information. Using a survey for this study will also help to serve as a reference point for future research to use surveys in other areas of the research context. The survey for the study was designed to establish information using the following categories: Participant demographics, Energy supply and sources and Energy affordability and quality of life. In developing the questionnaire, literature evidence was used to support the questionnaire's formation and the advantages and disadvantages of collecting data using surveys was considered.

4.19 Data analysis of the pilot and final survey

This section presents the analysis of the survey data. The primary purpose of the data analysis was to provide practical answers to the research study as presented in Chapter 1 and primarily to inform the interview questions. The information on the survey was analysed using descriptive statistics, which helped provide a general overview of the research characteristics such as population demographics, energy sources, services, affordability, and quality of life of respondents. At first, an inspection of histograms was done to check the assumptions of normality, and in line with the Shapiro-Wilk tests, the assumption of normality was violated. Due to the violation of the assumptions of normality, we selected non-parametric tests. The chi-squared test for independence was used to understand the relationship between demographic characteristics and location in low- or high-density suburbs. Spearman's correlation was used to test if there was a relation between variables such as location and preferred energy sources. In addition, at the stage of preliminary data

analysis, cross-tabulation generated two-way tables of categorical variables to display the association of one variable with another. The cross-tabulation also helped establish any relationship observed between any of the two or more categorical variables.

4.20 Data analysis of interviews and self-video

This research employed thematic data analysis, according to Braun and Clarke (2006), to analyse the semi-structured interviews and self-recorded videos. However, for clarity purposes, the way the video and interview data were analysed differed because of differences between the audio and visual data. NVivo software 1.7.1(1534) version. was used to extract audio data from the semi-structured interviews. The researcher transcribed and collated, the interview data and thematic analysis stages outlined in section 4.13 were followed to complete the analysis. The following paragraph will highlight how the video data were explicitly extracted from the video recordings to the transcripts using NVivo software 1.7.1(1534) version before analysis was completed using the thematic analysis.

The transcripts were created by uploading the videos, which were watched in NVivo software, and the participants' narration and any visual notes indicating body language were noted. The narration of video data that examine participants' experiences will involve the researchers examining the participants' lives through visuals. The process will require some participants to give a self-recorded or professionally recorded video account of life experiences. It is then followed by the researcher analysing the participants' views of their lives by looking at the visuals in the data and what is being said by the participants.

According to Ramey et al. (2016), video data can be seen from multiple perspectives. Although not much has been addressed fully in the literature, Ramey et al. conducted a study that investigated how video data can be analysed to achieve research objectives. Ramey et al. focused on three areas to analyse video data. These three were as follows: (1) transcriptional tensions, (2) defining the unit of analysis and (3) representing context. This research employed these concepts. Each of them will now be described, as well as how they were used within the research.

Transcriptional tensions: The main aim is to select which interactional phenomena need to be transcribed. Ardhendu et al. (2020) highlighted that video uncovers the comprehensive range of visuals used when talking, such as gestures, gaze, body positioning, facial expressions, movement, and objects that may help participants share information. Visuals such as facial expressions such as looking happy or sad were pivotal to this research. This was information noted during the video analysis separately from the words spoken by the participants, as they may have had differences in meaning. Considering cultural differences, some objects may be explicitly known in vernacular language by the participants. Still, if they are shown in the video recording, a description of the objects can be made on the basis of the footage.

Defining the unit of analysis: When videos are recorded, they can bring qualitative information that can bring different meanings and changes to codes that could have been made without visual content, such as gestures and objects. At times, video recording can start with participants talking without including objects, from which assumptions can be derived. However, later, they may include a visual gesture or show items clarifying their point and transforming the earlier assumption into a different meaning. Therefore, in this research defining the unit of analysis allowed the analysis to use this technique of noting any new meanings based on different descriptions given by the participants. The unit of analysis is the

phenomenon being studied; in this case, by selecting the communities of Harare Metropolitan Province and stakeholders to understand energy justice through lived experiences in Zimbabwe. The unit of analysis is important for both quantitative and qualitative methods. This research identified variables in the unit of analysis, such as the differences within the low- and high-density suburbs regarding what may vary in terms of energy distribution. Other variables included income and poverty rates.

Representation of context: Visual details make these easy, as captured surroundings of contexts and events aid an understanding of areas of interest in this research. A video clip that includes firewood or a gas cooker can be crucial, as the research is associated with energy issues and energy sources used. The dynamics of contexts are why the video data were included as part of the research, which showed the participants' experiences from their point of view. Participants were able to narrate details of what they perceived to be much more essential and affect their lives as a result of load shedding. The video recordings allowed the researcher to view the challenges faced by the participants visually in the case of not being in the context in person.

4.21 Coding of questionnaire and Codebook

The data were retrieved from the online survey data services. Then the responses were coded using numerical values, and the responses were input into SPSS to analyse the data. Table 8 highlights the way in which the questionnaire was coded. The specific questions on the questionnaire from which the data were collected are indicated.

Table 8 Example of coding.

Question no.	Coding
1: In which suburb of Harare Metropolitan Province do you live?	High density = 1 Low density = 2 Missing = 9
2: What best describes your gender?	Male = 1 Female = 2 Prefer not to say = 3 Prefer to self-describe = 4 Missing = 9

4.22 Methodology reflections (Remote data collection)

This section reflects the remote methodological process. Highlighting the remote data collection, the research areas that had to be investigated could have benefited from having the researcher collect data by being with the participants while studying the research location. Part of the study's design had to be changed from ethnography, which investigates cultural experiences and understanding, to capture participants' experiences using self-video recordings done by the participants.

The process of PhD work required a different level of work and an understanding of different studies that involved remote work and how this could be applied to this work. The research was done under challenging time and travel restrictions. The extensions being offered with the university during the Covid-19 pandemic came in handy due to Zimbabwe's technology being unpredictable because of power cuts and can still cause delays when collecting data. In addition to investigating experiences in the discourse of energy, justice could have been done in the geographical locations to access some disadvantaged community groups who may not have access to modern technology. Still, apart from travel restrictions, the time frame involved in getting ethics applications

and approval proved too challenging to change the research trajectory' or 'challenging, which changed the research trajectory. The remote data collection had to be done using many thought processes. It involved reviewing different literature altogether and reading broader literature. The researcher was limited in travelling because of security issues and the pandemic. This covered both restrictions; therefore, the research methodology was adjusted accordingly by conducting the study remotely.

The researcher had to prioritise how to gain in-depth knowledge of the area of investigation, not how much data were to be collected instead. This had to be meaningful and contribute to knowledge of the energy sector in Zimbabwe. Therefore, to mitigate the disadvantages, available and accessible social media platforms such as WhatsApp, used by Harare communities, were used when calling participants. When there was an issue with internet access, the participants were contacted over the phone for interviews, which were done at the cost of the researcher. The participants who completed the survey were asked to leave their email addresses and telephone numbers to be contacted for the interviews.

4.23 Gaining access to the gatekeeper

First, I contacted the Research Council of Zimbabwe [RCZ] via telephone on 1st June 2020 during the Covid-19 pandemic to understand their procedures as my data collection was going to be virtual, not face-to-face. The RCZ instructed me to send three copies of my research proposal via courier per their procedure. The RCZ also advised me that after my ethical approval, I would need to be aligned with an educational institute, such as University in Zimbabwe and that I should start looking for one who would be my gatekeeper.

I then emailed the University of Zimbabwe formally in May 2020, introducing myself. Following the ethical approval, in April 2021 emailed

the University of Zimbabwe with a letter in the appendices highlighting the help I needed from them. Following the first introductory email, the University of Zimbabwe asked for more detailed information about the study regarding any current background report of the study. I emailed them the research proposal. With the research proposal received, the University of Zimbabwe was happy to assist me during my data collection and if I needed to recruit a master's research assistant suitable for the work. I then contacted the Research Council of Zimbabwe on their dedicated Covid-19 out of office telephone line, informing them that the University of Zimbabwe would be my gatekeeper. The RCZ advised me that following their review of my research scope and due to the way, I was collecting data without direct human contact, I could proceed with working with the University of Zimbabwe.

4.24 Ethical Considerations and implications

Ethics approval was granted by the School of Health and Society research ethics committee (see appendix 1), and the School of Health and Society application ID was 1282. The ethics process was informed by the British Psychological Society's principles and good practices outlined in the Society's Code of Ethics and Conduct (BPS, 2009). The ethics application was submitted to the School of Health and Society research ethics committee via the new ethics application system. Supervisors guided the application process. The application process helped the researcher to understand the importance of having a straightforward sampling method and protecting the participants from any distress, although unlikely, due to the nature of the study.

The participants shared sensitive information about themselves, and the study assured participants that all information shared would be kept confidential. All participants signed a consent (See appendix 5) form before taking part in the research and could withdraw at any time. DeRenzo and Moss (2006) highlighted that researchers should understand

the importance of participants consenting before taking part in any research and that confidential coding of participants' details should be considered.

Information sheets (See appendix 5 & 6)) about the study were given to the participants before the data were collected. They were asked to sign an online consent form with a personal code as the identifier to maintain confidentiality. All participants had the right to withdraw from the study at any point up to 2 weeks after taking part in the interviews, video recordings and surveys and did not need to give a reason, and all their data would be destroyed. Those taking part in the interviews were also told that an audio recording would capture information beyond the interview questions, thus adding clarity and value to the data collected. All participants were assured of confidentiality in accordance with the principles established in the General Data Protection Regulations (GDPR) and the Data Protection Act 2018. All the online survey and consent forms came directly to the researcher via an online survey portal.

The research participants were advised about other present research participants' confidentiality and consent. The researcher informed the participants that it would be essential to read the information sheet and sign the consent form (See appendix 5) if anyone appeared in the video footage. Including their consent form, the research participants were given spare consent forms as hard copies for them and other parties to sign and return to the research assistant. Research by Wiles et al. (2006) highlighted that participants do not always comply with respecting others' confidentiality. The participants were requested to respect and maintain the confidentiality of all the discussions. Krueger and Casey (2009) highlighted that research could not guarantee that all participants would comply with keeping confidentiality.

4.25 Thematic analysis of the self-video recordings and transcripts of semi-structured interviews

Thematic analysis is one of the methods used to analyse qualitative interviews from the participants' experiences and perspectives. It helps qualitative researchers to systematically arrange a broad range of collected information to describe datasets logically and coherently. (Boyatzis, 1998; Braun & Clarke, 2006). Data analyses were carried out to extrapolate findings, using NVivo software 1.7.1(1534) version while identifying key themes that arose (Thomas & Harden, 2008).

Thematic analysis was used to analyse the interviews and include inferences from the participants' video recordings. Survey results were analysed using IBM SPSS Statistics version 27.0.1. Additionally, thematic data analyses also explored the impact of energy poverty and energy insecurities on domestic energy use. Thematic analysis identified similar themes within the collected data, thus gaining more knowledge of the subject area (Braun & Clarke, 2006). Table 9 below gives an outline of the phases of the thematic analysis.

Qualitative data analysis was done using thematic analysis, as this approach does not follow stringent rules such as grounded theory (Alhojailan, 2012). Thematic analysis follows a comprehensive process to identify differences in data when the themes evolve from the data being collected (Greene & Caracelli, 1997; Hayes et al., 2000). Thematic analysis is inductive and deductive when data are analysed (Halldorson, 2009; Niece, 2011).

The aim will be to understand the relationship between variables and compare different sets of evidence relating to different situations in the same study. Therefore, thematic analysis was more suitable for analysing data from this study. Boyatzis (1998) supported thematic analysis by stating that it exemplifies the data greatly by looking at diverse subjects through interpretations. Thus, thematic analysis will be used to understand the

context further using interpretations. When compared to grounded theory, thematic analysis is similar to its process for coding themes from collected data (Braun & Clarke, 2006). Owing to the remote method used to collect data in this study, thematic analysis was selected because grounded analysis applies an ongoing process by returning to coding and analysis throughout the data collection. In contrast, thematic analysis collects the data first before any analysis (Glaser & Strauss, 1967; Miles & Huberman, 1994).

Table 9 Phases of thematic analysis. Adapted from Braun and Clarke (2006).

Phase 1	Familiarising yourself with your data
Phase 2	Generating initial codes
Phase 3	Searching for themes
Phase 4	Reviewing themes
Phase 5	Defining and naming themes
Phase 6	Producing the report

Phase 1: Data familiarisation

Phase one involves developing initial codes by reading the transcribed interviews with due diligence (Braun & Clarke, 2006).Trustworthiness will be maintained by keeping a record of the research observations related to the study from start to finish. The evidence should be reiterative, and questioning of the data should be considered.

This study's initial coding was done using the version of NVivo software 1.7.1(1534). The first analysis stage was categorising relevant information into sections relating to the research questions and objectives. The following initial codes are presented in the next section.

Phase 2: Generating initial codes.

During the fieldwork, as mentioned in section 4.18.1, 22 interviews were conducted for a total of 26 hours and 20 seconds. The interviewees included householders and the government energy departments, the private energy sector and NGOs were interviewed. In addition, eight females from 8 households recorded twenty-two short video clips while doing day-to-day tasks such as cooking. Interview questions for the householders (See appendix 2) and the stakeholders (See appendix 3) were generated to address the topic objectives and research question. The interview schedule for the householder was generated and informed by the survey results to get a clear picture of the study's context. The coding process was proving a structure for the data being analysed. According to Boschmann (2011), coding reduces a participant's words into smaller meaningful ideas by connecting them to specific concepts. Braun and Clarke (2006) noted that coding is a process which evolves towards developing and refining the analytical process of the data.

Each transcript was analysed separately, and initial codes were created, as shown in table 10. The data was organised using the NVivo software. Reference quotations and codes of the combined transcripts were formulated. The researcher coded the transcripts relating back to the research questions and objectives. According to Merriam and Tisdell (2016), researchers should use open coding initially and assign these emerging codes into groups or themes and then sub-themes (Merriam & Tisdell, 2016). Most notably, this coding process was applied in this study to provide the researcher with a clear understanding of the meaning and reflect on the data's emergence to account for similarities and identify exciting aspects of the data that may start forming the basis of repeated patterns. The codes which were formed were based on the research inquiry. The codes populated as more of the data was being analysed. As

per Braun and Clarke (2006), the approach aids data organisation into meaningful categories for easy access and retrieving data during the analysis stage. Initially, 52 codes were created, and then some of the codes which were not relevant were eliminated with the consideration of the research objectives and questions.

Table 10 Phase 2 generating initial codes.

Interview excerpts	Codes
Stakeholder 1 I was part of the company formation, and my role was from designing systems and maintaining all the electrical systems for buildings. In Zimbabwe, we have different sources that generate power. I am also part of the team that is still looking at tapping into all the sources for power generation without getting into the technical details; currently, I am primarily working with renewable energy sources. Our division is also looking into the feasibility of new technologies and ensuring our current projects meet safety regulations. The government has tight regulations on small or upcoming businesses. **Stakeholder 4** Yes, because our business is also word of mouth, those customers will tell the next person or business how we are growing. **Stakeholder 6** Zimbabwe Energy Regulatory Authority [ZERA], it was us private solar companies that came together and said, look, we need to have some governance in the energy sector,	Company role Strategic planning Regulations Business structure Private sector structure

Phase 3: Searching for themes.

It is essential to code and theme all the actual data (Braun & Clarke, 2006) before importing them into the results and analysis table. Following the initial coding process, the emerging codes were refined and labelled, which resulted in 30 themes which were identified and aligned to answer the research question. At this stage, the emerging themes from the interview data focused on the collective ideas and perceptions of the participants. Aronson (1995) highlighted that this stage is crucial in collecting combined ideas and experiences of the research's participants. Sub-themes also evolved in this study, resulting in main themes with different sub-themes organised.

Phase 4: Reviewing themes.

This stage involves modifying and developing as well as combining related themes. (Maguire & Delahunt, 2017). Wellington and Szczerbiński (2007) supported similarities in data by saying that some themes may have been categorised differently initially but that when reviewed, the themes can be regrouped under the same theme. Additionally, the researcher can create additional themes required to support the data further. At this data analysis stage, from the above 30 themes, the researcher grouped the themes into 25 themes that described each quotation, ensuring there was no overlap and building a comprehensive narrative to answer the research questions and objectives.

Phase 5: Defining and naming themes

At this stage, the researcher will determine the category of themes that capture data. Then the researcher will identify the themes according to the data and the research questions (Braun & Clarke, 2006). Following the review of the themes, five main themes and 20 sub-themes from the data analysis. See the appendix outlining the five themes used to structure and focus on the analysis. Also, the analysis revealed a systemic relationship

between disengagement and mistrust, two central themes that emerged from the final naming of the themes. See appendix seven for the final map of themes.

Phase 6: Producing the report.

At this phase, the data will be finalised into the main themes, which will be presented in the results and discussion chapter. Logical and coherent arguments related to the research question and objectives will be guided by the finalised themes (Braun & Clarke, 2006).

4.26 Summary

This chapter has presented and discussed the research approach adopted and justified how the data were collected at each stage. The chapter started by highlighting the research philosophy, and it was shown that the pragmatic philosophical approach and relativist approach were appropriate. The concepts in the research methodology were outlined, as they were used to achieve the objectives and answer the research questions. The chapter also outlined the strategies used when collecting data. The surveys were analysed to gather descriptive statistics, which were used to select community participants for the interviews. The self-video recording was also explored in detail, as it benefited the understanding of communities' experiences. Qualitative and quantitative methods of collecting data were discussed, in terms of which the survey served its purpose of recruiting community participants. The stakeholders were purposively recruited from both private and public energy companies. The survey process was discussed in detail, and literature was used to support both methodologies. Details of how the survey data were analysed were also explored, and ethical considerations were included in the survey data collection process and when conducting an interview.

5 Findings - Energy sector background and householder's stories

5.1 Introduction to Chapter 5

The thesis findings will be presented across three chapters. Chapter five answers objective one and discusses socioeconomic factors and cultural challenges experienced by Zimbabwean communities. Chapter six answers objectives two and three and discusses energy supply, energy access problems, consumer experiences with load shedding, power cuts, and the impact of energy poverty on the people of Zimbabwe. Chapter seven, answering objectives four and five, discusses the national energy operation strategy. Each chapter's findings will be distinct yet interlinked towards answering the research objectives of understanding people's experiences and how they manage energy-related problems, and what energy access, sources, services, and support may be available to ease the burden.

5.2 Background of the energy supplier

This section provides insight into the background of the energy supplier and existing energy systems from the participants' perspective. The key issues to be discussed will, in turn, aid the understanding of the existing energy systems and lead to recommendations to inform policy. The key issues discussed aim to clarify the Zimbabwe energy institutional context and, more specifically, its monopoly nature, the different barriers to causing difficulties in accessing adequate energy supply, and the controversies of prepayment metering systems.

5.2.1 Monopoly

Through the study context, it appears that the issue of energy needs in Zimbabwe is primarily caused by a monopolised system that does not allow flexibility and collaboration by including the private energy sector and involving the community in the decision-making process. The practice of not involving all goes against the procedural justice tenets which advocate for it and demands equitable and democratic involvement of all stakeholders in energy decision-making. As the quotes below highlights, communities not involved in decision-making may impact what the energy justice principles are attempting to moderate.

> *'And the government is responsible through the parastatal company ZESA. No one has a voice within most communities, but the government is responsible for making all the decisions.*
>
> (Musiwa, Householder-3)
>
> *'The government decided that the householders who wished to connect to the primary grid should pay even though many may need help to afford it. Communities were not consulted in the processes which led to these decisions by Zesa, but when you inquire about the connections, you find out you have to pay'.*
>
> (John, Householder-9).
>
> *'In most cases, communities are not involved in decisions about energy-related services.*
>
> (Private sector -Stakeholder-6)

The finding indicates that improving the issues with power cuts and load shedding requires flexibility, new ideas, and collaboration between the leading energy supplier and all energy stakeholders. This suggests that there is value in communities being in decision-making. This interpretation is similar to that of Setyowati (2021), who points out that the involvement

of all stakeholders and communities when decisions are being made shows democracy within the energy sector. Moreover, the expertise of the private sector can potentially bring new insights and perspectives.

Instead, a monopoly in the energy sector could lead to some energy injustices for the community, leading to issues such as dissatisfaction with service, disconnections, high energy prices, and a lack of trust between energy companies and suppliers. Studies (Davidson & Mwakasonda,2004; Stojilovska, 2021) highlighted that having one supplier could cause dissatisfaction if the energy services are inadequate. These results are similar to those reported in this study: one energy supplier has contributed to dissatisfaction with energy prices, which most householders indicated during the interviews. Musiwa (householder 3) explains: "*Zimbabwean government has the monopoly of many sectors in this country, with ZESA being one. With no competition, the energy sector can make up any prices, and where can you turn to as a consumer when there are no other energy companies in the country? It is unfortunate*".

Monopolies and energy justice framework have been the centre of debate in broader literature and can be related to this study in that a monopolised system lack of procedural justice in that it causes a lack of involvement of all stakeholders and communities. Procedural energy justice and monopoly have already been discussed in detail in the literature review chapter of this thesis. ZESA was established in 1995 with no other energy supplier as a competitor. The survey data collected for the study showed that 95% of respondents highlighted that ZESA supplies their energy, confirming that ZESA monopolises the energy sector in Zimbabwe.

The apparent lack of competition does not help to boost the service's quality or motivate ZESA to address national issues and challenges of energy poverty. A monopolised energy sector and energy sectors with more than one energy supply could differ not only in the supply of energy

but also in how they have more energy-supplying companies that can increase competitiveness. A competitive energy market offers different energy tariffs for the energy consumer—in addition to aiding energy consumers in switching suppliers (OFGEM, 2023). However, Deller et al. (2021) found that despite the liberal energy markets, for example, in Australia and UK, where energy consumers could switch their energy suppliers, there were inhibiting factors such as time pressures to look for an energy supplier, worried about the switching process. Norouzi and Maryam (2021) argue that such explanations of having a liberal energy market are unsatisfactory because competition alone will not yield the desired results. After all, leaving the energy market too liberal may also lead to a private monopoly. But Norouzi and Maryam (2021) suggested that independent authorities could regulate the consumer energy market to avoid the government monopolising the energy system.

Adding to the above, Watson et al. (2020) established that consumers are significantly more likely to engage with local energy suppliers under a multiple-supplier model than under the current single-supplier model. This model could work in Zimbabwe, where ZESA could allow small energy companies to produce energy through microgrids to supply some of the electricity deficit to consumers than relying on one energy supplier.

Most householders during the interviews highlighted that with one energy supplier, there are several disadvantages, such as high energy cost and poor service. Most of the householder mentioned that they could not afford energy sources such as coal as alternatives, and the poor provision of electricity made their situation dire and desperate. Energy prices have continued to affect ordinary Zimbabweans, and they are still incurring more power cuts owing to the failure of the energy-supplying company to cover the energy deficit (Nyavaya,2022).

In addition, the householders highlight that they have no choice of switching their energy supplier for better, reliable, and cheap service. Mutede highlights: '*You cannot switch to another supplier but rely on poor government service, which is a big problem'*. Switching energy suppliers has been documented in literature as a method that can help consumers find cheaper energy suppliers or suppliers of their choice (McFadden, 2006; BEIS,2017).

Another point worth noting is that even if householders in this study could not switch energy suppliers, it is crucial to finding cheaper tariffs. There were similarities between contexts with one supplier and those competitive markets in that energy consumers may still be unable to afford energy rates: due to the increase in wholesale energy buying prices and low income. In this study, during the interviews, householders highlighted that they could not afford their energy rates due to insufficient income to cover all essential needs, including energy needs. Hazel indicated that "*Some of my income is from the lodgers or tenants, but at times, the tenants cannot afford to pay rent, and I cannot, in turn, afford to pay for electricity.*". However, what would be considered average household income was unclear during the interviews and could not be extrapolated as some householders were self-employed and some employed. Therefore, the results needed to be interpreted cautiously as it was unclear how much, on average, is classed as regular household income and if the households had a regular income.

Energy prices continue to rise and are not affordable for low-income people (IEA,2021). Thus, choosing to switch energy suppliers does not necessarily equate to energy consumers being able to afford their energy bills, especially those families of low income who would still struggle to pay their energy bills. It is also notable that Zimbabwe is not the only country having one energy supplier; it is a common practice in Southern Africa. An example is South Africa, whose 95% of its energy supply is produced by the Electricity Supply Commission (ESKOM). However, having the chance

to choose can give the consumers more options and, thus, control over their energy services.

Distributional justice, as discussed in section 2.7.1, is connected to environmental justice and advocates for energy plants to consider the locations they are built are not too close to communities. A monopolised energy system may not consider all environmental factors and the supplier's ethical energy production (Deller et al.,2021). Deller et al. additionally noted the effects of using inappropriate energy sources on the environment and impacts on health. Figure six shows a firepit used to cook food and warm water by householders.

Figure 7 Still video image showing a firepit soon after rain and the link to the video.

Musiwa video narration .MP4

Smoke inhalation was experienced by householders in this, as seen in the video (see figure 7) when women were cooking on firepits directly exposed to the smoke and may result in health issues, as noted by Deller et al.

Overall, the section highlighted the issue of a monopolised system as a case that should be addressed to have an energy justice framework that accounts for the needs of the energy consumers. A fair, equitable energy distribution would need to be accounted for in the study context per the

energy justice framework to avoid the injustices brought by the monopolised energy sector (Sovacool,2013). So far, participants' accounts revealed their dissatisfaction with their energy supplier, which is coupled with a broken energy system managed by the ZESA utility energy company. It was established through the interviews that most householders had no options to have other energy providers available but continuous struggles with high energy costs, lack of trust, and poor service. Having discussed how a monopolised system affects energy distribution compared to an open energy market, the next section will address barriers to energy access dues to prepayments meter as identified by the study's participants.

Finally, it is crucial to note that energy poverty in Zimbabwe is directly linked to injustices due to a monopolistic system. A system that regulates energy pricing and makes record profits but does not improve its failing energy infrastructure. According to Bouzarovski et al. (2017), in most countries, profiteering and increasing energy costs seem to be the priority without the progress of improving the supply of clean, affordable, and sustainable energy for all. A report by Russu (2022) noted that high energy prices cause those already in poverty to fall into more energy poverty. In Zimbabwe, energy prices are rising, as noted in the findings, and affecting people experiencing poverty more, leaving them without basic needs, including energy sources. The critical point to make is the argument in the study that communities' energy poverty and energy insecurities are rooted in and arise due to the monopolistic system, which has its internal regulatory systems and policies that effectively ease the communities' burden of energy poverty.

5.2.2 Prepayment metering

The broader literature highlights that if prepayment meters are adequately managed, they can allow householders to manage how much they can spend on their energy costs (O'Sullivan et al., 2014, Qing et al., 2013). Returning briefly to the literature on the subject of Zimbabwe prepayment meters, ZESA (2016) indicated the purposes of prepayment meters: (i) convenience for householders to top up from their homes, (ii) energy supplier debt collection (arrears) and (iii) improved revenue collection for the utility company. Regarding another context, for example, South Africa, Jack, and Smith (2016) support why electricity suppliers use prepayment meters, giving the reason that energy suppliers would need to recover revenue from consumers who cannot pay their electricity bills.

The majority of the householders during the survey highlighted that they pay for their energy through prepayment meters. But still, even though there were some benefits to the prepayment system, some householders, through the interviews, indicated they might not have money to top up their electricity meter. Similarly, to the study's results, and as noted by O'Sullivan et al. (2013), a disadvantage of prepayment meters is that some householders would choose to self-disconnect as a result of not having money to top up their prepayment meters. The literature highlights that ZESA is installing prepayment meters to recover lost revenue from some of its energy consumers. Such approaches, however, failed to address and communicate to the consumers; how much debt would be recovered at each transaction of topping up the electricity units. One major drawback of this approach highlighted was that some householders with existing energy debt feared topping up their electricity. Further analysis of the interviews shows that householders would prefer to buy other alternative energy sources because they thought all their

money would be put towards debts. They would instead purchase alternative energy sources, as highlighted in the interview excerpt below.

> *'Again, since the prepayment meters, some of my neighbours are scared to top up because they owe ZESA money, and they are worried that ZESA will take all their money if they buy the token for electricity. Instead, they will buy other alternatives, such as candles for light, firewood, and gas for cooking. Also, if you have budgeted 10 dollars for cooking, I would understand why they would rather use other means than ZESA taking half of that amount. It is sad because people are not working, and ZESA is to recover their debt without considering where people will get it from.'* (Shamiso, Householder-13)

As per the interview excerpts below, the householder highlighted an unawareness at the initial stages of the prepayment meters installations regarding how much of their debt the utility company would collect or deduct when they topped up their energy, which indicated poor communication between energy suppliers and consumers.

> *'Then they installed prepayment meters. So, since they installed the prepayment meter, I was initially so scared that I did not use it for seven months, thinking they would take all the money. So, now we understand that some of the money we top up in the prepayment meter will remain; they only take some.'* (Yeukai, Householder-6)

Therefore, ZESA's strategy may not result in collecting all the debts unless ZESA effectively communicates with its energy customers. The householders, through the interviews, indicated that it would be helpful for ZESA to send householders statements of how much energy is left each month so that they can keep updated on the existing debt. The main limitation of the prepayment meter installation was that householders reported through the interviews that ZESA did not consult them, and no

information was given to them before the prepayment meter was installed. Householders indicated that they had no choice, but the decision was already made on their behalf:

> *'ZESA forced us to have prepayment meters: I even tried to barricade the engineers once (laughs), but they said I would be arrested, so I had no choice but to let them put one in my house. I owed some energy bills, so they took their money when I topped up and left me with some units.'* (Hazel, Householder-11)

Poor communication between the utility company and its consumers was evident during the rolling out of the prepayment meters. Poor communication may cause difficulties, such as failure to meet the primary objectives of the prepayment meters project. Installation of prepayment meters left some energy consumers frustrated, with no other energy company or citizens' advice bureau where they could seek consumer services.

Due to ZESA needing to collect existing debts by installing prepayment meters, they had to issue transitional bills to the energy consumers before the prepayment meters were installed. The bills were meant to show how much each household owed, and if a household was in debt, the amounts were to be deducted when they topped up their prepayment meters, but as mentioned above, there was no clear explanation of how much the deductions would be. The other issue raised by the householders via the interviews was that ZESA would not update them on how much they still owed, even after months of deductions. The householders indicated that *'ZESA installed the prepayment meters, and if ZESA said you owe them, they would still deduct from your prepayment meter, but you would not get an update on how much they would have deducted'* (Dorcas, Householder-5).

Most consumers highlighted that they could not afford to pay or confirm if their final bill was accurate before the prepayment meter installation. This may imply poor organisation on the part of the energy supplier, with no mediators or energy advisors. Inaccurate billing could lead to consumers having ongoing unresolved debt and anxiety and added stress to their already complex lives caused by power cuts and load shedding. Mistrust of inaccurate bills would also lead consumers not to top up their prepayment meters but to use other cooking methods such as candlelight, gas, and firewood.

As per the findings of this study and according to Zesa (2020), householders' experiences with misrepresentation, miscommunication, and poor customer service from ZESA have exacerbated the mistrust between them. A prepayment meter may not be the solution for energy consumers in this context to be in charge of their bills unless they have the resources or income to top up. Otherwise, householders can still be disconnected from the energy supply even when there are no power cuts and load shedding due to not being able to afford to top up their prepayment meters.

Overall, in this section, the interviewees' accounts highlighted the lack of alternatives to energy provision, rolling out prepayment meters and the monopolised energy sector in Zimbabwe. The study results revealed that householders face enormous challenges, of which many are socioeconomic and mentally draining because of the exacerbated long experiences with energy poverty and insecurities linked to energy affordability, debts, and the lack of an alternative in the form of renewable energy. Also, the results highlighted that poor communication, the lack of trust and consumer representation would need to be remedied.

Despite the study results highlighting the disconnection between energy consumers and energy suppliers, the broader literature highlights that it is essential to identify and include hard-to-reach energy consumers globally. Research by Walker and Devine-Wright (2008); Caramizaru and Uihlein (2020) indicate that, primarily in European countries, engaging energy consumers, despite their cultural and socioeconomic status, is vital towards a just transition. Community engagement can be done through citizens' advice bureaus or energy advisors, but in Zimbabwe, structures such as citizens' advice bureaus are non-existent. Services such as energy advice hubs are essential for energy consumers as a support system, mainly when trust is broken with energy suppliers. Also, energy advice hubs can be an instrument when identifying hard-to-reach energy consumers specific to different geographical contexts; there are multiple factors to consider. Energy advice hubs can manage information about hard-to-reach communities and later identify when resources are available. Still, some factors can be framed using the energy justice framework as per the literature review chapter and will also be discussed in detail in the discussion in chapter 8.

In the Zimbabwean context, the hard-to-reach could be identified and categorised but are not limited to the following: chronically ill, socially, and economically marginalised groups. Before considering possible recommendations, the following section will give a detailed summary of the daily lives of Zimbabwean households. The lived experiences of energy consumers are crucial in shaping policy and gaining a better understanding of their day-to-day lives and expectations than relying on statistics alone (Longhurst & Hargreaves, 2019). However, in the study context, the focus is mostly on producing and meeting energy demands rather than understanding the consumer's needs (Chipango,2021).

5.3 The reality of a Zimbabwean household's daily life

This section will give accounts of how life has been shaped and adapted around energy poverty in the study's context. The motivation for highlighting the daily life stories of the householders in the study is to explore evidence from householders and how experiencing power cuts and load shedding affects their daily lives. The study by Cloke et al. (2017) investigated Global South rural communities. Cloke et al. identified that energy access could not be measured using a simple binary connected to electricity and not connected to the electricity energy approach because of the complex factors associated with energy poverty. In line with achieving Objectives 1 and 2, Cloke et al. (2017) highlighted the importance of a holistic understanding of access to energy and the socioeconomic factors that can impact energy access.

Based on the context and study objectives, the areas discussed in this section will cover three categories: householders' stories and challenges with their daily routine due to power cuts and load shedding, gender dimensions, and sanitation. The categories will be discussed in detail in the discussion chapter; these issues are also related to the Sustainable Development Goals (SDGs), which are highlighted in this thesis's literature chapter two. However, as a combination, these issues will affect the household's daily needs and function, leading to a vicious life cycle with no end in the form of a better solution unless interventions are implemented.

5.3.1 Disruption to daily routine and stories of householders.

Most householders during the interviews indicated that power cuts and load shedding are not scheduled in most cases. Most householders reported facing the dilemma of making plans for the day, as the day may end following multiple unplanned routines depending on the availability of electricity. Householders, through the interviews and video recordings,

reported that some activities, such as meal preparation using electric cookers and looking for employment online, may occur during unsocial hours, such as between 12 midnight and 6 am when electricity is restored. Some householders during the interviews indicated that adequate facilities for storing medicines were affected. Through the interviews and video recordings, all householders reported that cooking during unsocial hours, such as between 12 midnight and 6 am, has become a daily occurrence. "*One householder noted that having no electricity during the day is problematic since my husband is diabetic. I must wake up around midnight or early morning, at 3 a.m. when power is restored, to cook his meal for the following day*" Dorcas's householder 5.

As mentioned in section 5.3.3, some householders would have used all their energy budget to top up their prepayment meters. Hence, using the available energy budget will leave householders no choice but to cook during unsocial hours when electricity is available. These issues may lead householders to have mental exhaustion and difficulty concentrating due to unscheduled power cuts and load shedding.

5.3.1.1 Jessica's story

Jessica is a young mother of two children. She narrated in the video (see figure 8) that it was 7 am and there was no electricity, but Jessica still had to prepare porridge for her children before they attended school. Having no electricity meant that Jessica had to light a fire outside with the hope that it was not raining, since it was the rainy season. Jessica walked around her house, which has poor lighting, to see if there were any plastics and paper, she could use to light a fire outside to cook porridge for her children. Jessica also indicated the issue of cleaning the pot she would have used on the fire as she did not have black pots, which were more suitable to use on an open fire. Stained pots require more time to clean on top of other chores, which Jessica has to attend to during the day.

Figure 8: Still video images and a link explaining the householder's morning routine.

Link to video (7 am): Video 7.MP4

Moving on to the next video in the afternoon, at 2.15 pm (see figure 9), Jessica reported that there was no electricity, and this caused much disruption to the daily routine.

Figure 9: Still video images and a link explaining the householder's afternoon routine.

Link to video (2.15 pm): Video 2.MP4

Jessica narrated that this experience of power cuts and load shedding has caused her to become highly stressed, affecting her well-being, and can be exhausting. She reported that the gas stove she was about to use to prepare lunch for her children does not work correctly, which is a challenge for her. However, Jessica still had to cook for her children on that faulty gas cooker as she reported no indication of when the electricity would be restored.

In another video recording (see figure 10), Jessica reported that it was 5.45 pm, and there was no electricity. Jessica reported not having gas to prepare food for the evening due to not having money to buy the gas.

Figure 10: Still video images and a link explaining the householder's evening routine.

Link to video (5.45 pm): Video 1.MP4

Looking for alternative energy sources such as gas and firewood requires money. Jessica reported at the time that she did not have the money; hence, she would have to wait for electricity to use the units she had purchased previously. Jessica was also distressed as she needed to iron her children's school uniforms. While Jessica was narrating her daily struggles with power cuts and load shedding, she indicated her hardships. It is also clear that Jessica prioritises her children's well-being over her own

by ensuring they have food to eat, even though there are days when she may not have any option to feed her children because of not having energy sources.

In another narration (see figure 11), Jessica narrated that it was 5.25 pm on a different day. Another power cut required her to start cooking using gas, which she had only just managed to afford on that particular day. Jessica described the gas as a small amount as she narrated, which may mean she only purchased what she could afford. Jessica reported that she had to cook using daylight before it got dark. Though Jessica did not get into details, it may be a case of not having the energy sources for light during the dark hours, or candlelight may not give enough light when cooking. During the narration, and not directly related to power cuts and load shedding. Jessica got frustrated as she realised there were no matchsticks when she was about to light the gas stove; hence, she had to travel to a local tuckshop and cook for her children.

Figure 11: Still video images and a link explaining the householder's evening routine.

Link to video (5.25 pm): Video 3.MP4

In another detailed narration (see figure 12), Jessica narrated that it was 5.25 pm on a different day, and there was no electricity. Jessica reported that the evening is mostly when the power cuts are frequent before they

cook and also before the children need their food. Jessica highlighted that she was going to cook using gas on this day before it got dark and before the children started crying, as they do not like nights with no indoor light, as in the above case. It may be the case that Jessica cannot afford to buy candles or lamps for evening light. Jessica reported that using gas gives her a headache, which brings the question of whether Jessica is buying her source of gas from vendors selling substandard LPG, which has flooded the Zimbabwean market and will be discussed in detail in Chapter 6.

Figure 12: Still video images and a link explaining the householder's evening routine.

Link to video (5.25 pm): Video 4.mov

In reference to Figure 13, the following part of this paper describes Jessica's narration from 6.25 p.m. on a different day, and there was no electricity. It is also important to note that due to the nature of the study and the stress associated with power cuts and load shedding, the researcher reminded the participant of the counselling services available and was signposted as per the information sheet.

Jessica reported that in the evening, she did not have gas for cooking; therefore, she would need firewood. Jessica reported in another video that her environment was very dark, which can be noted as an unfortunate, hard-hitting situation to witness on the recording and a deflating experience. As a concerned mother, Jessica highlighted further how her children, particularly the two-year-old child referred to, are affected by the dark and how it affects them as a family. The dark nights affect the children; in most cases, parents may not have access to alternative light, such as candles. Jessica then took us outside, where it was already dark, but that was where she was cooking the evening meal for her children. Jessica explained that she was cooking pap, a traditional maize meal. Jessica reported it was a very windy day; therefore, using a barbeque stand is also better if it rains, but it may need additional overhead shelter. Also, Jessica reported that she had no idea when the power would be restored.

Figure 13: Still video images and a link explaining the householder's evening routine.

Link to video (6.25 pm): Video 6.MP4

In the case of Jessica, the videos were taken on different days at different times, but there was a trend, which Jessica highlighted in also in figure 11, that power cuts were frequent during the evening when they needed electricity most for cooking. The issue of insufficient financial and inadequate energy resources was raised significantly as a daily issue. For instance, if a family is struggling to buy a candle to have light in the house, they may need help to afford other fuel sources, such as firewood and gas. As reported in the first video in figure 7, in the morning, though gas would have been a preferred and convenient choice, the householder had to use firewood at that time.

5.3.1.2 Musiwa's story

Turning on to weather effects which have been an essential concept in this study, and what householders experience during power cuts and load shedding. Supposing it was raining, as the other householder highlighted in the video recording (See figure 14), the daily routine could present some challenges with cooking outside due to wet weather. In the video in figure 13, Musiwa narrated that the firewood was wet; hence, the householder had to improvise and use other materials, such as paper and plastic, to light the fire. Being unable to cook warm food for her children and warm water for bathing children can be stressful for Musiwa, in a similar way to Musiwa's narrations. Musiwa reported that it was more important to cook for her children by least lighting a fire to cook for the children when she could not afford gas, which resonates with what Jessica had reported. Priority was placed on children, from cooking and household activities, despite the activities being labour intensive as per interviews and as shown in the videos presented throughout the results sections, children had to be fed despite the challenges. Musiwa reported that for her family, firewood was much cheaper than gas, and when it rains, their other option was using a prama stove that uses paraffin. However, it reported that the activities came with challenges, especially when using a firepit; the women were required to bend over several times,

which could lead to issues with backache or other related physical illnesses.

Figure 14: Still video image showing a firepit soon after rain and the link to the video.

Musiwa video narration .MP4

Overall, and according to the stories of Jessica and Musiwa, a typical day starts with the decisions that must be made about finances and how they can be used, but with an awareness that energy sources for cooking take precedence above all other issues. Most householders started and spent their day with physical challenges and were mentally exhausted. The daily issues raised in the videos related to householders' inability to purchase lighting sources, such as candles and energy sources and struggles with cooking food throughout the day. As the householders recounted their daily challenges, mainly due to power cuts and load shedding, it demonstrated that the severity is enough to merit that the situation in Zimbabwe must be reviewed. These conclusions illustrate the potential for increased adverse health effects when householders inhale the smoke when cooking on an open fire, as discussed in section 5.2.1, and shown in Figure 13, which may contain toxins from the burning materials. It also demonstrates that energy poverty and insecurity affect well-being and cause psychological stress and social consequences such as air pollution.

5.3.2 Stories of survival and income resources

Moving on to consider the concepts of high workload and unemployment were central to the study; most householders during the interviews highlighted concerns that there is a vicious cycle of meeting household demands. At the same time, looking for employment locally or, in some cases, making applications for jobs online. However, seeking employment online was highlighted as a challenge because of the power cuts and load shedding, as the internet network is also affected when there is no power.

A particular concern was that some of the householders, via the interviews and video recordings, highlighted that they engaged in some small businesses to raise money for the needs of their families. Shared views of some householders were that if the electricity supply were adequately available, it would help them start bigger-scale businesses they could rely on as sources of income. But, as the energy problems worsened, the challenge was that householders could not feed or look after their families properly, even though small projects requiring adequate electricity.

> *"I am a mother working full-time, which is a blessing. I have been working now for a few years. Still, I also do a side business for myself to have extra income. I sell second-hand clothes to local people as I have school-going kids, and I also look after my elderly relatives, which is a lot, but it must be done. We call it black tax, but I hope my kids will not have to be looking after me, but only if they need to not this life I am living"*. (Hazel, Householder- 11).

The common problem reported via interviews; householders further emphasised that, for example, a small poultry business would suffer losses, especially if the power cuts are ongoing for extended periods. The losses were because the poultry business requires electricity and refrigeration for storing the chickens before selling them. However, as part of the daily struggles, some interviewees noted that the challenges and losses they

face when throwing away perishable products because of these power cuts caused them distress, but with not much that they could do. This then can cause people to be disempowered as a result of the situation of not having reliable electricity.

During power cuts and load shedding, one of the disadvantages is that householders are faced with dilemmas of which area of the day to prioritise, whether sourcing energy sources, water to drink or seeking employment. All these activities mentioned above can take up the whole day to achieve, which supports the claims and reveals that householder's daily struggles due to energy poverty will affect the householder's well-being and are a considerable burden on the women who perform most of the household chores. To an extent, these issues can be attributed to some of the factors mentioned in section 5.3. looking for cooking fuel and running the household.

The theme of unemployment was a reoccurring issue and a constant reminder of the inability to afford household basics. The link between power cuts and the unemployed emerged because householders gave details of their day-to-day experiences; they noted and lamented that an inadequate electricity supply for industrial areas caused some businesses to close. Jessica commented on unemployment and explained: *'So far, there has been no employment or self-employment'* (Jessica, Householder-1). Many interviewees voiced how the poor infrastructure and power cuts affected some industries, leading to their closure, which caused job losses in both the private and public sectors. Unemployment affects the family's income, causing an inability to afford some energy sources and top-up prepayment meters, which will, in turn, affect having limited options in terms of what food to buy that does not use much energy.

> Overall financial hardships and unemployment worsen some households' well-being and cause depression. The increased concern was that householders would therefore spend the day worrying about where they could find income, even odd jobs such as buying and selling; the income would not be enough to sustain a family. These issues highlight a daily routine consumed with endless worrying: '*It can be difficult; some people have no jobs. Then there is no electricity, and you have to look for other ways of cooking and lighting the house, such as using a candle, which can be depressing and is on if you have no money.*' (Yeukai, Householder-6.

With the energy-related issues and unemployment affecting the householders' daily lives, this demonstrates and supports the complexity of energy problems. The key problems householders disclosed were the pain and difficulties of not providing warm food for children and the frustration of not being able to afford gas, a better option than lighting a fire, which takes a physical toll on householders. As it emerged in the videos, the emotional turmoil experienced by the respondents shows how urgent the need to address the energy poverty in Zimbabwe is. As previously stated, the physical constraints of constantly being on the go and using cooking sources such as firewood and cooking on a firepit on the ground could cause chronic backaches. Exposure to smoke may result in respiratory conditions and COPD. Figure 15 demonstrates some of the energy sources used by some householders that would be exposed to the smoke directly while cooking.

Figure 15: Still video image and link to a video showing ladies surrounding a fire boiling water.

Link to video: Video 1.MP4

Using unsuitable energy sources, such as burning plastics, as shown in the above video, is a major environmental problem and the leading cause of respiratory health issues (WHO, 2019,2021). Some householders are exposed to smoke daily, and their daily lives become more challenging. Notably, the worse the power cuts and load shedding get, the more their daily lives are challenging. These outcomes suggest that having an effective energy policy guided by a change in the energy justice framework could ease this current situation, which may affect the householders' health. These results could add to the body of knowledge, and approaching the issue by recommending a just transition could shape an inclusive policy. In addition to recognitional justice, highlighted in this thesis's literature chapter and discussed further in the discussion chapter, understanding householders' energy needs and experiences using the bottom-up approach is crucial and can be related to the literature (Cockbill et al., 2020; DellaValle, 2019). Applying the recognitional justice principle may lead to asking questions such as what

the householder's needs are, who are hard to reach, and how their needs can be identified, and strategies may be implemented as a result of understanding their challenges.

5.3.3 Household duties and gender dimensions

At this stage, the study discusses the issue of gender dimensions. Most women reported that they carried out most household duties, including caring for the children, cleaning their homes, washing, cooking meals, and drawing water from the boreholes. The women also said that this was expected in the cultural setting and community, especially for those women who may also be responsible for taking care of their elderly parents. There was evidence that the burden of household responsibility was on the women, which was made worse by having to find energy sources for cooking and working unsocial hours between 12 midnight and 6 am, as mentioned in section 5.3.1, which could add to stress and impact physical health. Males were rarely considered responsible for domestic duties. Some interviewees noted an everyday impact on their daily routine caused by power cuts and load shedding. During the interviews and video recording, the householder reported that their typical day was never-ending, as sometimes householders do some tasks, such as cooking, at midnight or in the early morning when power is restored. In most cases, the women reported feeling overwhelmed with the responsibilities.

Householders narrated that:

> *'There are days when I will cook as soon, I hear that the electricity is back; even if it is 4 am, I will wake up to prepare a meal for my husband due to his health.'* (Sarah, Householder-4)

> *'The worst part is, at times, there is a power cut and load shedding, which could be restored at any time during the night or early hours of the morning, like at 2 am to cook the next day's meals; it can be*

a vicious cycle when I have to work the next day. It affects my mental well-being.' (Yeukai, Householder-6)

Half of the householders who participated in the study were women and reported to be responsible for the daily household chores; as in most videos, women were responsible for cooking around the firepits. These are primarily due to cultural norms reflecting the categorisation of duties within a household. The men indicated they are responsible for the technical side of energy, such as making sure solar batteries are charged, and other electrical responsibilities, such as lightbulb fitting. These issues are a daily part of some households, especially those that use solar lamps for light; they need to be charged daily for use in the night, and hence this was a part of the daily chores. According to Stakeholders 8 NGO organisations, specific issues emerged during the lights-up workshops. The workshops were arranged to listen to communities' grievances with also the primary goal of helping communities understand some energy-related issues, such as understanding, for example, why energy-saving lights are part of cutting down energy costs and saving energy.

> *'The lights-up energy workshops were also an opportunity to listen to the householders as we did not want them to attend for knowledge. Still, we needed to know some of the challenges they were facing in terms of electricity and if they understood the issues surrounding the energy issue in our country. We also discovered that women had no interest in electricity issues as they thought men were the ones who had to deal with those issues.'* (Stakeholder-8 Private sector-NGO).

Returning briefly to the gender roles mentioned above, though, women were primarily responsible for household chores such as cooking and cleaning. Another point to highlight is that women believed that changing lightbulbs was men's duty, not theirs, in line with section 1.3, which details the day-to-day reality of a Zimbabwean and a brief analysis of gender roles. Poor access to and availability of energy supply affected women

and men differently. When power cuts, and loads were shedding, it meant more household work from women and having to do extra duties such as fetching water. Men were affected by not having access to technology when seeking employment and being unable to manage small projects such as poultry leading to not having income to support their families. Relative to the context, it is clear that women are impacted most by environmental issues such as smoke from fires as they are primarily responsible for cooking on open fires, thus inhaling smoke when cooking meals for the family.

5.3.4 Stories of health

Owing to the continuous power cuts and load shedding, some interviewees reported daily struggles related to a decline in health, health services, and facilities for storage of medication. It is widely reported in the broader literature that energy poverty can impact health services (Oliveras,2020). As a shared concern, householders reported that energy poverty impacted the public health system, which has become a daily struggle, particularly for those with chronic health conditions. Another critical issue was that some householders live with chronic illnesses, which require them to take their prescribed medication with food in the morning, afternoon, and night; therefore, energy for cooking was needed.

> *'My husband had a stroke a few years ago, and before he takes his medication, he has to eat first, and it is a very stressful situation if there is a power cut. We rely so much on electricity because our landlord's house has no prepayment meter. So, we pay for our energy as part of the rent, so we are left with no money for firewood. So, when there is no electricity, we cannot cook, and it is very stressful for someone who has to take medication. We both do not work and rely on a small disability allowance, which barely covers food.'* (Sarah, Householder-4)

Still, no consideration or programmes are in place to safeguard vulnerable groups during long power cuts and load shedding. The literature suggests that identifying vulnerable populations living in energy poverty should be a starting point that may help improve their well-being (Bylanes, 2019).

Adding on to the above point of identifying the vulnerable. Some householders reported that their poor health negatively impacts their life in general and brings some inequalities in the community due to their conditions. One reason for this is that community members believed conditions such as diabetes were contagious and would not associate with an individual affected with diabetes or assist them in using their gas fridges to store their insulin during power cuts. Similarly, stigmas around diabetes are mainly due to negative societal attitudes (Abdoli et al., 2018; Botchway et al., 2021). Research by Benjamin (2022) and Binns and Low (2015) indicated growing concern about public health. However, different goals, such as improving world health and safety, have been slowly achieved since 1946, when World Health Organization was formed.

Apart from the inequalities caused by illnesses, as mentioned above, another problem highlighted that the power cuts and load shedding had affected some of the householder's health. The health impact was due to poor refrigeration used to store medications and energy sources for meal preparation to take their medication. Therefore, understanding and knowing the consumer's needs should be prioritised. They will, in turn, enable the energy supplier to support vulnerable households during long power cuts and load shedding and provide affordable energy.

Also, apart from the stigma attached to some health conditions, such as diabetes, the householders reported other health issues, such as poor mobility. Householders with mobility issues reported that they would find it difficult to store their medication in a neighbour's fridge facilities. Owing to their mobility issues, they will struggle to walk long distances. The World Health Organization's accounts suggest that some health inequalities are

attributable to biological variations, and others are attributable to the external environment and conditions mainly outside the control of the individuals concerned. The interview discussions showed that not all interviewees would necessarily understand the injustices happening before them. Their interpretation overlooks having power cuts and load shedding and does not see it as an injustice but as part of their lives. Concluding that resilience was part of the participants' daily lives, where they used different means to survive, regardless of poor access to energy sources, food, health facilities and clean water.

5.3.5 Daily challenges with sanitation

Though this thesis is not investigating the issue of the water crisis in Zimbabwe, water shortages in Zimbabwe have resulted in municipality introducing water shedding, a term commonly used in Zimbabwe and South Africa. Water shedding is a process in which there is stringent water rationing for domestic use. The water system uses energy from the main grid, which could cause issues if the energy supply to the water reservoirs is disconnected. They may not have a facility for an alternative backup system, such as a generator, thus causing water shedding. It emerged during the interviews that power outages worsen the severity of water shedding, as most of the municipalities rely on the main grid energy supply and cannot pump enough water for domestic use as their operations are interrupted by power cuts (Matsa et al., 2021; World Economic Forum, 2008).

The majority of the householders reported an added day-to-day stress of water shedding caused by the ongoing power cuts and load shedding. Water shedding can cause an increase in diseases such as cholera, typhoid, and dysentery. Most householders reported a lack of water due to power cuts which also affects the water utility companies to pump water into the household due to the reservoirs depending on power from the main power grid and no other backup plan such as generators. Thus,

householders have to fetch water from boreholes, and some used shallow wells. As highlighted in the literature chapter and discussed in the discussion chapter, the issue of energy poverty is caused by population growth, ageing equipment, lack of funding and lack of new knowledge on improving the existing energy network. The same issue of poor and ageing equipment is affecting the distribution of water in Harare, which is made worse by power cuts and load shedding. Some issues with sanitation were reported during the interviews.

> *'The area I live in is quiet but has challenges regarding poor sanitation due to water shedding and electricity issues. The area has gone through a lot of hostility and poor maintenance for years, and the local council needs to be more helpful in all the concerns. Most of the boreholes use electric pumps, so there will be long queues if there is a power cut because we have a few manual boreholes and high-water demand, and as I am talking to you, I need to go and check my number in the queue.'* (Talent, Householder-10)

These results suggest that there are several interconnected issues highlighting how power cuts affect a range of aspects of daily life. Some of the affected areas include poor water facilities, leading to a rise in cases of diseases such as typhoid linked to drinking water from poor sources such as boreholes. Boreholes have been a new source of water in the Harare Metropolitan Province Area. Musiwa a householder highlighted that '*Every corner you turn, there is a borehole, and most are not government-owned but were commissioned by non-governmental organisations. The government is not concerned'*.

To add to the water woes the water utility company had to resort to water shedding as it could not afford chemicals to clean the water, and charities started installing boreholes to mitigate poor sanitation. The electricity issue affected the water plant and the supply to households. In most cases, when there is no electricity, the households do not have a

water supply. These daily experiences demonstrate the correlation between experiences with energy poverty, leading to other issues such as sanitation needs, health, and well-being.

5.4 Summary

Lack of trust between the energy service providers and householders has led householders to lose interest and disengage from understanding the root cause of the energy crisis in Zimbabwe, as they were more focused on surviving through the challenging times caused by economic hardships. Owing to all these problems, the householders expressed through the interviews a problematic existence caused by power cuts and load shedding. The householders indicated that they do not feel as though they can do anything to change their situations unless the government intervenes with an alternative such as solar energy or is able to supply adequate energy. However, most householders highlighted that they could not envision or trust the government helping them out of the situations they have been living in for many years. Energy supply is monopolised, with one energy supplier and a few private sector companies, who mostly install solar systems rather than supply electricity directly to the consumer.

Regarding constant power cuts and load shedding, the energy consumers who rely on the primary grid experience poor services. The householders feel that no solutions to the power cuts and load shedding have been occurring for many years, which has led the energy consumers not to have confidence in the energy sector. Therefore, there is a need for favourable policies for the private sector if solutions for reducing energy poverty and producing more energy are to be implemented.

Despite varied undesirable effects caused by a poor energy supply, the analysis revealed that householders may have started to normalise power cuts and load shedding as a way of life. This may be due to believing that

no one is willing to help them improve their energy supply. Theoretically, a new dialogue between the energy supplier and consumers should be re-established by consumers having a say in how they can present their grievances.

These householders also presented shared experiences of severe socioeconomic and sociocultural challenges, which are primarily due to the deprivation in which they live and are worsened by power cuts and load shedding. In addition, gender dimensions were revealed, with women experiencing daily challenges, which included physically demanding tasks. Achieving gainful employment was also proving a challenge for a broken system, and with power cuts and load shedding, a lot of online job hunting is fruitless. The lack of a reliable income affects householders' ability to provide basic needs for their families, and not being able to afford energy sources would cause an overwhelmingly stressful situation for the women who cannot cook and heat water for their children.

To add to the above, it may be likely that household roles in the study context might not be regarded as a burden. Still, as a result of perceptions of gender roles and household duties, the burden was disproportionately placed on women in this study. In particular, in the study context, it is a cultural expectation of women to fulfil household-related duties such as cooking, preparing children for school and fetching water.

6 Limitations, Challenges and Strategies in dealing with energy poverty.

6.1 Introduction

Chapter 6 is the second of the three findings chapters and achieves Objectives 2 and 3. Objective two characterises the socio-economic and cultural challenges experienced by Zimbabwe. Objective three seeks to understand energy supply, access problems, and consumer experiences with load shedding and power cuts. In addition, this chapter will review the differences between high and low-density suburbs and the impact of energy poverty on the people of Zimbabwe.

Given the research focus and objectives, this chapter concentrates on energy poverty and insecurity, consequences, and the causes of energy poverty, such as poor structure, poor access to energy sources, affordability, and funding issues. The chapter is structured thematically, incorporating quantitative data to give a detailed discussion of the challenges stated by the study participants. Furthermore, the chapter highlights participants' perceived limitations on energy sources in their homes and spaces, characterised by continuous power cuts and load shedding. The chapter continues by discussing energy affordability and access to better services, which shape the behaviours of the communities and determines a form of resistance to the chronic energy problem.

6.2 Cost of energy and affordability

This section will first discuss affordability, inflation, Zimbabwe currencies and household strategies to alleviate energy poverty. As mentioned in the previous chapter five, most householders highlighted that they struggled to pay for energy sources and that energy costs were too high. From the survey results (Question 2, see appendix), more householders (84%) reported that energy costs were too high, whereas 16% of householders did not; additionally, more householders (66%) reported that they could afford to pay their energy bills, whereas 34% did not. These results raise the likelihood that householders are paying high energy bills because they did not have any alternative energy provider, as mentioned in section 5.3.1, to enable them to switch to cheaper and affordable tariffs.

Other studies have shown that providing households with better information on energy tariffs and how to use electrical gadgets efficiently will aid householders in making better decisions and engaging more with energy matters. According to Yohanis (2012), affordable energy could be achieved by giving householders information on energy-efficient appliances, meaning that using energy-efficient appliances will lower household bills. In particular, communities can be educated on energy-saving techniques. The limitation could be that most householders may be disadvantaged due to information not being readily available.

Another shared common finding was that the householders understood that the electricity prices were increasing in cost and also expensive, as per the interview excerpts below. These results may indicate that householders may have been engaged concerning increasing electricity costs and that energy was expensive. But they did not know the exact cost of energy or the tariffs there were using, which may be due to low energy literacy and no awareness of prepayment meters tariffs. Some householders highlighted a challenge that the energy costs kept

changing and energy costs were high. Still, they were unsure how much the utility company had increased its energy tariffs.

> Interviewee: *'We use the EcoCash mobile service, but the cost per unit differs each month because we pay more.'* (Jessica, Householder-1)

> Interviewee: *'It is costly, and sometimes we run out of units, and we use candles for lights even when there is electricity. Never mind the added cost of other things, such as gas; you sometimes borrow from work to assist you until the next payday. Remember you must cook and boil water for bathing, especially in winter and the rainy season. It can be cold.'* (Talent, Householder-10)

Recent studies (Cilliers, 2021; Tovar Reaños, 2021) shows that increasing energy costs affect low-income households in mostly densely populated and informal settlements. This is a global issue that could lead to debt as householders will need to cover the added household energy costs. As highlighted in the following interview excerpts, low income was one of the issues raised by most householders. The difficulty in affording the cost of energy to cover household needs such as cooking and heating was highlighted as an issue made worse by the continued increase in the cost of electricity units. This can create budgeting problems within a household:

> *'And sometimes, how can you even control life beyond your control? Because you cannot budget for electricity. Even if you say I have budgeted money, for example, 30 US dollars, that month alone, you realise their electricity has gone up. So, for example, this month, you may have gotten 300 units for 30 US dollars; next month, you will get a different number of units. You probably get 250 units for 30 US dollars. So, that's when you start cutting down on what you use electricity for, such as ironing.'* (Dorcas, Householder-5)

> *'In a video narration, a householder highlighted that my family would have to eat or prepare food that does not need cooking due to the monthly increased electricity tariffs. The cheapest energy sources they would use are plastic bags, empty bottles they can pick from rubbish for free than firewood and gas they have to buy.'* (Chengi, Householder-12)

Following above description of the householders highlights cost and energy affordability as barriers to accessing electricity and other energy sources. Furthermore, during the interviews, most of the householders indicated that they had no other access or assistance with their energy bills, regardless of the chronic power cuts and load shedding that may be crippling the country.

As stated above, regarding householders not having not enough financial resources to access energy sources, there were however, some interventions from charity organisations noted during the interviews. Though, the charities had criteria to help the elderly and families who had children below the age of 2 years could get help to pay their energy bills. Also, the charity organisations assist householders in most cases if their energy debt accumulated before the prepayment meters installation could lead to consequences such as repossession of fixed assets such as a family home by the energy company:

> *'I know a place occupant were evicted because they owed thousands on their electricity bills, so ZESA, the utility company, was trying to auction the property to recover their money. But we heard later that a charity intervened to help the family so they would not lose their house. But you can get a clear picture of how the government can be brutal, and then some outside organisation can rally around to help you.'* (Muguni, Householder-8)

Adding to the above issue of energy debts, though, not every household could not get support from charity organisations. Some householders

shared experiences of having energy debts accumulated before the prepayment meters highlighting that energy debt could significantly lead the utility company to recover their debts by any means possible, including selling the assets of consumers. These results suggest that a debt situation could lead to added stress. As mentioned in section 5.2, there was a problem with the billing system; however, there was some indication that householders were not fully engaged with their energy bills. As they had no organisation, such as a citizens' advice bureau, they could consult to understand what debt they had accumulated before the prepayment meter installation. These conclusions indicate that energy consumers were not involved or engaged in energy-related issues such as understanding the energy tariffs. Also, they indicated that the energy cost was high and was constantly increasing.

The energy policy may fail to address their energy needs, such as cost leading to increased energy poverty and levels of injustice. In this study context, there is a clear need to encourage the engagement of householders and for the energy supplier building of trust. For example, building trust may be facilitated by the energy supplier passing on energy-related information, such as tariff costs and service changes. Some energy suppliers apply this practice in other geographical contexts, such as the UK, where energy consumers are given information and energy advice on debt. Still, in the study context, the study highlighted that an established lack of trust between consumers and the utility company would not yield the anticipated consumer engagement process. Therefore, the energy company would need to regain consumers' trust by understanding their basic needs through community engagement approaches, such as energy-related workshops and engaging trusted community leaders.

As mentioned in section 5.4, the issue of unemployment was a cause of concern for the majority of the householders and added stress to their daily lives. Additionally, Zimbabwe's currency crisis has caused numerous economic problems, such as shortages of food, fuel, and other

commodities (Nyamund, 2021). The finance-related issues are embedded in the country's local currency. In the study context, the local currency and low incomes mean that householders struggle to afford energy sources used for cooking, light, warmth, and businesses. Low income is linked mainly to the unstable local Zimbabwean currency and inflation. Owing to the unstable currency, some businesses will use other currencies, such as United States dollars, to sell fuel sources such as firewood and charcoal.

In terms of income, most householders are paid in the local currency, which can be challenging. Therefore, findings worthy of note are those highlighted by the householders (see the interview excerpts below) that the cost of their household outgoings is higher than their monthly income, affecting how they can pay for their energy bills or electricity units. The added strain on income was due to the issue that the local currency was prone to inflation on a day-to-day basis. Therefore, due to inflation, there are two significant drawbacks noted. Firstly, regarding the consequences of inflation, some householders expressed that even if they could convert the local currency, for example, to United States dollars, the exchange rates are high on the black market. Peter, a householder, mentioned that *'With local currency, keeping up with the cost of living is challenging. You can have 2000 local currency today, and the value tomorrow will be half that amount, so how can you buy other currencies?'*

Though, it would be difficult to do so based on their low income, affecting their income for commodities such as energy sources. The second drawback of inflation was that some businesses, such as gas sellers, use other currencies, such as United States dollars, to sell energy sources. Still, at the same time, some small businesses that sell energy sources such as firewood may take the local currency. However, this inflation issue may be a problem for those on low incomes as it renders local currency loses value. Especially when they try to convert their income to other currencies

to buy, for example, gas; it may not be possible, but they will be left with fewer choices, such as buying firewood.

> *'RTGS is the local Zimbabwe currency, but it is prone to inflation every day you wake up. It is useless money and can be a depression to think about it.'* (Talent, Householder-10).

> *'One day, businesses can use US dollars. The following, businesses have to use the local currency, which is unsustainable.'* (Stakeholder-4, private energy company)

> *'I purchased my firewood from a local market close by; however, it is costly to buy it from there because they only accept US dollars, and the exchange rate from the local currency to US dollars is not favourable. Most sellers will not accept RTGS as it loses its value frequently. Then again, firewood at 1 dollar is cheap than buying electricity units.'* (Talent, Householder-10)

> *'Another participant added, "Gas vendor accepts RTGS unless you beg them, they may consider, but you end up paying using the black-market rate".'* (Mutede, Householder-7).

Moving on to how the energy utility supports energy customers, the householders highlighted that the energy supplier announced a cheaper tariff scheme to help householders. The cheap tariffs were only available the first week of each month to support and mitigate the rise in the cost of electric units.

> *'The energy utility company has tried to support the customers in that the first week of every month, the electricity is cheaper compared to the rest of the month. However, even if it is a bit cheaper, you have to buy your cheap energy the first week, but the first week of the month, you may still not have the money to afford the cheap tariff. Also, it is difficult for everyone to buy cheap*

electricity, apart from money, as the system is jammed.' (Jessica, Householder-1)

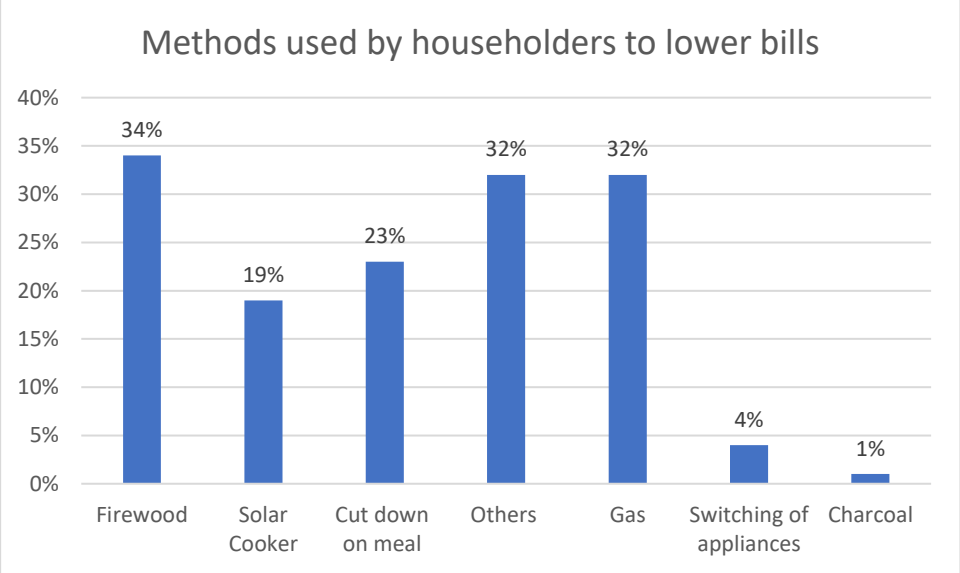
Though this initiative is welcome, some householders may not have money to buy the cheaper units at the beginning of each month. It may also be difficult for householders who can afford to buy the units at the beginning of the month, as the online purchasing system may be gridlocked. Hence, the consumers have to keep trying to purchase their electricity units in the first week. This, however, signals a system with no preparedness for the services it is offering its consumers and an inadequate purchasing system unable to meet the demands of its consumers when there are high demands on the service.

Although continuous power cuts and load shedding affect householders daily, as mentioned in the interview excerpt above, the high energy costs and not understanding energy tariffs seem to have been issues, and poor income sources exacerbate the problem of energy poverty. These outcomes suggest multiple energy-related problems likely to worsen energy poverty and injustices experienced in this context, especially for those without a stable income.

At a global level, most governments have raised concerns about the surge in energy prices, and countries, such as the UK, have resorted to subsidising households and energy price controls (Celasun et al., 2022). However, with different government measures in place and soaring prices of energy sources, such as natural gas, householders are still struggling to pay their energy bills and remain in energy debt (IEA, 2022). In contrast, in the Zimbabwean context, householders do not have government assistance, apart from some charity organisations mentioned above, despite the soaring energy costs. To add to the ongoing energy problems, Zimbabwe still relies on importing some of its energy fuels from the international market, which means high energy costs for the end receiver.

The continual rise in energy costs highlights different methods householders use to keep energy costs down, which vary across different countries. Analysis of the survey data was conducted to understand methods used by householders to lower their energy bills survey question 20 (See appendix 4). As per figure 16, the results indicated that 34% of the householders highlighted that they used firewood to keep their bills down, followed by 32% of householders who indicated that they used other methods such as: gas 32% and charcoal 1% and switching off lights 4% to lower their energy bills. Some householders (23%) indicated they would cut down on meals, and 19% used solar energy. In addition to the survey results, and from the excerpts of the interview below, highlighted other methods, such as cooking large meals and skipping meals to save on energy bills.

Figure 16



'People have to skip meals, not because people are not hungry, but it is to save energy for the next meal.' (Musiwa, Householder-3)

'Unless you skip meals. I think that will probably help, and if you cook one big meal, I think that can save energy as well, but sometimes it doesn't work when you have children, because you cook for them in the morning, afternoon, and evening. So, it is difficult to answer

because overall, the energy cost is getting high, and we still need to eat and cook.' (Shamiso, Householder-13).

'Zimbabwe is a sad case because there is no equity if I may say. The poor are so poor to the point of skipping meals because they do not have food or power in some cases, and to my observation, they are working to provide energy through restoring faults. So, we have a considerable divide as such; wealthy people never see the dark or use candles per se as the other poor.' (Stakeholder-4, private sector)

With regard to cost and methods to mitigate the energy-related issues, these results suggest that even though households were using other methods to reduce their energy costs. This still did not take away the stress and guilt of the parent when they had to feed their children, as highlighted in section 5.3.1.

As has already been noted, as per the interviews, the householders indicated they struggled to buy energy sources. Overall, this was due to low incomes and the local currency, leading to an inability to cook and heat water for bathing, getting into debt and seeking help from charitable organisations to repay debts. The interviewees' narratives and survey data suggest that energy costs and affordability are results and direct representations of a problem that policy should address and practise to meet the consumer's needs. How the energy company handles its consumers is leading to more problems, such as widening the gap between the company and its consumers and increasing energy poverty and insecurities. There seem to be intricate issues that should be addressed to assist consumers; as mentioned earlier, the hard-to-reach may well be householders unwilling to communicate with the utility company because of fear and other factors such as stigma. Establishing a well-funded organisation that will work with energy consumers gives

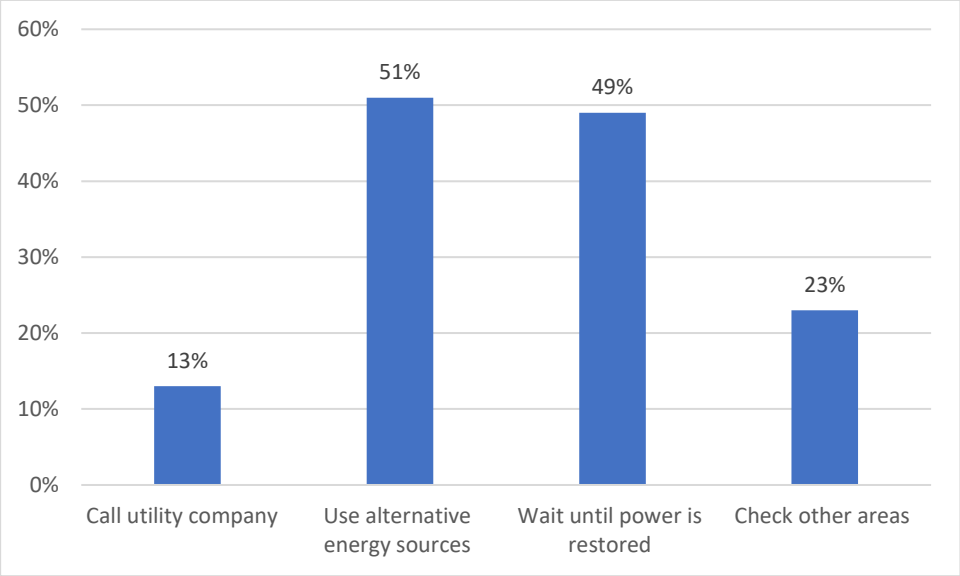
them choices and chances to understand their energy consumption. The following section will present results about householders' sources of energy for cooking.

6.3 Household behaviours during a power cut and load shedding

This section highlights how householders behave and respond during a power cut and load shedding. Most of the interviewees' narratives highlighted some mistrust built up between the energy supplier and its consumers. As discussed earlier at the beginning of this chapter, the area of the problem and the daily experiences of householders have been established. Therefore, understanding how householders react to energy problems with power cuts and load shedding will establish how consumers seek help and help the study understand further barriers between consumers and energy suppliers.

Figure 17 shows that out of the householders who responded to survey question 14 (See appendix 4) on what they do during power cuts and load shedding. At least 51% of the householders highlighted that when they experience power cuts or load shedding, they use alternative energy sources, with only 13% calling the utility company. These results may indicate poor service and relationships between the householders and the service provider. Also, 49% of the householders indicated that they would wait until the power was restored, and 23% would check if other areas nearby were also affected by the power cuts and load shedding.

Figure 17 Participants' responses to service provision during power cuts and load shedding



During the interviews, the householders stated that they used alternative methods because they felt it was more reliable than calling their energy provider during power cuts and load shedding. The participants' behaviours and reactions during power cuts and load shedding were also due to poor communication and a lack of trust in the energy utility company services, which was highlighted in 5.2.2 and narrated in the excerpts.

> *'The utility company's communication is never up to standard. Most of the time, we are not told if it is load shedding or a power cut. There is no formula. It can happen anytime since we are not told, so we don't know if it's a load shedding or a power cut, and it is the government that is responsible through the parastatal company ZESA.'* (Musiwa, Householder-3)

> *'We don't get those notifications of a pending power cut or when there is a power cut, when they may send an engineer to fix a fault. They disconnect power whenever they want to disconnect the*

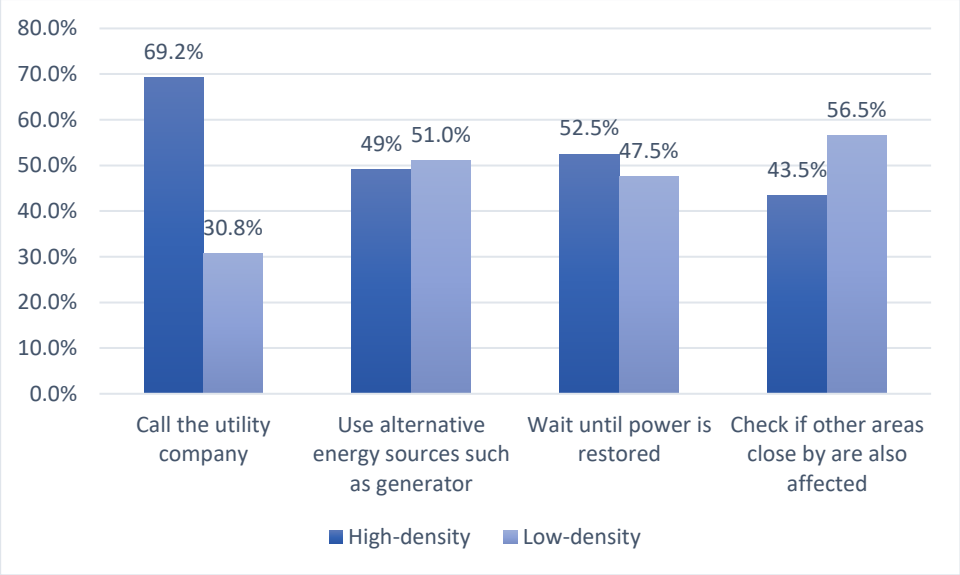
electricity. It is infrequent, especially in our community. So, it would be better to look for your alternative sources for cooking.' (Sarah, Householder-4)

'ZESA is mainly unreliable, but they try to send messages on my phone when there is load shedding and power cuts. However, one never knows. It can go up to two weeks without electricity, and they will not tell you if it is a fault. We have no alternative but to rely on poor government service, which is a big problem.' (Mutede, Householder-7)

The outcomes may indicate a broken system, which should be improved to support and give appropriate consumer advice. Most interviewees highlighted the need for a better service than the one offered. Therefore, beyond improving service, these results highlight the need for the utility company to understand its energy consumers, demonstrating its engagement and interaction with its consumers.

Additionally, crosstabulation analysis was conducted using the participants' locations to understand how householders in high- and low-density suburbs behave during a power cut. Figure 18 shows percentages of people who responded in each way to power between householders who lived in either low or high-density suburbs. There were varied responses based on location. Though 69.2% who lived in high-density suburbs would call the utility company during a power cut or load shedding compared to the 30.8%, this could signal some discrepancies between the suburbs, which need to be addressed by the energy supplier.

Figure 18: Crosstabulation percentages of respondents in low and High-density suburbs responding in each way to power cuts and load shedding.



It may be due to having different access to resources and why householders would seek a different route or response to the power cuts and load shedding. Also, householders may respond and report a power cut to the utility company. For example, suppose a householder relies on gas for cooking. In that case, they may not see reporting a power cut and load shedding to the utility company as urgent in comparison to those who use electricity.

The interviews highlighted that some householders with a family member with chronic health issues would call the utility company if a power cut or load shedding goes on for more than a day: '*Sometimes, we may contact the utility company because we would have been left stranded for the day without power. In most cases, we will have no money to buy other alternative fuel, such as firewood, for cooking, and, due to my husband's health, we are forced to contact them for more details on when power will be restored.*' (Sarah Householder-4). Therefore, outcomes would

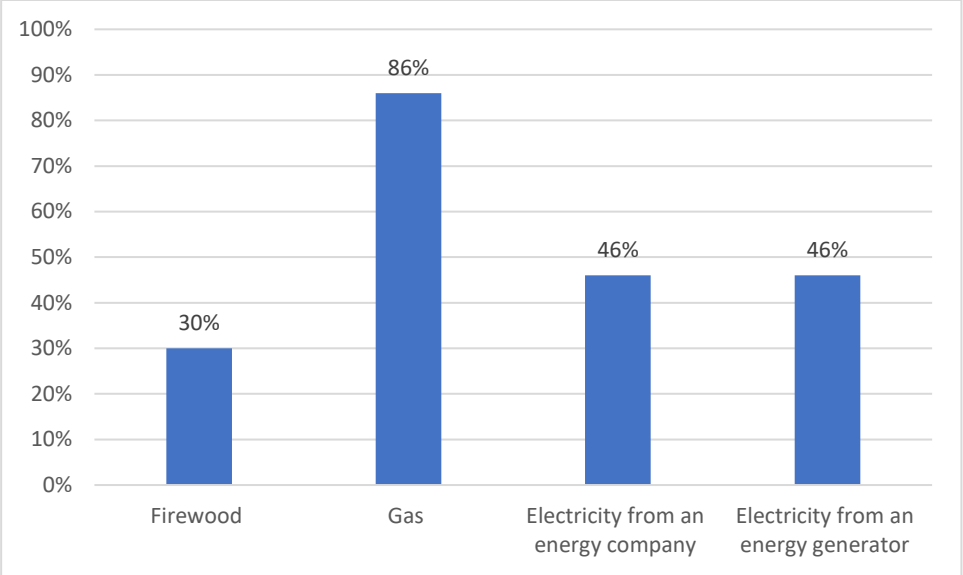
contribute towards a revised energy policy that will benefit energy consumers and aid better service and a just transition to ease the burden of energy poverty.

6.4 Energy sources

Regarding the continuous rise in energy consumption and concerns about the impact fossil fuels have on the environment, some countries in sub-Saharan Africa still rely on energy sources such as gas, coal, and firewood (Hiemstra-van der Horst & Hovorka, 2009; Masekela & Semenya, 2021). Njenga et al. (2021) highlighted that dwellers in rural areas, for example, in Kenya, rely primarily upon firewood for cooking and heating, which is similar to the case in most African countries.

With regard to the results of the survey results, question 19 (See appendix 4) asked which type of fuel householders use for cooking. The results highlighted that 86% of householders use gas for cooking in comparison to 30% of householders who use firewood. Lower usage of firewood in the urban setting could be because there are fewer forests where people can source firewood, as opposed to the rural setting. Despite firewood being a cheaper energy source for low-income families, the survey data indicated that 86% of the householders used gas for cooking, with only 46% using electricity from an energy company and generators.

Figure 19 Cooking fuels for households



As stated in the cost of energy and affordability section (section 6.2), most householders found it challenging to afford other energy sources, including gas, which is not relatively cheap, as energy prices have been rising globally. However, they used gas as it was a convenient source of energy. The household use of gas as a source of cooking energy was highlighted in most video narrations as the most reliable and convenient form of energy for cooking and water heating (see figures 20 and 21). In addition, the householders narrating in the videos and interviews highlighted that, despite having difficulties affording gas, they felt it was an efficient source of energy for preparing meals for their children, especially when preparing them to go to school.

Turning now to the evidence of energy sources related to health. In line with the research by Njenga et al. (2021), firewood collection can have disadvantages for well-being and advantages for earnings if women can also sell extra firewood. In the urban setting, firewood is mainly used for cooking. If one needs to sell firewood, one should acquire a licence from the government, which comes at a cost. The firewood selling licence is a method used by the Zimbabwean government to protect against environmental degradation. The householders indicated that collecting firewood, which is one of the available energy sources, can also

contribute to health issues, especially when women have to walk long distances to fetch firewood. However, the motivators for using firewood are low incomes and having no other energy sources.

> *'I have a few times broken my ankle a while walking in the bushes looking for firewood. My back is now always in pain due to the physical tasks I have to do every day. I can walk for more than two hours to find firewood and then go to the local boreholes to fetch water if we have no running water at home, so my body is always in pain these days. I guess it also has to do with age, but I am not sure.'*

Another householder, through a video narration, highlighted the dangers of using a one-plate gas tank but felt that gas was quicker at cooking compared to other energy sources.

'Despite the danger of using a one-plate gas tank [see figures 20- 21)*, gas is much quicker for cooking and warming water as there is no better alternative, and we are not yet connected to the main grid in this location. It is an enduring power, so we must rely on gas, as firewood can be difficult to find in the middle-density suburbs'* (Peter Householder-2).

In an interview, Peter added, '*Firewood and charcoal have disadvantages. You cannot cook inside the house; you have to get outside the house. But on days where it's raining, and you need to be inside the house, so you need your gas and your other alternative'* (Peter Householder-2).

The above excerpts indicate that using one plate gas tank was indicated to be dangerous and could cause burns and even house fires, which was agreed upon by most of the householders. Still, the majority of householders also indicated knowledge that gas was a better alternative when it is raining, noting the impact on one's health they are affected by using firewood and charcoal indoors. The results suggest that householders are aware of the dangers associated with some energy

sources but are left with limited choices. The conclusions would be recommended as another possible area to improve the existing systems and structures to accommodate better clean energy practices which could be used safely.

Figure 20: Still video image and link to a video showing a one-plate gas cylinder used to boil water.

Link to video: Video 2.MP4

Figure 21: Still video image and a link to a video showing a two-plate gas stove being used for cooking and heating water in a household.

Link to video: Video 3.MP4

Despite the convenience of using gas, it is essential to note that Zimbabwe has no infrastructure or gas pipes connected to households; therefore, householders must buy an LPG cylinder and connect it to gas cookers. The Zimbabwe Energy Regulatory Authority (ZERA), which is supposed to regulate licensing and monitor gas use, is failing its mandate; therefore, householders may be using substandard LPG, which can result in explosions, causing fires and loss of life. The Zimbabwe Sunday Mail (2014) and ZERA (2021) reported the dangers of using LPG, which can be related to the study's results. Most households switched to using gas because of the power cuts and load shedding, leading to poor-quality gas flooding the market. During the study, one of the householders reported and presented a photo of a burn injury caused by a gas explosion as they were

about to prepare a meal. These outcomes present a need that the energy sector should address, not only to regulate gas vendors but also to restructure its energy facilities for gas to be supplied to households safely and in a just manner.

During the interviews, householders highlighted a trend for householders to purchase combined energy sources such as electricity units, firewood and gas for cooking, which brings potential flexibility for households during power cuts and load shedding: *'Gas is the first thing we use to cook, especially when there is no electricity, because, at times, it can be accessible and efficient for cooking then, to start looking for firewood so we can start cooking, especially when there's a power cut while you are in the middle of cooking you can switch from the electric cooker straight to a gas cooker'* (Dorcas -Householder-5).

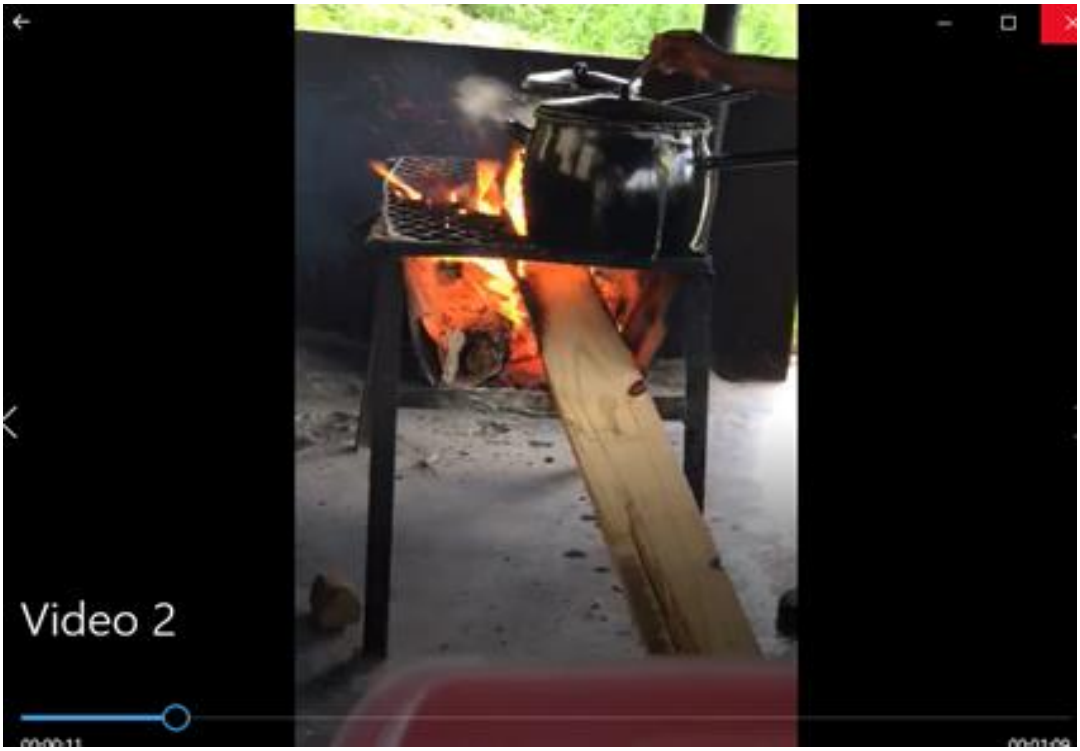
The results indicated that there was some preference for firewood due to culture. This can be linked to a study conducted in Brazil by Mazzone et al. (2021), which found that the use of fire was associated not only with socioeconomic factors but with cultural values, preferences for cooking food using firewood, rituals, and habits. These results may be contextualised as, in some contexts, firewood is used, but its use is not linked entirely to cost but culture:

> *'We always feel like using firewood is part of our culture in some areas. I will take you back to the rural villages where people are accustomed to using firewood. It was like an automatic decision to use firewood during a power cut and load shedding for those in the city due to cultural links rather than considering other sources of fuel, such as solar.'* (Stakeholder-2, public energy company).

It emerged in a video narration that, owing to poor facilities, cost and service, a householder who worked at a hospital facility highlighted that the issue with poor energy sources was not only within the home but extended to her job as a nurse. The householder narrated in one of the

video recordings as an illustration of how poor electrical resources and facilities can affect some hospital facilities, showing the catering staff cooking outside in a makeshift open-fire cooking stand because of the hospital's inability to afford to repair the hospital kitchen (see figure 22).

Figure 22: Still video image and a link to a video of the fire cooking stand.



Link to video: Video 1.MP4

The householders highlighted that the hospital could not afford to equip the hospital kitchen with sufficient electrical cookers to such a point that they had to use cheaper firewood, which is sold at a discounted rate by local wood sellers who have permits to sell firewood. The use of firewood was mainly due to being unable to repair the kitchen and buying electric cookers. Meaning assessing the cost of energy may not apply in this context as they would not be able to ascertain how much it will cost to run the electric cookers.

The catering staff highlighted issues that affected the patients' dietary needs, such as using the outside fire could cause delays and difficulties, especially when it rains: the makeshift shelter needed to be adequate to shelter them while cooking during the rainy season. Through the video recording, it can be heard that the voices of the catering staff were somewhat lower at the beginning of the recording and interaction. It was unclear whether they felt they had no say in the cooking arrangements or if this was due to fear of the management, which could also be an indicator of workplace disparities indirectly caused by energy poverty. It was evident in the video that smoke inhalation can also affect members of the catering staff, though the catering staff did not seem concerned as they were more concerned about the patient's needs.

The catering staff and householders also added that the long time required for fire preparation and cooking patients' food was also a worry, especially when it was raining, as patients needed food urgently to take their medication. Some of the patients' medication also requires refrigeration, but inadequate storage systems can be detrimental to the patient's health and stressful to the staff.

> Yeukai added, *'It may be cheaper sometimes, but what if it rains and you need to use firewood? It can be difficult, as the shelter they built us is insufficient; as if it rains and windy, firewood can get wet, and what you do then so you cannot use the firewood.'* (Yeukai, Householder-6)

As per the above excerpt, there is also inadequate space to store firewood, which can get wet during the rainy season, impacting the catering staff's ability to provide food for the patients on time, as semi-dry wood does not produce adequate heat when used for cooking. At this particular hospital, it may be that priorities for energy sources focus on cost rather than the efficiency of catering to the sick. Below are the inferences from the videos:

> *'The catering staff always have to think about organising more firewood as soon they see we are running out. We have to request and use firewood because it is cheaper for the hospital to get firewood than to update the existing kitchen. They do not have sufficient working electric cookers. It is not an issue of having electricity and a generator but the affordability of repairing the kitchen. After all, the firewood is cheaper, as it is discounted by local sellers who have permits.'* (Video narration by Yeukai, a householder-6, while at work)

The narration indicated that firewood was cheaper, but the hospital staff must always be on their guard, ensuring they still have enough supply before the next delivery. Though the hospital has a kitchen space, the hospital does not have the resources to refurb the kitchen. Thus, the kitchen staff have to use firewood.

In regard to the fuel sources and to add to the above, most householders highlighted and explained that they struggle to find fuels such as firewood because of scarcity and health issues, as mentioned above. In addition, they cannot walk long distances searching for firewood in abandoned farming areas. Additionally, in a video narration, a householder highlighted that they struggle to find and cannot afford most of the energy sources; hence, they have to substitute with sawdust (see figure 23), which they buy in three buckets for one dollar at local factories. The householders use a stove named 'Mbaula' to burn sawdust, thus generating energy to cook. 'Sawdust is a much cheaper option as it costs let than one USD per 5 kilograms' (Musiwa, a householder-3)

The study results also indicated that the householders using sawdust for cooking stayed in a new development location with new houses being built, which could aid with the scarcity of firewood, as forests had to be cleared for housing. In line with the study outcomes, householders would resort to cutting down trees for firewood. Zvobgo and Tsoka (2021) highlighted that the causes of deforestation or vegetation loss in urban Harare and the peri-urban area are new housing developments, cooking fuel sources and agriculture, mainly tobacco harvesting. The increase in deforestation led the government to ban tree cutting in particular areas unless a licence is acquired by a tree cutter cutting trees for commercial use, such as timber.

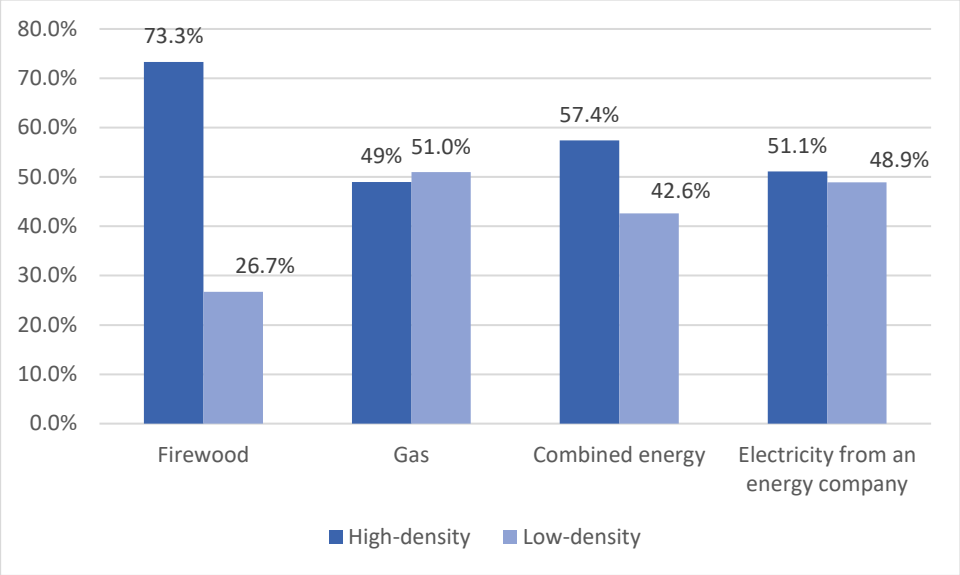
In addition, to the used fuel sources, in figure 23, video narration, the householder indicated that they use a Mbaula stove powered with sawdust. The householders added that not having access to electricity can be demoralising and embarrassing, especially cooking in poor outdoor conditions. Buying sawdust as an energy source was reported by the householder because it was due to not having adequate income but other energy sources. The behaviour of the householder highlighted the stigma associated with energy poverty, which can also be experienced in other countries, and the inability to separate poverty and energy poverty. In this particular situation, it could be that some householders' needs should be measured using not just energy poverty indicators but also other poverty indicators.

Figure 23: Still video image and a link to the video of the 'Mbaula' stove powered with sawdust.

Video link: Video 1.MP4

Crosstabulation analysis was done using survey data to understand subgroups based on location and the energy/fuel they use for cooking. The percentages in Figure 24 are percentages of people who used each type of fuel. As established above, most householders in interviews highlighted that they would prefer to use gas for convenience. The survey results indicated that (see figure 24) 51% of respondents who indicated that they used gas as a source of cooking energy were from low-density suburbs, and 49% lived in high-density suburbs. However, the difference was too small and insignificant between the use of gas in high- and low-density suburbs.

Figure 24: Crosstabulation of cooking fuel sources by location.



In response to the above results, the fuel used by location primarily may have to do with economic status and affordability of resources or income and affordability per household, regardless of location. The difference was also highlighted in an interview with a stakeholder agreeing that some householders could afford alternative energy sources such as gas. Stakeholder-3 narrated:

> *'In low density, we can assume it is a different case because there are areas where people can be said to be financially better off; they use gas more and have better solar systems. But they can also use similar sources, such as firewood, in their fireplaces during winter. But those in the high-density suburbs would use firewood for cooking rather than for warmth again.'* (Stakeholder-3- Private sector).

Returning to the results in (figure 24) A proportion of 57.4% of those who used combined energy sources lived in the high-density suburbs, as did 51.1% of those using energy and electricity from an energy company. Thus, sources of fuel for cooking were varied, as highlighted by the

majority of participants. This likely indicates that some householders would use any available sources, as narrated by Stakeholder-4:

> *'I have noticed in deprived areas it is more of a situation on what people can use, from plastic to wood. Though the most used method now is gas, only those who can afford to buy gas.'* (Stakeholder-4)

Lastly, 42.6% of those who used combined energy sources lived in the low-density suburbs, as did 48.9% of those using electricity from an energy company. These results highlighted that location did not have much effect on households' fuel sources, but these were based on cost, availability, and convenience.

The preferred energy source was stated in section 5.3.2. Still, the cost was the barrier to having a solar system as an energy source. The cost of solar affordability makes it difficult for some householders to have large systems. Still, some householders could afford small solar systems but could only generate electricity for a few household items such as lights, wife, and sockets but not refrigeration (see video figure 25). Dorcas narrated in a video:

> *'For example, it is cheaper to have a small solar system for the Wi-Fi system to help students work from home than to buy expensive internet bundles or mobile data. But you have to bear in mind that the solar system is just for the lights and plugs/sockets. If there is a power cut and we cannot afford gas, you will need to buy firewood to cook outside. It will be beneficial to afford a solar system which can supply electricity to the fridge. Yes, we can watch the TV, but the fridge doesn't work with the solar system and even the electric cooker.'*

Figure 25: House videos of a mini-solar system: still video image and link to the video.

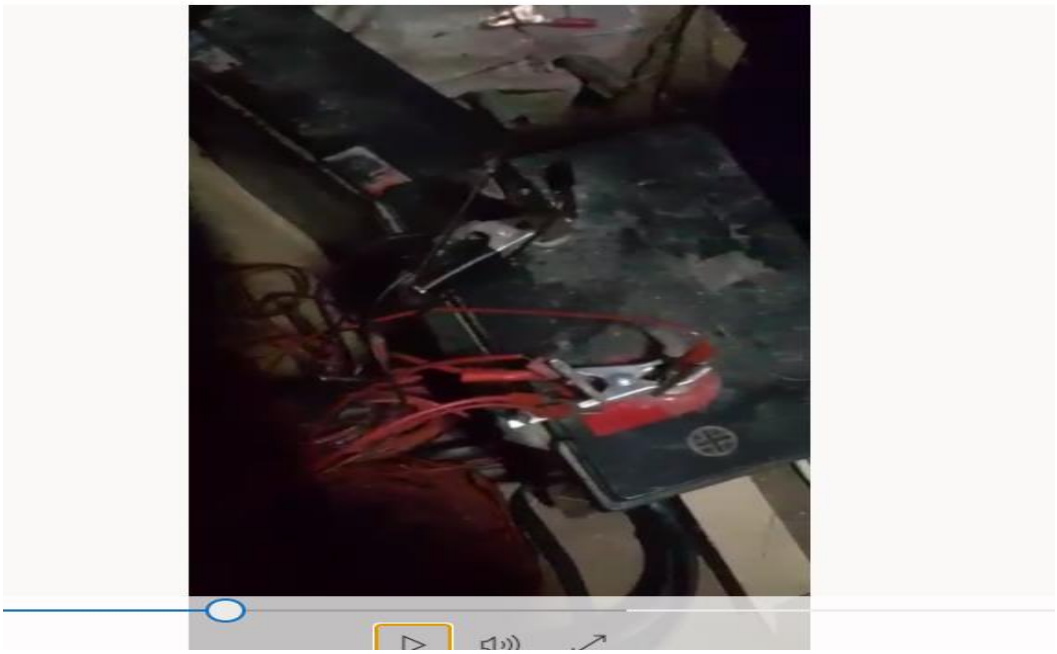
Video 2.MP4

Most households prioritise powering their lights and plug over having a more extensive solar system that can power other household items, such as a fridge.

> *'In Harare, most people need lights and sockets power, which is cheaper for most households who can afford it, but you have to consider some extremely poor households per community who may never be able to install solar systems. But within some communities considered poor, you will find that some households can afford a full system that will power even refrigeration.'* (Stakeholder, private energy company)

It emerged that some householders, through formal services, could not afford a professional company to install a system because of the high cost of solar systems in Zimbabwe. It came out in the video recordings and interviews that some householders, via informal services, buy some small basic solar panels and energy storage batteries, which they will connect to have lights and use the plugs. (see figure 26).

Figure 26: Still image of the makeshift solar system and link to a



video.

Link to video: Video 4 .MP4

Overall, most householders agreed that it was costly to install solar systems, and, as suggested in section 5.3.2. Householders felt it was the government's responsibility to assist householders in installing a solar system that generates enough energy, especially during power cuts and load shedding. A way to mitigate the energy issue householders used multiple energy sources during a power cut or as a preferred cost-cut method. Problems with energy sources led to a sub-theme named 'community sharing of cooking fuels', which will be discussed in the next section.

6.5 Cultural identity and sharing of cooking fuels.

Another emerging theme was sharing of cooking fuels between householders. Most householders during the interviews indicated that combining cooking resources could be cost-effective, thus forming local cookhouses, which were also established to help the vulnerable people in the communities (see figure 27). The financial gain of a cookhouse is based on goodwill from those community householders willing to combine their existing sources of cooking energy, such as firewood, to prepare group meals (seen in the following excerpts below).

> *'Even the firewood is sold in US dollars, and that is expensive, especially for unemployed people, which is why we cook together as a community. It was a cheaper option, as we all could contribute towards buying firewood. At times we could get free firewood from rural areas, but you need a permit from the government.'* (Hazel, Householder-11)

> *'We have a local cookhouse where we can all help each other when cooking when there is a power cut or load shedding because we realise that if we do not help each other, some people probably go for days without eating a hot meal. And yet to realise that sometimes with a power cut or load shedding, it can take up to 2 to 3 weeks before power is restored, so you have to help each other.'* (Dorcas, Householder-5)

Figure 27: Still video image and link to a video

Link to video: Sheltered cooking place Community Video 1.MP4

An important point noted was that most householders highlighted that their communities showed a spirit of togetherness. Thus, problems with power cuts and load shedding extend to the communities' vulnerable members, who rely on community champions or charitable assistance for cooking meals.

Inadequate availability of cooking fuel causes desperate and challenging times for community champions when they need to help the most disadvantaged by providing meals and warm water for bathing. Some community champions have to look close to home for fuel sources, such as cutting down their domestic trees, as a mechanism for having fuel sources to cook for the poor: *'I can give an example of a local lady who even had to cut down a tree so that she could facilitate cooking for those vulnerable families. The local lady realised that some kids were even going as long as two days without a proper meal because the families may be unable to afford to buy firewood when there is a power cut and load shedding'* (Sarah, Householder-4).

However, a method such as cutting down domestic trees as a fuel source is not a long-term or sustainable solution. In addition, this shows one of the desperate methods householders adopt when sourcing cooking fuel. In the long term, adopting new strategies as a community, understanding new energy technologies, and working with NGOs who have access to funding may lead to communities having solar mini grids rather than relying on the primary grid and unsustainable energy sources.

Another point is that community sharing of fuels may be presented differently in other countries, such as Scotland (Slee,2020). For example, starting renewable energy microgrids in communities may be regarded as community-sharing fuel generated and shared between householders (Lacey-Barnacle,2020). However, in Zimbabwe, owing to poor access to funding, power cuts and load shedding, the householders in the study have resorted to using the community cookhouses. Cookhouses contribute towards supporting vulnerable community members by cooking their meals. Still, also it is essential to note that they come with a share of smoke inhalation, which can impact their health. The above video demonstrates that the cookhouses are also formed as social gathering places for women, which can be heard from how the women interact.

Jessica noted, *'Though we are used to the impact and effects of power cuts and load shedding, our kids still want to go out and play. However, it can be a challenge if you are cooking outside on a firepit; you have to keep a close eye on your children. Otherwise, your child can get burnt because they want to play close to the fire while the adults are cooking, and at times the child will be on the mother's back.'*

Figure 28: Still video image and link to a video of a householder cooking on a firepit.

Link to video: Video 3.MP4

Highlighted was a health concern due to smoke inhalation, inappropriate sources of cooking energy and poor cooking facilities for householders. A fire hazard could affect children because of the areas where firepits for cooking are situated, which can lead to accidental burns. Physical health problems include back pain and smoke-related illnesses (see Figure 28). The firepits are situated in an open, not secure place where children would be playing and, if not being monitored, could go close to the firepit, which could be a fire hazard. The firepits were mainly run and manned by women, which helped them to socialise and share firepits necessary. This supports the point of community spirit discussed earlier in this section.

6.6 Housing factors

Before the next section on the effects of power cuts and load shedding on daily life and safety, it is crucial to visit the location factor. Changing location due to power cuts and load shedding was one of the key areas assessed in the study. Though some householders responded via the survey and indicated moving areas due to power cuts and load shedding, a common view amongst interviewees was that some locations had fewer power cuts. During the interviews, one of the householders highlighted that they changed location from high-density to low-density suburbs and have since experienced fewer power cuts and less load shedding in the low-density suburb than when they lived in the high-density suburb: '*My children made sure I would move from Mufakose because the electricity issue has been dire for over two centuries. They realised it was better to move the area and move to an area with a minor power cut because this place is close to the presidential residence, you see, so the power cuts and load shedding are almost non-existent'* (Householder-Mutede-7). These few power cuts and load shedding in the low-density suburbs may be attributed to the fact that the low-density suburbs have better services than the high-density suburbs, which are the most densely populated. Still, poorly maintained infrastructure, including houses and substations, can cause crippling power cuts and load shedding in high-density suburbs, which means that updating the substations and housing stock should be a priority. Though the high-density suburbs are densely populated, the properties are usually small. In addition, the demand for energy for electrical gadgets such as laptops and phones may also be limited because of householders not being able to afford some electrical gadgets, resulting in less energy usage when compared to the low-density suburbs, which mostly house wealthy or middle-class people.

6.7 Quality of life and safety implications

Moving on now to consider the aspect of quality of life. Through the survey, householders were asked about their quality of life in their locations during load shedding or power cuts. The survey results in Table 11 highlight that the householders in low-density suburbs, when asked about the effects of power cuts or load shedding on daily life using a scale of 1–4, scored a median of 3 (one not affected, two slightly, three moderately and four greatly affected). Through the survey, householders in high-density suburbs, when asked about the effects of power cuts or load shedding on daily life using a scale of 1–4, scored a median of 2. As the assumption of normality was not satisfied, a non-parametric Mann–Whitney test was used to test for significant differences. The results found no significant differences between high- and low-density suburbs in terms of the impact on daily life when there is a power cut and load shedding. This may be because consistent power cuts, load shedding, and lack of solutions result in the resilience of householders in either high or low-density suburbs, as they are both affected. Still, some households may be more affected than others.

Table 11 The effects of power cuts and load shedding on householder's daily life.

Survey question	High-density suburbs	low-density suburbs	Mann-Whitney U-test	Z	P-VALUE	Effect size
Q21 Survey question Scale:1-4 (See appendix 4)	Median=2, n49	Median=3, n50	U=1129	z=-0.722	P=0.47	with a weak effect sizer=0.1

Householders were also asked via the survey respondents were asked about their safety in their locations during load shedding or power cuts. Through the survey, and as per table 12, householders in high-density suburbs, when asked about the effects of power cuts or load shedding on safety using a scale of 1–10, scored a median of 2 (One being unsafe and ten being safest). When asked about the effects of power cuts or load shedding on safety using a scale of 1–10, the householders in low-density suburbs scored a median of 3. As the assumption of normality was not satisfied, a non-parametric Mann–Whitney test was used to test for significant differences. The results found no significant differences between high- and low-density suburbs in terms of the impact on safety when there is a power cut and load shedding. The results may be in high- or low-density suburbs; power cuts and load shedding have profound safety consequences for householders. Because the highlighted that would be worried about walking in dark areas due to poor or no lighting at night, which could lead to mugging regardless of location.

Table 12 The effects of power cuts and load shedding on householder's safely

Survey question	High-density suburbs	low-density suburbs	Mann-Whitney U-test	Z	P-VALUE	Effect size
Survey question:24 (See appendix 4) On a scale from 0-to 10 0 being unsafe and 10 being the safest.	Median=2, n49	Median=3, n50	U=958.5	z=-1.88	P> 0.06	with a weak effect size r=0.2

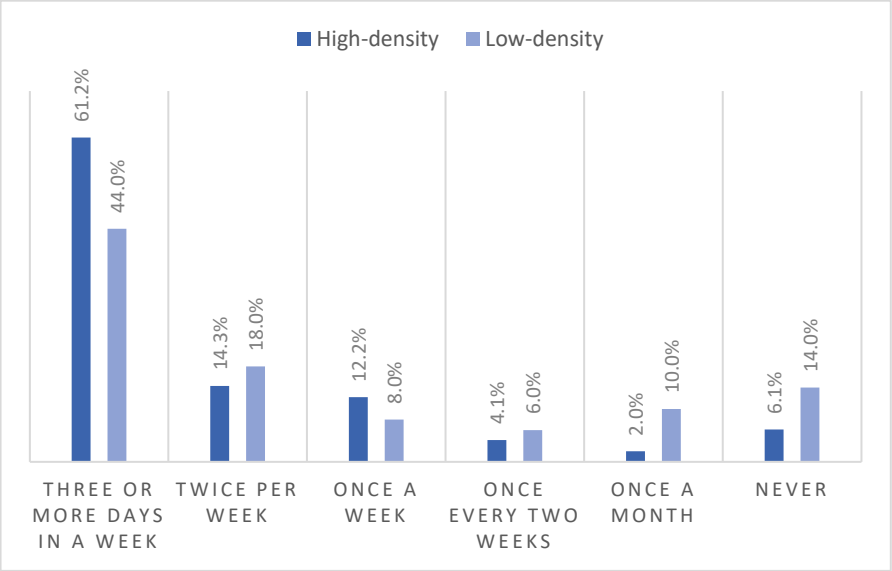
6.8 Before Covid-19 -existing energy problems.

This study took the novel chance to compare power cuts or load shedding based on the locations of the householders before and during Covid-19. The purpose of the Covid-19 narrative is to review these unprecedented times and present any new trends which could be presented in this study. This section will first present results on the impact of power cuts and load shedding before Covid-19. This will then be followed in the next section by reviewing any shifts in the energy-related issues which may have been noticeable during Covid-19 and how these changes temporarily eased some of the energy burdens noted in the present section.

In Zimbabwe, high-density suburbs are mostly crowded with poor services. From the survey results, figure 29 shows that 61% of all householders from high-density areas indicated that they had power cuts or load shedding

on three or more days per week before Covid-19; this compares with 44% of householders from low-density areas. Spearman's rank-order correlation test was performed to examine the relationship between location and experiences with power cuts and load shedding before the pandemic. The results indicated weak positive and significant correlations between location and power cuts or load shedding before the pandemic ($r_s = .20$, $n = 99$, $p = .049$). These results support the conclusion that before Covid-19, there was a significant difference in power cuts and load shedding between high- and low-density areas. While this was the case before Covid-19, the next section will examine whether there were changes in the energy supply during Covid-19.

Figure 29: Frequencies of power cuts and load shedding experienced in households in high- and low-density areas before Covid-19.



6.9 During Covid-19 -A problem eased

While the Covid-19 lockdown understandably resulted in more public health concerns, there were various changes in domestic energy consumption, with some households losing their income and ending up in energy debt due to increased domestic energy usage during Covid-19 (Evans et al., 2021; Kirli et al., 2021). In the study context, some

householders reported fewer power cuts during the Covid-19 lockdown. Interviewees highlighted how the Covid-19 lockdown afforded them more access to electricity than before the pandemic, which will be discussed in the section.

As previously stated in section 5.3, the householder's narrations were centred on worry as part of the ongoing challenges of energy poverty and continuous worry about the energy-associated challenges. Despite other added stress of Covid-19, such as job loss, there was a relief of fewer power cuts and load shedding. During the Covid-19 householders could use electrical facilities without worrying about buying other energy sources such as candles and charging solar lamps for light, mostly used during a power cut and load shedding. It is also likely that those who could not top up prepayment meters due to not having money, as mentioned in section 1.2.2, would not enjoy the benefits from the relief of fewer power cuts and load shedding during Covid-19.

Despite other householders who may have struggled to buy their electricity units, the householders who could buy electricity units found the daily storage burden eased and felt they could store more perishable foods and their medication. Dorcas, a householder, indicated that: *'at least these days of lockdown, we have fewer power cuts, and my husband's diabetic medication can be stored as per the doctor's directions. Most civil servants work from home, and the government has to keep the power on, and we are also benefitting'*. Another significant aspect of Covid-19 and fewer power cuts and loadshedding could be supported by two theories. The first possible explanation for this might be that the availability of electricity was primarily due to the closure of city centre businesses, and electricity was diverted for domestic use.

Of interest and somewhat contrary to the former reason for fewer power cuts during the Covid-19. Householders believed that the fewer power cuts during the pandemic were because government people were

working from home; therefore, they thought the utility company had no choice but to supply energy. Interviewees suggested some discrimination in terms of who gains more in an unjust system and when others are included. In this case, the results should be taken with caution as householders believed civil servants, who work directly for the government, were considered more important than people's needs; hence fewer power cuts and load shedding during the Covid-19 so that the civil servants would work from home. But in most cases, the working-from-home strategy to stop the spread of the Covid-19 virus was a short-term solution for easing a lived experience related to energy problems.

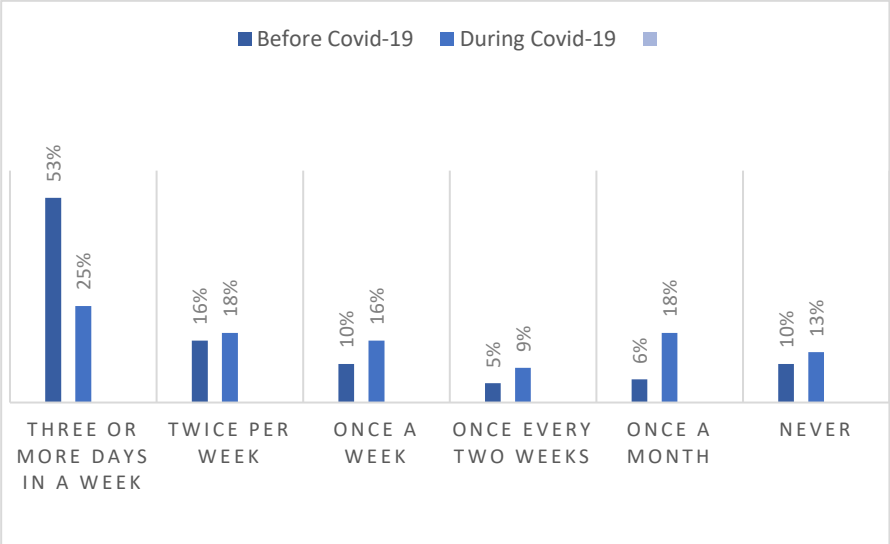
As mentioned above, access to electricity improved in the short-term as they had refrigeration and lighting, including that of students, who were able to do schoolwork while electricity was available: '*Having all the sources of energy around you all at the same time, completely doing away with any inconvenience whatsoever, is better than one being unable to access energy'* (Peter, Householder-2).

Though there may well be other energy-related problems, such as the affordability of the energy units, which will be discussed in the next section on cost and affordability, the householder indicated that it was better to have energy availability than not having energy available. Having a choice was the case during the Covid-19 pandemic. Householders had an electricity supply and could choose whether to use electricity, firewood, or gas. According to Mbaka et al. (2019), energy preference and consumption are based on different factors such as location, decisions made by households on which energy source to use, income and level of education within the home.

To further understand the participants' experiences with power cuts and load shedding during the unprecedented times of the global Covid-19 pandemic, a descriptive analysis was done to understand the energy supply distribution before and during Covid-19. Crosstabulation analysis

compared the energy supply before and during Covid-19 using the participants' locations. Figure 30 shows that 53% of the householders reported that before the Covid-19 pandemic, they experienced power cuts or load shedding in their households on three or more days a week. In comparison, during the Covid-19 pandemic, the proportion was lower, at 25%. These results, as mentioned earlier, may have been due to the closure of industries during the global pandemic and the energy suppliers providing energy to households that the government typically prioritises for economic purposes.

Figure 30: Frequencies of power cuts and load shedding experienced in households in high- and low-density areas before and during Covid-19.

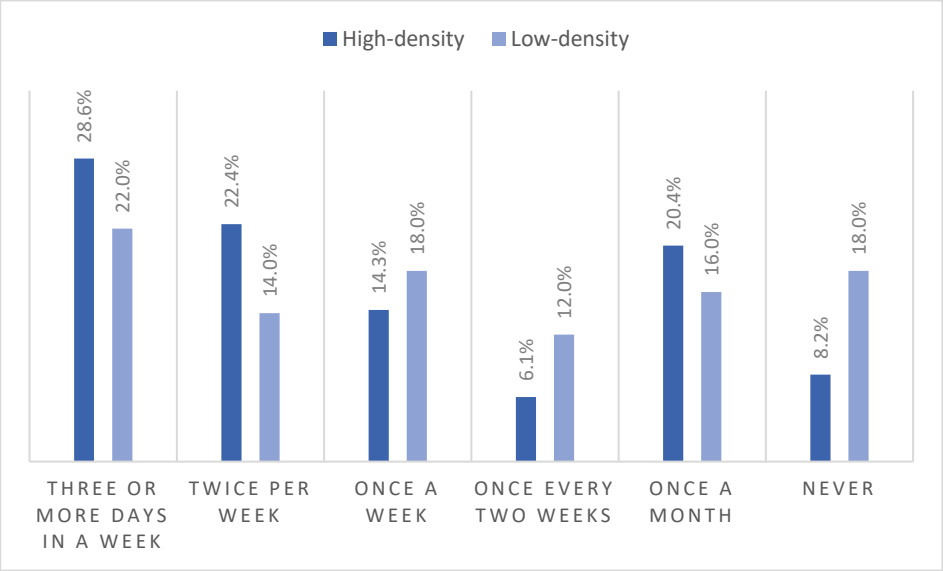


Given this difference in the survey results shown in Figure 30, the interview analysis also revealed that a few householders indicated that they experienced fewer power cuts and less load shedding during the Covid-19 pandemic. One private sector interviewee also highlighted that the sector experienced less demand for installing solar systems: '*Because our business is also word of mouth, those customers will tell the next person or business how we are growing: a gradual process, but we are growing.*

During the pandemic, however, we noticed inquiries went down. We could only guess it was because the industries that take up most of the power were not operating. Therefore, the energy capacity could cater for domestic usage' (Stakeholder-4, private sector). The Covid-19 pandemic could have impacted the solar business negatively, as power cuts were less frequent and equipment transportation would have been affected. As mentioned above, the less frequent power cuts and load shedding during the Covid-19 pandemic could have been due to most employees working from their homes and students studying online. The supply of energy for domestic purposes during the Covid-19 pandemic was possible because the energy company could divert what is typically used for powering companies to households. As another householder added: '*One more thing is, since our university closed due to the pandemic and we had to study from home, load shedding and power cuts have been less frequent as opposed to other times'* (Dorcas-5, Householder).

The role of location was a predominant factor in this study; therefore, further analysis was done to compare power cuts or load shedding during Covid-19 based on location. Figure 31 shows that 28% of all householders from high-density areas indicated that during Covid-19, they had power cuts or load shedding on three or more days per week, which was higher than the proportion of 22% for low-density areas.

Figure 31: Crosstabulation analysis: Power cuts and load shedding experienced in households in high- and low-density areas during Covid-19.



Spearman's rank-order correlation was performed to examine the relationship between location and experiences with power cuts and load shedding during the pandemic. The results indicated weak positive and insignificant correlations between location and power cuts or load shedding during the pandemic (r = .14, n = 99, p = .179). These results suggest that during Covid-19, there was no significant difference in power cuts and load shedding between high- and low-density areas. The graph in figure 30 suggests that multiple incidences of load shedding were more prevalent in high-density suburbs. However, this is contradicted by the once-a-week data, which resulted in an r value that indicates a very poor correlation.

The results may be because there was adequate energy capacity to supply households' energy needs and less need to supply industries since most closed during the pandemic. Still, the low-density suburbs also had fewer power cuts and load shedding before and during the pandemic than the high-density suburbs. The differences in the frequencies of power

cuts and load shedding could be because service provision and infrastructure in low-density areas are better than in high-density areas.

6.10 Summary

Financial pressure is prevalent in most households because of low incomes and poverty. Painting a picture of hardships and suffering, with the added issue of power cuts and load shedding was highlighted in the results, there is a deprivation of a better life in the study context. Householders spent most of their time looking for energy sources and water and doing household duties, leaving little time for anything else that could aid a better quality of life, such as recreational activities. Energy issues such as high energy costs and poor access to energy sources caused many uncertainties in the study context and forced householders to adapt to their situations to survive, as no other options or assistance from the energy supplier were available.

The sources of fuels used for cooking are embedded in different elements, and the reasoning for choices can differ by household. For example, the sources of energy used for cooking vary by household as a result of affordability, weather conditions and health. The householders use different survival mechanisms to find energy sources and methods for cooking without full support on how the issues associated with power cuts and load shedding can be resolved. Instead of looking into better solutions, they put the most significant effort into finding appropriate energy sources and fuels for cooking. In turn, desperate situations could cause stress and risk to householders using appropriate energy sources.

Though some of the energy sources are purchased in US dollars, the cost of energy sources differs from that in other thriving economies because of irregularities in Zimbabwe's currency. In addition, energy market prices seem to differ daily because of the fluctuating value of Zimbabwean currency. Another added factor is that only one parastatal company is

regulating the energy industry. With one energy supplier, competition in the energy sector is poor and less innovative because of the monopoly. A better system is required to have cheaper or affordable energy prices if new energy companies are introduced into the market independently of the government.

In summary, owing to ongoing power cuts and load shedding, communities found solutions to support each other, mainly by assisting the vulnerable with cooked food during power cuts. Some householders indicated that they would skip meals to save fuel sources and keep costs down, which could be challenging for those with health needs such as diabetes and those requiring food to take their medication.

In light of their cookhouse solutions, communities would require much better and more sustainable solutions. Communities need to be educated on the issue of energy poverty, which could be a long-term solution, especially when considering issues such as physical health. Community initiatives such as the cookhouses are based on community togetherness. Hence, it is important for communities also to be engaged so that they would know who they could approach, thus being advised on having more sustainable cooking fuels than relying on firewood.

7 Findings- Energy sector mechanisms, technologies, and practices

7.1 Introduction

This chapter will seek to answer objectives four and five. Objective four contributes to the ongoing debate on the meaning of energy poverty. Five proposes policy recommendations to help tackle energy insecurity and poverty in Zimbabwe and improve the national energy operation strategy. The discussion will be guided and focuses on analysing the data generated from the thematic data analysis of interviews and video data, guided by emerging themes and sub-themes. The ongoing debate on understanding energy poverty, energy policies and the roles of the public and private energy sectors will be presented with critical recommendations based on the strategies for renewable energy outcomes. Householders' input will also be reviewed in this chapter where necessary. The chapter will conclude with a summary of the results from the section.

7.2 Operational strategy

It emerged from the interviews with private and public stakeholders that an operational strategy is a multifaceted mechanism which the private and public energy sectors put together as an umbrella guideline. The operational strategy mechanism includes three elements: (1) Sustainability and Affordable renewable energy, (2) Technology and Funding (3) Procedural implementation and distributional strategy. The three classifications of the elements will be discussed in detail in the following sections. As highlighted by stakeholder 8 from an NGO:

> *'Yes, there may be disputes but the government does work collaboratively with the private and charitable sectors. All energy sectors realised that energy-saving strategies combine to form*

strategies such as energy-saving light bulbs but, most importantly, introducing sustainable energy projects throughout the country'.

Additionally, stakeholders- (6 private sector) explained further what is involved in operational strategy:

'Unfortunately, something happened at the Hwange Colliery, one of the biggest power producers in Zimbabwe. The government had to establish collaborative working with other energy companies, private or charities, where the agenda was focused on having sustainable strategies and to fund energy projects. Also, they had to work towards reducing energy costs for households. The government did attempt to cancel all areas for those mostly poor households, but I do not know if this happened in the end. Overall, the agenda was to establish a robust policy with clear procedures and distributional operational strategies for all energy sectors.

Based on the elements and more clarification on the operational strategy, sharing ideas appears to be the core of the strategy. All stakeholders seek collaborative work to ease the burden of energy poverty. These findings were supported by the European Commission (2023) and Bolano et al. (2022), who highlighted that the collaborative working of all energy stakeholders was crucial, primarily due to the worsening energy burden caused by COVID-19. The operational strategy is meant to support and guide both the private and public energy sectors in determining the optimal level of implementing renewable energy to improve community access to adequate energy provisions.

Most stakeholders, both private, public sector and non-governmental sector, highlighted that an operational strategy is also an approach which identifies opportunities and sustainable methods and new technologies which can be applied to transition towards clean energy and potentially

successfully implement renewable energy projects. Echoing similar suggestions, Stakeholder 6 stated:

> *'First, it would be a dream for the nation to be a hundred per cent green energy. But we have the capability instead of building new power plants, we could have been collaboratively building new hydro dams and adding onto our solar system; even hydro alone, we have enough hydropower in Zimbabwe to power the whole of Zimbabwe if the infrastructure put into place in and also help with our water reservoirs and also allowing total solar panels'*.

The strategies include procedural implementation and energy distributional strategies assessing socioeconomic and environmental factors towards the transition to renewable energy and alleviating energy poverty. Private and Public stakeholders believe these strategies should be a coordinated effort which should mean having an inclusive energy policy and a plan from those knowledgeable in the energy arena. The following sections discuss three elements captured as the themes under the umbrella of operational strategy.

7.2.1 Sustainability and affordable renewable energy

As stated above, this section will now discuss the first element of the operational strategy. Some private, public, and non-governmental stakeholders suggested that for better planning to ease the energy burden, it is crucial to understand the Zimbabwean housing stock, population growth and energy demand. Stakeholder – 1 private sector highlighted that: '*At the moment, my role is to understand the new Zimbabwe, so to speak, as to understand what exactly the energy demand is and who has access to the primary grid; most of these details are missing, so I do believe that it is practical to understand the housing landscape of Zimbabwe to gauge the actual energy demand*'. This indicates that some planning still needs to be done in Zimbabwe to before the energy issues are

addressed fully. Stakeholder 1 private sector added: 'In Zimbabwe, we have different sources that generate power. I am also part of the team that is still looking at tapping into all the sources for power generation without getting into the technical details; currently, I am primarily working with renewable energy sources. Our division is also looking into the feasibility of new technologies and ensuring our current projects meet safety regulations'.

This suggests that other energy resources and potential locations for installing solar farms would be key for sustainable energy production, which was a point that was highlighted in the interviews by all stakeholders. As supported by Kumar (2020) having alternative energy sources which produce additional energy for the primary grid will result in supporting the energy-poor communities. However, Roddis et al. (2020) highlighted the importance of understanding the barriers and communities' acceptance of alternative energy. In the Harare Metropolitan province context, the barriers were mostly mistrust and poor communication between energy consumers and the companies. This was primarily exposed when ZESA implemented prepayment meters, as highlighted in section 5.2.2, the holder's resistance in prepayment meters due to poor communication of the energy company.

The vast majority of householders in the study's context have no financial resources to have solar systems; therefore, unable to afford rooftop solar systems, at least one that would provide lights and sockets power during power cuts and load shedding. These findings were similar to the literature review by Shakeel et al. (2023), which highlighted that solar adoption was influenced by different factors such as economic, environmental, and social factors. The participants in the study—stakeholders from all sectors and householders—highlighted that most householders would prefer the use of alternative energy, such as having a rooftop solar system; however, installing a solar system is unaffordable for most householders.

For those householders who had managed to install solar systems, they were basic packages, which power lights and plugs but no other electrical goods such as electric cookers. One of the stakeholders from a private energy company mentioned that their mini-solar package cost around 500 US dollars, the most expensive one going beyond 5000 US dollars. Most private energy companies highlighted that they also offer payment plans for solar systems. However, even with the payment plan offer, only a few householders can afford it, as stated by one of the private stakeholders:

> *'We also have payment plans that the sales department deals with because not everyone can pay at once, with the cheapest starting from below 500 US dollars. But not everyone can afford even the payment plans, as most people are unemployed and rely on small business income, which may have unreliable income. However, all our customers have to pay 70% of the cost of any solar package they select.'* (Stakeholder-1, private energy sector)

Owing to the affordability issues, and as shown in the following excerpts, most householders and private and non-governmental stakeholders agreed that the Zimbabwean government should be responsible for installing subsidised solar systems, especially in new developments and for householders who need electricity because of health problems.

> *'I think the government can help by installing solar systems because they are struggling to supply electricity to households, and some people cannot afford to buy electricity.'* (Yeukai, Householder-6)

Most private stakeholders highlighted that those lessons are still to be learned within the Zimbabwean energy sector. Both private stakeholders and householders agreed that having new housing developments use alternative energy sources or decentralised energy sources, such as solar systems, would help ease the country's energy burden and may be sustainable. Similarly, to other literature findings, the benefits of

decentralised energy systems form combined renewable energy sources, thus reducing fossil fuel usage and reducing the carbon emissions being emitted (Strandberg, 2021; Das et al., 2023).

As seen in the excerpts below, most private, and public stakeholders suggest improving the energy infrastructure should be in place and implementing renewable energy when funding is available. Most power stations require repair and can no longer produce the energy required by the country. Therefore, alternative energy-producing solar farms and hydropower may lead to a much more sustainable future, including continual exploration of other energy sources.

> *'When funding is available, there will be more developments. Some of the power stations need to be closed to build new power stations or even solar farms that can use renewable energy. A case of South Africa using wind turbines to generate energy, some of the things we learned from our neighbouring countries.'* (Stakeholder-2, public sector)

> *'I would like my nation to be hundred per cent green energy. We have the capability, instead of building new power plants, could build new hydro dams to add to our solar system. Even with hydro alone, we have enough hydropower in Zimbabwe, which can power the whole of Zimbabwe if the infrastructure is implemented, help with our water reservoirs, and allow full solar panels.'* (Stakeholder-6, private sector)

One of the most crucial points to highlight is that renewable energy may supply energy to consumers from a decentralised energy system feeding to the main grid to cover the existing energy deficit. However, suppose the decentralised energy systems are to function independently from the main grid. In that case, it may also encourage new developments of new energy systems replacing the old, dilapidated ones, though it will require more funding.

7.2.2 Technology and funding

Some stakeholders from all sectors discussed their knowledge of new technologies, such as solar energy, and how they could increase energy production, reduce barriers, and help the transition towards clean and sustainable energy. One stakeholder also highlighted that some solar mini-grids installed in 2015 benefited communities by enabling them to grow their businesses by having access to electricity. Even though the batteries used during installation will need changing in the future, the project has been a success with some lessons to learn regarding the battery quality. The batteries used at the time of the project were gel batteries with a shorter life cycle, compared to lithium batteries with a longer life cycle, which was the noted issue. The stakeholder highlighted:

> *'We started a project installing solar mini-grids in 2015, and they are still working now. The batteries could have been better at storing energy compared to today's standards, but at the time, they were quite good and expensive, but they are nearing the end of their lifespan. The technology is robust. It's quite reliable. We haven't had too many issues with the technology'* (Stakeholder-7)

These above findings can be related to Zebra et al. (2021) study, which stated that despite barriers such as lack of incentives and high cost to implement renewable energy, the benefits of renewable energy in developing countries would be crucial.

New technologies such as solar systems were discussed mainly by the interviewees as more sustainable energy sources in the long term than using generators or relying on electricity from the primary grid. The issue with generators involved having to meet the cost of buying diesel to run the generator, which can be costly. Stakeholder 6- private sectors described their experience using generators, which led them to start their

business in solar installations. The stakeholder highlighted: '*You can put a generator on, but you cannot run a generator on for two weeks, and you cannot put a generator on for the whole day either. Diesel costs a lot of money. It is not just sustainable for yourself, even the generator itself. I started by selling small lanterns and small solar lights, and then I – so, that is when I started getting into the renewable energy sector. I realised there is more to this; you can generate power from the sun and then have full-time power fridges, lights, and TVs. That's how the journey of me becoming a solar installer started.*'

As per the excerpts below, the private energy sector has made attempts through lobbying for the government to give them business opportunities and funding to start renewable energy projects which can generate and meet the country's energy needs. Despite the efforts, the government limits private energy sector opportunities by issuing lesser practising licences. The government issues 20 trading licences to private companies per financial year, thus leaving some private companies unable to do large-scale renewable energy projects such as solar farms. '*We ended up having to lobby and push through Zimbabwe regulatory authority (ZRA) for government funding to enable private solar companies the capability to do a solar farm and produce power. However, the Government only could give 20 licences at a time to private energy companies* (Stakeholder-6, private energy company).

Globally, due to COVID-19, the energy crisis has worsened, with high energy prices affecting business production, profits, and household energy affordability (Xu et al., 2022; IEA, 2022). The findings can be linked to this study, with most of the private sector companies during the interviews indicating that energy companies had seen that the energy crisis was worsening in Zimbabwe and was mainly affecting vulnerable and low-income households. However, in Zimbabwe the primary cause before, during and after COVID-19 is poor strategies, such as failure to

close old power stations and move on to new technologies as other countries like South Africa, which has now implemented energy production through wind turbines:

> *'Some power stations must be closed to build new or even solar farms that can use renewable energy. I may give a case of South Africa using wind turbines to generate energy, some of the things we learned from our neighbouring countries.'* (Stakeholder-2, public energy sector)

The private energy sector had noticed that only a minority of the population could afford solar installations because they were in better-paying jobs or had families living abroad who could facilitate the payments. However, the majority of the country remained in energy poverty with no way out. Their agenda was to start microgrid energy-producing projects and supply those vulnerable people at a cheaper and affordable rate, as well as other projects that could supply to the primary grid. There are arguments as well of renewable energy hypocrisy where the wealthy nations are still relying on fossil fuels yet expecting the developing nations to move towards using renewable sources (Lomborg, 2022). Nevertheless, there is no funding or access to grants for people experiencing poverty, which means some developing countries continue to rely on fossil fuels for their energy needs (Ahmed, 2023).

As discussed above, to implement renewable energy, there are various barriers. In Zimbabwe, owing to the government's licensing limit, private energy companies have access to only 20 energy trading licences, which are insufficient for every private sector company to make a difference in energy production. The licencing issues were further highlighted in a report by Madya (2023) that if the licences were given to many private energy companies, it would allow private sector companies to start renewable energy projects to generate energy to sell to the main grid and new housing developments.

However, as highlighted in the interview excerpts below, keeping the trading licence could be challenging for the private sector, with funding being an issue. This is because the terms and conditions of the trading licence suggest that the holder of the licence should successfully start a project, such as a solar farm, within 12 months. But being unable to secure funding, most private sector companies lose their licence before setting up a project. The private stakeholders also highlighted that seeking funding was an issue, and bank loans had high-interest rates, which would not make business sense.

> *'There is a licensing issue where renewable energy companies have a minimum time from getting the licence to getting funds and coming up with a project such as a solar or wind energy generating farm. Suppose you do not get funding from external donations such as NGOs or other funding sources within a specific time, you lose the licence. Applying for local loans won't be easy as Zimbabwe loans are expensive due to high-interest rates and will not be sustainable. So, as private energy companies, we can lose the licence within 12 months if we do not trade due to no funding and have to reapply again. There is also a limit on how many private sector companies can get licences. It is a frustrating situation altogether.'* (Stakeholder-1, private energy company)

Bylanes (2019) added that though the national renewables policy in Zimbabwe encourages the private sector to engage with ZESA through tendering for microgrids, corruption within the tendering system is high and associated with political interference. Through the interviews, corruption was also not by all the private and non-governmental energy sectors. Most were disadvantaged with regard to starting energy projects on a larger scale. Due to corruption, some of the private sectors will not be able to afford projects due to no funding:

> *'There is also a lot of corruption in this country, so sometimes you lose out on projects because you are not connected to the government'* (Stakeholder-1, private sector).

In a review of the above, it is clear that most private sector stakeholders are keen to collaborate with the government to ease the energy burden. Still, they cannot control the abovementioned challenges: poor funding with high-interest loans and bureaucratic licensing issues.

> *'If you do not get the funding from external donations or funding, as Zimbabwe loans are expensive, sometimes up to 40% interest rates.'* (Stakeholder-1, private energy company)

Most of the stakeholders interviewed in this study were conscious of how the government licensing conditions impacted the development and provision of enough energy for consumers. However, they can only do something if they have funding and can work without stringent conditions.

Furthermore, Biswas et al. (2022) stated the importance of collaboration between the private and public energy sectors, which could benefit communities and work towards easing the burden of energy injustices. Safety, environmental factors, respect for surrounding people and health are key areas that could be the focus of both private and public energy companies in Zimbabwe. Hence, working collaboratively in the private and publicly owned energy sectors would work towards achieving the goal of supplying affordable energy for all, as per the SDG (IRENA,2019; UN,2023).

Despite the private sector facing some challenges in working with the government towards increasing the capacity to meet the country's energy needs. Another public sector interviewee alluded to a different notion of government undertaking development by restructuring the energy company to develop and improve the energy supply throughout the country:

> *'You will find rural development, renewable energy, and infrastructure-focused departments within those departments. So many things are happening right now, pointing towards improving the energy supply and increasing capacity. However, I am looking at the renewable energy planning processes because we need to find ways to help us revitalise what has been lost within the Zimbabwe energy system.'* (Stakeholder-2, public sector)

Though these developments are still happening, other issues should be addressed, such as those highlighted above and limiting the private sector to also making contributions to the development. Though the Zimbabwean government is restructuring and creating new departments, not including the private energy sector may not yield adequate solutions in the fight to ease the energy burden. The government would still require increased funding in the energy sector and ideas from other experts in the energy sector. Working collaboratively towards tackling energy needs and finding spaces to build new energy projects may reduce costs for all parties involved. It is not that Zimbabwe is facing funding issues. According to the IEA (2022), there has been a global increase in investment for renewable energy, but more funding is still needed to tackle the energy crisis.

7.2.3 Preferences for solar systems and financial support

As mentioned in the previous section, 3.2.2, despite the high solar system installation costs, householders highlighted that they would prefer a rooftop solar system as an alternative energy source. However, according to the survey results, solar energy as an alternative energy source may be unreachable to many. Only 5% of the study's respondents who completed the survey indicated that their household energy is generated through solar systems installed by a private energy company.

As stated by most householders and stakeholders, the high costs of solar installations were the reason they could not consider having a solar

installation. As well as the high costs, there were other limiting factors to consider for householders to have access to decentralised solar systems, as noted in the excerpt below, such high cost of solar. The majority of the householders highlighted that because of their economic circumstances, solar subsidies would be helpful for them to secure a solar system.

> *'Yes, it would have been a great idea if ZESA made the absolute responsibility to have an alternative subsidiary power system such as solar systems. Customers can pay overtime because few can afford a solar system in this challenging economic climate.'* (John, Householder-9)

As highlighted in the study, access to solar subsidies was supported in studies (Alhammami & An, 2021; Macintosh & Wilkinson, 2011) that indicated that solar subsidies are a primary driver for increasing the uptake of decentralised solar systems. It is important to note that there is an electricity gap that a solar system can fill in this context. Apart from solar subsidies, as noted by Lee (2019), there are other issues to consider, such as structural and technical issues.

As mentioned in section 6.5, multiple stakeholders from all sectors should also consider technical and structural issues and the feasibility of installing a financially viable solar system. As it stands, having a decentralised solar system may not be adequate for all households, as the structures of some properties and space may be a barrier, as they may not be suitable for solar systems on rooftops. Poor funding does not aid the just energy transition of moving from fossil fuels, as outlined in the current global energy justice framework, which advocates for recognising inequalities. In response to the barriers to renewable energy, stakeholders highlighted trade restrictions and poor funding for private energy companies.

As in the stakeholder's narration below, the majority of the participants during the interviews also believed that the renewable energy market in Zimbabwe had been flooded with substandard solar products, which may be another reason for the low uptake of solar power, as some householders may worry that they will purchase malfunctioning systems.

> *'Zimbabwe Energy Regulatory Authority [ZERA], it was us private solar companies that came together and said, look, we need to have some governance in the energy sector, especially into solar power, because people were bringing substandard products of solar panels.'* (Stakeholder-6, private sector)

These results are also similar to the findings by Bylanes (2019), highlighting that the low uptake of solar installations in Zimbabwe could also be due to householders worrying about investing in poor-quality electrical equipment such as solar panels and batteries.

Even though householders may be asking the government to offer financial assistance or solar subsidies to install rooftop solar systems, Zimbabwe is not doing well economically, as highlighted in the literature review chapter of this thesis. If the government cannot support householders with solar energy grants, this may lead to householders doing solar connections themselves without proper guidance from electrical engineers. Some interviewees indicated they would therefore resort to installing an improvised solar system for lights and plugs. As shown in figure 32, householders narrated and demonstrated the connection of a makeshift solar system used for lights and to charge mobile phones.

Figure 32: Still video image and link illustrating a makeshift solar installation by a householder.

Link to video: Video 3.mov

As much as this may be an ideal solution for householders, makeshift solar systems may pose risks, such as fires, if not connected properly. However, the householders in this study did not mention any household fires caused by a poorly installed solar system. Fires caused by solar systems can be linked to the literature; a report from the BRE National Solar Centre (2018) highlighted that there might be unknown root causes of solar photovoltaic system fires. However, an analysis of solar photovoltaic system fires found that some root causes of solar photovoltaic fires were faulty products. This study highlighted that the Zimbabwean market had some substandard solar equipment. Another root cause highlighted in their report could be poor installation practices.

Vulnerability to the risk of fires can be a significant challenge for householders, as they do not have much choice but to try to improve their situations by installing makeshift solar systems. To ease the burden of householders and for a just transition to renewable energy, some private stakeholders highlighted that the government should invest in renewable energy initiatives such as centralised and decentralised solar projects and hydro dams, which will produce energy. Thus, easing the barriers to renewable energy at the grassroots level, as centralised and decentralised renewable energy, would, in turn, help the utility company and the government increase their energy capacity for the country and ease the energy issues being experienced by householders.

> *'We have the capability; instead of building new power plants, the government can fund the building of new hydro dams, adding to solar farms. But we have to keep this in mind: even with hydro alone, we could have enough renewable energy, including hydropower in Zimbabwe, which can power the whole of Zimbabwe if the infrastructure is put into place and also help with our water reservoirs and solar power to feed back to the grid. Some systems could be decentralised and centralised. But I am insisting or advocating for multiple energy sources because we have also experienced drought, affecting our water levels and energy production.' (*Stakeholder 1-private sector)

Despite Zimbabwe having economic difficulties, according to Mas'ud et al. (2016), some countries, such as South Africa, in the sub-Saharan region, are paying immediate attention to renewable technologies such as solar photovoltaic, hydro and wind energy. In a similar way to the study's outcomes, Zimbabwe is also working on renewable energy initiatives on a broader scale to contribute towards reducing fossil fuel use, improving public health, and increasing the country's energy capacity. Stakeholder-5 highlights:

'ZESA has multiple renewable energy projects working collaboratively with many other countries in the southern region to help tackle air pollution and deforestation issues. The projects include the sensationalised Gwanda project and the Batoka hydropower project. In return, there are also the benefits of improving the population's energy supply and health, which usually inhale smoke from some energy sources.'

7.2.4 Impacts of trading policy on Internal and external stakeholders

Having discussed the energy licences and technology, this section addresses the Zimbabwe trading policy. Engaging all energy sector stakeholders, private, public, and non-governmental, is one solution that can be used to improve energy capacity in Zimbabwe. Most stakeholders envision renewable energy projects consigned to internal companies and other countries, which may benefit the country through renewable energy projects. At the same time, if the trading policies are friendly and would ease the energy injustices happening in Zimbabwe, despite the sanctions imposed on Zimbabwe by countries such as America and UK. In 2003, Zimbabwe implemented a trading policy called Look East Policy, though focusing on trading mainly with China (Stiftung,2004). The trade policy is that China will be expected to replace other donors, such as those from the West. This policy may have substituted resources that may have been coming from the West and hindered some elements of progress once sustained by donors from the West. The private sector did not co-sign on this trade policy between China and the Zimbabwean government. The critical problem was that the private sector viewed Chinese exports would cause unfair competition with the local business and primarily benefiting those affiliated with the ruling government (Chipango,2019, Kemp,2023). The trade policy was also causing cost issues for most small businesses due to taxes and duties (Chidya,2023).

> *'African countries suffer different things, such as sanctions or even the bureaucracy and how the governments work. Even importing solar panels from China becomes very expensive due to taxes and duties. Things could be cheaper. For example, in Europe and China, electrical equipment can be affordable, but to import to Africa, the process between and after it gets to Africa is costly.'* (Stakeholder-6, private sector)

To sum up the above points, it is essential to note that with the aims and objectives of this research, poor funding will widen the energy access gap and undermine SDG7, which relates to affordable and clean energy for all. Most interviewees aired the idea of self-sufficiency because of the ongoing power cuts and load shedding. Still, owing to the high cost of solar systems, householders noted this might not be possible unless the government subsidises householders to install solar systems. Funding challenges and monopolisation are at the core of these problems. Perhaps the most severe disadvantage of poor funding and monopoly is the barriers to renewable energy, especially with a lack of fairness concerning who decides on funding and how it would be distributed. The private stakeholders' suggestions and what householders narrated can provide information to their utility company. But their specific needs should be accounted for the implication of policy and practise; also, the information gathered may contribute to the body of knowledge of the context.

In addition, even though the utility company may not be popular with its consumers, the participants' suggestions may open dialogue and engage consumers in energy decisions. Lastly, from an energy justice point of view, this raises important questions about the distribution of energy in Zimbabwe. It calls for a closer look at potential contextual issues, such as some householders being left behind as a result of financial barriers, as well as greater access to affordable and clean energy for all.

7.2.5 Procedural implementation and distributional strategy

Most stakeholders and householders reported, as mentioned in section 5.2.2. that ZESA was primarily the cause of the energy crisis because of structural issues, monopoly, and poor funding. The study indicated that all stakeholders interviewed understood that a robust energy policy would help energy growth, which is frequently anticipated by both the private and public energy sectors. Stakeholders from the private sector spoke of the current renewable energy policy as a good initiative. However, it was only partially favourable for the private sector because of its regulation of procedural strategy, which then affects the distribution of adequate energy to the consumer.

The energy policy, which also governs the new renewable energy policy, which aims to have low-carbon energy sources, (ZERA,2019) was mentioned by the stakeholders as a good guide towards tackling the energy crisis in Zimbabwe. However, lessons are still to be learned from their situations and mistakes in some cases from other countries, if applicable, on which strategic approach to follow. Implying a coordinated effort and approach and resources from both the public and private sectors to determine the optimal level of tackling the energy crisis in Zimbabwe. The effects of the Zimbabwean energy policy affect not only local companies but also hinder external investors, who may bring new ideas and advanced strategies, which may support the country towards a low-carbon economy and improved access to energy for its people. Both the public and private sectors were conscious of the concept of energy licences and policy, and how this impacted improvements in energy access were described by a stakeholder as follows:

> *'To operate as a solar installation company, we do not need a special licence from the government, though I believe working collaboratively with the government, we would have achieved*

much more within the country by having multiple local mini-solar grids, which can feed into the main grid owned by the government to reduce the energy deficit. But if you have to feed to the government grid, that is when you need a special licence, as they would take some commission from your company, yet you are helping the population, so it is not a good business deal for the private sector. We believe the government or the benefiting consumer should pay us, not us paying the government for our effort. How do we get out to return?' (Stakeholder-3, private sector)

As seen in the following excerpts, in the effort to implement energy access and distribute energy to all, the objectives of energy policy are clear on working towards rural electrification, as rural dwellers are the most marginalised groups in Zimbabwe. Most rural dwellers relied on different energy sources, such as firewood and cow dung. However, with charitable organisations raising awareness of the benefits of electricity, rural communities' welcome new ideas, such as using solar lamps for light and gas for cooking. These conclusions suggest that marginalised communities are open to welcoming energy improvement projects from the private sector.

'There's been quite a lot of change since the energy policy we had pre-2019. Besides the energy policy we had, they have been very interested in intentional efforts to try to find a way to get energy access to two communities through setting up the rural electrification fund, which has a mandate.' (Stakeholder-7)

'As ours to work in those areas to ensure that they are in support of this kind of project as well, with now have a renewable energy policy that was launched 2019 August 2019.' (Stakeholder-7)

Most householders and all stakeholders interviewed highlighted that the process of implementing energy access for all would benefit the rural population and those from new developments that are still to be

connected to the primary grid. The majority of the participants, however, agreed that to achieve equity, which will benefit the population, especially the marginalised, the electricity supply should be able to produce enough energy to supply both industries and domestic usage. Most householders are having to cut back on essentials such as cooking because of poor access to electricity, which can impact their well-being, causing stress. Also, the energy sector companies are affected by the policy, which is not favourable for fulfilling their business models (Madya,2023).

As mentioned above, most stakeholders from all sectors highlighted the importance of defining energy poverty based on the context, which could support the operational strategy. Most stakeholders, therefore, gave an overview of what constitutes and causes energy poverty in the study context, including the structural issues and inadequate clean energy resources.

Most stakeholders from all sectors highlighted some theoretical aspects of the term 'energy poverty' that should be reviewed at a global level, as there may be differences in how energy poverty can be defined in a different context. In the study context, terms such as 'power cuts' and 'load shedding' were primarily associated with energy poverty. Still, the term energy poverty was not widely used within the energy sector as per se. These findings align with recent research by Che et al. (2021), which advocated for an integrated approach to the energy poverty definition.

Furthermore, through the interviews, most public and private stakeholders indicated that in the study contexts, the term energy poverty was not understood by those in the community. It could be possible that some workers within the energy sector may not have heard the term energy poverty. Therefore, through the interview, private and NGO stakeholders suggested raising awareness through programmes such as Training for Transformation was crucial as a national-level campaign rather than an in-house-only training for the energy sector.

The training programmes are mostly designed to highlight what energy poverty is, its impact and how energy can potentially improve people's lives and give back to the community. This strategy aimed to engage householders as a catalyst for networking and promoting new decentralised solar projects. All the stakeholders stated that awareness-raising projects were used to inform communities about the planning and development of energy production projects.

> *'The first thing we do is call Training for Transformation because we don't take for granted that anyone should understand what energy poverty is. So, right now, you can even go to a very well-renowned doctor and community member who has never been interested or looked into the area of energy; they may not even know that well at all. So, it is going to the community and basically, raising awareness while potentially can change the energy landscape.'* (Stakeholder-7, private sector)

These results demonstrated that the private sector (non-governmental organisation) prioritises educating energy consumers from the grassroots level. It also suggests that energy providers should effectively engage and inform communities about energy-related issues. Communities could also be engaged in energy projects, which can be life-changing. In summary, the experience of chronic power cuts and load shedding should not just

guide the householders' understanding of energy poverty. Given the situation, other awareness of energy poverty should be prioritised to ensure that communities can access energy advice, clean energy sources and services. The private sector stakeholders also highlighted that community members needed to be educated not only on what encompasses energy poverty but also on the dangers of illegal connections.

A lack of knowledge of the dangers of illegal connections may cause fires, in some cases, death. Therefore, as part of the operational strategy, it would be helpful for the energy supplier when raising awareness of energy poverty-related issues; they should include educating householders on the dangers of illegal connections. Some householders were not connected to the main grid, as they lived in new developments. Because ZESA takes time to connect them to the main grid, these householders would attempt to make illegal connections to the main grid. Illegal electricity connection has been widely stated in the literature, highlighting different reasons for avoiding high costs and why communities bypass the electricity utility companies (Kirsch, 2005). Illegal electricity connections also impact government revenue collection. Most private stakeholders and householders stated that the public energy sector, which has the energy monopoly, should raise awareness of the dangers of illegal electricity connections, which can cause fires, electrocution, arrests and, at times, deaths. Dorcas (Householder-5) stated: '*I know some people were trying to make illegal connections, but ZESA arrested them when they were caught trying to sell the copper, I think, and so many reports on the TV that people die while trying to steal copper.*'

Returning briefly to the issue of connections to the main grid, some householders and all the private stakeholders stated that the main electricity supply authority could do more at no cost to support consumers connected to the new developments. Peter (Householder -2)

highlighted, *'There is a certain connection fee that the householders must pay towards the connection. Now, who can afford to pay the connection fee? You're looking mainly at the connection between the poles and the main lines. They said the timeline is around March next year, 2023.'*

The delays by ZESA were too long; hence, illegal connections may be prevalent. Additionally, it was noted that some householders in newly built homes had paid the connection fees, but ZESA was yet to meet its side of the contract. A stakeholder narrated:

> *'We have the poles I'm talking about; the electrical lines are above our house. ZESA needed to connect one line to the main substation, which is 20 kilometres away, which was paid for, and they needed to come into that. For over 20 years, they have not come, and the whole setup is now dilapidated in the people's houses and dilapidated.'*

Some householders and stakeholders stated that the poorly maintained old substation and electricity infrastructure were also to blame for their poor access to electricity. This may suggest that poor maintenance and strategies led to slow processes, especially in new developments, causing chronic power cuts and load shedding.

> *'Many years ago, ZESA used to maintain the substations; communities never used to have the issues of poor services. Everything was maintained then, but it is dirty and not maintained right now. Yes, the utility company need to do more such painting; keeping a record of maintaining old and new substations may be a better idea. Nobody is looking after the substations.'* (Dorcas, Householder-5)

Maintaining substations was mentioned in this thesis's literature review on Zimbabwe. The energy policy should include a strategy for new connections to new buildings. Planning new connections may also prove challenging to implement because of the already insufficient energy

structure and poor energy policy. Despite the apparent challenges of implementing new connections and educating communities about energy poverty, another added challenge is that both the energy supplier and the governments may not have on their agenda as top priorities to accommodate these needs. Still, their focus may be to tackle the current energy crisis and find an immediate way to fill the energy deficit.

7.3 Summary

Owing to the need for a reliable energy supply for the population, various ideas were put forward by all stakeholders and householders. This chapter highlighted that theoretical issues, technology, poor funding, and infrastructure are factors to be considered. In addition, having alternative sustainable energy technologies is deemed essential for mitigating the country's energy deficit.

The results reveal that there is not enough support from the Zimbabwean government to ease the burdens of energy poverty, energy injustice, lack of funding and poor health. However, several challenges or barriers need to be addressed initially, including improved access to funding, including communities in the energy agenda, collaborative working between the public and private sectors and improving the energy and trading policies.

This study aimed to understand energy justice through lived experiences in Zimbabwe. In conclusion, the chapters demonstrated that experiences with energy poverty and energy insecurities are different for everyone worldwide; however, in the study context, they depend on factors such as infrastructure, monopoly, affordability, poor energy policy and contextual factors associated with energy access. Due to the complex nature of energy poverty in different contexts, it is essential to identify the central and specific factors that may cause energy poverty and energy insecurities.

I reflected on energy justice framework and the complex linkages between energy poverty, health, and sanitation. There is a need for a comprehensive and integrated energy definition for all, which includes the continuous lack of clean energy as an issue and urgent global goal. An inclusive and contextual energy poverty definition will, in turn, cater to those more marginalised in energy-related issues, as outlined in this research. Communities suffer not only power cuts and load shedding but also other multilevel problems they encounter due to power cuts and load shedding. Respectively, poor energy sources such as which emit

toxins, health, and sanitation issues due to water shedding, which is frequent as power cuts and loadshedding.

Additionally, the literature reviewed in this study often challenges governments and funders to be receptive to understanding energy issues by applying not only the top-down narratives but also prioritising the bottom-up narratives, which will reinforce understanding of what community's energy needs are—having a framework which provides a detailed set of community energy-related questions which will help energy suppliers to be able to assess the needs of the communities, primarily vulnerabilities of marginalised groups. For instance, how are the energy needs and resources identified and distributed? Is the distribution of energy diverse considering the whole population?

Finally, from the stakeholder's perspective, the renewable energy transition design and implementation should consider the processes. And the development of structures at a collaborative level. When the government addresses the issues of marginalisation and bias in the energy funding resources, most importantly, the government should continuously offer dialogue to ensure a fair and inclusive process for all those in the energy sector. Though it is also evident from the findings that dialogue within the energy sector can take a different direction depending on how well the due process will address the issues of injustice and the whole energy sector will need to consider what contributions they will make environmentally towards just, sustainable, affordable, and clean energy. A final thought is on the critical importance of context, space, time, and geography, as it is paramount for governments and researchers to investigate its context and design frameworks, which will guide thinking, errors and shed more light on different forms of injustices and justice.

8 Discussion

8.1 Introduction

This chapter, within the broader context of energy justice and multi-level perspective literature, discusses the study's main findings and the theoretical implications of the research findings. This research contributes knowledge towards tackling energy poverty as part of SDG7, which aims to ensure access to affordable, reliable, sustainable, and modern energy for all. The study characterises the socioeconomic and cultural challenges encountered by householders affected by power cuts and load shedding. It investigates the best practices that could be implemented to alleviate energy poverty. Overall, the thesis has advanced the understanding of energy justice systems and provided a grassroots narrative considering energy justice principles and injustices that may negatively impact householders in the Harare Metropolitan Province Area. This chapter consolidates the results from Chapters 5, 6 and 7, presents comparisons with the broader literature presented in Chapters 2 and 3 and introduces new literature in light of its findings.

Prior literature, such as Samarakoon's (2019) study, outlines how the household drivers of energy poverty or precariousness, energy insecurities and energy services are rarely accounted for within African indices and existing energy justice frameworks. Adding to Samarakoon's work, this study strives to develop a deeper understanding of the causes and challenges of energy poverty in a context where energy poverty and the implementation of the energy justice framework are not well-researched, using the bottom-up approaches. Chapters 5, 6 and 7 revealed various challenges concerning the causes of energy poverty, including a monopolistic system, prepayment meters, gender-related vulnerabilities, socioeconomic challenges, energy sources, affordability, technology, and energy policy.

In reviewing the findings, the discussion draws upon the energy justice framework guided by the three energy justice tenets: distributional justice, justice as recognition and procedural justice. As mentioned in sections 3.4 and 3.5, using the three-tenet justice framework will guide the discussion to highlight some challenges of energy poverty that can be addressed through the energy justice framework. The findings and the discussions on understanding energy justice through lived experiences of householders will lead to recommendations and implications for policy and practice. The recommendations aim to outline the main limiting factors and barriers identified in the analysis to inform a fair and equitable energy distribution, which will ease the burden of energy poverty for marginalised communities. Also, understand the specific energy poverty drivers based on the study's outcomes.

This section returns to the findings presented in the results of the chapters. It discusses the insight into the energy supplier's background, mirroring sections 2.8 and 2.9 in the literature chapter, which highlight that Zimbabwe has been crippled by energy issues. Given that the energy supplier is currently facing poorly maintained energy plants resulting in inadequate energy production, leaving the country in an energy deficit, and households are affected by power cuts and load shedding for up to 18 hours daily. Unsurprisingly, the public sector was identified and criticised for causing most energy-related issues, such as power cuts and load shedding. There were three central themes which emerged from the analysis of the data: disengagement, gender disparities and lack of trust. The following section fully describes the initial barriers of a monopolised system. The following sections will discuss central themes to confirm the association between the householders and private and non-governmental energy sectors in their views and experiences.

8.2 Framing energy poverty indicators in the study context.

Objective one of the study was to identify whether there are energy poverty and energy insecurity challenges associated with infrastructure and regulatory systems. The findings were contrary to the previous goals set out by the Zimbabwean government. Zimbabwe's energy sector has engaged in the Sustainable Energy for All Initiatives Action Agenda [SE4ALL] through having a renewable energy policy (Schroth, 2016). However, viewed through the energy justice lens, a very different picture emerges in the study context, which suggests that, despite these efforts, the study has revealed several barriers and injustice, with the first identified as a monopolistic system in the energy sector. However, viewed through the energy justice lens, a very different picture emerges in the study context, which suggests that, despite these efforts, the study has revealed several barriers and injustices, with the first identified as a monopolistic system in the energy sector. This implies that it is not a monopoly issue alone, but the energy supplier is doing little to improve the energy burden, impacting communities significantly.

Concerning the procedural justice principles, this study indicated that, due to the existing regulatory regime and an energy sector run entirely by the government, the private and non-governmental energy sectors who wish to partake in alleviating the energy poverty burden indicated a restricted space to contribute to the decision-making process. Essentially, the monopolistic system of the energy company, as noted similarly in this study, has been highlighted in recent literature as an issue that leaves stakeholders not much room to join in electricity decision-making processes (Morris & Martin, 2015; Setyowati, 2021). Inadequate access to funding, energy developments and a process with a lack of transparency when projects are being developed and implemented, cause procedural obstacles for the private and non-governmental energy sectors.

Working collaboratively and having other energy players are also solutions for easing the energy burden in Zimbabwe. However, the householders and stakeholders who participated in the study experienced the predicament of having one energy supplier while at the same time not having a good energy service and experiencing ongoing power cuts and load shedding. Energy consumers had no alternative energy suppliers who would at least offer price comparison and alternative service provision to relying on ZESA. Therefore, the findings can draw a close link between a monopolised energy system and householders' energy poverty. The stakeholders reiterated the challenges of an inadequately functioning energy system that lacks progress because of the dominance of ZESA in the energy sector.

The results indicated that monopolisation had led householders to disengage and not trust the energy supplier. The desperation caused by power cuts and load shedding led to householders being dissatisfied with energy services. High energy costs were also reported to be factors contributing to energy issues and the dire need for energy sources. The predicament of the monopolised system heightened householders' inability to shield themselves from energy poverty in an often socially, culturally, and economically limited environment.

Moreover, concerning the monopoly, the results also demonstrated the needs of communities, such as health, poverty, resources, and well-being, in an unjust system. These needs must be considered for a conceptual review of energy poverty whilst applying the existing energy justice principles in the study context; the community's needs must be accounted for. Also, as stated in section 3.3, a just procedural system implies an appropriate inclusive system for all, which can lead to the engagement of all sectors and communities where they will have a platform to highlight their needs.

Further discussed in section 8.3, the limitations include poor government support for communities that are in energy poverty. On the surface, infrastructure issues, funding issues, monopolies and limited renewable energy sources may exist (IEA,2021). Still, this burden falls outside the remit of communities, and the government should aim to resolve them for its people (Antwi & Ley,2021). Resolutions and ideas require a dialogue with the people, as advocated by the principle of justice as recognition and procedural justice. The government still needs to address the problems that have left the householders and the private sector feeling neglected, disengaged, and not trusting due process, resulting in poverty caused by the injustices of energy poverty.

Energy security implies that energy investments should be made available for economic developments and environmental needs and that adequate energy systems should keep the energy supply chain uninterrupted (IEA, 2020). However, this study's highlighted a lack of energy security, as the stakeholders and householders indicated that the energy systems did not support a fair and inclusive system but an unjust one. This research speculates that all the stakeholders' and householders' experiences with the energy supplier shared similarities in that what they perceived as unjust was not having a choice. As discussed in the literature section 3.4, the people of Zimbabwe continued to suffer under Mugabe's perpetuated dictatorship of his people. Despite the need to empower and indigenise its citizens, they were denied democracy, with resulted in prolonged injustices even after Mugabe's era. The interview results also highlight that the system was unfair, where most resources, such as essential human resources, such as electricity and water, were scares for the householders.

Also, private sector stakeholders had limited financial options available due to a monopolised system. Apart from monopoly, this is a system which presents the unfair distribution of financial resources, with most large-scale energy projects being mainly for the public sector instead. Poor funding for the private energy sector will directly impact their contribution toward building renewable energy at a large scale, therefore not making enough contribution towards the energy deficit.

As discussed in section 2.4.1, countries in the global south, most governments, Zimbabwe included, have a monopoly on energy companies and determine energy prices. Yes, the monopolised system can leave communities vulnerable to having less choice of who provides their energy and at which price. Though it can be argued that if the monopolised system was run with the needs of the communities as a priority when providing the services and aiming to resolve existing problems, the mistrust between the householders and ZESA might not have been an issue. Also, highlighting the discourses of distributional justice, Hirmer et al. (2021) and Diaz et al. (2017) suggested the importance of international and national policymakers to have equitable and democratic involvement of all stakeholders in energy decision-making.

In summary, the aspiration to increase energy capacity and access led to a new formulation of renewable energy policy that prioritises new energy infrastructure, grid expansion, renewable energy sources and decentralisation. At the same time, the policy reviews could benefit the country in addressing the ongoing energy issues. Regarding principles of distributive justice, existing problems, such as poor power stations and energy infrastructure, may impede addressing the disparity of electricity access in other geographical areas, such as rural areas. At the same time, the study was conducted in the Harare Metropolitan Province area, where both low and high-density suburbs were facing severe issues with energy poverty. In this case, a feasible solution should be found for most

of the country's current energy issues. Ramping up rural electrification may have a negative effect if the energy supply authority fails to meet the energy capacity for those already connected to the primary grid unless robust and inclusive solutions are in place.

8.3 Reflections on funding -householders, private and non-governmental organisations

Both householders and stakeholders agreed it should be the government's role to fund, maintain and update the energy infrastructure, not the population's responsibility to resolve the energy crisis and the government owning the energy infrastructure. The study results align with previous studies that linked poor access to energy, funding, poor energy infrastructure and maintenance (Seetharaman et al.,2019); Sambodo et al.,2022). If it were an equal system, it would have been much easier for the householders, private sector, and NGO stakeholders to open dialogue to present their grievances to the government, as identified in the report on planning net zero strategies involving communities (Bakhtavar, 2020). In that case, the government may be obliged to do something about the energy supply deficit. Awareness would support the householders in understanding what encompasses energy poverty and insecurity and which channels they could take for the government to listen to their needs.

8.4 Reflections of all householders and private and non-governmental energy sectors- Disengagement and lack of trust

The most significant finding from the evidence was the central theme of disengagement and lack of trust because it is shared as a common view among most households' private and non-governmental stakeholders. As previously stated, this study aimed to understand energy justice through lived experiences in Zimbabwe.

Experiences with energy poverty and energy insecurities are different for everyone worldwide; it depends on factors such as infrastructure, affordability and contextual factors associated with energy access. Due to the complex nature of energy poverty in each context, it is essential to identify specific factors that may cause energy poverty and energy insecurities and affect energy behaviours.

8.5 Stakeholders- Private and non-governmental organisations

Even though the disengagement is parallel between householders and stakeholders, stakeholders were disconnected mostly from collaborative ideas towards easing the country's energy burden due to a lack of financial support in initiating energy projects. Even if some financial institutions offer to fund energy projects, the interest rates are not conducive to small businesses. Another issue, raised mainly by private stakeholders, highlighted that they did not trust the government due to strict and unfavourable private energy licences and policies imposed on the private energy sector. The policies and licencing regulations left the stakeholders little incentive to do more to help with the energy crisis. The private energy sector stakeholders also highlighted that foreign investors, such as China, are likely only to invest when the energy policies are favourable. Investors do not trust the Zimbabwe government due to the documented and recognised economic crisis. The private stakeholders spoke on policies and investors. They highlighted there was also a need

for the government to ease up the foreign policy in terms of external investors to be able to come and do business in Zimbabwe.

8.6 Householders' reflections

An example of disengagement was when most householders lacked interest in understanding the current causes of the chronic power cuts and load shedding in Zimbabwe. Even though a few householders were aware of issues such as the country's poor economy and poorly maintained energy infrastructure, it was evident most of the householders needed to gain knowledge and interest in the causes and solutions of the energy crisis and the cost of electricity tariffs. For example, not understanding the cost of energy tariffs may suggest that householders may be missing opportunities to use their energy when the tariffs are cheaper despite the severe power cuts and load shedding. It would help them negotiate household activities such as ironing children's uniforms. Furthermore, there are vital issues that could also cause issues with not understanding the actual energy cost, such as low literacy and the complex nature of the newly installed smart meters.

8.7 Community Solutions to mitigate energy poverty.

With regard to household income, the majority of the householders were unemployed, which had an adverse effect on energy provision. There was insufficient money to buy energy sources; this would affect the whole household and its needs. In the context of the energy justice framework, affordability as a principle is linked to being able to afford and access energy. Affordability was mentioned several times in the interviews with householders and stakeholders who had to develop cooperative approaches. Some community members had to develop inclusive mechanisms to support each other in the difficult situations caused by energy poverty. Primarily women developed the community cookhouses to help each other, mainly the vulnerable members of the community,

with warm food during more prolonged power outages. Community groups that dealt with issues of energy-related access and affordability were also noted in a study in Nepal by Islar et al. (2017). As in this study, these groups were organised mainly by charitable groups and NGOs. Community members mostly trusted these groups rather than the energy companies or government departments. However, one of the private stakeholders indicated that they also work collaboratively with the government in some of their renewable rural energy initiatives in order to limit their costs when the projects are being implemented.

8.8 Income barriers and energy poverty

A recurring theme of socioeconomic hardship experienced by householders emerged. There were financial difficulties in households. Low incomes and a shortage of ready cash to buy energy sources and other essentials were mentioned by the majority of the participants. The crisis of poverty and low incomes was worsened by their unemployment status, which is contributed by the economic climate in Zimbabwe. The literature has shown that socioeconomic challenges are related to justice as recognition, which implies the importance of fair representation of communities that highlights that individuals should be free from physical threats and includes equal political rights (Monyei et al., 2019). However, in this study, most householders lacked basic needs, and situations were made worse by the issue of power cuts and load shedding, which prevented the operation of small projects that needed refrigeration, such as poultry businesses. Small businesses would help householders as a source of income.

In addition, the issue of power cuts and load shedding, as a result, limited their chances to improve their lives financially and could also affect their children's education when it came to doing homework at night-time. If they had challenges with income, their children would be affected as the parents could not provide adequately. And also, as noted in the interview,

some householders could not afford to buy a candle to use as light during the night, affecting the children's education since they could not do homework without light and could not study or even prepare for their exams. Lack of education would affect future generations and impact the conducive economic power, resulting in fewer educated people without an improved life. The impact of energy poverty on education also highlights the government's disregard for its population's future. Similar to the findings in the publication by Sule et al. (2022) and Knoth (2015), which also highlights that poorer societies are affected more as, at times, many people cannot afford the sources of light needed for schoolchildren to study at night. Most householders highlighted being involved in small businesses, such as poultry businesses and selling foodstuffs and second-hand clothes to survive. A few had indicated their attempts to go into business. Still, they had lost some of their profits because of the ongoing power cuts and load shedding if their products required refrigeration. Due to the long spells of power cuts and load shedding, the produce would be affected and thrown out. Women also indicated that they had to negotiate daily activities and look for household income. It was challenging to balance the demands of daily household activities, such as looking for energy sources, cooking, sourcing water and cleaning, which impacted their financial security even more.

Socioeconomic adversity also impacts food and energy security. The householders stated that they had insufficient money to pay for energy sources. Householders reported that energy resources and ensuring enough food and warm water to bathe were significant challenges that mainly affected the children and ill in their households. Energy insecurity causes food insecurity, as the householders cannot cook food on time or have to also cater for the young children before school and the chronically ill, depending on the energy sources available or if they have to ask to cook on someone's fire.

The study's findings revealed a dependency ratio between the middle-aged and the elderly. Though the women mostly cared for the children and elderly, there was also an expectation that the middle-aged employed look after their elderly parents and cater to their needs. This has been described as a black tax in some parts of Africa: a study by Montle (2020) implied this claim in the context of South Africa. A black tax is when those who would have had a financial breakthrough and breadwinners are expected to carry the family's financial burden. In addition, most working householders face the challenge of providing for their parents' financial needs. Householders highlighted the effects of power cuts and load shedding, which made the situation worse as they would need to improvise other sources of cooking energy that could add to their budgets.

8.9 Reflections on well-being and energy poverty

Furthermore, there was an indication that householders needed to be informed and supported to recognise and understand what role they could play in having better access to safe and clean energy. Most householders would rather compromise their well-being by using unsafe methods of cooking as well as hazardous fuels rather than opening a dialogue with their energy supplier due to not trusting the supplier. The householders felt they had to prioritise household needs, such as finding cooking energy sources to prepare food for children, rather than complaining to the government or the energy supplier.

Some household routines were unstructured depending on when they have an energy supply. Some households indicated that they could cook even at midnight due to the time they may have energy as they must prioritise their children's and chronically ill nutritional intake. Most householders added that they could not trust the energy service providers

to help them with their energy grievances even if the government knows that some householders are chronically ill.

The householders elaborated that they felt they had to contend with power cuts and load shedding, not because householders enjoyed having no electricity but because they had lost faith in the energy services. The householder felt they had no support or could not trust the issue of power cuts and load shedding to be resolved, as it had been going on for more than 20 years with no resolution.

The findings on the impact of a poor supply of energy on the quality of life are consistent with those of Qin's (2022) study in Chinese households, highlighting that poor access to energy and affordability could impact the quality of life. Similarly, energy poverty affected the well-being of communities in Zimbabwe and South Africa (Mambondiyani,2017; Moloi et al., 2023. The householder expressed how depressed they feel each time there is a power cut and have to find alternative cooking methods for the children.

8.10 Health care

Another significant aspect of this study is health and health care, which will now be discussed. Over and above the household burdens mentioned above, the women also had to care for extended family members, the elderly and orphaned grandchildren whose parents may have died because of poor health systems. The burden of care was not easy in households significantly affected by power cuts and load shedding whilst looking after the sick. As mentioned by Chengi, a household lost a parent because her equipment required electricity, but this was not always the case in all the other households. The power cuts and load shedding impacted other issues, such as not being able to cater for the needs of the sick such as feeding them on time and having warmth for the sick during the cold seasons. In addition, the disrupted routines also

burdened and frustrated both men and women, primarily as they had to find ways to feed the children and chronically ill by finding energy sources, which was difficult for those on low incomes.

With respect to health, the study revealed that medical knowledge among the chronically ill was evident. However, they would find themselves in situations where they did not have refrigeration for their medication. The effectiveness of medication and treatment is linked to knowledge of how to use the medication and its storage. In this context, even though there was a demonstration of understanding of how to use and store their medication, the ill had no choice of appropriate storage facilities because of power cuts and load shedding.

The consequences of poor storage facilities for medication were incredibly frustrating for the householders and those elderly who had mobility issues. Poor mobility issues would be a barrier to travelling a distance looking for appropriate refrigeration to store their insulin, for example, at local shops where they will have refrigerators run by generators. However, medication such as insulin, depending on the prescription, would require a few journeys while waiting for power to be restored. This could be impossible for those with mobility issues, leading them to store their medication in inappropriate storage facilities that may cause the medication to be ineffective. Care provision for the chronically ill may require particular and specialised skills catered for by the family. Still, the family members indicated that power cuts and load shedding make caring for the sick challenging, as some medical equipment may require electricity.

The results highlight some injustices, especially the question of who requires justice: the chronically ill, householders, women, and men? The householders also shared concerns about the impact of some of the energy sources they used, as they were likely to impact their health. Access to energy sources like plastics to light a fire and alternatives such as solar systems would help mitigate these worries. It also shows that energy justice in this context concerns poor and wealthy households, the ill, and women. It is essential to understand who is responsible for addressing the injustices and whether the burden of improvements should fall on the energy supplier or a change of policy by the government to include recognition of those who may need assistance the most.

The global energy sectors and governments, including Zimbabwe, are focusing on a just transition towards renewable energy and energy for those who do not have access to energy as per the 2030 7th Sustainable Development Goal, which is working towards affordable and clean energy for all. Even though the householder reflected on their needs, they provided accounts of what would ease their energy burden and injustices caused by power cuts and load shedding. However, with the intentions of the Sustainable Development Goals, communities continue to suffer while waiting for the energy sector to deliver energy for all, which may take years to be implemented globally. Also, the householders indicated that it would be best for the energy company or the Zimbabwean government to intervene and subsidise the householders to have solar systems as a backup energy supply. But clearly, based on the results and literature Zimbabwe has been failing to support its population welfare.

8.11 Prepayment meter installation

As an energy justice concern, the case of the installation of prepayment meters by the energy supplier is crucial in the study's context. Prepayment meters produced negative results for the householders in Harare, similar to other contexts such as South Australia, where prepayment meters have

targeted low-income households (Grealy, 2022; von Schnitzler, 2013). The households in the study were mostly on low incomes. Owing to affordability issues, low incomes led to most households not meeting their energy needs. Household prepayment meter installation was an initiative for the energy supplier to continue collecting revenue and collecting existing energy debts.

Nonetheless, based on this research findings, prepayment meter installation in Harare indicated high user dissatisfaction with the installation of the prepayment meters. The householders highlighted that there were not consulted or given and given information post-installation. Though the results could not be generalised, other study contexts, namely Zambia and Australia, had positive results compared to those of Zimbabwe with user satisfaction following the installation of prepayment meters.

Some additional details from the findings in the study context, there was a clear indication of mistrust regarding the energy tariffs, which may have been an issue of energy illiteracy or poor information from the energy supplier regarding prices per energy unit. Most householders did not know precisely how much they were paying per unit but knew that energy costs increased each month.

However, Malama et al. (2014) conducted a study in Zambia, which found that householders indicated satisfaction when they installed prepayment meters. Malama et al. stated that householders had indicated that they had control over their expenditures, improvements in their budgeting for electricity, and a drop in historical debts following the installation of prepayment meters. The findings of Malama et al., which was conducted in Zambia, were similar to those of the study by McKenzie (2013), which found that prepayment meter installation for the Alice Springs town camps in Australia indicated a degree of satisfaction with the prepayment meters and preferences for prepayment meters over the billing system. The findings from Malama et al. study highlighted that

householders in Alice Springs were satisfied with the prepayment meter installation. However, these findings were not similar to the findings of this study. However, Malama et al. and McKenzie (2013) shared similar findings to this study in that some householders could not afford to top up their energy meters because of their inability to afford them. The residents who could not afford to top up credit on their prepayment meters resorted to disconnections. Findings of disconnection or not topping up the prepayment meters in low-income households are typical of research on energy poverty and insecurity (Hernández, 2016; Middlemiss, 2017).

The householders in this study also mentioned dissatisfaction with the communication when their prepayment meters were rolled out in Harare. The householders highlighted that they received no communication from the energy provider on why the meters were being installed, but an engineer would turn up to start the installation. In Zimbabwe, the prepayment meters systems were installed in most households, whether in high or low-density suburbs.

A just process is a crucial element, although, on reflection, this has not been the case in this study. Hazel, one of the householders, tried to barricade the engineers who had come to install a prepayment meter at her house, as the householder felt that no process had been communicated beforehand. A fair procedure is an essential aspect of procedural justice that aims to guarantee stakeholder contribution in energy decision-making processes, inclusion and understanding of the needs of energy consumers. Nevertheless, this research showed widespread procedural injustice that side-lined the stakeholders in energy decision-making processes.

8.12 Understanding energy tariffs

On the basis of the results given at this point, more research can be conducted on an energy justice framework that investigates dissatisfaction and communication mechanisms used to communicate with energy consumers and suppliers. As highlighted in Chapter 3 and in a similar way to the broader literature, it has been argued that transparency and due process are essential for consumers and can attract potential investors (Setyowati, 2021). Therefore, transparency on energy tariffs or the method used to communicate tariffs to consumers could be improved and applied in Zimbabwe to start a better dialogue between energy consumers and the energy supplier.

Following a review, van den Broek (2019) stated that different levels of household energy literacy could impact energy consumers in understanding energy tariffs. Procedural engagement could include discussions centred on technical and physical attendance at seminars for community leaders who would pass information to their communities when new technology is being rolled out. Access to information for householders would help in the cases where engineers installed prepayment meters without leaving information for the householders on how they use the prepayment meters. The development of the core results in this study adds to the work of Sovacool and Dworkin (2015), highlighted in the literature chapter. Sovacool and Dworkin stated the importance of due process, good governance, energy availability, affordability, and other elements central to energy justice principles. Thus, fair energy decision-making should be applied when making energy choices.

In summary, in this study context, there was a presentation of consistent negative discourses, though not all householders may have reported barricading the prepayment meter installer. But householders did share similar sentiments about the absence of communication pre- and post-installation. The energy company indicated that they poorly communicated with their customers, and an undertone of using force to install prepayment meters by the energy company in the study context is embedded in the government dictatorship regime. More broadly, the conclusions have illustrated that improving the procedural justice tenet and the principle of energy justice can be an added factor in current and future energy policies informed by contextualised findings from this study.

In summary, procedural injustice occurs through the energy supplier's limited disclosure of information and transparency, and other noted contributory factors not communicating the energy tariffs. Tariffs may also change daily due to the inflation rates in Zimbabwe; hyperinflation affected Zimbabwe, and the currency has not stabilised, as mentioned in the literature. Thus, it may be difficult for the energy company to keep their customers without information as the prices were continuously adjusted based on inflation.

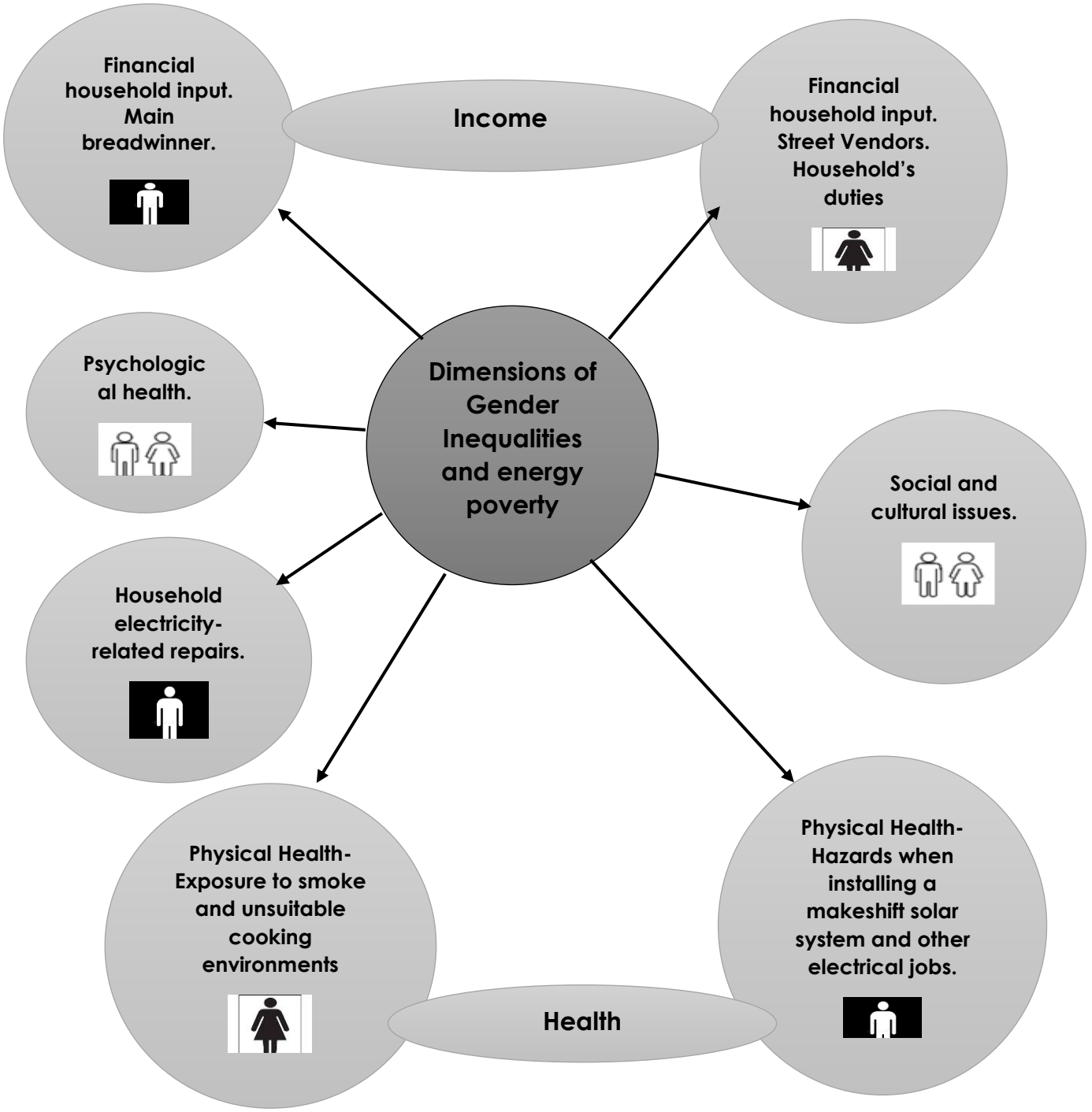
Disengagement due to long-term experiences of power cuts and load shedding with no solutions available results in mistrusting the energy supplier and adds to the injustices energy consumers face. The failure and inability to address the procedural injustice caused by the energy supplier also add to the energy poverty issues.

8.13 A lived reality across gender-related vulnerabilities and inequalities

In line with energy justice and the justice as recognition tenet objective, which advocates for fair representation of communities and that individuals should be free from physical threats, including equal political rights. The following sections will discuss and articulate outcomes from the householders highlighting similar views and differences in the study's context and other global contexts concerning where reviews are crucial to meet the objective of energy justice.

This study's outcome is contrary to that of the European Economic and Social Committee (2022), which highlights that women are more likely to be affected by energy poverty as they are the primary users of household energy, making the energy poverty gap significant between men and women. Of the 1.3 billion people in developing countries living in poverty, 70% are women (EESC,2022). Though despite the existing data, there is still limited data highlighting the impact of energy poverty between men and women (EESC,2022). Contrary to the above findings, and as demonstrated by figure 33, showing the dimensions of gender inequalities caused by energy poverty. This study did find that energy-related gender inequality has been noted to affect both men and women facing different factors: physical, health, economic/financial needs, and cultural factors, putting both men and women and their households at higher risk of energy poverty.

Figure 33 Dimensions of Gender Inequalities and energy poverty



8.14 Gender Roles and cultural factors

Having analysed gender inequalities in detail, we can now review some aspects of gender roles and energy. There are different elements of gender roles – understanding tariffs, electrical-related duties, and cultural and household duties – which have already been discussed above and are done mainly by women.

As per the objective of procedural justice, which demands equitable and democratic involvement of all stakeholders in energy decision-making, disclosure of all information, different essential elements, and robust policy mechanisms to encourage communities' participation are essential to energy-related issues. In this study, not all community members had the information necessary to be engaged in all energy-related issues, such as understanding the cost and energy tariffs. Most householders, as mentioned in the section above, had a perception of gender roles, with women mostly doing and believing their roles were cooking, cleaning, and sourcing fuels for cooking. However, another dimension to domestic roles related to electricity emerged: some women also believed that duties such as changing light bulbs were men's duties, not theirs. Gender roles and energy add to the debate that even though women mostly do energy usage-related duties, they did not show interest in knowing or understanding the production of energy and issues associated with power cuts and load shedding. Gender roles and energy engagement points of view were illustrated in an interview with a stakeholder who held seminars on energy and highlighted the need for more to be done to include community members in energy-related knowledge.

Turning now to social and cultural issues relating to gender, in line with the above figure. Householders highlighted that even when men were present and could assist with the burden of running the household, cultural expectations would not allow the duties to be shared. Most household chores are considered women's work in Zimbabwean society. Gender discrepancies in household chores and roles were also reported in a study by Cerrato and Cifre (2018), with conflict arising between men and women, with women doing more household chores. The results from Cerrato and Cifre (2018) are Similar to this study's context. The householders' reality involved women carrying out most household activities such as cleaning the house, cooking, preparing children for school, collecting firewood, looking after householders who were not well, and collecting medication supplied by the doctors. There were also situations of poor sanitation due to power cuts and load shedding, causing water shedding and adding more work for women to collect water from a borehole. It has been demonstrated that women are left to carry out most of the daily chores. As per cultural norms, women have been treated differently and experience inequalities regarding sharing some domestic chores.

8.14.1 Income

Having discussed social and cultural issues in the above section will now discuss household income in relation to gender. Though males were involved in bringing in income and looking for energy resources, they evidenced minimal or no participation in the household chores predominately carried out by women. These findings are similar to those of other studies, which state that women and men tend to have multiple roles in a household, but men's roles are fewer than women's (Kiptot, 2015; Posadas et al., 2017). The women in the research experienced much more enormous household responsibilities, as demonstrated by the number of

household chores and cooking using energy sources that are inefficient and inconvenient for household needs. Women indicated that when it comes to household income, both men and women would be responsible as a result of the economic climate and cost of living. The women also had to tend to money-generating projects such as selling at the local markets or running a poultry business.

During the interviews, and as mentioned in chapter five, a few women indicated that they were single parents and had responsibilities for their immediate family, including their parents. Single-parent households found it challenging because they did not have additional support or income that could come from having a partner. The women had to face the burden of living costs alone and also try to navigate the landscape of high energy costs and poor access to energy sources.

8.14.2 Psychological health

Adding on to the issues of health as stated above, the study indicated that the family members caring for the sick that were interviewed had no prior medical training. In particular, both men and females struggled with psychological distress when they could not give full medical attention to their loved ones to prepare their meals in time to take with their prescribed medication. The situation was mainly made worse in those households that would have used their energy budget to top up the prepayment meter and were left with no other money to buy other energy sources, such as firewood. This would mean waiting for power to be restored, though waiting for hours would result in the stress of those caring for the sick and the sick also exacerbated by the lack of energy, leading to stress calls for specific assessments for households with long-term. These chronically ill family members would fall under the principles of justice as recognition and distributional justice. In some developed countries, there is a database where the utility companies would know which households would require a backup energy supply for medical equipment; in the

case of a national disaster or an outage, help would be prioritised for those households. However, these results demonstrated a broken system failing to cater for the most vulnerable as a result of energy poverty and a system needing an assessment of needs.

Prolonged exhaustion was stated in most of the householders' accounts of their experiences, mainly when they had to cook food during unsocial hours between 12 midnight and 3 am when electricity was restored. The householders had to reschedule their daily tasks, such as looking for work online, which would be at times when they had an electricity supply and good network coverage to use the internet. However, most women recounted exhaustion after a day's work, as their household chores would extend to looking for water and queueing at the borehole location. It can be concluded that the exhaustion was because of the power cuts and load shedding and resulted from their never-ending workload without a fixed routine. When householders are supposed to be asleep, they cook between 12 midnight and 3 am. Then they wake up to get the children ready for school, followed by looking for water and energy sources they could potentially afford and access.

Overall, the psychosocial challenges reported by the householders are closely related to gender-related vulnerabilities and energy poverty. It was found that householders endured a range of psychological difficulties, which included feeling depressed, stressed, and exhausted and extreme worry. These psychological problems were connected with and worsened by power cuts and load shedding. The women and carers of chronically ill family members had almost lost a sense of self-care; instead, they prioritised their children when there was a power cut and load shedding, especially when thinking of meals. On the other hand, men would suffer the psychological stress of being unable to look after their families due to unemployment and energy poverty affecting their position to start projects that may need electricity, such as carpentry and chicken poultry projects.

The results of this research are comparable to those of other studies that have been conducted on energy poverty and its impact on wellbeing (Li et al., 2022; Phoumin & Kimura, 2019). In the study, the women caring for the young and chronically ill family members suggested that they suffered more psychological effects affecting their wellbeing. The reason for this is possible that women had the burden of caring for the young, who would require nutrition regardless of a power cut and load shedding. However, the women reported feeling that they had no choice in their situation, as the power cuts and load shedding were something they could not resolve. The women had to find means and ways to sustain their families during the power cuts and load shedding, whether using energy sources such as plastic to prepare meals for their children. Consequently, this caused mental and physical exhaustion daily. Psychological challenges have also been reported by Li et al. (2022). However, their study was carried out in China; they found that energy poverty affects cognitive and mental health among middle-aged and older people in China. Though it is crucial to note that there are psychological challenges, the householders showed some resilience in handling the struggles and experiences caused by energy poverty and energy insecurities.

8.15 Reflections on the temporary solution -coping mechanisms

The availability of clean energy is one of the core elements and contributes to achieving energy justice (Sovacool, 2013). It is crucial to highlight that other energy justice principles can be achieved when the energy supply is uninterrupted, clean, and adequate. Concerning distributive justice, Zimbabwe's energy policy indicated the ambition to implement universal electrification, which may be a limited interpretation of the energy justice component because universal electrification may not be possible when the country is not generating enough energy.

The householders used various strategies with the challenges and adverse effects of power cuts and load shedding. These were not limited to the community cookhouses, but they sought assistance from neighbours and friends when there was a power cut or load shedding before they finished cooking. There were other activities where the householders, especially women, would share firewood to cook and warm water for their children or household use. Some householders also stated that they would have to opt for food that would not require cooking as highlighted in section 5.3.

Some householders reported that they would have to ask their workplace and friends for financial assistance. The money would assist them in buying charcoal, gas, and firewood, as they would not have planned for the power cuts and load shedding or have the extra money to buy these energy sources. The householders indicated that depending on family or well-wishers has become a safety net for many as the issue of energy poverty has heightened their needs, as some small enterprises, such as woodwork workshops, would need electricity to function.

If an individual is affected, they may not be able to buy energy sources or meet other household bills. In some instances, as shown in the videos, these safety nets would also provide emotional and physical support, especially for the elderly who were not well enough to find their energy sources. Some retired householders also relied on their children to be housed in better accommodation where they would not have to deal with power cuts and load shedding. Women depended on their neighbours to borrow firewood and food products. These injustices can be identified and addressed under the justice as recognition tenet, which states the importance of energy services for marginalised groups. The literature does state that marginalised groups continue to face more discrimination and poor access to services such as energy, health, and education (Baah et al., 2019; Sevelius et al., 2020). In this study, the householders would find alternative ways of coping with their energy

poverty-related issues using some of the abovementioned means without considering reporting faults to the energy company.

Another significant aspect is also part of not trusting the energy company to resolve their problems. Some were, in these situations, forced to use inappropriate energy sources, which as a consequence, may affect their health in the long term. In the community, groups also act as a coping mechanism where women sit and talk about community problems and share business ideas. Apart from sharing business ideas, women would help each other watch the queue at the water boreholes so that they could assist their fellow women within the community.

Though energy poverty was a significant issue, these householders are finding ways to mitigate the challenges of multiple areas of injustice that should be contextualised. However, with the energy justice framework, when energy is available, the other principles would help categorise some of these community issues and how communities can transition after a long time of being affected by energy poverty. As Sovacool (2013) described the energy availability principle as being the start for alleviating energy poverty and fulfilling the other energy justice principles, in this study it may be recommended as a start for solving the immediate issues. Still, it would be crucial to assist the householders to have safe equipment and infrastructure suitable for an energy supply.

However, the recommendation would need a procedure and process listing the existing problems centred on the community's needs and how they could be addressed to produce clean and affordable energy. Overall, the collective activity of the householder was to remedy the state's failures to provide reliable and affordable energy. It shows the desperate situation and the injustices that need to be addressed by understanding community needs and the problems, including the energy source primarily used in the cookhouses, such as firewood, which causes environmental pollution.

8.16 Stakeholder's reflections on practices and implications of policy

The Zimbabwe Ministry of Energy and Power Development regulates the energy sector and its provisions. However, the energy sector is structured in a limited way due to fewer trading licences issued for the private. For example, the licences would enable more private sector companies to build large solar farm projects, which they could sell to the main grid to supplement the energy deficit. Another drawback is the issue of poor funding which limits the private sector and non-governmental organisations from implementing projects at large scales even if it is one of their goals. Therefore, there needs to be more flexibility for a multiple-sector approach to energy poverty issues. Various private energy companies stated that they are involved in the fight against energy poverty in different ways and in mitigating its effects. Some stakeholders did mention the collaboration with the public energy sector. Still, as a minimal collaboration, they would prefer this, as the problem requires joint resources such as funding to start making repairs and building the national grid using renewable sources. The public sector is responsible for providing energy to industries and households with energy from the national grid; none of the private sector companies has the licenses to do so. Though it has been reported lately that some independent decentralised solar farms can sell energy to the primary grid, they still have to follow and adhere to government policies and procedures, which may not be suitable and favourable for their business models.

Problems arise when there is no precise pricing mechanism, and the dominant energy sectors need to clarify how much the private sector would benefit from joint energy projects. This has pushed most private companies to prefer installing solar panels directly for householders and thus making some of their profits. Similarly, for example, Setyowati (2021) highlighted that key stakeholders commonly report that the existing procurement and bidding practices for renewable energy projects need

to be more transparent because the public sector is only involved in making decisions. There is a need for consistency in access to information. Resolving the issue of having a process which will involve all the stakeholders will help confront the challenging energy situation, why the energy issue is ongoing and how to tackle and share information, what has worked before and the failures.

Additionally, in the study, the private stakeholders wishing to participate in the bidding processes for business tenders must have licenses with a limited timeline and a lengthy process. These findings are similar to those of the study by (Setyowati,2021) which highlighted that private companies were frustrated by the lengthy, poorly funded projects and unclear bidding for participation in the energy process. Such unclear processes were highlighted in the study by both householders and stakeholders as the root of corruption within the energy sector, where some of the maintenance needs to be done as the money will be stolen or spent elsewhere, causing further power cuts and load shedding.

Despite the unclear processes mentioned above, corruption cases have been widely reported in Zimbabwe, with Energy Central (2017) reporting irregularities during the prepayment tender process. In this case, a company that had initially won the prepayment meter installation tender later lost the tender, which influential government members then awarded to initially disqualified companies during the bidding process. Another widely reported corruption case in the Zimbabwe energy sector The Zimbabwe Electricity Transmission and Distribution Company (ZETDC) was accused of awarding a US$9 smart meter to a company they had not assessed per the correct due processes (Ndoro, 2021). The process check had to be done first to ensure the smart meter was suitable and would be installed and perform smoothly without causing domestic consumers issues upon completion.

Areas of similarities regarding a comparable case of corruption in the energy sector. Indonesian electricity chief who accepted bribes when a coal power plant was being built; in exchange for the bribes, the electricity chief would award tenders to the companies who were paying him. This, in turn, is not a process carried out in a just manner for those other small private companies that may wish to contribute towards the alleviation of energy poverty (Gokkon, 2019). Similarly, similar cases of corruption in the energy sector have been reported in the study context.

The consequences of the current regulatory systems in the study context create substantial disincentives for the private sector's energy projects and initiatives that are too expensive to be viable because of the unavailability of funding. Additionally, existing programmes involve impediments, and few ideas get past the planning of the monopolised energy sector. Thus, a system is fostered that may not facilitate schemes whereby energy poverty might best be alleviated by generating different and distributed renewable energy solutions bolstered by the ease of access to capital spending.

In this study, progress in collaborative energy projects is affected by inadequate financial opportunities, specifically for the private sector, which impacts distributed renewable energy projects. However, previous research has shown that access to finance for large-scale renewable projects is much better where policies are conducive enough to attract international and domestic finance. In addition, the Zimbabwean financial market is relatively small and dominated by a banking sector that typically relies on high-interest loans, which may not suit the business models of small energy companies.

As per the United Nations, the worldwide narrative on climate investment often emphasises private financial flows as a crucial means for the transition to low-carbon development (United Nations, 2023). This suggestion of relying exclusively on private finance may jeopardise the

quest for fair and equitable energy transitions. In the study context, several factors still primarily affect financing decisions. The private sector has to consider factors such as project viability, sound equipment and expenditure, return and the integrity of project contractors. Also, as per the energy justice principles, the emphasis on energy affordability should shape policies that favour affordable clean energy sources. It is also important to note that Zimbabwe's energy sector is still making efforts to investigate viable renewable sources such as geothermal power and building more dams for hydropower. Though the new policies focus on renewable energy, most old international energy policies have favoured fossil-fuelled power plants. In most countries, coal is still constantly being used to produce energy, and Zimbabwe, for example, receives significant energy from subsidies from South Africa, which also relies on coal. Other nations such as China, the USA and Asia still rely on coal. Supposing the use of coal to power Zimbabwe continues, and the policy priority to address the energy deficit continues to be the using coal; in that case it may jeopardise Zimbabwe's and the broader international agenda to transition to low-carbon energy. Consequently, it could destabilise the pursuit of energy justice, in which clean and sustainable energy sources are crucial.

The government stated that the distribution of biogas and solar technology throughout rural areas is on its agenda for renewable energy (ZESA,2012,2022). If these new technologies are rolled out using the principle of procedural justice and subsidies from the government, the communities involved may essentially benefit and create a sense of ownership. Including communities in energy projects has been reported in the study as a method of engaging the communities, and Pandey (2009) also reported that when more people are connected to the grid through their contributions, such as taking part in the work, it creates a sense of ownership as a result, and community members involved would look after their equipment in comparison with the areas were everything

was done by the energy supplier. As a result, householders may also benefit from cheaper energy tariffs if the new technologies are implemented in a fair system as per the energy justice framework. As much as the Zimbabwean population needs access to reliable electricity, recognition of people's rights and needs should be acknowledged.

9 Conclusions of the Study

9.1 Introduction

The final chapter outlines the study's main conclusions, highlighting the contributions to knowledge, the implications for policy, recommendations, limitations of the study and opportunities for future research. The research explored the energy justice framework through lived experiences of householders in the Harare Metropolitan Province Area, Zimbabwe. The study identified the limiting factors caused by energy injustice, undermining the energy justice principles, and the alleviation of energy poverty.

The analysis of the case study indicated that the energy justice principles are not effectively applied in the study area unless the fundamental need for energy supply is met. Common barriers across the study context associated with energy poverty include affordability, poor energy sources, monopoly, and inequalities. The overarching reoccurring theme was the issue of mistrust and disengagement regarding energy issues. The lesson to be learned from this study is that the key barriers are entwined in other socioeconomic and cultural issues, which has increased knowledge by understanding the areas that must be considered when new policies are being considered and incorporating grassroots needs using the bottom-up approach. Finally, reflecting on the limitations of this study, there are specific areas where further lines of enquiry would be required, as well as potential research pathways.

9.2 Empirical contribution of the study

It is considered that this study has added to a greater understanding of the matter of energy justice through the experiences of householders affected by power cuts and load shedding in the Harare Metropolitan Province Area, Zimbabwe. Specifically, the research has contributed to the existing knowledge of householders' and stakeholders' challenges. A central theme that emerged from the study is the role of disengagement from energy-related issues and the lack of trust between the householders, the private energy sector, and the monopolised energy sector.

Not being engaged with the causes of energy poverty and the lack of trust have significantly increased socioeconomic challenges, forcing the poor into greater difficulties in affording energy sources and leading to significant deprivation of other daily needs such as food and sanitation. In addition, the issue of energy poverty is also connected to other health-related problems, such as stress and depression. However, these health issues may worsen because of the disengagement from energy issues and the lack of trust between the energy supplier and householders. Thus, poor wellbeing pervades each householder's life, and energy poverty has worsened an already unstable way of life. Energy poverty and its related challenges contribute to householders' experiences entwined with poverty and other injustices. It is also due to poverty that the households become more vulnerable to energy poverty, as they have to use energy sources that may impact their health in future.

Concerning gender and sociocultural issues, women faced more challenges and, for cultural reasons, would find it difficult to share duties with their male counterparts. Concerning socioeconomic factors, the householders experienced financial hardships, which made them cope with power cuts and load shedding. The coping mechanisms during power cuts included skipping meals, prioritising children and the

chronically ill and sharing community fuels to survive daily, as these power outages were so frequent that they had no choice. These findings can be related to the existing research by Burlinson et al. (2022), Beatty et al. (2014), and Bhattacharya et al. (2003) indicate that it has been highlighted that householders in some parts of the world would need to decide whether to heat their homes or save energy for cooking.

Concerning the relevance and contribution of the study, all the challenges that have been detailed have been examined by using energy poverty literature and energy justice principles. The study has contributed to the body of knowledge by concentrating on the plight of the householders using the energy justice lens, novel methodological framework and applying the gender lens. Feminism highlights how gender and power can cause inequalities in societies, which would impact and cause an enormous burden on those most affected. The householders experienced these challenges because of energy poverty, and the added challenges for women were based on societal norms and gender expectations, which are different to those of their male counterparts.

9.3 Theoretical contributions

Numerous studies investigating energy justice focused on a just transition to renewable energy, though not all social factors were not considered (Samarakoon, 2019; Monyei and Adewumi, 2017; LaBelle (2017); Sovacool & Dworkin, 2015; Schlosberg, 2004). Studies seeking an inclusive energy justice framework must research beyond the existing framework. Still, it is crucial to note that different communities, such as those experiencing different forms of energy poverty, need different solutions fitting their environments, which may cause more injustice (Samarakoon, 2019; Schlosberg, 2004). Therefore, this study investigated experiences of power cuts and load shedding using mixed techniques. It is one of the few studies in Zimbabwe, such as that of Chipango (2021), to have researched

understanding energy justice through householders' lived experiences and social relations using mixed methods and paradigms.

While most studies on energy justice have been conducted in countries with already-advanced energy systems, the current study is notable for examining householders' experiences in a context crippled by power cuts and load shedding. As a result, and building on previous studies by Brand-Correa and Steinberger (2017) and Samarakoon (2019), the study seeks to understand energy justice principles and the specific contextual human needs entwined within energy poverty. While evaluating energy poverty and related activities, it is, therefore, crucial to consider the human needs and socioeconomic factors that may be embedded in energy poverty.

The study's findings which may be regarded as distinct and unique to the study contexts and were found across the householders, private sector, and non-governmental sectors, were the disengagement to energy poverty issues and lack of trust towards the public sector. The disengagement and lack of trust would be classed differently between the participants, householders, and stakeholders (private and non-governmental energy sectors.

The following theoretical findings of this study will help inform all stakeholders seeking to implement policies as part of incorporating an all-encompassing energy justice system, including other components based on human needs. The study will also contribute towards a just transition towards a low carbon economy and recommend appropriately assessing whether adequate resources exist, such as fairly distributed funding. The householder's causes of disengagement with energy issues are embedded within different issues resulting from energy poverty. These issues which occupy the householder's day to day lives include water shedding, looking for cooking sources and working during unsocial hours when there is electricity. This then leads the householders to have a

relentless day-to-day cycle. But it was unclear if the householder disengagement in energy poverty hindered their judgement in that these underlining factors, for example working during social hours, were identified as an energy injustice.

It appeared as though the householders seemed to have settled on finding ways of surviving, yet the injustices are caused mainly by poor energy supply. The householders resorted to not complaining or protesting against the energy supplier due to not trusting the supplier to act or resolve the ongoing power cuts and load shedding. Whereas in other contexts, such as South Africa, it has been reported how communities rally together to protest against high energy costs and load shedding (Africa News, 2023).

The private and non-governmental sectors were mainly disengaged from finding solutions to resolve related energy poverty due to the reported unjust due process leading to a lack of trust between the public and private stakeholders. This may be similar to another context, as in the case of Indonesia of corruption but in Zimbabwe, this is causing even more issues of stakeholders from the private and non-governmental energy sector to distance themselves as they are not being involved in any decision-making if energy for all is to be achieved. The private and NGO stakeholders were disengagement in resolving the energy poverty due to not friendly trading licences and poor funding. They highlighted not being able to benefit in a business sense though they realised it was critical to be part of the transition towards a just transition.

The householders distrust the energy supplier because of poor communication, pricing issues, or energy tariffs, mostly noted during the prepayment meters installations. The private and non-governmental sectors' lack of trust was primarily centred around the issue of not fully regulated tendering systems and policies unfavourable to fair trading standards.

The study engages with energy poverty-related vulnerabilities and energy justice theories to understand the challenges of householders affected by energy poverty and experiences of load shedding. Owing to low incomes, continuous power cuts, poor services, disengagement and a lack of trust, householders experience high levels of energy poverty.

In terms of gender, the study has added to the body of knowledge by highlighting issues such as those raised by Nguyen and Su (2021), advocating for governments to prioritise gender inequalities within their energy policy to curb gender inequalities. In most African countries, for example, women experience a separate set of challenges from those experienced by men because women have to do more household chores and source energy sources such as firewood, which can take hours (Njenga et al. 2021; Maphosa, 2022). The impact of power cuts and load shedding noticeably affects their physical and mental well-being (Pakendorf,2023; Load Shedding, 2023; Moloi et al., 2023). Gender inequality in Zimbabwean society results from collective obstacles, for example, the burden of care and domestic dues, specifically in the study context, that significantly affect women (Dhatt,2017). The women living in the studies society must do the household chores as a cultural expectation which takes the bulk of the day. However, men also contribute financially and look for firewood in some households. Women dominated even the cookhouses, and men would only visit the cookhouses if they had to drop off firewood.

Power cuts and load shedding cause unavailability of electricity used for cooking, consequently leading to householders sourcing other cooking resources, which can be time-consuming, inefficient cooking sources and not clean. Women are therefore subjected to several interrelated gender-related barriers due to the added demands not just limited to household chores but the added burden of caring for the children, elderly and chronically ill compared to men. Power cuts and load shedding add to these inequalities, disproportionately affecting women more than men.

But the added burden caused by energy poverty affects both women and men regarding household needs.

9.3.1 Theoretical contributions – Zimbabwe energy context

As a result of energy poverty, Zimbabwe has experienced an exceedingly heavy economic and social burden. An adequate energy supply is needed for a country's development and people. Chapter 3 discusses the global context and Zimbabwe's economic issues, which have seen the country struggle in most areas, including the energy sector. This study has shown that the energy sector and the government are not finding appropriate ways to bear the burden of energy poverty, which affects householders regarding energy availability and other areas of their lives. The level of energy poverty in Zimbabwe is at its highest, and the results have shown that the adverse consequences of energy poverty continue to permeate households. In addition, the research has also revealed that households and small businesses experience severe challenges arising from the impoverished conditions in which they exist, exacerbated by power cuts and load shedding.

Zimbabwe has been participating in the international agendas, which state that by 2030 developing countries would have eliminated extreme poverty, achieved gender equality, combated diseases such as malaria, HIV and AIDS and achieved universal electrification by ensuring environmental sustainability (UNDP, 2022). This study has contributed to understanding the country's status with regard to how energy justice principles can be reviewed and improved in terms of the existing energy justice framework. The study results show that the country still has much to do regarding energy poverty, primarily where it is a matter of building trust with energy consumers, education, socioeconomic factors, poverty, equality, and health issues. There were gender inequalities caused by energy poverty between men and women. The research has demonstrated that regarding these energy-related burdens, women in

Zimbabwe were affected disproportionately by energy poverty compared to men.

9.3.2 Theoretical contributions-relevant to the understanding of energy justice through lived experiences in Zimbabwe

The study contributes to understanding energy justice through the lived experiences of householders. Energy justice in Zimbabwe should be more evident and remedy the desperate energy poverty situation, where a large proportion of the population is affected in a country already affected by ageing power plants and poor energy infrastructure. Although the country has been importing energy from other countries, it is clear that importing energy is a complex and challenging pathway for alleviating the energy burden. The challenges include governments needing more revenue to import energy, poor infrastructure, and corruption impacting the country's progress without the population's needs as a top priority. The energy sector is burdened with many complexities intractably entwined in the energy justice fabric and the socioeconomic and cultural fabric of the society in which the householders affected by power cuts and load shedding live. However, the study has also found that the renewable energy policy in Zimbabwe has considerations towards having energy access for all. Still, because of the lack of funding, energy for all may be an issue when funding is unavailable to implement the policy mandate.

9.4 Conclusions

The conclusions illustrated by the study regarding the power cuts and load shedding and associated energy justice principles are based on the 7th SDG, which is intended to ensure access to affordable, reliable, sustainable, and modern energy for all. This chapter discusses the study's findings regarding energy poverty and how energy justice principles can be understood and applied in Zimbabwe.

The results suggest a poorly operational energy sector that results in frequent power cuts and load shedding lasting up to 17 hours or more on average. However, there appears to be a substantial inconsistency between policy and practice. The renewable energy policy aligns with SDGs and World Health Organization guidelines. Yet, at the grassroots, there are indications that a significant gap exists between policy and practice and that this disparity must be tackled to eliminate energy poverty. The challenges experienced by the householders and stakeholders indicate that the application of energy justice principles needs significant re-evaluation. The burden of energy poverty has made the already uncertain and precarious lives of householders in society more difficult.

Power cuts and load shedding adversely affect the children, chronically ill and elderly. As emerged from the study, these three groups of household occupants are prioritised by the women taking care of the household, which can also negatively burden the women. Women neglect to prioritise the needs of the young, elderly, and ill to cater to their immediate energy-related needs, such as dietary requirements. The neglect is evident when the women are always on the go with household chores, to the point of having to prepare meals during unsocial hours between 12 midnight and 3 am when electricity is restored. They could then use electricity for cooking by using the allowance they would have credited to their prepayment meter. These cases are common when in

most cases, some households would have used all their energy budget to top up the electricity meter and would not have had any other financial means to buy energy resources.

The burden of care and low incomes for women consisted not only of caring for the household but extended to being responsible financially for their parents. The burden cycle was enduring and worsened by the enormity of energy poverty-related issues. It is, therefore, clear that women are overstretched, which impacts their ability to care for themselves effectively and would fall under the justice as recognition principle. All the demands on women and their time affect their wellbeing. These women are exhausted and stressed by situations embedded in energy justice principles. However, women are still not engaged with the energy issues. Still, men indicated they are involved in repairing and fixing household electricals and are in charge of anything to do with electricity. However, in this case, it is clear they are the ones directly impacted by energy issues, including chronic power cuts and load shedding.

In addition, there is an issue of poor energy tariff literacy. Rendering householder's dependent on the energy supplier they do not trust, indicating that the energy prices increase monthly without a clear tariff outline or that the householders do not question the energy price increase. The study clearly showed that householders could benefit from moving out of the predicament of mistrusting the energy company and therefore beginning to engage with them.

9.5 Recommendations for policy

This study presented an understanding of energy justice through lived experiences in Zimbabwe, one of the sub-Saharan African countries affected severely by energy poverty resulting in chronic power cuts and load shedding. The observed outcomes highlighted poor infrastructure, energy supply, energy sources, behaviours resulting from the administrative rules and the monopolistic nature of the system. In addition, a government whose energy policies has yet to manage to change the energy situation of its country and injustices caused by the poor supply of energy.

These interactions of multiple factors have resulted in poor progress towards innovative transformational processes for achieving energy for all and energy justice. These factors underscore the need for adequate energy supply, community needs and development. However, learning from the existing problems, effective policy, and integrating energy justice principles should be prioritised as goals to work towards improving the identified issues causing energy poverty.

The study pointed out some apparent challenges for householders in Zimbabwe, especially in the Harare Metropolitan Province Area. Some challenges were unique and not well recognised by the energy industry and policy makers, presenting a considerable barrier to overcoming energy poverty. Presenting these energy problems to policymakers and highlighting how the energy justice principles could be applied towards supporting and improving the needs of the communities would be crucial. Therefore, the following recommendations are per the discussion, and conclusions are drawn from the study. The recommendations to policymakers, stakeholders and implications for future renewable energy are centred around seven critical components essential for improving the community's energy needs and well-being and moving towards a just, equitable system.

The recommendations are as follows:

- The Zimbabwean government should implement a long-term policy grounded in achievable objectives to be influenced by the government and support a transition for a just transition. United Nations Development Agency (UNDP,2023) supports this point, suggesting that long-term policy would be a helpful strategy supporting a just transition and green economic growth for the community and the Zimbabwean government.
- Public, private and NGO energy sectors should put forward more specific visions and expectations for the energy systems in Zimbabwe, opening spaces for communities' visibility and awareness about energy poverty.
- The energy supplier should work with private and NGO stakeholders to strengthen energy customer protection/human rights and empower householders to improve gender inequalities by improving economic opportunities such as access to jobs and adequate electricity for small projects. Wiebeet et al. (2023) suggest that energy policies in Zimbabwe dominate climate policies and that it is crucial to implement renewable energy projects to create green jobs in the coming years. They also note that it is crucial to understand community skills and needs.
- The Zimbabwean government should encourage the energy company to establish clear guidelines for energy unit pricing, tariff conditions, and transparency, promoting different tariffs through publicity.
- Public, private and NGO energy sectors should raise awareness and educate members of the public about energy technology and the benefits of understanding tariffs to help recognise the injustices and to help drive cultural and behavioural change.
- Public, private and NGO energy sectors should work collaboratively with the industry to support training in new technologies specific to

Zimbabwe, such as prepayment meters tariffs, and to understand the advantages and disadvantages of prepayment meters.

- The Zimbabwean government should develop better trade policies to build their businesses to aid the growth and development of the renewable energy market.

9.6 Further research

There is still a need for further, more detailed social science studies to be conducted in this area, as several aspects were beyond the scope of this study. For example, it was observed that there were responsibilities beyond household costs, including looking after extended families and parents. The responsibility of looking after an extended family could have been investigated, as well as what impact that may also have on the energy demands of the household and if their other family members were contributing to the cost needed to be determined. It was clear that the parents needed to look after themselves financially. Still, it needed to be clarified whether the extended family also needed financial support or contributed towards the household's energy costs.

More studies need to be conducted in other areas of Zimbabwe to compare with this study's findings and determine which areas of the energy justice principles may similarly be lacking. Future studies could also research whether women in other areas similarly view energy-related burdens in less gendered societies, including education, access to income/employment and age. Such studies may add to the existing energy justice framework in terms of the assessment of inequalities or the recognitional justice principle.

Further studies using ethnographic methods would help the researchers immerse themselves in the experiences of the communities and present a different view of the observed challenges. Some interviewees were worried about discussing some of the factors that may be causing energy

poverty due to fear of political retaliation, even though they were told about the study's confidentiality and ethical consideration of the study.

It is possible and crucial for future studies to use discrete research samples from the private and public sectors and have different samples from different departments, such as energy policymakers giving their views on how the policy process works.

9.7 Concluding remarks

With energy research that has spanned over 15 years, with researchers such as Sovacool and Dworkin (2015) and Samarakoon (2019) who identified energy justice as an area for future researchers, this research has contributed and identified that householders are affected by power cuts and load shedding. Still, they need to be more engaged with the causes and what role they can play towards alleviating the issue of energy poverty. Given the associated energy problems the householders are facing, the issue of mistrusting the energy company has become a fundamental block to opening a dialogue between the energy provider and householders. The householders seem to have no voice, as do the private energy sector players, because of the monopolised energy sector.

Often the goals, agendas and needs in the study context are overshadowed by a monopolised system with no comparable energy provider that can be used as a measure of factors such as energy price comparisons; the issues in this context are ingrained in different aspects such a government which has failed to secure its basic population needs. The existing problems in the context, when put into consideration and understood, would then be beneficial towards making changes were the most need is. The most complex challenge is getting trust to be regained between the householders and energy providers because of the broken relationships as an ongoing struggle that does not seem to have been addressed. The strategies for mitigating energy poverty that is used by

householders are harmful, draining, overwhelming and maybe fruitless with regard to achieving the alleviation of energy poverty. This requires a policy that considers the energy needs of the people from a grassroots level.

The issue of poverty was also one of the issues raised across the data. The challenges connected to poverty were linked to power cuts and load shedding when it came to establishing a business; additionally, the country's economic status led to extreme poverty.

The study has identified some key research findings drawn from analysing the results and has achieved the study's objectives. The contributions to knowledge were noted, recommendations were suggested, and limitations of the study were noted. In conclusion, as long as the energy sector and energy policy reviews cannot resolve the causes of the energy deficit, energy poverty will continue to affect householders, making their lived experience unbearable and not fulfilling the requirements of the energy justice principles. An effective way to alleviate the energy burden would be to incorporate and build upon existing energy justice measures based on the identified needs of the communities. Effective interventions, which include building trust between the energy supplier and the householders to meet essential energy needs, would assist the householders and alleviate their daily challenges. Thus, they would have a better existence and improved wellbeing.

10 References

Alhammami & An (2021). Techno-economic analysis and policy implications for promoting residential rooftop solar photovoltaics in Abu Dhabi, UAE. Renewable Energy, 167, 359–368. https://doi.org/10.1016/j.renene.2020.11.091

Apergis, N., Polemis, M., & Soursou, S.-E. (2022). Energy poverty and education: Fresh evidence from a panel of developing countries. Energy Economics, 106, 105430–. https://doi.org/10.1016/j.eneco.2021.105430

Aristondo, O., & Onaindia, E. (2023). Decomposing energy poverty in three components. Energy (Oxford), 263, 125572–. https://doi.org/10.1016/j.energy.2022.125572

Agius, C. (2009). Social constructivism. In Social constructivism. Oxford University Press.

Aristondo, O., & Onaindia, E. (2020). On measuring the sources of changes in poverty using the Shapley method. An application to Europe. Fuzzy Sets and Systems, 383, 80–91. https://doi.org/10.1016/j.fss.2018.12.011

Amankwaa, G., Heeks, R., & Browne, A. L. (2023). Smartening up: User experience with smart water metering infrastructure in an African city. Utilities Policy, 80, 101478–. https://doi.org/10.1016/j.jup.2022.101478

Ayaaz (2022) Zimbabwe's power cuts cripple business. Retrieved from https://mg.co.za/africa/2022-12-09-zimbabwes-power-cuts-cripple-business/

Amin, A., Liu, Y., Yu, J., Chandio, A. A., Rasool, S. F., Luo, J., & Zaman, S. (2020). How does energy poverty affect economic development? A panel data analysis of South Asian countries. Environmental science and pollution research international, 27(25), 31623-31635. doi:10.1007/s11356-020-09173-6

Ambrose, A., Baker, W., Brierley, J., Butler, D., Marchand, R., & Sherriff, A. (2020). Stuck at home in a cold home : the implications of Covid-19 for the fuel poor.

Akizu, O., Urkidi, L., Bueno, G., Lago, R., Barcena, I., Mantxo, M., . . . Lopez-Guede, J. M. (2017). Tracing the emerging energy transitions in the Global North and the Global South. International journal of hydrogen energy, 42(28), 18045-18063. doi:10.1016/j.ijhydene.2017.04.297

Akrofi, M. M., & Antwi, S. H. (2020). COVID-19 energy sector responses in Africa: A review of preliminary government interventions. Energy research & social science, 68, 101681-101681. doi:10.1016/j.erss.2020.101681

Almeshqab, F., & Ustun, T. S. (2019). Lessons learned from rural electrification initiatives in developing countries: Insights for technical, social, financial and public policy aspects. Renewable

& sustainable energy reviews, 102, 35-53. doi:10.1016/j.rser.2018.11.035
Aristondo, O., & Onaindia, E. (2018). Inequality of energy poverty between groups in Spain. Energy (Oxford), 153, 431–442. https://doi.org/10.1016/j.energy.2018.04.029
Anderson, W., White, V., & Finney, A. (2012). Coping with low incomes and cold homes. Energy policy, 49, 40-52. doi:10.1016/j.enpol.2012.01.002
Armeni, C. (2016). Participation in Environmental Decision-making: Reflecting on Planning and Community Benefits for Major Wind Farms. Journal of environmental law, 28(3), 415. doi:10.1093/jel/eqw021
Abubakar Mas'ud, A., Wirba, A. V., Muhammad-Sukki, F., Albarracín, R., Abu-Bakar, S. H., Munir, A. B., & Bani, N. A. (2016). A review on the recent progress made on solar photovoltaic in selected countries of sub-Saharan Africa. Renewable & Sustainable Energy Reviews, 62, 441–452. https://doi.org/10.1016/j.rser.2016.04.055
Abdoli, S., Doosti Irani, M., Hardy, L. R., & Funnell, M. (2018). A discussion paper on stigmatizing features of diabetes. Nursing Open, 5(2), 113–119. https://doi.org/10.1002/nop2.112
Africa LEDS Partnership (2021) Renewable Energy.
Retrieved from https://africaledspartnership.org/tag/renewable-energy/
ANDERSON, G. Q. A., & FERGUSSON, M. J. (2006). Energy from biomass in the UK: sources, processes and biodiversity implications. Ibis (London, England), 148(s1), 180–183. https://doi.org/10.1111/j.1474-919X.2006.00535.x
Awan, R., Sher, F., & Abbas, A. (2013). An Investigation of Multidimensional Energy Poverty in Pakistan. The Pakistan Development Review, 52(4), 405-418. Retrieved May 25, 2020, from www.jstor.org/stable/24397902
Anderson, C. (2010). Presenting and evaluating qualitative research. American Journal of Pharmaceutical Education, 74(8), 141–141. https://doi.org/10.5688/aj7408141
Adesola, S., & Baines, T. (2005). Developing and evaluating a methodology for business process improvement. Business process management journal,11(1), 37-46. doi:10.1108/14637150510578719
Agius, C. (2009). Social constructivism: Oxford University Press.
Althubaiti, A. (2016). Information bias in health research: Definition, pitfalls, and adjustment methods. Journal of multidisciplinary healthcare, 9(1), 211-217. doi:10.2147/JMDH.S104807

Ardhendu, B., Peter, M., Alexander, K., Peter, V., Hui, F., & Susan, C. (2020). Associating facial expressions and upper-body gestures with learning tasks for enhancing intelligent tutoring systems.
Awaworyi Churchill, S., & Smyth, R. (2020). Ethnic diversity, energy poverty and the mediating role of trust: Evidence from household panel data for Australia. *Energy Economics*, *86*, 104663–
Awaworyi Churchill, S., & Smyth, R. (2021). Energy poverty and health: Panel data evidence from Australia. *Energy Economics*, *97*, 105219–. https://doi.org/10.1016/j.eneco.2021.105219
Antwi, S. H., & Ley, D. (2021). Renewable energy project implementation in Africa: Ensuring sustainability through community acceptability. *Scientific African*, *11*, e00679–. https://doi.org/10.1016/j.sciaf.2020.e00679
Ahmed, K. (2022) Rich countries 'trap' poor nations into relying on fossil fuels.https://www.theguardian.com/global-development/2023/aug/21/rich-countries-trap-poor-nations-into-relying-on-fossil-fuels
Bolano, A.,Lodesani, F., Pacthod, D.,Polymeneas, E., Pozas Pratt,M., Samandari,H., & Tai,H. (2022). The energy transition: A region-by-region agenda for near-term action.https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/the-energy-transition-a-region-by-region-agenda-for-near-term-action#/
Bouzarovski, S., Tirado Herrero, S., Petrova, S., Frankowski, J., Matoušek, R., & Maltby, T. (2017). Multiple transformations: theorizing energy vulnerability as a socio-spatial phenomenon. *Geografiska Annaler. Series B, Human Geography*, *99*(1), 20–41. https://doi.org/10.1080/04353684.2016.1276733
Bouzarovski, S. (2018). *Energy Poverty (Dis)Assembling Europe's Infrastructural Divide* (1st ed. 2018.). Springer Nature. https://doi.org/10.1007/978-3-319-69299-9
Banzhaf, S., Ma, L., & Timmins, C. (2019). Environmental Justice: The Economics of Race, Place, and Pollution. *The Journal of Economic Perspectives*, *33*(1), 185–208. https://doi.org/10.1257/jep.33.1.185
Butler, C. (2022). *Energy Poverty, Practice, and Policy*. Springer
Nature.Biswas, S., Echevarria, A., Irshad, N., Rivera-Matos, Y., Richter, J., Chhetri, N., Parmentier, M. J., & Miller, C. A. (2022). Ending the Energy-Poverty Nexus: An Ethical Imperative for Just Transitions. *Science and Engineering Ethics*, *28*(4), 36–36. https://doi.org/10.1007/s11948-022-00383-4
Burke, J. (2017). Emmerson Mnangagwa promises 'free and fair' elections in Zimbabwe. https://www.theguardian.com/world/2017/nov/24/emmerson-mnangagwa-sworn-in-as-zimbabwes-president
Belaïd, F. (2022). Implications of poorly designed climate policy on energy poverty: Global reflections on the current surge in energy

prices. *Energy Research & Social Science*, 92, 102790–. https://doi.org/10.1016/j.erss.2022.102790
Bakhtavar, E., Prabatha, T., Karunathilake, H., Sadiq, R., & Hewage, K. (2020). Assessment of renewable energy-based strategies for net-zero energy communities: A planning model using multi-objective goal programming. *Journal of Cleaner Production*, *272*, 122886–. https://doi.org/10.1016/j.jclepro.2020.12288
Biau, D. J., Kernéis, S., & Porcher, R. (2008). Statistics in Brief: The Importance of Sample Size in the Planning and Interpretation of Medical Research. Clinical orthopaedics and related research, 466(9), 2282-2288. doi:10.1007/s11999-008-0346-9
Bernard, T., & Torero, M. (2015). Social Interaction Effects and Connection to Electricity: Experimental Evidence from Rural Ethiopia. Economic Development and Cultural Change, 63(3), 459–484. https://doi.org/10.1086/679746
Butler, C. (2022). Energy Poverty, Practice, and Policy. Springer Nature.
Ballesteros-Arjona, V., Oliveras, L., Bolívar Muñoz, J., Olry de Labry Lima, A., Carrere, J., Martín Ruiz, E., Peralta, A., Cabrera León, A., Mateo Rodríguez, I., Daponte-Codina, A., & Marí-Dell'Olmo, M. (2022). What are the effects of energy poverty and interventions to ameliorate it on people's health and well-being? A scoping review with an equity lens. Energy Research & Social Science, 87, 102456–. https://doi.org/10.1016/j.erss.2021.102456
Basten Gokkon (2019) Indonesia's electricity chief charged with bribery over a coal-fired power plant. MONGABAY https://news.mongabay.com/2019/04/indonesia-electricity-chief-charged-with-bribery-over-coal-fired-power-plant/
Benjamin, G. C. (2022). What Is Public Health? Telling Our Own Story. American Journal of Public Health (1971), 112(4), 613–614. https://doi.org/10.2105/AJPH.2022.306771
Boardman, B. (2010). Fixing fuel poverty : challenges and solutions. London ;: Earthscan.
Bickerstaff, K., Bulkeley, H., & Walker, G. (2013). Energy justice in a changing climate : social equity and low-carbon energy. London: Zed Books.
Bickerstaff, K., Bulkeley, Harriet, & Walker, Gordon. (2013). Energy justice in a changing climate: Social equity and low-carbon energy (Just sustainabilities Energy justice in a changing climate). Building Research Establishment. (2013). Client report. Retrieved from https://www.bregroup.com/
Boamah, F. (2020). Desirable or debatable? Putting Africa's decentralised solar energy futures in context. Energy research & social science, 62, 101390. doi:10.1016/j.erss.2019.101390
Bombaerts, G., Jenkins, K., Sanusi, Y. A., & Guoyu, W. (2020). Energy Justice Across Borders (1st ed. 2020. ed.). Cham: Springer International Publishing.

Bosco, S., Pulselli, R. M., & Bastianoni, S. (2007). Renewable energy impact in reducing greenhouse gas emissions at local scale: The case study of South Tuscany geothermal fields. In (Vol. 101, pp. 253-262).
Bouzarovski, S., Thomson, H., & Cornelis, M. (2021). Confronting Energy Poverty in Europe: A Research and Policy Agenda. Energies (Basel), 14(4), 858–. https://doi.org/10.3390/en14040858
Bouzarovski, S. (2010). Post-socialist energy reforms in critical perspective: Entangled boundaries, scales and trajectories of change. European urban and regional studies, 17(2), 167-182. doi:10.1177/0969776409356159
Bouzarovski, S. (2018). Energy Poverty (Dis)Assembling Europe's Infrastructural Divide (1st ed. 2018. ed.). Cham: Springer International Publishing.
Bouzarovski, S., & Petrova, S. (2015). A global perspective on domestic energy deprivation: Overcoming the energy poverty–fuel poverty binary. Energy research & social science, 10, 31-40. doi:10.1016/j.erss.2015.06.007
Bouzarovski, S., & Simcock, N. (2017). Spatializing energy justice. Energy policy, 107, 640-648. doi:10.1016/j.enpol.2017.03.064
Bouzarovski, S., & Tirado Herrero, S. (2017a). The energy divide: Integrating energy transitions, regional inequalities and poverty trends in the European Union. European urban and regional studies, 24(1), 69-86. doi:10.1177/0969776415596449
Bouzarovski, S., & Tirado Herrero, S. (2017b). Geographies of injustice: the socio-spatial determinants of energy poverty in Poland, the Czech Republic and Hungary. Post-communist economies, 29(1), 27-50. doi:10.1080/14631377.2016.1242257
Bridge, G., Bouzarovski, S., Bradshaw, M., & Eyre, N. (2013). Geographies of energy transition: Space, place and the low-carbon economy. Energy policy, 53, 331-340. doi:10.1016/j.enpol.2012.10.066
Bridge, G., Özkaynak, B., & Turhan, E. (2018). Energy infrastructure and the fate of the nation: Introduction to special issue. Energy research & social science, 41, 1-11. doi:10.1016/j.erss.2018.04.029
Banya, N. (2019) Power crisis turns night into day for Zimbabwe's firms and families. Retrieved from https://www.reuters.com/article/us-zimbabwe-economy-power-idUSKCN1UR4SA
Brazilian, M. & Yumkella, K. (2015). Why energy poverty is the real energy crisis. Retrieved From
https://www.weforum.org/agenda/2015/03/why-energy-poverty-is-the-real-energy-crisis/
Balachandra, P. (2011). Modern energy access to all in rural India: An integrated implementation strategy. Energy policy, 39(12), 7803-7814. doi:10.1016/j.enpol.2011.09.026
Bloom, F. (2020) Green energy revolution powered by global South Retrieved from

https://www.scidev.net/global/news/green-energy-revolution-powered-by-global-south/
British Broadcast Cooperation. (2019). Letter from Africa: Zimbabwe descends into darkness. Retrieved from https://www.bbc.co.uk/news/world-africa-49097080
Building Research Establishment (2013). Dwelling level housing stock modelling and database for Bury Council. Retrieved from https://search3.openobjects.com/mediamanager/bury/jsna/files/bre_dw elling_level_stock_models_-_bury_pdf.pdf
Binns, C., & Low, W.-Y. (2015). What Is Public Health? Asia-Pacific Journal of Public Health, 27(1), 5–6. https://doi.org/10.1177/1010539514565740
Brabandere, E. de, & Gazzini, T. (2014). Foreign investment in the energy sector : balancing private and public interests (E. de Brabandere & T. Gazzini, Eds.). Brill Nijhoff.
Botchway, M., Davis, R. E., Merchant, A. T., Appiah, L. T., & Moore, S. (2021). Diabetes-Related Stigma and its Influence on Social Networks, Social Support, and HbA1c in Ghana. Ethnicity & Disease, 31(1), 57–66. https://doi.org/10.18865/ed.31.1.57
Book -Ockwell, & Byrne, R. (2017). Sustainable Energy for All: Innovation, technology and pro-poor green transformations (1st ed.). Routledge. https://doi.org/10.4324/9781315621623
Bhattacharyya, S. C. (2012). Energy access programmes and sustainable development: A critical review and analysis. Energy for Sustainable Development, 16(3), 260–271. https://doi.org/10.1016/j.esd.2012.05.002
Bacon, R. (2010). Robert Bacon discusses definitions of energy poverty and policies to reduce it. Oxford Energy Forum(81), 3.
Behera, S. R., & Dash, D. P. (2017). The effect of urbanization, energy consumption, and foreign direct investment on the carbon dioxide emission in the SSEA (South and Southeast Asian) region. Renewable & Sustainable Energy Reviews, 70, 96–106. https://doi.org/10.1016/j.rser.2016.11.201
Barandiarán, J., Damluji, M., Miescher, S., Pellow, D., & Walker, J. (2022). Energy Justice in Global Perspective: An Introduction. Media + Environment, 4(1). https://doi.org/10.1525/001c.37073
Brand-Correa, L. I., & Steinberger, J. K. (2017). A Framework for Decoupling Human Need Satisfaction From Energy Use. Ecological Economics, 141, 43–52. https://doi.org/10.1016/j.ecolecon.2017.05.019
Brereton, R. G. (2015). Populations and samples. Journal of chemometrics, 29(6), 325-328. doi:10.1002/cem.2695
BRE National Solar Centre (2017) Fire and Solar PV : Investigations and evidence retrieved from:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/630639/fire-solar-pv-systems-investigations-evidence.pdf

Chipango, E. F. (2018). Reinterpreting energy poverty in Zimbabwe: a scalar perspective. *Journal of Political Ecology*, *25*(1), 205–220. https://doi.org/10.2458/v25i1.22964

Chipango, E. F. (2023). Why do capabilities need Ubuntu? Specifying the relational (im)morality of energy poverty. Energy Research & Social Science, 96, 102921–. https://doi.org/10.1016/j.erss.2022.102921

Chipango, E. F. (2021). Constructing, understanding, and interpreting energy poverty in Zimbabwe: A postmodern perspective. *Energy Research & Social Science*, *75*, 102026–. https://doi.org/10.1016/j.erss.2021.102026

Clark, R. G., & Steel, D. G. (2022). Sample design for analysis using high-influence probability sampling. *Journal of the Royal Statistical Society. Series A, Statistics in Society*, *185*(4), 1733–1756.https://doi.org/10.1111/rssa.12916

Cadwell, I. (2013). Growing up without a reliable supply of energy: A child's experience. https://www.sei.org/featured/growing-without-reliable-supply-energy-childs-experience/

Clancy, J. (2019). Gender in the transition to sustainable energy for all: From evidence to inclusive policies. https://www.energia.org/assets/2019/04/Gender-in-the-transition-to-sustainable-energy-for-all_-From-evidence-to-inclusive-policies_FINAL.pdf\

Come Zebra, E. I., van der Windt, H. J., Nhumaio, G., & Faaij, A. P. C. (2021). A review of hybrid renewable energy systems in mini-grids for off-grid electrification in developing countries. *Renewable & Sustainable Energy Reviews*, *144*, 111036–. https://doi.org/10.1016/j.rser.2021.111036

Cloke, J., Mohr, A., & Brown, E. (2017). Imagining renewable energy: Towards a Social Energy Systems approach to community renewable energy projects in the Global South. Energy Research & Social Science, 31, 263–272. https://doi.org/10.1016/j.erss.2017.06.023

Celasun, O., Zeng, L., Mineshima, A., Wong, Y. C., Toscani, F., Arregui, N., Zhou, J., Mylonas, V., & Iakova, D. (2022). Targeted, Implementable, and Practical Energy Relief Measures for Households in Europe. IMF Working Paper, 2022(262), 1–. https://doi.org/10.5089/9798400227400.001

Congedo, P. M., Baglivo, C., D'Agostino, D., & Zacà, I. (2015). Cost-optimal design for nearly zero energy office buildings located in warm climates. Energy (Oxford), 91, 967–982. https://doi.org/10.1016/j.energy.2015.08.078

Chikumbirike, J., Bamford, M., & Esterhuysen, A. (2019). WOOD FOR CHARCOAL: IDENTIFYING TREE SPECIES FROM ARCHAEO-METALLURGICAL SITES AT CHIGARAMBONI, SOUTHEASTERN ZIMBABWE. South African Archaeological Bulletin, 74(211), 112–119. https://doi.org/10.3316/informit.189031512040891

Che, X., Zhu, B., & Wang, P. (2021). Assessing global energy poverty: An integrated approach. Energy Policy, 149, 112099–. https://doi.org/10.1016/j.enpol.2020.112099
Creswell, J. W., & Creswell, J. D. (2018). Research design : qualitative, quantitative, and mixed method approaches (Fifth edition.). SAGE.
Cockbill, S. A., Mitchell, V., & May, A. J. (2020). Householders as designers? Generating future energy services with United Kingdom home occupiers. Energy Research & Social Science, 69, 101615–. https://doi.org/10.1016/j.erss.2020.101615
Carley, S., & Konisky, D. M. (2020). The justice and equity implications of the clean energy transition. Nature Energy, 5(8), 569-577. doi:10.1038/s41560-020-0641-6
Castán Broto, V., Baptista, I., Kirshner, J., Smith, S., & Neves Alves, S. (2018). Energy justice and sustainability transitions in Mozambique. Applied energy, 228, 645-655. doi:10.1016/j.apenergy.2018.06.057
Castaño-Rosa, R., Sherriff, G. A., Solís-Guzmán, J., & Marrero, M. (2020). The validity of the index of vulnerable homes : evidence from consumers vulnerable to energy poverty in the UK.
Chenari, B., Dias Carrilho, J., & Gameiro da Silva, M. (2016). Towards sustainable, energy-efficient and healthy ventilation strategies in buildings: A review. Renewable & sustainable energy reviews, 59, 1426-1447. doi:10.1016/j.rser.2016.01.074
Chester, L. (2010). Conceptualising energy security and making explicit its polysemic nature. Energy policy, 38(2), 887-895. doi:10.1016/j.enpol.2009.10.039
Chiteka, K., & Enweremadu, C. C. (2016). Prediction of global horizontal solar irradiance in Zimbabwe using artificial neural networks. Journal of cleaner production, 135, 701-711. doi:10.1016/j.jclepro.2016.06.128
Chockalingam, A., Tolunay, H. E., Prabhakaran, D., & Narula, J. (2012). Household Air Pollution: An Emerging Risk Factor for CVD. Global heart, 7(3), 197-199. doi:10.1016/j.gheart.2012.06.013
Cock, J. (2019). Resistance to coal inequalities and the possibilities of a just transition in South Africa. Development southern Africa (Sandton, South Africa), 36(6), 860-873. doi:10.1080/0376835X.2019.1660859
Corker,B (2015) REINTRODUCES ELECTRIFY AFRICA BILL: 1. In Congressional Documents and Publications. Federal Information & News Dispatch, LLC.
Chakravarty, S., & Tavoni, M. (2013). (Rep.). Fondazione Eni Enrico Mattei (FEEM). Retrieved May 26, 2020, from www.jstor.org/stable/resrep00927
Committee on climate change (2020) Net Zero: The UK's contribution to stopping global warming. Retrieved from https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf

Chris Coonick (2018) Fire and Solar PV Systems Retrieved from Investigations and Evidencehttps://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/786882/Fires_and_solar_PV_systems-Investigations_Evidence_Issue_2.9.pdf

Celik, A. N., & Özgür, E. (2020). Review of Turkey's photovoltaic energy status: Legal structure, existing installed power and comparative analysis. Renewable & Sustainable Energy Reviews, 134, 110344–. https://doi.org/10.1016/j.rser.2020.110344

Cilliers, J. (2021). The Future of Africa : Challenges and Opportunities. Springer International Publishing AG.

Carey, S., Zaitchik, D., & Bascandziev, I. (2015). Theories of development: In dialog with Jean Piaget. Developmental review, 38, 36-54. doi:10.1016/j.dr.2015.07.003

Čížek, T. (2009). Book Review - Creswell, J. W. and Plano Clark, V. L.: Designing and Conducting Mixed Methods Research. In Central European Journal of Public Policy (Vol. 3, pp. 92-95): Univerzita Karlova v Praze, Fakulta sociálních věd.

Collis, J., & Hussey, R. (2014). Business research : a practical guide for undergraduate & postgraduate students (Fourth edition. ed.). Houndmills, Basingstoke, Hampshire ;: Palgrave Macmillan.

Collis, J., Hussey, R., & Hussey, J. (2003). Business research : a practical guide for undergraduate and postgraduate students (2nd ed. / Jill Collis and Roger Hussey. ed.). Basingstoke: Palgrave Macmillan.

Creswell, J. W., & Creswell, J. D. (2018). Research design : qualitative, quantitative, and mixed method approaches (Fifth edition. ed.). Los Angeles: SAGE.

Creswell, J. W., & Miller, D. L. (2000). Determining Validity in Qualitative Inquiry. Theory into practice, 39(3), 124-130. doi:10.1207/s15430421tip3903_2

Creswell, J. W., & Plano Clark, V. L. (2017). Designing and conducting mixed methods research (Third edition. ed.). Los Angeles: SAGE.

Cunningham-Burley, R., Roche, J., Fairhurst, C., Cockayne, S., Hewitt, C., Iles-Smith, H. M., & Torgerson, D. J. (2020). Enclosing a pen to improve response rate to postal questionnaire: an embedded randomised controlled trial.

Das, S., Pradhan, S., & De, S. (2023). Multi criteria decision making for the most suitable combination of energy resources for a decentralized hybrid energy solution with green hydrogen as the storage option. *Energy Conversion and Management*, *285*, 117028–. https://doi.org/10.1016/j.enconman.2023.117028

Dong, K., Zhao, J., & Dong, X. (2023). *Energy poverty in China : evaluation and alleviation* (Second edition.). Elsevier.

Dhatt, R., Theobald, S., Buzuzi, S., Ros, B., Vong, S., Muraya, K., Molyneux, S., Hawkins, K., González-Beiras, C., Ronsin, K., Lichtenstein, D., Wilkins, K., Thompson, K., Davis, K., & Jackson, C. (2017). The role of women's leadership and gender equity in leadership and health

system strengthening. *Global Health, Epidemiology and Genomics*, *2*, e8–e8. https://doi.org/10.1017/gheg.2016.22
Denscombe, M., & Denscombe, M. (2010). Ground rules for social research guidelines for good practice (2nd ed. ed.). Maidenhead: Open University Press.
Dzawanda, B., Matsa, M., & Nicolau, M. (2021). Poverty on the rise: The impact of the COVID-19 lockdown on the informal sector of Gweru, Zimbabwe. International Social Science Journal, 71(S1), 81–96. https://doi.org/10.1111/issj.12285
Day, R. (2010). Environmental Justice and Older Age: Consideration of a Qualitative Neighbourhood-based Study. Environment and planning. A, 42(11), 2658-2673. doi:10.1068/a43109
Day, R., Walker, G., & Simcock, N. (2016). Conceptualising energy use and energy poverty using a capabilities framework. Energy policy, 93, 255-264. doi:10.1016/j.enpol.2016.03.01
Deller, D., Giulietti, M., Loomes, G., Price, C. W., Moniche, A., & Jeon, J. Y. (2021). Switching Energy Suppliers: It's Not All About the Money. The Energy Journal (Cambridge, Mass.), 42(3), 1–. https://doi.org/10.5547/01956574.42.3.ddel
Davies (2017) Five Ways to Revive Zimbabwe's economy.
from https://www.bbc.co.uk/news/world-africa-4207958
Denzin, N. K, & Lincoln,Y S.(2011). The SAGE handbook of qualitative research. London: SAGE.
de Greef, K. (2019). Lights out: the price hikes leaving millions of South Africans in the dark in Cape. The Guardian. Retrieved from https://www.theguardian.com/global-development/2019/jun/11/electricity-price-hikes-south-africa.
Duan, H., Mo, J., Fan, Y., & Wang, S. (2018). Achieving China's energy and climate policy targets in 2030 under multiple uncertainties. Energy economics, 70, 45-60. doi:10.1016/j.eneco.2017.12.022
DellaValle, N. (2019). People's decisions matter: understanding and addressing energy poverty with behavioral economics. Energy and Buildings, 204, 109515–. https://doi.org/10.1016/j.enbuild.2019.109515
Deller, D., Giulietti, M., Loomes, G., Price, C. W., Moniche, A., & Jeon, J. Y. (2021). Switching Energy Suppliers: It's Not All About the Money. The Energy Journal (Cambridge, Mass.), 42(3), 1–. https://doi.org/10.5547/01956574.42.3.ddel
Deichmann, Meisner, C., Murray, S., & Wheeler, D. (2011). The economics of renewable energy expansion in rural Sub-Saharan Africa. Energy Policy, 39(1), 215–227. https://doi.org/10.1016/j.enpol.2010.09.034
Davidson, O., & Mwakasonda, S. A. (2004). Electricity access for the poor: a study of South Africa and Zimbabwe. Energy for Sustainable Development, 8(4), 26–40. https://doi.org/10.1016/S0973-0826(08)60511-6
Elmallah, S., Reames, T. G., & Spurlock, C. A. (2022). Frontlining energy justice: Visioning principles for energy transitions from community-

based organizations in the United States. *Energy Research & Social Science*, *94*, 102855–. https://doi.org/10.1016/j.erss.2022.102855.
European Academies' Science Advisory Council (EASAC) (2018). The Smart Villages project's first phase concludes with a 'Findings' report.https://www.interacademies.org/news/promoting-smart-villages-less-developed-countries
Energy Poverty In Zimbabwe Takes Many Forms But Policy Only Looks At One. (2021). New Zimbabwe. From: New Zimbabwe
Evans, S., Alkan, E., Bhangoo, J. K., Tenenbaum, H., & Ng-Knight, T. (2021). Effects of the COVID-19 lockdown on mental health, wellbeing, sleep, and alcohol use in a UK student sample. Psychiatry Research, 298, 113819–113819. https://doi.org/10.1016/j.psychres.2021.113819
Anton Eberhard, O. R. (2011). *Africa's Power Infrastructure: Investment, Integration, Efficiency* (pp. xxix–xxix). World Bank. https://doi.org/10.1596/978-0-8213-8455-8
Energy Department Energy Republic of South Africa (2013). A survey of energy related behaviour and perceptions in South Africa: The Residential Seactor.Retrieved from: http://www.energy.gov.za/files/media/Pub/DoE-2013-Survey-of-EnergyRelated-Behaviour-and-Perception-in-SA.pdf
Edomah, N., & Ndulue, G. (2020). Energy transition in a lockdown: An analysis of the impact of COVID-19 on changes in electricity demand in Lagos Nigeria. Global transitions, 2, 127-137. doi:10.1016/j.glt.2020.07.002
Enrique Vez, L., & Verónica Bertani, T. (2017). The Impact of Self-Video Recordings in Raising Oral Production. Matices en lenguas extranjeras(11), 76. doi:10.15446/male.n11.71855
Esser, F., & Vliegenthart, R. (2017). Comparative research methods. In: Wiley Blackwell.
Emilio, G. (2020). Energy Transition and Post-Covid Recovery, a Challenge for Latin America. Inter Press Service.
Eskom (2021) What is load shedding. Retrieved from https://loadshedding.eskom.co.za/loadshedding/description
Energy Department Energy Republic of South Africa (2013). A survey of energy related behaviour and perceptions in South Africa: The Residential Seactor Retrieved from: http://www.energy.gov.za/files/media/Pub/DoE-2013-Survey-of-EnergyRelated-Behaviour-and-Perception-in-SA.pdf
Fisher, S., Bellinger, D. C., Cropper, M. L., Kumar, P., Binagwaho, A., Koudenoukpo, J. B., Park, Y., Taghian, G., & Landrigan, P. J. (2021). Air pollution and development in Africa: impacts on health, the economy, and human capital. *The Lancet. Planetary Health*, *5*(10), e681–e688. https://doi.org/10.1016/S2542-5196(21)00201-1

Fang, W., Farooq, U., Liu, Z., Lan, J., & Iram, R. (2022). Measuring energy efficiency financing: a way forward for reducing energy poverty through financial inclusion in OECD. Environmental Science and Pollution Research International, 29(47), 71923–71935. https://doi.org/10.1007/s11356-022-20139-8

Federal Democratic Republic of Ethiopia (2019) Ethiopia's Climate Resilient Green Economy National Adaptation Plan. https://www4.unfccc.int/sites/NAPC/Documents/Parties/Final%20Ethiopia-national-adaptation-plan%20%281%29.pdf

Fabbri, K. (Ed.). (2019). *Urban fuel poverty*. Academic Press.

Feenstra, M., & Özerol, G. (2021). Energy justice as a search light for gender-energy nexus: Towards a conceptual framework. Renewable & sustainable energy reviews, 138, 110668. doi:10.1016/j.rser.2020.110668

Food and Agriculture Organisation (2023) Zimbabwe at a glance. Food and Agriculture Organisation https://www.fao.org/zimbabwe/fao-in-zimbabwe/zimbabwe-at-a-glance/en/

Forman, A. (2017). Energy justice at the end of the wire: Enacting community energy and equity in Wales. Energy policy, 107, 649-657. doi:10.1016/j.enpol.2017.05.006

Folk E (2020) Growth of Farm Equipment Running on Alternative Energy. Renewable energy magazine. https://www.renewableenergymagazine.com/emily-folk/growth-of-farm-equipment-running-on-alternative-20201028

Fitzpatrick, R. (1991). Surveys of patient satisfaction: II--Designing a questionnaire and conducting a survey. British Medical Journal, 302(6785), 1129-1132. doi:10.1136/bmj.302.6785.1129

Fuller, S., & McCauley, D. (2016). Framing energy justice: perspectives from activism and advocacy. Energy research & social science, 11, 1-8. doi:10.1016/j.erss.2015.08.004

Füssel, H.-M., & Jol, A. (2012). Climate change impacts and vulnerability in Europe 2012: an indicator-based report. EEA report, 12/2012.

Friedman, L. (2021). Biden Finds Fossil Fuels Hard to Quit. The New York times, B1.

Gasparatos, Mavromati, G., Kotsovilis, P., & Massas, I. (2015). Fractionation of heavy metals and evaluation of the environmental risk for the alkaline soils of the Thriassio plain: a residential, agricultural, and industrial area in Greece. Environmental Earth Sciences, 74(2), 1099–1108. https://doi.org/10.1007/s12665-015-4096-1

Gillingham, K., Keyes, A., & Palmer, K. (2018). Advances in Evaluating Energy Efficiency Policies and Programs. *Annual Review of Resource Economics*, *10*(1), 511–532. https://doi.org/10.1146/annurev-resource-100517-023028

Gebreegziabher, Z., & van Kooten, G. C. (2013). Does community and household tree planting imply increased use of wood for fuel? Evidence from Ethiopia. Forest policy and economics, 34, 30-40. doi:10.1016/j.forpol.2013.03.003
Given, L. M. (2008). The Sage encyclopedia of qualitative research methods. London: SAGE.
Göras, C., Nilsson, U., Ekstedt, M., Unbeck, M., & Ehrenberg, A. (2020). Managing complexity in the operating room: A group interview study. BMC health services research, 20(1), 440-440. doi:10.1186/s12913-020-05192-8
Greene, J. C., & Caracelli, V. J. (1997). Defining and describing the paradigm issue in mixed-method evaluation. New directions for evaluation, 1997(74), 5-17. doi:10.1002/ev.1068
Guadagnoli, E., & Velicer, W. F. (1988). Relation of Sample Size to the Stability of Component Patterns. Psychological bulletin, 103(2), 265-275. doi:10.1037/0033-2909.103.2.265
Goldthau, A. (2013). The handbook of global energy policy. Chichester, West Sussex ;: Wiley-Blackwell.
González-Eguino, M. (2015). Energy poverty: An overview. Renewable & sustainable energy reviews, 47, 377-385. doi:10.1016/j.rser.2015.03.013
Gebreegziabher, Z., & van Kooten, G. C. (2013). Does community and household tree planting imply increased use of wood for fuel? Evidence from Ethiopia. Forest Policy and Economics, 34, 30–40. https://doi.org/10.1016/j.forpol.2013.03.003
Gasparatos, A., von Maltitz, G. ., Johnson, F. ., Lee, L., Mathai, M., Puppim de Oliveira, J. ., & Willis, K. . (2015). Biofuels in sub-Sahara Africa: Drivers, impacts and priority policy areas. Renewable & Sustainable Energy Reviews, 45, 879–901. https://doi.org/10.1016/j.rser.2015.02.006
Gunningham, N. (2013). Managing the energy trilemma: The case of Indonesia. Energy policy, 54, 184-193. doi:10.1016/j.enpol.2012.11.018
Grealy, L. (2022). Enforced commensuration and the bureaucratic invention of household energy insecurity. Australian Geographer, ahead-of-print(ahead-of-print), 1–18. https://doi.org/10.1080/00049182.2022.2127144
Hanto, J., Schroth, A., Krawielicki, L., Oei, P.-Y., & Burton, J. (2022). South Africa's energy transition – Unraveling its political economy. *Energy for Sustainable Development*, *69*, 164–178. https://doi.org/10.1016/j.esd.2022.06.006
Healey, J. (2013). *Fossil fuels*. Spinney Press.
Healy, N., & Barry, J. (2017). Politicizing energy justice and energy system transitions: Fossil fuel divestment and a "just transition." *Energy Policy*, *108*, 451–459. https://doi.org/10.1016/j.enpol.2017.06.014

Herald (2020). Bad customer services still bedevils councils Zesa.https://www.herald.co.zw/editorial-comment-bad-customer-relations-still-bedevil-council-zesa/
Helliker, K., & Murisa, T. (2020). Zimbabwe: continuities and changes. *Journal of Contemporary African Studies*, *38*(1), 5–17. https://doi.org/10.1080/02589001.2020.1746756
Hadi Dehghani, M., Karri, R. R., & Roy, S. (Eds.). (2022). *COVID-19 and the sustainable development goals*. Elsevier.
Habib, M., Pathik, B. B., & Maryam, H. (2014). Research methodology -- contemporary practices : guidelines for academic researchers. Newcastle upon Tyne: Cambridge Scholars Publishing.
Hartwig, M., Emori, S., & Asayama, S. (2023). Normalised injustices in the national energy discourse: A critical analysis of the energy policy framework in Japan through the three tenets of energy justice. Energy Policy, 174, 113431–. https://doi.org/10.1016/j.enpol.2023.113431
Hesse-Biber, S. N., & Johnson, B. (2015). The Oxford handbook of multimethod and mixed methods research inquiry. Oxford ;: Oxford University Press.
Heyvaert, M., Hannes, K., Maes, B., & Onghena, P. (2013). Critical Appraisal of Mixed Methods Studies. Journal of mixed methods research, 7(4), 302-327. doi:10.1177/1558689813479449
Hogarty, K. Y., Hines, C. V., Kromrey, J. D., Ferron, J. M., & Mumford, K. R. (2005). The Quality of Factor Solutions in Exploratory Factor Analysis: The Influence of Sample Size, Communality, and Overdetermination. Educational and psychological measurement, 65(2), 202-226. doi:10.1177/0013164404267287
Hurmerinta-Peltomäki, L., & Nummela, N. (2006). Mixed Methods in International Business Research: A Value-added Perspective. Management international review, 46(4), 439-459. doi:10.1007/s11575-006-0100-z
Hearn, A. X., Mihailova, D., Schubert, I., & Sohre, A. (2022). Redefining energy vulnerability, considering the future. Frontiers in Sustainable Cities, 4. https://doi.org/10.3389/frsc.2022.952034
Hernández, D., & Siegel, E. (2019). Energy insecurity and its ill health effects: A community perspective on the energy-health nexus in New York City. Energy Research & Social Science, 47, 78–83. https://doi.org/10.1016/j.erss.2018.08.011
Hernandez, D. (2016). Understanding "energy insecurity" and why it matters to health. Social Science & Medicine (1982), 167, 1–10. https://doi.org/10.1016/j.socscimed.2016.08.029
Holstenkamp, L. (2019). What do we know about cooperative sustainable electrification in the global South? A synthesis of the literature and refined social-ecological systems framework. Renewable & Sustainable Energy Reviews, 109, 307–320. https://doi.org/10.1016/j.rser.2019.04.047

Halkos, G. E., & Gkampoura, E.-C. (2021). Coping with energy poverty: Measurements, drivers, impacts, and solutions. Energies (Basel), 14(10), 2807. doi:10.3390/en14102807
Heffron, R. J., & McCauley, D. (2014). Achieving sustainable supply chains through energy justice. Applied energy, 123, 435-437. doi:10.1016/j.apenergy.2013.12.034
Heffron, R. J., & McCauley, D. (2017). The concept of energy justice across the disciplines. Energy policy, 105, 658-667. doi:10.1016/j.enpol.2017.03.018
Heffron, R. J., McCauley, D., & Sovacool, B. K. (2015). Resolving society's energy trilemma through the Energy Justice Metric. Energy policy, 87, 168-176. doi:10.1016/j.enpol.2015.08.033
Hewitt, R. J., de Boer, C., & Flacke, J. (2020). Participatory development of digital support tools for local-scale energy transitions: Lessons from two European case studies. Global transitions, 2, 138-149. doi:10.1016/j.glt.2020.07.003
Hussein, M., & Filho, W. (2012). Analysis of energy as a precondition for improvement of living conditions and poverty reduction in sub-Saharan Africa. Scientific Research and Essays, 7, 2656-2666.
Hosseini, S. E. (2020). An outlook on the global development of renewable and sustainable energy at the time of COVID-19. Energy research & social science, 68, 101633-101633. doi:10.1016/j.erss.2020.101633
Howden-Chapman P., Viggers H., Chapman R., O'Sullivan K., Barnard L.T., Lloyd B. (2012). Tackling cold housing and fuel poverty in New Zealand: a review of policies, research, and health impacts. Energy Policy, 49:134-142.
Harrell, M., & Bradley, M. (2009). Data Collection Methods. Semi-structured Interviews and Focus Groups. Retrieved February 19, 2016, from The RAND National Defence Research Institute: http://www.rand.org/content/dam/rand/pubs/technical_reports/2009/RAND_TR718.pdf
Hernandez, D. (2016). Understanding "energy insecurity" and why it matters to health. Social Science & Medicine (1982), 167, 1–10. https://doi.org/10.1016/j.socscimed.2016.08.029
Hiemstra-van der Horst, & Hovorka, A. J. (2009). Fuelwood: The "other" renewable energy source for Africa? Biomass & Bioenergy, 33(11), 1605–1616. https://doi.org/10.1016/j.biombioe.2009.08.007
International Energy Agency (2022) World Energy Outlook 2022 shows the global energy crisis can be a historic turning point towards a cleaner and more secure future.https://www.iea.org/news/world-energy-outlook-2022-shows-the-global-energy-crisis-can-be-a-historic-turning-point-towards-a-cleaner-and-more-secure-future
Irena (2022) World energy Transition outlook 2022. https://www.irena.org/Digital-Report/World-Energy-Transitions-Outlook-2022

International Energy Agency. (2021) Universal Access to Sustainable Energy Will Remain Elusive Without Addressing Inequalities Retrieved from https://www.iea.org/news/universal-access-to-sustainable-energy-will-remain-elusive-without-addressing-inequalities
International Energy Agency (2020), The impact of the Covid-19 crisis on clean energy progress, IEA, Paris https://www.iea.org/articles/the-impact-of-the-covid-19-crisis-on-clean-energy-progress
International Energy Agency. (2020). Renewable power markets are more resilient than previously thought. Retrieved from https://www.iea.org/reports/renewables-2020/renewable-electricity-2#abstract
International Energy Agency. (2019) : Access to affordable, reliable, sustainable and modern energy for all. Retrieved from https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity
Islar, M., Brogaard, S., & Lemberg-Pedersen, M. (2017). Feasibility of energy justice: Exploring national and local efforts for energy development in Nepal. Energy Policy, 105, 668–676. https://doi.org/10.1016/j.enpol.2017.03.004
International Energy Agency. (2017). World Energy Outlook 2017 Paris.
Retrieved from http://www.iea.org/weo/
International Energy Agency. (2020). Population without access to electricity falls below 1 billion – Analysis.Retrieved from https://www.iea.org/commentaries/population-without-access-to-electricity-falls-below-1-billion
Ikuenobe, P. (2018). African communal basis for autonomy and life choices. Developing World Bioethics, 18(3), 212–221. https://doi.org/10.1111/dewb.12161
Initiative for energy justice. (2023) Section 1 – Defining Energy Justice: Connections to Environmental Justice, Climate Justice, and the Just Transition. Initiative for energy justice. https://iejusa.org/section-1-defining-energy-justice/
International Energy Agency. (2022). Key highlights on SDG 7 targets retrieved from https://www.iea.org/reports/tracking-sdg7-the-energy-progress-report-2022/key-highlights-on-sdg-7-targets
Ingrid, L. (2006). Real World Research (2nd ed.) by Colin Robson. Educate, 3(1).
International Energy Agency (2018) Access to electricity retrieved from https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity
Ismail, Zaakirah & Khembo, Patrick. (2015). Determinants of energy poverty in South Africa. Journal of Energy in Southern Africa. 26. 66-78. 10.17159/2413-3051/2015/v26i3a2130.
IRENA. (2018). OFF-GRID RENEWABLEENERGY SOLUTIONS Global and regional status and trends. Retrieved from https://www.irena.org/publications/2018/Jul/Off-grid Renewable-Energy-Solutions

Inglesi-Lotz, R., & Ndlovu, V. (2019). Positioning South Africa's energy supply mix internationally : comparative and policy review analysis. Journal of Energy in Southern Africa, 30(2), 14–27. https://doi.org/10.17159/2413-3051/2019/v30i2a5409
Jenkins, K. (2018). Setting energy justice apart from the crowd: Lessons from environmental and climate justice. Energy Research & Social Science, 39, 117–121. https://doi.org/10.1016/j.erss.2017.11.015
Jagoe, Rossanese, M., Charron, D., Rouse, J., Waweru, F., Waruguru, M., Delapena, S., Piedrahita, R., Livingston, K., & Ipe, J. (2020). Sharing the burden: Shifts in family time use, agency and gender dynamics after introduction of new cookstoves in rural Kenya. Energy Research & Social Science, 64, 101413–. https://doi.org/10.1016/j.erss.2019.101413
Jones, T. L., Baxter, M. A. J., & Khanduja, V. (2013). A quick guide to survey research. Annals of the Royal College of Surgeons of England, 95(1), 5-7. doi:10.1308/003588413X13511609956372
Jung, S., & Lee, S. (2011). Exploratory factor analysis for small samples. Behavior research methods, 43(3), 701-709. doi:10.3758/s13428-011-0077-9
Jack, B. K., & Smith, G. (2016). Charging Ahead: Prepaid Electricity Metering in South Africa. NBER Working Paper Series, 22895–. https://doi.org/10.3386/w22895
Jakstas, T. (2019). What does energy security mean? In (pp. 99-112).
Jenkins, K. (2018a). Energy poverty and vulnerability: A global perspective. In (Vol. 147, pp. 388-389): Elsevier Ltd.
Jenkins, K. (2018b). Setting energy justice apart from the crowd: Lessons from environmental and climate justice. Energy research & social science, 39, 117-121. doi:10.1016/j.erss.2017.11.015
Jenkins, K., McCauley, D., Heffron, R., Stephan, H., & Rehner, R. (2016). Energy justice: A conceptual review. Energy research & social science, 11, 174-182. doi:10.1016/j.erss.2015.10.004
Jessel, S., Sawyer, S., & Hernández, D. (2019). Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging Literature. Frontiers in public health, 7, 357-357. doi:10.3389/fpubh.2019.00357
Jiang, X.-Q., Mei, X.-D., & Feng, D. (2016). Air pollution and chronic airway diseases: What should people know and do? Journal of thoracic disease, 8(1), E31-E40. doi:10.3978/j.issn.2072-1439.2015.11.50
Jain,N. & Prabhash,A.(2014) Power of Hybrid Systems in Transforming Precarious African Electricity Sector : An Innovative Approach. Retrieved from https://www.beroeinc.com/whitepaper-viewer/power-of-hybrid-systems-in-transforming-precarious-african-electricity-sector-an-innovative-approach/
Jessel, S., Sawyer, S., & Hernández, D. (2019). Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging

Literature. Frontiers in Public Health, 7, 357–357. https://doi.org/10.3389/fpubh.2019.00357

Jiang, P., Fan, Y. V., & Klemeš, J. J. (2021). Impacts of COVID-19 on energy demand and consumption: Challenges, lessons and emerging opportunities. Applied Energy, 285, 116441–116441. https://doi.org/10.1016/j.apenergy.2021.116441

Kumar, M. (2020) Social, Economic, and Environmental Impacts of Renewable Energy Resources. https://www.intechopen.com/chapters/70874

Kuzemko, C., Lockwood, M., Mitchell, C., & Hoggett, R. (2016). Governing for sustainable energy system change: Politics, contexts, and contingency. *Energy Research & Social Science*, *12*, 96–105. https://doi.org/10.1016/j.erss.2015.12.022

Kelly, J. C., Dai, Q., & Wang, M. (2020). Globally regional life cycle analysis of automotive lithium-ion nickel manganese cobalt batteries. *Mitigation and Adaptation Strategies for Global Change*, *25*(3), 371–396. https://doi.org/10.1007/s11027-019-09869-2

Kemp,Y.(2023). Zimbabwe: Expanding solar project to add 25MW onto grid.https://www.esi-africa.com/industry-sectors/generation/zimbabwe-expanding-solar-project-to-add-25mw-onto-grid/

Knoth,G. (2015). A classroom worst nightmare ? Energy poverty. One. https://www.one.org/us/blog/a-classrooms-worst-nightmare-energy-poverty/

Kelley, K., CLARK, B., BROWN, V., & SITZIA, J. (2003). Good practice in the conduct and reporting of survey research. International Journal for Quality in Health Care, 15(3), 261-266. doi:10.1093/intqhc/mzg031

Kitchin, R. (2014). Big Data, new epistemologies and paradigm shifts. Big Data & Society, 1(1), 205395171452848–. https://doi.org/10.1177/2053951714528481

Knowledge Bylanes (2019) Bulawayo City Council to begin 96-hour water shedding. (2019). New Zimbabwe. https://www.newzimbabwe.com/bulawayo-city-council-to-begin-96-hour-water-shedding/

Kniffin, K. M., Narayanan, J., Anseel, F., Antonakis, J., Ashford, S. P., Bakker, A. B., Bamberger, P., Bapuji, H., Bhave, D. P., Choi, V. K., Creary, S. J., Demerouti, E., Flynn, F. J., Gelfand, M. J., Greer, L. L., Johns, G., Kesebir, S., Klein, P. G., Lee, S. Y., … Vugt, M. van. (2021). COVID-19 and the workplace: Implications, issues, and insights for future research and action. The American Psychologist, 76(1), 63–77. https://doi.org/10.1037/amp0000716

Kiptot, E. (2015). Gender roles, responsibilities, and spaces: implications for agroforestry research and development in Africa. The

International Forestry Review, 17(4), 11–21. https://doi.org/10.1505/146554815816002257
Kirsch, T. G. (2005). "Illegal connections": conflicts over electricity in Soweto, South Africa. Soziale Welt, Sonderband, SB 16, 195–210.
Kirli, D., Parzen, M., & Kiprakis, A. (2021). Impact of the COVID-19 Lockdown on the Electricity System of Great Britain: A Study on Energy Demand, Generation, Pricing and Grid Stability. Energies (Basel), 14(3), 635–. https://doi.org/10.3390/en14030635
Kyaw, K. T. W., Ota, T., & Mizoue, N. (2020). Forest degradation impacts firewood consumption patterns: A case study in the buffer zone of Inlay Lake Biosphere Reserve,
Karpinska, L., & Śmiech, S. (2021). Breaking the cycle of energy poverty. Will Poland make it? Energy economics, 94, 105063. doi:10.1016/j.eneco.2020.105063
Kaygusuz, K. (2011). Energy services and energy poverty for sustainable rural development. Renewable & sustainable energy reviews, 15(2), 936-947. doi:10.1016/j.rser.2010.11.003
Klemeš, J. J., Fan, Y. V., & Jiang, P. (2021). COVID-19 pandemic facilitating energy transition opportunities. International journal of energy research, 45(3), 3457-3463. doi:10.1002/er.6007
Kruger, R., & McCauley, D. (2020). Energy Justice, Hydropower and Grid Systems in the Global South. In Energy Justice Across Borders (pp. 91-109). Springer, Cham.
Kazmi, H., Suykens, J., Balint, A., & Driesen, J. (2019). Multi-agent reinforcement learning for modeling and control of thermostatically controlled loads. Applied Energy, 238, 1022–1035. https://doi.org/10.1016/j.apenergy.2019.01.140
Kontokosta, C. E., Reina, V. J., & Bonczak, B. (2020). HIGH ENERGY COST BURDENS ON LOW-INCOME HOUSEHOLDS. Planning, 86(5), 17–18.
Kumar, D. S., Noronha, V., Joshi, A., Jain, H., & Prabhash, K. (2014). Carcinomatous meningitis in non-small cell lung cancer: palliation with intrathecal treatment. Indian journal of medical and paediatric oncology: official journal of Indian Society of Medical & Paediatric Oncology, 35(1), 75.
Kaseke, N., & Hosking, S. G. (2013). Sub-Saharan Africa Electricity Supply Inadequacy: Implications. Eastern Africa social science research review, 29(2), 113-132. doi:10.1353/eas.2013.0009
Li, Ning, X., Wang, Z., Cheng, J., Li, F., & Hao, Y. (2022). Would energy poverty affect the well-being of senior citizens? Evidence from China. Ecological Economics, 200, 107515–. https://doi.org/10.1016/j.ecolecon.2022.107515
Li, Yang, H., & Jia, J. (2022). Impact of energy poverty on cognitive and mental health among middle-aged and older adults in China. Humanities & Social Sciences Communications, 9(1), 1–13. https://doi.org/10.1057/s41599-022-01276-4
Lester & O'Kane (2021) Sanctions law practice and guidance. Retrieved from https://www.europeansanctions.com/region/zimbabwe/

LaBelle, M. C. (2017). In pursuit of energy justice. Energy policy, 107, 615-620. doi:10.1016/j.enpol.2017.03.054
Lee, J., & Byrne, J. (2019). Expanding the conceptual and analytical basis of energy justice: beyond the three-tenet framework. Frontiers in energy research, 7. doi:10.3389/fenrg.2019.00099
Lennon, B., Dunphy, N. P., & Sanvicente, E. (2019). Community acceptability and the energy transition: a citizens' perspective. Energy, sustainability and society, 9(1), 1-18. doi:10.1186/s13705-019-0218-z
Lee, M. (2019). Economic feasibility analysis and policy implication for photovoltaic system at cohousing in KOREA. Renewable Energy, 144, 30–40. https://doi.org/10.1016/j.renene.2018.11.109
Longhurst, N., & Hargreaves, T. (2019). Emotions and fuel poverty: The lived experience of social housing tenants in the United Kingdom. Energy Research & Social Science, 56, 101207–. https://doi.org/10.1016/j.erss.2019.05.017
Larson, W., & Yezer, A. (2015). The energy implications of city size and density. Journal of Urban Economics, 90, 35–49. https://doi.org/10.1016/j.jue.2015.08.001
Lacey-Barnacle, M. (2020). Proximities of energy justice: contesting community energy and austerity in England. Energy Research & Social Science, 69, 101713–101713. https://doi.org/10.1016/j.erss.2020.101713
Ledema, R., Forsyth, R., Georgiou, A., Braithwaite, J., & Westbrook, J. (2006). Video Research in Health. Qualitative research journal, 6(2), 15-30. doi:10.3316/QRJ0602015
Lavrakas, P. J. (2008). Encyclopedia of survey research methods. Thousand Oaks, Calif: SAGE Publications.
Lewis-Beck, M. S., Bryman, A., & Liao, T. F. (2003). The SAGE encyclopedia of social science research methods. Thousand Oaks, [Calif.] ;: SAGE.
Lomborg, B. (2022) Energy Hypocrisy as Rich Countries Denying the Poor the Power to Develop.https://www.aier.org/article/energy-hypocrisy-as-rich-countries-denying-the-poor-the-power-to-develop/
Lee, J., & Byrne, J. (2019). Expanding the Conceptual and Analytical Basis of Energy Justice: Beyond the Three-Tenet Framework. *Frontiers in Energy Research*, *7*. https://doi.org/10.3389/fenrg.2019.00099
Load Shedding, (2023). Load Shedding and Mental Health: How Power Outages Are Affecting South Africans' Well-Being. https://loadshedding.com/load-shedding-and-mental-health-how-power-outages-are-affecting-south-africans-well-being/
Mensah, J. K. (2022). Electricity and informal settlements: Towards achieving SDG 7 in developing countries. *Energy Research & Social Science*, *93*, 102844–. https://doi.org/10.1016/j.erss.2022.102844

Madya, N. (2023). Renewable energy laws and regulations in Zimbabwe. https://iclg.com/practice-areas/renewable-energy-laws-and-regulations/zimbabwe

Murrell, A. J., Jones, R., Rose, S., Firestine, A., & Bute, J. (2022). Food Security as Ethics and Social Responsibility: An Application of the Food Abundance Index in an Urban Setting. *International Journal of Environmental Research and Public Health*, *19*(16), 10042–. https://doi.org/10.3390/ijerph191610042

Mensah, J. K. (2022). Electricity and informal settlements: Towards achieving SDG 7 in developing countries. *Energy Research & Social Science*, *93*, 102844–. https://doi.org/10.1016/j.erss.2022.102844

Maphosa, M. (2022).Matabeleland institute for human Rights. https://matabelelandinstituteforhumanrights.org/2022/12/14/protection-of-women-and-girls-rights-key-during-this-acute-zimbabwe-electricity-shortage-situation/

Monyei, C. G., Adewumi, A. O., & Jenkins, K. E. H. (2018). Energy (in)justice in off-grid rural electrification policy: South Africa in focus. *Energy Research & Social Science*, *44*, 152–171. https://doi.org/10.1016/j.erss.2018.05.002

Mambondiyani, A. (2017) (FEATURE - In drought-hit Zimbabwe, women's 'second shift' burden grows.https://www.reuters.com/article/zimbabwe-drought-women-idINKBN14Q0ZS

Moloi,M., Pretorius,L., & Malan,.M. (2023) By the numbers: What load shedding does to your mental health.https://www.news24.com/life/wellness/mind/by-the-numbers-what-load-shedding-does-to-your-mental-health-20230412-2

Matusiak, K. K. (2017). Studying information behavior of image users: An overview of research methodology in LIS literature, 2004–2015. Library & information science research, 39(1), 53-60. doi:10.1016/j.lisr.2017.01.008

McDonald, K. C., Saunders, K. E. A., & Geddes, J. R. (2017). Sleep problems and suicide associated with mood instability in the Adult Psychiatric Morbidity Survey, 2007. Australian and New Zealand journal of psychiatry, 51(8), 822-828. doi:10.1177/0004867416687398

McKim, C. A. (2017). The Value of Mixed Methods Research: A Mixed Methods Study. Journal of mixed methods research, 11(2), 202-222. doi:10.1177/1558689815607096

McQuitty, S. (2004). Statistical power and structural equation models in business research. Journal of business research, 57(2), 175-183. doi:10.1016/S0148-2963(01)00301-0

Morrissey, J. (2017). The Energy Challenge in Sub-Saharan Africa: A Guide for Advocates and Policy Makers: Part 2. In Policy File. Oxfam.
Middlemiss, L. (2017). A critical analysis of the new politics of fuel poverty in England. https://doi.org/10.1177/0261018316674851
Metz, T. (2017). Replacing Development: An Afro-Communal Approach to Global Justice. Philosophical Papers (Grahamstown), 46(1), 111–137. https://doi.org/10.1080/05568641.2017.1295627
Macintosh, A., & Wilkinson, D. (2011). Searching for public benefits in solar subsidies: A case study on the Australian government's residential photovoltaic rebate program. Energy Policy, 39(6), 3199–3209. https://doi.org/10.1016/j.enpol.2011.03.007
Malama, A., Mudenda, P., Ng'ombe, A., Makashini, L., & Abanda, H. (2014). The Effects of the Introduction of Prepayment Meters on the Energy Usage Behaviour of Different Housing Consumer Groups in Kitwe, Zambia. AIMS Energy, 2(3), 237–259. https://doi.org/10.3934/energy.2014.3.237
McKenzie, M.2013. Prepayment Meters and Energy Efficiency in Indigenous Households. AliceSprings: Bushlight, Centre for Appropriate Technology. https://static1.squarespace.com/static/5450868fe4b09b217330bb42/t/547530c1e4b08b6cd903ce46/1416966337194/Bushlight-Report-PPM-Energy-Efficiency-Feb131.pdf
Montle, M. E. (2020). Examining the effects of black tax and socio-economic isolation of the black middle-class in South Africa through the study of Skeem Saam. African Journal of Development Studies, 10(3), 235–252. https://doi.org/10.31920/2634-3649/2020/10n3a12
Madurai Elavarasan, R., Pugazhendhi, R., Jamal, T., Dyduch, J., Arif, M. T., Manoj Kumar, N., . . . Nadarajah, M. (2021). Envisioning the UN Sustainable Development Goals (SDGs) through the lens of energy sustainability (SDG 7) in the post-COVID-19 world. Applied energy, 292, 116665. doi:10.1016/j.apenergy.2021.116665
Martin, A., Gross-Camp, N., Kebede, B., McGuire, S., & Munyarukaza, J. (2014). Whose environmental justice? Exploring local and global perspectives in a payments for ecosystem services scheme in Rwanda. Geoforum, 54, 167-177. doi:10.1016/j.geoforum.2013.02.006
Martin Ii, W. J., Glass, R. I., Araj, H., Balbus, J., Collins, F. S., Curtis, S., . . . Bruce, N. G. (2013). Household Air Pollution in Low- and Middle-Income Countries: Health Risks and Research Priorities. PLoS medicine, 10(6), e1001455-e1001455. doi:10.1371/journal.pmed.1001455
Mastrucci, A., Byers, E., Pachauri, S., & Rao, N. D. (2019). Improving the SDG energy poverty targets: Residential cooling needs in the Global South. Energy and buildings, 186, 405-415. doi:10.1016/j.enbuild.2019.01.015

Matamanda, A. R. (2021). Mugabe's Urban Legacy: A Postcolonial Perspective on Urban Development in Harare, Zimbabwe. Journal of Asian and African studies (Leiden), 56(4), 804-817. doi:10.1177/0021909620943620

Matamanda, A. R., Chirisa, I., Kanonhuhwa, T. N., & Mhlanga, D. D. (2021). Politics and the legacy of street renaming in postcolonial Zimbabwe. Journal of cultural geography, 1-18. doi:10.1080/08873631.2021.1927348

Micallef, A., Caldwell, J., & Colls, J. J. (1998). The Influence of Human Activity on the Vertical Distribution of Airborne Particle Concentration in Confined Environments: Preliminary Results. Indoor air, 8(2), 131-136. doi:10.1111/j.1600-0668.1998.t01-1-00008.x

Monyei, C. G., Jenkins, K. E. H., Monyei, C. G., Aholu, O. C., Akpeji, K. O., Oladeji, O., & Viriri, S. (2019). Response to Todd, De Groot, Mose, McCauley and Heffron's critique of "Examining energy sufficiency and energy mobility in the global south through the energy justice framework." Energy Policy, 133, 110917– https://doi.org/10.1016/j.enpol.2019.110917

Monyei, C. G., & Adewumi, A. O. (2017). Demand Side Management potentials for mitigating energy poverty in South Africa. Energy policy, 111, 298-311. doi:10.1016/j.enpol.2017.09.039

Monyei, C. G., Adewumi, A. O., & Jenkins, K. E. H. (2018). Energy (in)justice in off-grid rural electrification policy: South Africa in focus. Energy research & social science, 44, 152-171. doi:10.1016/j.erss.2018.05.002

Monyei, C. G., Jenkins, K., Serestina, V., & Adewumi, A. O. (2018). Examining energy sufficiency and energy mobility in the global south through the energy justice framework. Energy policy, 119, 68-76. doi:10.1016/j.enpol.2018.04.026

Monyei, C. G., Adewumi, A. O., Obolo, M. O., & Sajou, B. (2018). Nigeria's energy poverty: Insights and implications for smart policies and framework towards a smart Nigeria electricity network. Renewable & sustainable energy reviews, 81, 1582-1601. doi:10.1016/j.rser.2017.05.237

Moore, R. (2012). Definitions of fuel poverty: Implications for policy. Energy policy, 49, 19-26. doi:10.1016/j.enpol.2012.01.057

Meisen, P & Krumpel, S (2009). Global Energy Network Institute: Renewable energy potential of Latin America. Retrieved from http://www.geni.org/globalenergy/research/renewable-energy-potential-of-latin-america/Potential%20of%20Renewables%20in%20Latin%20America-edited-12-16%20_Letter_.pdf

Munro, P., & Schiffer, A. (2019). Ethnographies of electricity scarcity: Mobile phone charging spaces and the recrafting of energy poverty in Africa. Energy & Buildings, 188-189, 175-183.

McCauley, D., Heffron, R., Hannes, S., & Jenkins K. (2013). Advancing energy justice: the triumvirate of tenets, Int. Energy Law Rev. 32 (3) 107–110.

Mertens, D., & Hesse-Biber, S. N. (2013). Mixed methods and credibility of evidence in evaluation (New directions for evaluation; no. 138). San Francisco, Calif.]: Jossey-Bass.
Minkler, Meredith, & Wallerstein, Nina. (2010). Community-Based Participatory Research for Health (2. Aufl. ed.). Hoboken: Jossey-Bass.
Minkler, M., & Wallerstein, Nina. (2008). Community-based participatory research for health from process to outcomes (2nd ed.). San Francisco, CA: Jossey-Bass.
Makanjuola, Victor, Esan, Yomi, Oladeji, Bibilola, Kola, Lola, Appiah-Poku, John, Harris, Benjamin, . . . Gureje, Oye. (2016). An explanatory model of psychosis: Impact on the perception of self-stigma by patients in three sub-Saharan African cities. Social Psychiatry and Psychiatric Epidemiology, 51(12), 1645-1654.
Myers 2004. Hermeneutics in information systems research. In: Social theory and philosophy for information systems. Chichester: John Wiley and Sons, pp. 103–128.
Munien, S., & Ahmed, F. (2012). A gendered perspective on energy poverty and livelihoods — Advancing the Millennium Development Goals in developing countries. Agenda: Empowering Women for Gender Equity, 26(1 (91)), 112-123. Retrieved May 25, 2020, from www.jstor.org/stable/23287236
Matsa, Mark, Robertah Mavugara, and Beauty Dzawanda. "Urban Domestic Water Supply Crisis in the City of Gweru, Zimbabwe." GeoJournal 86, no. 3 (2021): 1173–92. https://doi.org/10.1007/s10708-019-10118-x.
Mbaka, C. K., Gikonyo, J., & Kisaka, O. M. (2019). Households' energy preference and consumption intensity in Kenya. Energy, Sustainability and Society, 9(1), 1–11. https://doi.org/10.1186/s13705-019-0201-8A
Mazzone, A., Cruz, T., & Bezerra, P. (2021). Firewood in the forest: Social practices, culture, and energy transitions in a remote village of the Brazilian Amazon. Energy Research & Social Science, 74, 101980–. https://doi.org/10.1016/j.erss.2021.101980
Masekela, M. E., & Semenya, K. (2021). Factors influencing the use of firewood post-electrification in rural South Africa: The case of Ga-Malahlela village. Journal of Energy in Southern Africa, 32(3), 24–40. https://doi.org/10.17159/2413-3051/2021/v32i3a7781
Myanmar. Global Ecology and Conservation, 24, e01340–. https://doi.org/10.1016/j.gecco.2020.e01340
Meier, P., Vagliasindi, M., Imran, M., Eberhard, A., & Siyambalapitiya, T. (2015). The design and sustainability of renewable energy incentives : an economic analysis. The World Bank.
Melvin, J. (2018). The split incentives energy efficiency problem: Evidence of underinvestment by landlords. Energy Policy, 115, 342–352. https://doi.org/10.1016/j.enpol.2017.11.069

Mitchell. (2010). Biofuels in Africa: Opportunities, Prospects, and Challenges. In Biofuels in Africa. World Bank Publications. https://doi.org/10.1596/978-0-8213-8516-6
Markandya, A., & Wilkinson, P. (2007). Electricity generation and health. The Lancet (British Edition), 370(9591), 979–990. https://doi.org/10.1016/S0140-6736(07)61253-7
Macintosh, A., & Wilkinson, D. (2011). Searching for public benefits in solar subsidies: A case study on the Australian government's residential photovoltaic rebate program. Energy Policy, 39(6), 3199–3209. https://doi.org/10.1016/j.enpol.2011.03.007
Müller, & Welpe, I. M. (2018). Sharing electricity storage at the community level: An empirical analysis of potential business models and barriers. Energy Policy, 118, 492–503. https://doi.org/10.1016/j.enpol.2018.03.064
Morrissey, J. (2017). The Energy Challenge in Sub-Saharan Africa: A Guide for Advocates and Policy Makers: Part 2. In Policy File. Oxfam.
Mccauley, D., Heffron, R. J., & Jenkins, S. K. (2013). Advancing energy justice: the triumvirate of tenets. International Energy Law Review, 32(3), 107–110. Retrieved from http://dspace.stir.ac.uk/handle/1893/18349
McHarg. A (2020) Energy justice: understanding the 'ethical turn' in energy law and policy Energy Justice and Energy Law, Oxford University Press, 10.1093/oso/9780198860754.003.0002A
Njenga, M., Gitau, J. K., & Mendum, R. (2021). Women's work is never done: Lifting the gendered burden of firewood collection and household energy use in Kenya. *Energy Research & Social Science*, *77*, 102071–. https://doi.org/10.1016/j.erss.2021.102071
Nachmany, M. (2015) CLIMATE CHANGE LEGISLATION IN ZIMBABWE AN EXCERPT FROM The 2015 Global Climate Legislation Study A Review of Climate Change Legislation in 99 Countries. https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/ZIMBABWE.pdf
Nguyen, C. P., & Su, T. D. (2021). Does energy poverty matter for gender inequality? Global evidence. *Energy for Sustainable Development*, *64*, 35–45. https://doi.org/10.1016/j.esd.2021.07.003
Novosel, L. M. (2023). Understanding the Evidence: Sampling and Probability (Random) Sampling Designs. *Urologic Nursing*, *43*(4), 194–196. https://doi.org/10.7257/2168-4626.2023.43.4.194

Nyavaya (2022). As energy poverty persists and prices soar, Zimbabwe urgently needs sustainable answers.https://energytransition.org/2022/09/as-energy-poverty-persists-and-prices-soar-zimbabwe-urgently-needs-sustainable-answers/

Nixon, J. D., Bhargava, K., Halford, A., & Gaura, E. (2021). The challenges of community-based solar energy interventions: Lessons from two Rwandan Refugee Camps. Energy for Sustainable Development, 65, 175–184. https://doi.org/10.1016/j.esd.2021.07.007

Nyamunda, T. (2021). "Open for Business" but Bankrupt: Currencies, the "New Dispensation" and the Zimbabwean Economy. Journal of Asian and African Studies (Leiden), 56(2), 204–217. https://doi.org/10.1177/0021909620986585

Njenga, M., Gitau, J. K., & Mendum, R. (2021). Women's work is never done: Lifting the gendered burden of firewood collection and household energy use in Kenya. Energy Research & Social Science, 77, 102071–. https://doi.org/10.1016/j.erss.2021.102071

Nkiruka Avila, Juan Pablo Carvallo, Brittany Shaw, and Daniel M. Kammen 2017 The energy challenge in sub-Saharan Africa: A guide for advocates and policy makers https://s3.amazonaws.com/oxfam-us/www/static/media/files/oxfam-RAEL-energySSA-pt1.pdf

Novacheck, J., & Johnson, J. X. (2015). The environmental and cost implications of solar energy preferences in Renewable Portfolio Standards. Energy Policy, 86, 250–261. https://doi.org/10.1016/j.enpol.2015.06.039

Ndaguba, E. (2018). Load Shedding and Community Health Centres in South Africa: A Conceptual Scholarship (2014 – 2016). Studies on Ethno-Medicine, 12(4), 205-211.

Newby, P. (2010) Research Methods for Education. England. Pearson Education Limited.

Nagaj, R., & Korpysa, J. (2020). Impact of COVID-19 on the level of energy poverty in Poland. Energies (Basel), 13(18), 1. doi:10.3390/en13184977

Norouzi, N.,& Fani, M. (2021) Monopoly and competition in the energy market: A legal analysis. International Scholars Journal, 15 (2),001-007

Nardi, P. M. (2016). Doing survey research : a guide to quantitative methods (Third edition. ed.). London, [England] ;: Routledge.

O'Sullivan, Kimberley Clare (2019) Health Impacts of Energy Poverty and Cold Indoor Temperature https://doi.org/10.1016/B978-0-12-409548-9.11566-0

Ozaki, R. (2018). Follow the price signal: People's willingness to shift household practices in a dynamic time-of-use tariff trial in the

United Kingdom. Energy Research & Social Science, 46, 10–18. https://doi.org/10.1016/j.erss.2018.06.008
O'Cathain, A., Murphy, E., & Nicholl, J. (2010). Three techniques for integrating data in mixed methods studies. BMJ (Overseas and retired doctors ed.), 341(7783), 1147-1150.
O'Cathain, A., Murphy, E., & Nicholl, J. (2007). Integration and Publications as Indicators of "Yield" From Mixed Methods Studies. Journal of mixed methods research, 1(2), 147-163. doi:10.1177/1558689806299094
Ontokosta, C. E., Reina, V. J., & Bonczak, B. (2020). Energy Cost Burdens for Low-Income and Minority Households: Evidence From Energy Benchmarking and Audit Data in Five U.S. Cities. Journal of the American Planning Association, 86(1), 89–105. https://doi.org/10.1080/01944363.2019.1647446
O'Sullivan, K. C., Viggers, H. E., & Howden-Chapman, P. L. (2014). The influence of electricity prepayment meter use on household energy behaviour. Sustainable Cities and Society, 13, 182–191. https://doi.org/10.1016/j.scs.2013.10.004
O'Sullivan, K. C., Howden-Chapman, P. L., Fougere, G. M., Hales, S., & Stanley, J. (2013). Empowered? Examining self-disconnection in a postal survey of electricity prepayment meter consumers in New Zealand. Energy Policy, 52, 277–287. https://doi.org/10.1016/j.enpol.2012.09.020
O'Sullivan, K., & Barnes, D. F. (2007). Energy policies and multitopic household surveys guidelines for questionnaire design in living standards measurement studies. World Bank.
Ogunbiyi,D. (2023). Energy Justice is Socially Just. A brief history of social justice. https://www.seforall.org/news/energy-justice-is-socially-just
Padmanaban, S., Sharmeela, C., Sivaraman, P., & Holm-Nielsen, J. B. (2021). Residential Microgrids and Rural Electrifications. Elsevier Science & Technology.
*Pakendorf, P. (2023)*The possible impact of loadshedding on your mental well-being. https://www.nationsonline.org/oneworld/map/zimbabwe_map.htm
Paganga, L. (2023). Zimbabwe embarks on ambitious rural aquaculture programme.https://thefishsite.com/articles/zimbabwe-embarks-on-ambitious-rural-aquaculture-programme
Petrova, S. (2018). Encountering energy precarity: Geographies of fuel poverty among young adults in the UK. Transactions - Institute of British Geographers (1965), 43(1), 17–30. https://doi.org/10.1111/tran.12196
Palit, D., Sovacool, B. K., Cooper, C., Zoppo, D., Eidsness, J., Crafton, M., . . . Clarke, S. (2013). The trials and tribulations of the Village Energy Security Programme (VESP) in India. Energy policy, 57, 407-417. doi:10.1016/j.enpol.2013.02.006

Papada, L., & Kaliampakos, D. (2016). Measuring energy poverty in Greece. Energy policy, 94, 157-165. doi:10.1016/j.enpol.2016.04.004
Pereira, M. G., Sena, J. A., Freitas, M. A. V., & Silva, N. F. d. (2011). Evaluation of the impact of access to electricity: A comparative analysis of South Africa, China, India and Brazil. Renewable & sustainable energy reviews, 15(3), 1427-1441. doi:10.1016/j.rser.2010.11.005
Petrova, S., Simcock, N., & Thomson, H. (2018). Energy poverty and vulnerability : a global perspective. New York: Routledge.
Phoumin, & Kimura, F. (2019). Cambodia's energy poverty and its effects on social well-being: Empirical evidence and policy implications. Energy Policy, 132, 283–289. https://doi.org/10.1016/j.enpol.2019.05.032
Posadas, J., Paci, P., Sajaia, Z., & Lokshin, M. (2017). Measuring gender equality. THE WORLD BANK.
Parker, I. (2005). Qualitative psychology introducing radical research. Maidenhead, England ;: Open University Press.
Peng, N. X. (2014). Fuzzy Logic Based Closed-End Questionnaire Design. Applied mechanics and materials, 525, 791-793. doi:10.4028/www.scientific.net/AMM.525.791
Punch, K. (2014). Introduction to social research : quantitative and qualitative
approaches (Third edition. ed.). Los Angeles, California: SAGE.
Punch, K., & Punch, K. (2003). Survey research the basics. London ;: Sage Publications.
Quinn, A. K., Bruce, N., Puzzolo, E., Dickinson, K., Sturke, R., Jack, D. W., Mehta, S., Shankar, A., Sherr, K., & Rosenthal, J. P. (2018). An analysis of efforts to scale up clean household energy for cooking around the world. Energy for Sustainable Development, 46, 1–10. https://doi.org/10.1016/j.esd.2018.06.011
Qing, B. Y., Zeng, B., Teng, Z. S., & Li, G. (2013). Single-Phase Prepayment Meter Based on RFID+STS. Applied Mechanics and Materials, 333-335, 2384–2390. https://doi.org/10.4028/www.scientific.net/AMM.333-335.2384
Quinn, A. K., Bruce, N., Puzzolo, E., Dickinson, K., Sturke, R., Jack, D. W., Mehta, S., Shankar, A., Sherr, K., & Rosenthal, J. P. (2018). An analysis of efforts to scale up clean household energy for cooking around the world. *Energy for Sustainable Development*, *46*, 1–10. https://doi.org/10.1016/j.esd.2018.06.011
Ross,L. and Day,M. (2022) Community Energy Planning: Best Practices and Lessons Learned in NREL's Work with Communities https://www.nrel.gov/docs/fy22osti/82937.pdf
Russu, C. (2022) Energy poverty and prices on the rise. Consequences and Solutions | Experts' Opinions. https://www.developmentaid.org/news-stream/post/151874/energy-poverty-and-prices-on-the-rise

Reuters (2023). China Energy plans 1000 MW floating solar plant in Zimbabwe .https://www.reuters.com/business/sustainable-business/china-energy-plans-1000-mw-floating-solar-plant-zimbabwe-2023-03-27/

Reuter (2023) Who is Emmerson Mnangagwa, Zimbabwe's 'Crocodile' president?. https://www.reuters.com/world/africa/who-is-emmerson-mnangagwa-zimbabwes-crocodile-president-2023-08-26/

Roser,M.. (2020) - "The world's energy problem". Published online at OurWorldInData.org. 'https://ourworldindata.org/worlds-energy-problem'

Robinson, C., Bouzarovski, S., & Lindley, S. (2018). "Getting the measure of fuel poverty": The geography of fuel poverty indicators in England. *Energy Research & Social Science*, *36*, 79–93. https://doi.org/10.1016/j.erss.2017.09.035

Ritchie,H., & Roser ., M.(2018) - "Urbanization". Published online at OurWorldInData.org.https://ourworldindata.org/urbanization

Roddis, P., Roelich, K., Tran, K., Carver, S., Dallimer, M., & Ziv, G. (2020). What shapes community acceptance of large-scale solar farms? A case study of the UK's first "nationally significant" solar farm. *Solar Energy*, *209*, 235–244. https://doi.org/10.1016/j.solener.2020.08.065

Regmi, P. R., Waithaka, E., Paudyal, A., Simkhada, P., & van Teijlingen, E. (2016). Guide to the design and application of online questionnaire surveys. Nepal Journal of Epidemiology, 6(4), 640-644. doi:10.3126/nje.v6i4.17258

Rich, M., & Patashnick, J. (2002). Narrative research with audio visual data: Video intervention/prevention assessment (VIA) and NVivo. International journal of social research methodology, 5(3), 245-261. doi:10.1080/13645570210166373

Richards, D. A., Bazeley, P., Borglin, G., Craig, P., Emsley, R., Frost, J., . . . O'Cathain, A. (2019). Integrating quantitative and qualitative data and findings when undertaking randomised controlled trials. BMJ open, 9(11), e032081-e032081. doi:10.1136/bmjopen-2019-032081

Robson, C., & Poole, L. (2003). Real world research: a resource for social scientists and practitioner-researchers. In (Vol. 3, pp. 393-394).

Rutakumwa, R., Mugisha, J. O., Bernays, S., Kabunga, E., Tumwekwase, G., Mbonye, M., & Seeley, J. (2020). Conducting in-depth interviews with and without voice recorders: a comparative analysis. Qualitative research : QR, 20(5), 565-581. doi:10.1177/1468794119884806 Reviewed by Gabriela, S. (2017). Review of A Beginner's Guide to Structural

Ramirez, J., & Böhm, S. (2021). Transactional colonialism in wind energy investments: Energy injustices against vulnerable people in the Isthmus of Tehuantepec. Energy research & social science, 78, 102135. doi:10.1016/j.erss.2021.102135

Rocha, M., Baddeley, M., Pollitt, M., & Weeks, M. (2019). Addressing self-disconnection among prepayment energy consumers: A behavioural approach. Energy Economics, 81, 273–286. https://doi.org/10.1016/j.eneco.2019.03.02

Richard Bridle Philip Gass Aidy Halimajaya Lucky Lontoh Neil McCulloch Erica Petrofsky Lourdes (2018 SanchezIISD, Missing the 23 per cent target: Roadblocks to the development of renewable energy in Indonesia, https://www.iisd.org/sites/default/files/publications/road blocks-indonesia-renewable-energy.pdf, 2018 (accessed 21 February 2023).

Rodríguez, I., Daponte-Codina, A., & Marí-Dell'Olmo, M. (2022). What are the effects of energy poverty and interventions to ameliorate it on people's health and well-being? A scoping review with an equity lens. Energy Research & Social Science, 87, 102456–. https://doi.org/10.1016/j.erss.2021.102456

Roser, M. (2021) Energy poverty and indoor air pollution: a problem as old as humanity that we can end within our lifetime. Retrieved from https://ourworldindata.org/energy-poverty-air-pollution

Setyowati, A. B. (2021). Mitigating inequality with emissions? Exploring energy justice and financing transitions to low carbon energy in Indonesia. Energy Research & Social Science, 71, 101817–. https://doi.org/10.1016/j.erss.202a0.101817

Stegmann, R. by G. (2017). Review of A Beginner's Guide to Structural Equation Modeling (4th ed.), by Randall E. Schumacker & Richard G. Lomax: New York, NY: Routledge, 2016. 351 pp. $65.91 (paperback) [Review of *Review of A Beginner's Guide to Structural Equation Modeling (4th ed.), by Randall E. Schumacker & Richard G. Lomax: New York, NY: Routledge, 2016. 351 pp. $65.91 (paperback)*]. *Structural Equation Modeling: A Multidisciplinary Journal*, *24*(3), 475–477. Routledge. https://doi.org/10.1080/10705511.2017.1280798

Statista Research Department. (2023). Number of people without access to electricity worldwide from 2000 to 2021, by region. *Statista.* https://www.statista.com/statistics/829803/number-of-people-without-access-to-electricity-by region/#:~:text=Global%20population%20without%20electricity%20access%202000%2D2021%2C%20by%20region&text=The%20number%20of%20people%20without,billion%20in%20the%20latter%20year

Samarakoon, S. (2019). A justice and wellbeing centered framework for analysing energy poverty in the Global South. Ecological economics, 165, 106385. doi:10.1016/j.ecolecon.2019.106385

Santoyo-Castelazo, E., & Azapagic, A. (2014). Sustainability assessment of energy systems: integrating environmental, economic and social aspects. Journal of cleaner production, 80, 119-138. doi:10.1016/j.jclepro.2014.05.061
Schlosberg, D. (2004). Reconceiving environmental justice: Global movements and political theories. In (pp. 102-122).
Schulte, I., & Heindl, P. (2017). Price and income elasticities of residential energy demand in Germany. Energy policy, 102, 512-528. doi:10.1016/j.enpol.2016.12.055
Smith, N. H., & Deranty, J.-P. (2012). Work and the Politics of Misrecognition. Res publica (Liverpool, England), 18(1), 53-64. doi:10.1007/s11158-012-9185-3
Soeiro, S., & Ferreira Dias, M. (2020). Renewable energy community and the European energy market: main motivations. Heliyon, 6(7), e04511-e04511. doi:10.1016/j.heliyon.2020.e04511
Sovacool, B. K. (2012). The political economy of energy poverty: A review of key challenges. Energy for sustainable development, 16(3), 272-282. doi:10.1016/j.esd.2012.05.006
Sovacool, B. K., & Drupady, I. M. (2012). Energy access, poverty, and development : the governance of small-scale renewable energy in developing Asia. Surrey, England: Ashgate.
Sovacool, B. K., & Dworkin, M. H. (2015). Energy justice: Conceptual insights and practical applications. Applied energy, 142, 435-444. doi:10.1016/j.apenergy.2015.01.002
Sovacool, B. K., Furszyfer Del Rio, D., & Griffiths, S. (2020). Contextualizing the Covid-19 pandemic for a carbon-constrained world: Insights for sustainability transitions, energy justice, and research methodology. Energy research & social science, 68, 101701-101701. doi:10.1016/j.erss.2020.101701
Sovacool, B. K., & Saunders, H. (2014). Competing policy packages and the complexity of energy security. Energy (Oxford), 67, 641-651. doi:10.1016/j.energy.2014.01.039
Sovacool, B. K., Valentine, S. V., Jain Bambawale, M., Brown, M. A., de Fátima Cardoso, T., Nurbek, S., . . . Zubiri, A. (2012). Exploring propositions about perceptions of energy security: An international survey. Environmental science & policy, 16, 44-64. doi:10.1016/j.envsci.2011.10.009
Sovacool, Lipson, M. M., & Chard, R. (2019). Temporality, vulnerability, and energy justice in household low carbon innovations. Energy Policy, 128, 495–504. https://doi.org/10.1016/j.enpol.2019.01.010
Sovacool, B. K., & Dworkin, M. H. (2015). Energy justice: Conceptual insights and practical applications. Applied Energy, 142, 435–444. https://doi.org/10.1016/j.apenergy.2015.01.002
Salzmann-Erikson, M. (2018). Using focused ethnography to explore and describe the process of nurses' shift reports in a psychiatric intensive care unit. Journal of Clinical Nursing, 27(15-16), 3104-3114.

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2012). Research Methods for Business Students (6th ed. ed.). Old Tappan: Pearson Education UK.
Saunders, M. N. K., Lewis, P., & Thornhill, A. (2015). Research Methods for Business Students. Harlow, United Kingdom: Pearson Education UK.
Schober, M. F. (2018). The future of face-to-face interviewing. Quality assurance in education, 26(2), 290-302. doi:10.1108/QAE-06-2017-0033
Sekaran, U., & Bougie, R. (2017). Research methods for business : a skill-building approach (Seventh edition. ed.). Chichester, West Sussex, United Kingdom: Wiley.
Shannon-Baker, P. (2015). "But I Wanted to Appear Happy": How using Arts-Informed and Mixed Methods Approaches Complicate Qualitatively Driven Research on Culture Shock. International journal of qualitative methods, 14(2), 34-52. doi:10.1177/160940691501400204
Susoy, Z. (2015). Watch your Teaching: A Reflection Strategy for EFL Pre-service Teachers Through video Recordings. Procedia, social and behavioral sciences, 199, 163-171. doi:10.1016/j.sbspro.2015.07.501
Szolnoki, G., & Hoffmann, D. (2013). Online, face-to-face and telephone surveys—Comparing different sampling methods in wine consumer research. Wine economics and policy, 2(2), 57-66. doi:10.1016/j.wep.2013.10.001
Sekaran,U. (2010) Research Methods for Business - A Skill Building Approach, 5th Edition. (2010). M2 Presswire, pp. M2 Presswire, 2010-06-16.
Sedgwick, P. (2013). Snowball sampling. BMJ: British Medical Journal, 347(Dec20 2), F7511-f7511.
Simsek, E. (2012). Social Learning. In Encyclopedia of the Sciences of Learning (Vol. 7, pp. 3107–3109).
Surridge, A. D., (2007) Clean coal technologies in South Africa: South African National Energy Research Institute. Retrieved from https://sustainabledevelopment.un.org/content/documents/3292surridge_presentation.pdf
Silverstein, K. (2019). Off-Grid Solar Power Is Making Africa's Emerging Economies A Little Brighter. Retrieved May 25, 2020, from https://www.forbes.com/sites/kensilverstein/2019/08/19/off-grid-solar-power-is-making-africas-emerging-economies-a-little-brighter/#11fb72216cd3
Stephens, J. C., Burke, M. J., Gibian, B., Jordi, E., & Watts, R. (2018). Operationalizing Energy Democracy: Challenges and Opportunities in Vermont's Renewable Energy Transformation. Frontiers in Communication, 3. https://doi.org/10.3389/fcomm.2018.00043
Setyowati, A. B. (2020). Mitigating energy poverty: Mobilizing climate finance to manage the energy trilemma in Indonesia.

Sustainability (Basel, Switzerland), 12(4), 1603. doi:10.3390/su12041603
Smith, N. H., & Deranty, J.-P. (2012). Work and the Politics of Misrecognition. Res publica (Liverpool, England), 18(1), 53-64. doi:10.1007/s11158-012-9185-3
Soeiro, S., & Ferreira Dias, M. (2020). Renewable energy community and the European energy market: main motivations. Heliyon, 6(7), e04511-e04511. doi:10.1016/j.heliyon.2020.e04511
Setyowati, A. B. (2021). Mitigating inequality with emissions? Exploring energy justice and financing transitions to low carbon energy in Indonesia. Energy Research & Social Science, 71, 101817–. https://doi.org/10.1016/j.erss.2020.101817
Stojilovska, A. (2021). Energy poverty and the role of institutions: exploring procedural energy justice - Ombudsman in focus. Journal of Environmental Policy & Planning, ahead-of-print(ahead-of-print), 1–13. https://doi.org/10.1080/1523908X.2021.1940895
Snyman, & Maeko, G. (2021). Design and development of a low-cost system to convert solar thermal energy into electricity for households in South Africa using solar concentrators. Journal of Energy in Southern Africa, 32(4), 102–116. https://doi.org/10.17159/2413-3051/2021/v32i4a10661
Scarpa, & Willis, K. (2010). Willingness-to-pay for renewable energy: Primary and discretionary choice of British households' for micro-generation technologies. Energy Economics, 32(1), 129–136. https://doi.org/10.1016/j.eneco.2009.06.004
Showers, K. B. (2011). Electrifying africa: an environmental history with policy implications. Geografiska Annaler. Series B, Human Geography, 93(3), 193–221. https://doi.org/10.1111/j.1468-0467.2011.00373.x
Shakeel, S. R., Yousaf, H., Irfan, M., & Rajala, A. (2023). Solar PV adoption at household level: Insights based on a systematic literature review. *Energy Strategy Reviews*, *50*, 101178–. https://doi.org/10.1016/j.esr.2023.101178
Sherriff, G., Butler, D., & Brown, P. (2022). *"The reduction of fuel poverty may be lost in the rush to decarbonise": Six research risks at the intersection of fuel poverty, climate change and decarbonisation*.
Sovacool, B. K. (2013). Confronting energy poverty behind the bamboo curtain: A review of challenges and solutions for Myanmar (Burma). *Energy for Sustainable Development*, *17*(4), 305–314. https://doi.org/10.1016/j.esd.2013.03.010
Stoner, O., Lewis, J., Martínez, I. L., Gumy, S., Economou, T., & Adair-Rohani, H. (2021). Household cooking fuel estimates at global and country level for 1990 to 2030. *Nature Communications*, *12*(1), 5793–5793. https://doi.org/10.1038/s41467-021-26036-x
Sule, I. K., Yusuf, A. M., & Salihu, M.-K. (2022). Impact of energy poverty on education inequality and infant mortality in some selected

African countries. *Energy Nexus*, *5*, 100034–. https://doi.org/10.1016/j.nexus.2021.100034
Seetharaman, Moorthy, K., Patwa, N., Saravanan, & Gupta, Y. (2019). Breaking barriers in deployment of renewable energy. *Heliyon*, *5*(1), e01166–e01166. https://doi.org/10.1016/j.heliyon.2019.e01166
Sambodo, M. T., Yuliana, C. I., Hidayat, S., Novandra, R., Handoyo, F. W., Farandy, A. R., Inayah, I., & Yuniarti, P. I. (2022). Breaking barriers to low-carbon development in Indonesia: deployment of renewable energy. *Heliyon*, *8*(4), e09304–e09304. https://doi.org/10.1016/j.heliyon.2022.e09304
Sy, S. A., & Mokaddem, L. (2022). Energy poverty in developing countries: A review of the concept and its measurements. *Energy Research & Social Science*, *89*, 102562–. https://doi.org/10.1016/j.erss.2022.102562
Spargo, R. M., Coetzer, A., Makuvadze, F. T., Chikerema, S. M., Chiwerere, V., Bhara, E., & Nel, L. H. (2021). Knowledge, attitudes, and practices towards rabies: A survey of the general population residing in the Harare Metropolitan Province of Zimbabwe. *PloS One*, *16*(1), e0246103–e0246103. https://doi.org/10.1371/journal.pone.0246103
Schislyaeva, E. R., & Saychenko, O. A. (2022). Evaluation of post COVID-19 energy poverty and global trading impact on energy affordability. *Frontiers in Energy Research*, *10*. https://doi.org/10.3389/fenrg.2022.971122
Todd, I., & McCauley, D. (2021). Assessing policy barriers to the energy transition in South Africa. *Energy Policy*, *158*, 112529–. https://doi.org/10.1016/j.enpol.2021.112529
Tovar Reaños, M. A. (2021). Fuel for poverty: A model for the relationship between income and fuel poverty. Evidence from Irish microdata. Energy Policy, 156, 112444–. https://doi.org/10.1016/j.enpol.2021.112444
Thomson, H., Simcock, N., Bouzarovski, S., & Petrova, S. (2019). Energy poverty and indoor cooling: An overlooked issue in Europe. Energy and buildings, 196, 21-29. doi:10.1016/j.enbuild.2019.05.014
Tong, D., Zhang, Q., Zheng, Y., Caldeira, K., Shearer, C., Hong, C., . . . Davis, S. J. (2019). Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target. Nature (London), *572*(7769), 373-377. doi:10.1038/s41586-019-1364-3
Tewari, D. D. and Shah, T. Energy Policy, 2003, 31 (9), 911–927. (2003). Fuel and Energy Abstracts, 44(6), 382–382. https://doi.org/10.1016/S0140-6701(03)92465-9
The Federal Democratic Republic of Ethiopia (2011) Ethiopia's Climate-Resilient Green Economy Strategy. Retrieved from https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=392&menu=35

Texas Energy Poverty Research Institute. (2017). Energy Poverty Research Landscape Analysis. Retrieved from http://www.txenergypoverty.org/wp-content/uploads/2017/05/TEPRI-Energy-Poverty-Research-Landscape-Analysis-May-2017.pdf

Thomson, H., Simcock, N., Bouzarovski, S., & Petrova, S. (2019). Energy poverty and indoor cooling: An overlooked issue in Europe. Energy and buildings, 196, 21-29. doi:10.1016/j.enbuild.2019.05.014

Tong, D., Zhang, Q., Zheng, Y., Caldeira, K., Shearer, C., Hong, C., . . . Davis, S. J. (2019). Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target. Nature (London), 572(7769), 373-377. doi:10.1038/s41586-019-1364-3

The World Bank (2020). Increasing Access to Electricity and Renewable Energy in Bolivia Retrieved from https://www.worldbank.org/en/results/2020/10/15/increasing-access-to-electricity-and-renewable-energy-in-bolivia

The World Bank (2018) Access to clean fuels and technologies for cooking (% of population) retrieved from https://data.worldbank.org/indicator/EG.CFT.ACCS.ZS?locations=ZG

United Nations development Programme (2022). UNDP Energy Offer for Zimbabwe. Retrieved from: https://www.undp.org/zimbabwe/stories/undp-energy-offer-zimbabwe

United Nations Development Agency (UNDP,2023) Just Transition as an enabler to accelerate green economic growth in Zimbabwe. Retrieved from: https://www.undp.org/zimbabwe/news/just-transition-enabler-accelerate-green-economic-growth-zimbabwe

United Nations (2023) Introduction to climate finance. *Introduction to climate finance*. https://unfccc.int/topics/introduction-to-climate-finance

United Nations (2021). United Nation environment programmes. Retrieved from https://www.unep.org/about-un-environment/funding-and-partnerships/european-commission

United Nations Statistics Division. (2018). Ensure access to affordable, reliable, sustainable and modern energy for all.
Retrieved from https://unstats.un.org/sdgs/report/2018/goal-07/

United Nation (2015).The Millennium Development Goals Report.Retrieved from https://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%2020 15%20rev%20(July%201).pdf

United Nation (2018) Household air population and health. Retrieved from https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

United Nation. (2016). Leaving no one behind: Leaving no one behind: the imperative of inclusive development. Report on the World Social Situation 2016 https://www.un.org/esa/socdev/rwss/2016/full-report.pdf

Völlink, T., & Meertens, R. (2010). The Effect of a Prepayment Meter on Residential Gas Consumption: RESIDENTIAL GAS CONSUMPTION

AND PREPAYMENT METERS. Journal of Applied Social Psychology, 40(10), 2556–2573. https://doi.org/10.1111/j.1559-1816.2010.00670.x
Vaughn, S., Schumm, J. S., & Sinagub, J. (1996). Focus group interviews in education and psychology. Thousand Oaks, Calif. ;: SAGE.
Van der Waal, E. C. (2020). Local impact of community renewable energy: A case study of an Orcadian community-led wind scheme. Energy policy, 138, 1-11. doi:10.1016/j.enpol.2019.111193
Van Tran, V., Park, D., & Lee, Y.-C. (2020). Indoor air pollution related human diseases, and recent trends in the control and improvement of indoor air quality. International journal of environmental research and public health, 17(8), 2927. doi:10.3390/ijerph17082927
Velicu, I., & Barca, S. (2020). The Just Transition and its work of inequality. Sustainability : science, practice, & policy, 16(1), 263-273. doi:10.1080/15487733.2020.1814585
Van den Broek, K. L. (2019). Household energy literacy: A critical review and a conceptual typology. Energy Research & Social Science, 57, 101256–. https://doi.org/10.1016/j.erss.2019.101256
Wiebe, K. et al., (2023). Measuring the socioeconomic impacts of climate policies to guide NDC enhancement and a just transition : Zimbabwe green jobs assessment report, ILO.Geneva. https://policycommons.net/artifacts/1894525/measuring-the-socioeconomic-impacts-of-climate-policies-to-guide-ndc-enhancement-and-a-just-transition/2644550/
Wang, T.-L., & Lien, Y.-H. B. (2013). The power of using video data. Quality & quantity, 47(5), 2933-2941. doi:10.1007/s11135-012-9717-0
World Future Council (2021) Energy Democracy – Power to the People. World future council.https://www.worldfuturecouncil.org/energy-democracy-power-to-the-people/
Wagner, O., & Wiegand, J. (2018). Prepayment metering: Household experiences in Germany. Renewable & Sustainable Energy Reviews, 98, 407–414. https://doi.org/10.1016/j.rser.2018.09.025
Wellington, J. J., & Szczerbiński, M. (2007). Research methods for the social sciences. London ;: Continuum International Pub. Group.
Willig, C. (2013). Introducing qualitative research in psychology (3rd ed. ed.). Maidenhead, Berkshire, England: Open University Press.
Walker, G. (2012). Environmental Justice: Concepts, Evidence and Politics. London: Routledge.
Walker, G., & Day, R. (2012). Fuel poverty as injustice: Integrating distribution, recognition and procedure in the struggle for affordable warmth. Energy policy, 49, 69-75. doi:10.1016/j.enpol.2012.01.044
Walsh, B. (2011). Going Green. The worst kind of poverty: Energy poverty. Time.
Retrieved from http://content.time.com/time/health/article/0,8599,2096602,00.html

Wishanti, D. A. P. E. (2015). Alleviating Energy Poverty as Indonesian Development Policy Inputs Post-2015: Improving Small and Medium Scale Energy Development. Procedia environmental sciences, 28, 352-359. doi:10.1016/j.proenv.2015.07.044

Wamukonya, N. (2003). African power sector reforms: some emerging lessons. Energy for sustainable development, 7(1), 7-15. doi:10.1016/S0973-0826(08)60344-0

West, S. K., Bates, M. N., Lee, J. S., Schaumberg, D. A., Lee, D. J., Adair-Rohani, H., . . . Araj, H. (2013). Is household air pollution a risk factor for eye disease?

Williams, S., & Doyon, A. (2019). Justice in energy transitions. Environmental innovation and societal transitions, 31, 144-153. doi:10.1016/j.eist.2018.12.001

World Health Organisation (2006) Air quality guidelines global update 2005. Retrieved from https://www.who.int/publications/i/item/WHO-SDE-PHE-OEH-06.02

World Health Organisation (2014) Defining Clean fuels and Technologies https://www.who.int/tools/clean-household-energy-solutions-toolkit/module-7-defining-clean

World Bank. (2012). Access to electricity (% of population), World Bank, Sustainable Energy for All (SE4All) database from World Bank, Global Electrification Database. Retrieved May 13, 2021. http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS.

World Bank Group. (2012). State of the clean cooking energy sector in sub-Saharan Africa. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/22521/Clean0and0impr000a0landscape0report.pdf?sequence=1&isAllowed=y

Winkler, H. (2009). Cleaner Energy Cooler Climate, Developing Sustainable Energy Solutions for South Africa, HSRC Press, Cape Town.

World Health Organization (2018) Indoor air pollution and household energy the forgotten 3 billion. Retrieved from https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

Watson, N. E., Huebner, G. M., Fell, M. J., & Shipworth, D. (2020). Two energy suppliers are better than one: Survey experiments on consumer engagement with local energy in GB. Energy Policy, 147, 111891–. https://doi.org/10.1016/j.enpol.2020.111891

Xiao, Y., Wu, H., Wang, G., & Wang, S. (2021). The Relationship between Energy Poverty and Individual Development: Exploring the Serial Mediating Effects of Learning Behavior and Health Condition. *International Journal of Environmental Research and Public Health*, *18*(16), 8888–. https://doi.org/10.3390/ijerph18168888

Xu, J., Akhtar, M., Haris, M., Muhammad, S., Abban, O. J., & Taghizadeh-Hesary, F. (2022). Energy crisis, firm profitability, and productivity: An emerging economy perspective. *Energy Strategy Reviews*, *41*, 100849–. https://doi.org/10.1016/j.esr.2022.100849

Xu, S., & Wang, T. (2017). On energy equity and China's policy choices. Energy & environment (Essex, England), 28(3), 288-301. doi:10.1177/0958305X16684011

Xinhua. (2020, 29 May). Zimbabwe's COVID-19 cases climb to 149, adding 17. XinhuaNet. http://www.xinhuanet.com/english/2020-05/29/c_139098680.htm

Yohanis, Y. G. (2012). Domestic energy use and householders' energy behaviour. Energy Policy, 41(1), 654–665. https://doi.org/10.1016/j.enpol.2011.11.028

Zarycki, T., Smoczyński, R., & Warczok, T. (2017). The Roots of Polish Culture-Centered Politics: Toward a Non–Purely Cultural Model of Cultural Domination in Central and Eastern Europe. East European politics and societies, 31(2), 360-381. doi:10.1177/0888325417692036

Zhang, J., & Smith, K. R. (2003). Indoor air pollution: a global health concern. British medical bulletin, 68(1), 209-225. doi:10.1093/bmb/ldg029

Zheng, Feng, Wu, Zheng, & Chen, Yihua. (2012). A quantitative method for the measurement of membrane affinity by polydiacetylene-based colourimetric assay. Analytical Biochemistry, 420(2), 171-176.

Zimbabwe Ministry of Energy and Power Development. (2019). National Renewable Energy Policy. Retrieved from http://www.cfuzim.com/wp-content/uploads/2019/08/energy19.pdf

Zimbabwe Ministry of Energy and Power Development. (2012). National Energy Policy: Ministry of energy and power development. Retrieved from https://www4.unfccc.int/sites/PublicNAMA/_layouts/UN/FCCC/NAMA/Download.aspx?ListName=NAMA&Id=162&FileName=energy_policy.pdf.

Zimbabwe Electricity Transmission and Distribution Company. (2013). Analysis of impact of prepaid meters on power demand, energy consumption and revenue collection. Retrieved from https://dailynews.co.zw/articles/2013/05/06/consumers-to-buy-prepaid-meters

Zimbabwe National Statistics Agency. (2012). Census 2012 National report

Retrieved from

http://www.zimstat.co.zw/wpcontent/uploads/publications/Population/population/census-2012-national-report.pdf

ZimFact. (2020, 6 May). Zimbabwe COVID-19 isolation and quarantine facilities. *ZimFact.* https://zimfact. org/factsheet-zimbabwe-covid-19-isolation-and-quarantine-facilities

Zimbabwe's female entrepreneurs pound poverty at all odds Jeffey Moyo (2020) https://www.aa.com.tr/en/africa/zimbabwes-female-entrepreneurs-pound-poverty-at-all-odds/1698949#

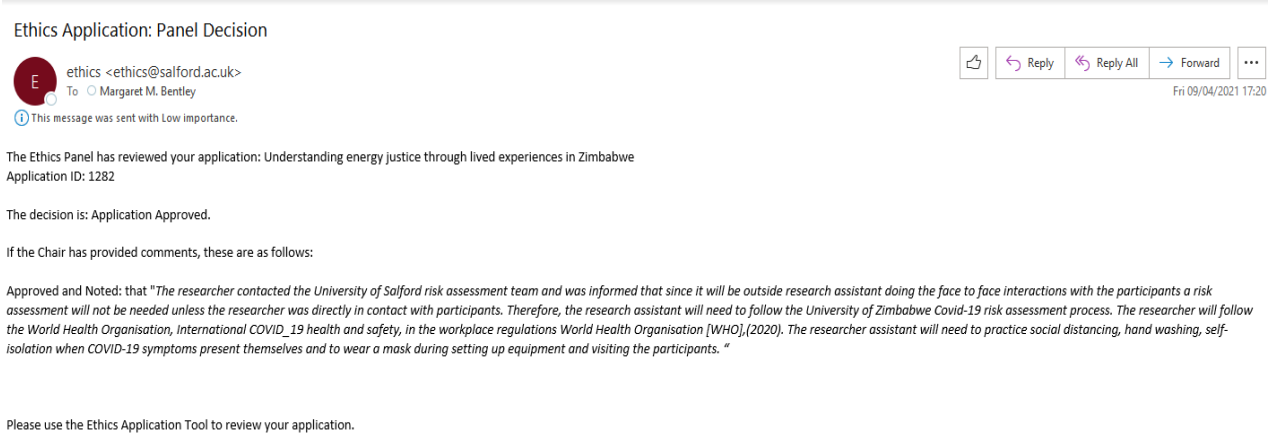
Zhang, C. H., Sears, L., Myers, J. V., Brock, G. N., Sears, C. G., & Zierold, K. M. (2022). Proximity to coal-fired power plants and neurobehavioral symptoms in children. Journal of Exposure Science & Environmental Epidemiology, 32(1), 124–134. https://doi.org/10.1038/s41370-021-00369-7

Zvobgo, L., & Tsoka, J. (2021). Deforestation rate and causes in Upper Manyame Sub-Catchment, Zimbabwe: Implications on achieving national climate change mitigation targets. Trees, Forests and People (Online), 5, 100090–. https://doi.org/10.1016/j.tfp.2021.100090

Zorić, & Hrovatin, N. (2012). Household willingness to pay for green electricity in Slovenia. Energy Policy, 47, 180–187. https://doi.org/10.1016/j.enpol.2012.04.055

11 Appendices

Appendix 1: Ethical consideration



Ethics Application: Panel Decision

E ethics <ethics@salford.ac.uk>
To Margaret M. Bentley
This message was sent with Low importance.

Reply | Reply All | Forward
Fri 09/04/2021 17:20

The Ethics Panel has reviewed your application: Understanding energy justice through lived experiences in Zimbabwe
Application ID: 1282

The decision is: Application Approved.

If the Chair has provided comments, these are as follows:

Approved and Noted: that "*The researcher contacted the University of Salford risk assessment team and was informed that since it will be outside research assistant doing the face to face interactions with the participants a risk assessment will not be needed unless the researcher was directly in contact with participants. Therefore, the research assistant will need to follow the University of Zimbabwe Covid-19 risk assessment process. The researcher will follow the World Health Organisation, International COVID_19 health and safety, in the workplace regulations World Health Organisation [WHO],(2020). The researcher assistant will need to practice social distancing, hand washing, self-isolation when COVID-19 symptoms present themselves and to wear a mask during setting up equipment and visiting the participants. "*

Please use the Ethics Application Tool to review your application.

The Ethics Panel has reviewed your application: Understanding energy justice through lived experiences in Zimbabwe
Application ID: 1282
The decision is: Application Approved.
If the Chair has provided comments, these are as follows:

Approved and Noted: that "*The researcher contacted the University of Salford risk assessment team and was informed that since it will be outside research assistant doing the face-to-face interactions with the participants a risk assessment will not be needed unless the researcher was directly in contact with participants. Therefore, the research assistant will need to follow the University of Zimbabwe Covid-19 risk assessment process. The researcher will follow the World Health Organisation, International COVID_19 health and safety, in the workplace regulations World Health Organisation [WHO], (2020). The researcher assistant will need to practice social distancing, hand washing, self-isolation when COVID-19 symptoms present themselves and to wear a mask during setting up equipment and visiting the participants. "*

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Appendix 2: Interview schedule for householders

University of Salford MANCHESTER

Quality of Life and Services

1. Can you introduce yourself and tell me in general about yourself?
2. Tell me a bit about your life in your community.
3. Is the community a safe place to live? Do you feel safe in your home and think about school safety, playgrounds, parks, and local shops? Do neighbours know and trust one another? Do they look out for one another?)
4. Is there economic opportunity in the community, such as Jobs? Are there locally owned and operated businesses, Is there local higher education opportunities, affordable housing, and good transportation in terms of buses etc.?
5. Are you satisfied with the health care system in the community? In terms of access, availability, quality, and options in health care?
6. Are there networks of support for individuals and families in terms of (social support, support groups, faith community outreach, and charitable groups) during times of need? Think of times of power cuts and other essential requirements.

Energy poverty Knowledge and Service Provision

7. Can you tell us about your experiences with power cuts or load shedding and how they impact your daily life, well-being, or health?
8. How do you feel about the amount of money you spend on energy?

   Prompt Do you feel this is too much or about right?
9. Do you feel you can rely on your energy supply?'
10. What strategies do your household use to maintain cheaper fuel bills? For example, do you prefer to use firewood, not charcoal?
11. As an energy consumer, do you know of services or service providers you can approach when affected or struggling to pay your energy supply and energy bills?
12. How do you pay for your fuel?

    Pre-payment meter

    Cash or cheque

Debit or credit card

Direct debit

Mobile payments

13. What are your thoughts on energy improvements such as (solar installation, easy access to energy sources) and if you think they will help improve your energy access?

Thank you for taking part in the interview; we have come to the end of my questions. Is there anything else you would like to add or something you might need me to explain to you further? If you need to ask questions later about the research, please feel free to use the contact details on your information sheet.

University of Salford MANCHESTER

Appendix 3: Interview schedule for stakeholders

1. Could you tell me about yourself?
2. Please tell me the position and the role duties and some information about your company/NGO by telling me the services you provide.
3. Interviewer: How do your services add to energy provision in Zimbabwe communities focusing on Harare?
4. What are the social-economic circumstances of the communities you work with?
5. What are your views of the energy resources within the community?
6. What is your opinion about the energy services within the community?
    - How reliable are these technologies?
    - Does the government help address power cuts and issues related to load shedding?
    - Are they used stand-alone or in conjunction with other technologies?
    - How are these projects financed?

7. Do you think there are any issues related to energy supply to the community?
    - Such as the impact on healthcare services and economic production
    - Community Safety?
    - Are there any actions taken around those energy-related issues?
    - Such as a renewable energy project?
    - Do you know if the government is considering working with private funding and external companies?

Appendix 4: Survey

Harare metropolitan province survey

About the Study

Title of study: Understanding energy justice through lived experiences in Zimbabwe.

Programme of Study: Social Policy (PhD)

Name of Researcher: Margaret Probin.

Affiliated with the University of Zimbabwe.

Thank you for taking the time to complete this survey. The purpose of the study is to understand better Zimbabwe communities' day-to-day experiences affected by the energy crisis. The survey should take you no more than 15 **minutes** to complete. As we explain in the Participant Information Sheet, all information you give us is treated anonymously.

Please click on the link below to read and download your information sheet.

Information sheet link

https://static.onlinesurveys.ac.uk/media/account/301/survey/749218/question/participant_information_sheet_.pdf

1. Do you live in Harare Urban District? *Required*

- Yes
- No

Your Consent and Information sheet link

Title of study: Understanding energy justice through lived experiences in Zimbabwe.

Name of Researcher: Margaret Probin

E: m.probin@edu.salford.ac.uk

Before you complete the survey, please read the following

statements and, if you are happy to participate, please select

'Yes".

2. I have read the participant information sheet. □ *Required*

- Yes
- No

3. I have been given the opportunity to ask questions about the survey. □ *Required*

- Yes
- No

4. I agree to participate in the study and for the data collected via this questionnaire to be used for this study. □ *Required*

- Yes
- No

5. I understand that I will not be personally identifiable. Any research outputs will be anonymised according to the principles established in the General Data Protection Regulations (GDPR) and the Data Protection Act 2018. □

Required

- Yes
- No

6. I consent to take part in the research. □ *Required*

Yes

No

Section 1: About you and your home

7. In which suburb of Harare Urban District do you live? □ *Required*

8. What best describes your gender?

Male

Female

Prefer not to say.

Prefer to self-describe.

8a. If you selected prefer to self-describe, please write your answer below.

9. Occupation/ Employment status. Please select all that apply to you. *Required*

Employed full-time Employed.

Part-time.

Out of work and looking for work

Out of work and looking for work

Homemaker

A student Military

Retired

Unable to work.

9a. If you selected Other, please specify:

10. How many people in each of the following age groups live within your house (Please type in your answer).

0-17 years	
18-25 years	
26-35 years	
36--45 years	
46-55 years	

56-65 years	
66-75 years	
76-85 years	
86-95 years	
96 years and above	

Section 2: Energy supply and sources.

11. Who is your energy supplier? □ *Required*

Zimbabwe Electricity Transmission & Distribution Company (ZETDC or commonly ZESA

Solar private companies' installation

Prefer not to say.

Other

11a. If you selected other, please specify:

12. *On average, **before the Covid-19** pandemic, how often did you experience power cuts or load shedding in your household? Please select the option that **best** describes these experiences.* (Required)

Three or more days in a week
Twice per week
Once a week
Once every two weeks
Once a month

13. On average, ***during the Covid-19 pandemic***, how often did you experience power cuts or load shedding in your household? Please select the option that ***best*** describes these experiences. *(Required)*

Three or more days in a week
Twice per week
Once a week
Once every two weeks
Once a month

14. What do you do when you experience a power cut or load shedding? Please select one or more which applies to you. *Optional*

- ☐ Call the utility company.
- ☐ Use alternative energy sources such as
- ☐ generator Wait until power is restored.
- ☐ Check if other areas close by are also affected
- ☐ Other.

14a. If you selected Other, please specify:

15. What energy/fuel do you normally use for your cooking? Please select one or more which applies to you. *Required*

Please select between 1 and 6 answers.

Firewood

Gas

Electricity from an energy company

Electricity from an energy generator

Paraffin

15a. If you selected other sources, please write below the sources you use for cooking, e.g., plastic or grass.

16. What approaches do you normally use to keep warm during the winter months? Please select one or more which applies to you. (Required)

Electric heaters during winter month,

Open fire

Wearing double layers

winter

16a. If you selected Other, please specify:

Section 3: Energy Affordability

17. Do you think the cost of energy is too high for households?

- Yes
- No

Required

18. Can you afford to pay your energy bills? *Required*

- Yes
- No

19. Please tick below how you pay your energy bills? *Required*

Cash (Over the counter)
Debit pr credit card
Mobile Payments
Not applicable
Other

19a. If you selected Other, please specify:

19b. Please tick below which electrical meter you have in your household? *Required*

Prepaid meters (e.g., using a top up voucher)
Post-paid meter (e.g., payment by bill)
Not applicable
Other

19.bi. If you selected Other, please specify:

20. What methods do you use to lower the costs of fuel bills? Please tick any that apply. *Required*

Cooking using firewood rather than electricity.
Use solar for cooking.
Cutting down on cooking meals
Other

20.a It you selected Other, please specity:

Section 4: Energy and Quality of life

21. Does a power cut or load shedding affect your daily life? *Required*

I am not affected by power cuts or load.
shedding
It interferes with my life slightly.
It interferes with my life moderately.
It interferes with my life Severely.

22. Have you ever moved house from another location due to any energy issues? *Required*

- Yes
- No

22a. If you answer yes, please select your reason/s for moving.

Power cuts
Load shedding
Not connected to the main grid
Other

22.a.i. If you selected Other, please specify:

23. If your business relies on electricity, do you feel power cut problems have affected your source of income or employment?

- Yes
- No
- I do not have a business.

24. On a scale from 0-10, how safe do you feel safe in your area during load shedding or power cuts? Zero being unsafe and ten being the safest.

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
I feel unsafe	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	I feel safe

25. Would you like to participate in a one-to-one interview?

- Yes
- No

Interview contact details.

26. If you answered yes in question 26, please provide a contact name, number, or email to contact you to arrange the interview. All your contact details will be kept confidential. *Required*

Thank you, page.

If your answer was ***NO*** to question 25, please continue to the final page.
Thank you, page.

If your answer was ***NO*** to question 1, please continue to the final page.
Final page

Thank you for completing this questionnaire!

Page 1: Information Sheet

Community PARTICIPANT INFORMATION SHEET

Programme of Study: Social Policy (PhD)

Title of study: Understanding energy justice through lived experiences in Zimbabwe.

Name of Researcher: Margaret Probin E: m.probin@edu.salford.ac.uk

Name of main Supervisor: Dr Graeme Sherriff Email: G.Sherriff@salford.ac.uk

Name of Co-Supervisors: Dr Francesca Fois Email: F.Fois@salford.ac.uk and Andrew P. Clark Email A.P.Clark@salford.ac.uk

1. Invitation paragraph

My name is Margaret Probin, and I am studying for a PhD degree in social policy at the University of Salford. I would like to invite you to take part in a research study. Talk to others about the study if you wish or if you think they can take part in the study. The researcher will be happy to go through this information sheet with you and answer any questions you have. Alternately, you can contact my main supervisor Dr Graeme Sherriff on telephone 0044161 295 4987 or E: G.Sherriff@salford.ac.uk

2. What is the purpose of the study?

The purpose of the study is to understand better the lived experience of Zimbabwe communities who are affected by energy crisis.

3. Why have I been invited to take part?

We have invited you to take part due to your experience of energy crisis in Zimbabwe.

4. Do I have to take part?

No, the study is completely voluntary; if you change your mind about the study, you can withdraw at any point up to 2 weeks after taking part in the interview, video recordings without giving a reason. You can withdraw by contacting me via email: m.probin@edu.salford.ac.uk and highlighting your participant code. All data will be destroyed once you have withdrawn, and no problems will be encountered once you have withdrawn.

5. What will happen to me if I take part?

If you agree to take part in the study, you will: Take part in a one-to-one interview Undertake video recording. If you are from Harare Metropolitan Province, the researcher will invite you to participate in a one-to-one interview. You will meet with the researcher virtually once for the interview session, which will be used for this study.

Before the interview, you are asked to complete a pre-interview questionnaire to establish if you are from the study's geographical location and live there. The interview will last no more than 1 hour.

You will also be asked to video record your day-to-day activities in your homes over five days. You can record cooking, ironing and any other daily routines linked to energy use over five days. For online transferring purposes, videos should be 15 minutes recordings at a time, even if you will be recording throughout the day where possible. You will submit the video recording data to the researcher via the one drive secure link or direct to the researcher's email. All the video clips will not be shown to anyone outside of the research team.

Before or after the interview, if you have any questions, you can speak to me soon after the interview, or you can contact me using the details above. The researcher will ask your permission to record the interview to ensure the information's accuracy during the interview and keep the analysis.

The interview will take place somewhere that is convenient for you and

somewhere with fewer interruptions. It is also essential to get everyone who appears in your home video recordings to read the information sheet and sign the consent form. Lastly, the researcher will be chairing the interviews via video conference, and you will receive a link which the researcher will help you with the setup. What are the possible disadvantages and risks of taking part?

There are no expected disadvantages or risks to you taking part in the study. If you choose to take part in the interviews, some of the questions discussed may cause feelings of discomfort. However, if you feel taking part in the interview is causing you distress, you can ask the researcher to stop at any time without giving a reason. If you wish to take a break or rearrange the interview for a later date, this can be arranged where possible, and you will be given information about free counselling services available offered with the following organisation below.

The researcher will have the contact numbers of the free counselling services available in Harare. Mufakose Clinic and FORYOUTHBYYOUTH will the nominated to be the point of contact for participants who will face distress.
FORYOUTHBYYOUTH is a charity organisation which works with individuals between the ages of 10 to 35 years and has links with other organisations within the Harare Urban districts.

6. What are the possible benefits of taking part?

Your participation will be valuable to this research, and you will be entitled to a summary of the outcomes of this research for your information upon request at no cost to you. However, following the research the information you provide may help in understanding the experiences of energy crisis. The research may help identify strategies that can be used to support individuals who are affected, and the strategies may help improve energy supply problem and well-being. Your involvement will also make a difference in affected areas in Zimbabwe. Such differences include hospitals, enhancing online learning and making it better for students since energy crisis has been an obstacle to their academic work.

7. What if there is a problem?

If you have any complaints about the project in the first instance, you should speak to the researcher who will do their best to answer your questions. If they are unable to resolve your concern, you can contact any member of the research team. If you feel your complaint has not been handled to your satisfaction, you can contact the University of Salford ethics team to take your complaint further. (See details below)

Project Supervisor Dr Graeme Sherriff Email : G.Sherriff@salford.ac.uk.

Researcher: Margaret Probin email E: m.probin@edu.salford.ac.uk

Project Supervisor: Dr Graeme Sherriff Email : G.Sherriff@salford.ac.uk.

Ethics Chair of the School of Health & Society Research ethics panel ,

by emailing Chair: Prof Andrew Clark Email:ethics@salford.ac.uk

Researcher: Margaret Probin email E: m.probin@edu.salford.ac.uk

8. Will my taking part in the study be kept confidential?

All the information will be kept confidential, and all the received questionnaires/interview notes will be kept in a safe locked cabinet and electronic data will be password protected. And you will be identified by the individual codes given to each participant.
Data will be kept in adherence to the Data Protection Act 1998.

9. What will happen if I don't carry on with the study?

If you feel uncomfortable taking part in the study, and wish to withdraw, all the information, and collect data collected data will be destroyed and removed from study files.

10. What will happen to the results of the research study?

The results will be written up and presented as part of the PhD thesis and journal publication.

11. Who is organising or sponsoring the research?

The researcher is organising the project as part of a PhD degree in Social Policy, under the supervision of the above-named supervisor. Finally, if you agree, thank you for taking part in this study and if you choose to withdraw thank you for showing interest in the study.

12. Further information and contact details:

If you wish to discuss anything about the research,

please contact: Margaret Probin

Email: m.probin@edu.salford.ac.uk

Dr Graeme Sherriff

Email: G.Sherriff@salford.ac.uk

Counselling services

Mufakose Clinic Harare and FORYOUTHBYYOUTH will the nominated to be the point of contact for participants who will face distress. Telephone number 00263775462468. Page 2: Your Consent

Title of study: Understanding energy justice through lived experiences in Zimbabwe.

Name of Researcher: Margaret Probin

E: m.probin@edu.salford.ac.uk

Before you complete the survey, please read the following statements and, if you are happy to participate, please select 'Yes".

1. I have read the participant information sheet.

- yes
- no

2. I have been given the opportunity to ask questions about the virtual face-to-face interviews or via phone.

- yes
- no

3. I agree to participate in the study and for the researcher to collect data via one-to-one interview. And the video recording data I collect will be used for the study.

- yes
- no

4. I understand that I will not be personally identifiable. Any research outputs will be anonymised according to the principles established in the General Data Protection Regulations (GDPR) and the Data Protection Act 2018.

- yes
- no

5. I consent to take part in the research.

- yes
- no

5.a. Researcher's signature.

5.b. Participant's signature.

Page 3: Thank you very much for signing your consent for the video recording.

Thank you very much for signing your consent for the video recording.

Appendix 6: Participants' information sheet and consent form for Stakeholder

1 Section stage

Do you work in the energy sector?

- Yes
- No

STAKEHOLDERS PARTICIPANT INFORMATION SHEET

Programme of Study: Social Policy (PhD)

Title of study: Understanding energy justice through lived experiences in Zimbabwe.

Name of Researcher: Margaret Probin E: m.probin@edu.salford.ac.uk

Name of main Supervisor: Dr Graeme Sherriff Email: G.Sherriff@salford.ac.uk

Name of Co-Supervisors: Dr Francesca Fois Email: F.Fois@salford.ac.uk and Andrew P. Clark Email A.P.Clark@salford.ac.uk

1. Invitation paragraph

My name is Margaret Probin, and I am studying for a PhD degree in social policy at the University of Salford. I would like to invite you to take part in a research study. Talk to others about the study if you wish or if you think they can take part in the study. The researcher will be happy to go through this information sheet with you and answer any questions you have. Alternately, you can contact my main supervisor Dr Graeme Sherriff on telephone 0044161 295 4987 or E: G.Sherriff@salford.ac.uk

2. What is the purpose of the study?

The purpose of the study is to understand better the lived experience of Zimbabwe communities who are affected by energy crisis.

3. Why have I been invited to take part?

We have invited you to take part due to your energy crisis experience in Zimbabwe and work in the energy sector.

4. Do I have to take part?

No, the study is completely voluntary; if you change your mind, you can withdraw at any point up to 2 weeks after taking part in the interview without giving a reason. You can withdraw by contacting me via email: m.probin@edu.salford.ac.uk and highlighting your participant code. All data will be destroyed once you have withdrawn, and no problems will be encountered once you have withdrawn.

5. What will happen to me if I take part?

If you agree to take part in the study, you will:

One to one interview

The researcher will invite you to take part in a one-to-one interview. You will meet with the researcher virtually once for the interview session, which will be used for this study. Before the interview, you are asked to complete a pre-interview questionnaire to establish if the private or public energy sector employs you and sign a consent form. The interview will last no more than 1 hour.

Before or after the interview, if you have any questions, you can speak to me (researcher), or you can contact me using the details above and below. The researcher will ask your permission to record the interview to ensure the information's accuracy during the interview and keep the analysis data.

The interview will take place somewhere that is convenient for you and somewhere with fewer interruptions. Lastly, the researcher will be chairing the interviews via video conference, and you will receive a link which the researcher will help you with the setup.

6. What are the possible disadvantages and risks of taking part?

There are no expected disadvantages or risks to you taking part in the study. If you choose to take part in the interviews, some of the questions discussed may cause feelings of discomfort. However, if you feel taking part in the interview is causing you distress, you can ask the researcher to stop at any time without giving a reason. If you wish to take a break or rearrange the interview for a later date, this can be arranged where possible, and you will be given information about free counselling services available offered with the following organisation below.

Mufakose Clinic and FORYOUTHBYYOUTH are nominated to be the point of contact for participants who will face distress. FORYOUTHBYYOUTH is a charity organisation that works with individuals between the ages of 10 to 35 years and links with other organisations within the Harare Urban districts. Their contact number is listed in the last section of the information sheet.

7. What are the possible benefits of taking part?

Your participation will be valuable to this research, and you will be entitled to a summary of the outcomes of this research for your information upon request at no cost to you. However, following the research the information you provide may help in

understanding the experiences of energy crisis. The research may help identify strategies that can be used to support individuals who are affected, and the strategies may help improve energy supply problem and wellbeing. Your involvement will also make a difference in affected areas in Zimbabwe. Such differences include hospitals, enhancing online learning and making it better for students since energy crisis has been an obstacle to their academic work.

8. What if there is a problem?

If you have any complaints about the project in the first instance, you should speak to the researcher who will do their best to answer your questions. If they are unable to resolve your concern, you can contact any member of the research team. If you feel your complaint has not been handled to your satisfaction, you can contact the University of Salford ethics team to take your complaint further. (See details below)

Researcher: Margaret Probin email E: m.probin@edu.salford.ac.uk

9. Project Supervisor Dr Graeme Sherriff Email: G.Sherriff@salford.ac.uk.

Ethics Chair of the School of Health & Society Research ethics panel, by emailing Chair: Prof Andrew Clark Email: ethics@salford.ac.uk.

10. Will my taking part in the study be kept confidential?

All the information will be kept confidential, and all the received questionnaires/interview notes will be kept in a safe locked cabinet and electronic data will be password protected. And you will be identified by the individual codes given to each participant.
Data will be kept in adherence to the Data Protection Act 1998.

11. What will happen if I don't carry on with the study?

If you feel uncomfortable taking part in the study, and wish to withdraw, all the information and collected data will be destroyed and removed from study files.

12. What will happen to the results of the research study?

The results will be written up and presented as part of the PhD thesis and journal publication.

13. Who is organising or sponsoring the research?

The researcher is organising the project as part of a PhD degree in Social Policy, under the supervision of the above-named supervisor. Finally, if you agree, thank you for taking part in this study and if you choose to withdraw thank you for showing interest in the
study.

14. Further information and contact details:

If you wish to discuss anything about the research,

please contact: Margaret Probin or

Dr Graeme Sherriff

Email: G.Sherriff@salford.ac.uk

15. Counselling services information

Mufakose Clinic and FORYOUTHBYYOUTH will the nominated to be the point of contact for participants who will face distress. Telephone number 00263775462468.

Your Consent

Title of study: Understanding energy justice through lived experiences in Zimbabwe.

Name of Researcher: Margaret Probin E: m.probin@edu.salford.ac.uk

Your consent

Please read the following statements and, if you are happy to participate, please select 'Yes.'

Which energy sector work for?

- Government energy sector
- Privately owned energy sector

What is your role in the energy sector?

What best describes your gender?

- Male
- Female
- Prefer not to say
- Prefer to self-

I have read the participant information sheet.

- yes
- no

I have been given the opportunity to ask questions both virtual face-to-face interviews and via phone.

- yes
- no

I agree to participate in the study and for the researcher to collect data via this interview.

- yes
- no

I understand that I will not be personally identifiable, and any research outputs will be anonymised in accordance with the principles established in the General Data Protection Regulations (GDPR) and the Data Protection Act 2018.

- yes
- no

I consent to take part in the research.

- yes
- no

Researcher's signature.

Participant's signature.

To participate in this study, you need to be working for the energy sector. Thank you.

Thank you very much

Appendix 7 Final themes