NATIONAL UNIVERSITY OF LESOTHO

THE CONTRIBUTION OF HARAMAROTHOLE SOLAR PLANT PROJECT TO THE ECONOMIC DEVELOPEMNT OF LOCAL COMMUNITIES

DISSERTATION SUBMITTED

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DECLARATION

This dissertation is my initial work and has not been presented for examination at any other university. No part of this project may be reproduced without authorization from the author and the National University of Lesotho.

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DEDICATION

This work is dedicated to my family for their solid support and encouragement in the hard times of my research. Thank you for enduring my absence when you needed me.

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ABSTRACT
Research has shown that energy and development are two interdependent concepts. Globally scholars have conducted studies where they studied the relationship between the renewable

energy use and the growth of the economy. It was found that renewable energy has a great influence on economic development. Against this background, the research aims to assess the contribution of renewable energy project in particular solar energy project in Haramarothole to the local communities. The study used qualitative methodology in the form of case study where in-depth interviews were used. The study established that the establishment of solar project in Haramarothole has led to creation of jobs, infrastructure development and establishment of income generating activities. The study concludes that, Haramarothole solar plant project contributed to the economic development of the local communities through various economic activities and this has boosted the economic development of local businesses and also this has led to the local community being economically independent. The study recommends that in order to improve or enhance the economy of local communities, local communities should be encouraged to use solar energy as their source energy since it is cheap and affordable.

Contents

List of Figures

ACRONYMS

ARDL	Autoregressive Distributive Lag
ECM	Error Correction Model
GDP	Gross Development Product
IPP	Independent Power Producers
IEA	International Energy Agency
LEC	Lesotho Electricity Company
MoNR	Ministry of Natural Resources
NUL	National University of Lesotho
OECD	Organisation for Economic Cooperation and Development
SADC	Southern African Development Community
UNDP	United Nations Development Programme

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Energy is a main source of economic development for the reason that a lot of manufacturing and consumption operations include energy as a basic input (Greenstone, 2014). The scholar adds that, energy is one of the most vital aspect for enhancing the development of economy. In the same argument, Lloyd (2017) also posit that energy is critical for assuring quality of life and underpins attainments of 2030 Agenda for Sustainable Development. The scholar further mentioned that it is difficult to overstate the role of access to consistent energy as a critical factor of development. These works clearly show that energy and development are interdependent concepts. Against this background, this study will focus on assessing the contribution of Haramarothole solar plant energy project to improving the economic development of local community.

1.2 Background of the study

Research has shown that energy and development are two inter-reliant concepts. Internationally, scholars like Wang el at (2016), conducted a study in China whereby they researched on the connection between the renewable energy utilisation and the growth of the economy whereby they used a panel of OECD countries. They found out that renewable energy has a favourable effect on the development of the economy. As well, Zahoor *et al*. (2016) also researched on the impact of unpolluted energy investment on the growth of economy in China over the period of 1970-2016. They establish that unpolluted energy investment is certainly related with growth of economy in China. Moreover, looking at other international countries, Kais and Sami (2016) researched on the impact of energy use and the growth of economy on carbon $_2$ emissions in several states spanning in the middle of 1990 and 2012. The states were separated into two regional smaller group as follows: North Asian region and Latin American. The endings showed that energy use has optimistic impact on carbon emissions in all sections. Moreover, it is discovered that growth of the economy has a positive and a statistically

essential impact on carbon emissions European and North Asian region. Ahmad *et al*. (2020) also studied the relationship between sectoral renewable energy consumption and economic growth in the US economy for the period of 1950-2020 using the Fourier component augmented unit root ,integration and causality analyses for the transportation ,industrial, residential electric power and commercial sectors .The experimental results in the long run revealed that renewable energy granger cause growth through the new jobs it created, the restructuring of the economy which was a prerequisite for replacing fossil energy with renewable energy. On the other hand, casual relationships are less stable and methodology and sector specific in the short run (Ahmad *et al.* 2020).

In Africa, Gyimah *et al*. (2015), carried out a study whereby they were studying the direct and indirect effects of renewable and non-renewable energy use on the growth of economy in Ghana. In their research, they utilised the granger connection test based on information since 1990-2015. The research's outcomes show a link between developing economic activity and a growth in the consumption of renewable energy (Gyimah *et al.,* 2015). The research indicates that people in Ghana are now using renewable energy regularly than non-renewable energy and this also means economic development of Ghana will be growing. Moreover, scholars such as Bernard and Obi (2016) studied the impact of sectoral use of non-renewable energy on the growth of economy in Nigeria whereby they used the descriptive statistics pie chart and ERC model techniques. The research used non-renewable energy used up by the manufacturing division, farming division, and transportation division, business and housing division as variables of study. The outcomes establish that almost the variables in this research contribute to the growth of the economy significantly. The research also establish that the housing division spent extra energy than the other divisions and contributed impressively to the growth of the economy. The research at that time suggested the creation of guidelines

targeted at inspiring the manufacturing division to boost growth of the economy and encourage energy use by the manufacturing division in Nigeria.

Regionally, related studies on energy and economic development have been carried out. Konuk *et al*. (2017), studied the link between the growth of the economy and energy used in Namibia. Their results proposed that biomass energy use and the growth of the economy go hand in hand. On contrary, Doytch and Naryan (2019) carried out the study whereby they were assessing the effect of manufacturing growth of the service on the utilisation of non-renewable and renewable energy sources. The results of their research reveal that improved development industries such as the service industry in advanced economies and the industrial divisions in developing economies benefit from renewable energy**.** Moreover, studies on energy and the development of the economy in the region by Khobai (2020), studied renewable energy production and government spending on the growth of the economy of South Africa and Botswana. The research utilises interval sequences information since 1980 to 2021 gathered from the World Bank. The research completed the DFGLS and PP unit root test, ARDL Bounds tests and linked diagnostics tests. The experimental proof discovered that renewable electricity production has a good impact in South Africa and a negative effect in Botswana on the growth of the economy.

In Lesotho, security of electricity is vulnerable by rising energy need with the highest power arrears being met through import from Eskom. Chang (2015), carried a study on the main factors behind the growth of electricity utilisation by investigating the role done by economic development, industrial enterprise and urbanisation in Lesotho's energy growth connection over period of 1973 -2012. The outcomes revealed that the growth of the economy, financial development and industrial enterprise are certainly connected to electricity utilisation in the long run. Furthermore, Chang (2015), posits that the overview of energy policy has certainly impacted on electricity demand in Lesotho, partially clarifying the perceived rise in family

electrification level in latest ages. The 1998 political instability, though, decreased electricity demand only in the short-run. These outcomes indicate that regulations and political unsteadiness as well count in examining the dynamics of energy demand. The research as well show data of the response causality in the middle of economic development and electricity use, and between urbanisation and the growth of the economy while former outcome shows that a rise in credit extension by financial institutions in Lesotho plays an essential part in rising energy demand. There is also a unidirectional connection from industrialisation to urbanisation, from urbanisation to economic development, and from electricity utilisation to industrial enterprise. The outcome shows that the growth of the industries in Lesotho needs more energy as an input in production of goods and services. Hence, energy people who, make policies in Lesotho have to make sure that the accessibility of electricity by encouraging efficient energy use and exploring other sources of energy. This could also reduce dependence from expensive electricity imports (Chang 2015).

Against this background, this research sought to assess the contribution of renewable energy project in particular solar energy project in Haramarothole. Haramarothole solar plant project is a 70MW solar power project located in Mafeteng district that operate over 220 hectares (Motsopa, 2022). The solar power plant has improved access to solar energy in Mafeteng and is expected to improve access to solar energy in Lesotho as whole by 2024 (Motsopa, 2022) This study will add new knowledge on non-renewable energy and development in general but with a specific focus on Lesotho's Haramarothole solar energy.

1.3 Statement of the problem

The problem is on how solar plant energy project contribute to economic development of local communities in Mafeteng Lesotho. A lot has been researched on energy and economic development by different scholars (Konuk *et al*., (2017): Zahoor *et al.* (2016): Doytch& Naryan (2019): Khobai (2020): Marinas *et al.* (2018): Hdom (2019): Oryani *et al*. (2020) and Ahmad

et al. (2020). However, not much has been studied on the contribution of solar energy projects as part of renewable energy to economic development of Lesotho. There is therefore an essential need for the study that assess the contribution of solar plant project to the economic development of communities. Furthermore, while there is evidently more than enough literature pertaining the energy and development very little attention has been given to solar energy and economic development specifically. There is a gap on how solar plant energy projects under renewable energy can contribute to the economic development of community. The study will therefore contribute new knowledge on economic development brought by solar plant project like job creations, development infrastructures and business opportunities to the local communities.

1.4 Justification of the problem

The study is significant especially to the academia in that it will add new information and knowledge to the already existing literature about how renewable energy contributes to the economic development of rural areas through engaging in projects that improve their economic status. The stakeholders such as the Ministry of Energy, may use findings of this study to improve on policy and programme formulation regarding use of solar energy in Mafeteng District and the Lesotho. Haramarothole Solar Plant project was chosen because it was the first energy project in the District of Mafeteng to be established which generates and produces solar energy.

1.5 Objectives

To assess the contribution of Haramarothole Solar Plant Energy Project to infrastructure development to the local communities.

To examine the role of Haramarothole Solar Plant Energy Project in employment creation of local communities.

To assess contribution of Haramarothole solar plant energy project in income generation to the local communities.

1.6 Research Questions

The study is guided by the following key questions

What is the contribution of Haramarothole Solar Plant Energy Project to infrastructure development to local communities?

What is the contribution of Haramarothole Solar Plant Energy Project in employment creation to the local communities?

What is the contribution of Haramarothole Solar Plant Energy Project to income generation to the local communities?

1.7 Theoretical Framework

The study used capability approach as a theoretical framework. Capability approach was developed by Amartya Sen around 1980s as an approach to welfare economics (Palatty, 2016). Capability approach is a regulative approach to human welfare that focuses on the real ability of a people to achieve lives they value (Ntibagirirwa, 2014). The main emphasis of the capability approach is enhancing access to the tools people use to live a satisfying life. Capability approach has been used in the human development (Palatty, 2016).

Capability approach is applicable to this research as the Haramarothole solar plant energy is seen as an improved tool that community (people) use to live a fulfilling life. This means that solar project is considered as a tool where youth or community work in the project with the aim of living a satisfying life.

1.8 Definition of key terms

Solar Energy-Breyer **(**2022**)** defines solar energy as a renewable energy which is limitless and acquired from the electromagnetic radiation from the sun. The scholar further states that solar energy produces electricity and heat in a way which is completely free and sustainable. As for

Susser (2017), solar energy refers to converting sunlight into electricity. Therefore, solar energy is the sunlight energy composed and used to make available electricity. This sunlight energy is a sustainable and clean source in the sense that it does not produce greenhouse gas emissions and shows to be environmentally friendly.

Economic Development –Panth (2020) define economic development as a structural transformation of an economy by introducing more mechanised and updated technologies to increase labour productivity, employment, incomes and standard of living of people. For Delicado (2016), economic development is the creation of wealth from which community benefit. Economic development therefore involves developments or activities that bring money as results or as the end product.

1.9 Limitations

The researcher faced some challenges when during collection of data. The challenges include; focus group discussion that could not be held or succeeded due to message from village chief that reached to people concerned lately. The researcher had to interview all those people who were supposed to form focus group one by one to find the data that was needed in this study. The researcher also had to increase the number of respondents with three more so as to obtain more data from various respondent since the focus group did not succeed. The above mentioned challenge made the researcher to take unexpected lot time in the fields.

1.10 Research Structure

Chapter one will focus on introducing the research problem that is the connection between energy and development. In Chapter two the researcher will review literature related to energy and development and chapter three will focus on research methodology to be used in this study. Chapter four's focus is on data presentation, analysis and discussion, the researcher is going to make analysis basing her on the findings from the respondents. Lastly, in chapter five which is

the conclusion and recommendation, the researcher will conclude first and make recommendations based on the findings from the field.

1.11 Chapter Summary

This chapter basically presented the research by an introducing the research problem highlighting the background of the study, the statement of the problem, research questions and objectives. The research also dealt with the theoretical framework, defined key terms. Lastly, the study provided limitations to the research and gave the research structure.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews a selection of present literature on economic development brought by renewable project. An attempt would be made not on literature that is specific to Lesotho but also literature that is on the other parts of the world. Therefore, the chapter will provide an overview in a funnel structure, meaning the overview will begin at worldwide level, continentally, regional, and then in detail to Lesotho.

2.2 Renewable Energy and development: A historical review

Energy is certainly a significant component during development route. It is claimed that deprived of energy, is nearly difficult to reach sustainable development (Susser, 2017). Energy is certainly a significant feature of development that touches nearly every single part of human life, and an important necessity for development of people.

Renewable energy and development have a long history of improving people's lives. Renewable energy system was invented in the mid-1970s, catalysed by skyrocketing oil prices (Breyer, 2022). Ever since the mid-2000s, renewable energy system has quickly changed into a noticeable research field covering an expansive and growing number of research groups and organizations across the world (Breyer, 2022).

The sufficient worldwide energy resources have significance that is equally to the world and the countries individually in relation to sustainable development, administration of the economy and welfare of the community. The scholars track the starting point of the link between renewable energy and development from the domestication of fire some 500,000 years ago (Walwyn, 2015). According to Walwyn (2015), from current socio epistemological and anthropological angle, it is the industrial revolution of the nineteenth century which stamps the link between renewable energy and development. The idea of energy in its contemporary sense is quite new. It shoots from the change of physics in Europe in the first half of the

nineteenth century which was carefully bound with the innovative development of heat and electrodynamics engines and the invention of the ideas of automatic industry by the engineers (Walwyn, 2015). The scholar further mentioned that classifying the development in the western lifestyle since the nineteenth century ahead was the begin of contemporary connection between renewable energy and development which enable people to go away from linear, developmental theory of economic history of world development.

The speedy development of renewable energy is grounded on the creation of inner combustion engine which allows motor vehicles and aircraft to be drove, making many new technical means of transporting commodities and people and acceleration the speed of transportation in the modern world (Breyer, 2022). Moreover, as Lu (2019) and Breyer (2022) highlight that the social invention of speed and acceleration started with the steam engine mounted on wheels and metal rails whose heyday started between 1970- 1980. The steam locomotive powered by coal or wood, consequently become the symbol modernity and progress propagated in colonial empires towards the end of the nineteenth century. According Breyer (2022), this process of industrial enterprise insinuates quitting from a certain state of nature society, which has its foundation in a deeply rooted ancient momentum. Walwyn (2015) states that Europe was industrious long before it was industrial, so was China. The Vitruvian paradigm of hydraulic technology is well and truly blown out of the water by the revolution of fire of fire engines and the increasingly rapid spread of the industrial use of fossil fuels namely coal, oil and natural gas (Walwyn, 2015).

Moreover, looking at energy and economic development at international level, Oryani *et al*. (2020) studied the impact of energy generation combination on the growth of the economy and emissions in Iran. Yearly time sequences information was utilised in the research, which spanned the years 1980 to 2016. The research utilised a SVA model with Blanchard and Quah

long run limitations to observe the connection in the middle of the variables. The experimental results indicated that expanding the portion of renewable energy in the grid has good impact on economic growth of Iran. To eliminate carbon emissions, the scholars suggest constriction of guideline on energy-intensive industries such as power plants and transportation (Oryani *et al*., 2020).

Furthermore, looking at what other scholars had said about energy and economic development at international level, Hdom (2019) studied the links in the middle of carbon dioxide, fossil and renewable energy production, and the growth of economy in South American states. The research illustrated on panel data covering 1980 to 2010. To observe the connection between the variables, the research utilised a panel ADL model. The experimental findings revealed the bad connection between fossil electricity generation in the short and long run, however the connection to the growth of the economy in the long run is unimportant. The scholars recommend South American countries to continue generating long-term electricity from renewable sources (Hdom, 2019).

Furthermore, Marinas *et al.* (2018) studied the relationship between the growth of economy and renewable energy use for ten EU fellow states since 1990-2014 from Central and Eastern Europe. The research used the Auto-regressive Distributed Lag (ARDL) approaches to examine the long run and the short run connection between the variables of the research. The research indicated the move to the new energy model in the short run and the long run on the other hand, linked to the long-term steadiness of the variables in research. As per their research, the outcomes discovered that gross domestic product and renewable energy use had a good in the short run in Romania and Bulgarian, whereas in Hungary, Lithuania, and Slovenia, rise in renewable energy use elevated the growth of the economy. Also, the bi-directional connection between renewable energy use and the growth of the economy was confirmed in the long run for all states in this investigation. The research hence studied the feasibility of the Europe 2020

objectives of elevating energy efficiency and planned community guidelines to reach these aim. On the other hand, Khobai (2018) carried out the study in South Africa, on the connecting relations among renewable electricity production and the growth of economy. The research utilised three-monthly information starting from the first quarter of 1997 to the fourth quarter of 2012. To observe the link in the middle of the variables, the researcher utilised a vector error correction model and granger causality tests. The experimental results showed a one-way connection between electricity generation and the growth of economy, besides the point that electricity production from renewable energy sources improves the growth of economy. In compliance with the scholars, the South African government have to make an intensive power to decide on energy guidelines that do not suppress the growth of the economy.

Furthermore, Sekantsi and Timuno (2017) researched the leading factors of accumulating energy need in Botswana utilising the Autoregressive Distributive Lag (ARDL) bounds testing method and the Error Correction Model (ECM) between 1981 and 2011. The research studied the part of development of the economy, industrial enterprise, and urbanisation in Botswana's energy. The outcomes of the research indicated that the growth of the economy, financial development, and industrial enterprise have a good influence on electrical energy utilisation, while urbanisation only rise electricity use in the long run. The outcomes of the research recommended that people who make policies should think through the rise in electricity demand accumulating from the development of economy, urbanisation, and industrial enterprise in their energy utilisation planning in the economy to get rid of energy disaster. Additionally, people who make policies have to finance in renewable energy source to get reasonable energy source (Sekantsi and Timuno, 2017).

The reviewed literature reflects how renewable energy has a huge impact on development but mainly on industrialization. It is against this background that the study intends to investigate how renewable energy contribute to the economic development of Haramarothole community in Lesotho.

2.3 Renewable energy and community development: Opportunities and benefits

Various studies on renewable energy, view renewable energy as a network to development and live change in the communities. It has been shown with no hesitation that renewable energy can and has impacted the community development positively. There are noticeable symbols of change in several the areas of human development especially in the communities (Wlokas, 2015). Studies show that renewable energy have positively impacted development of the people in most of the parts where various renewable energy developments have been executed. It has impacted in different ways and these are, provision of light, health benefits, environmental benefits, economic and business opportunities job opportunities and capacity building and community empowerment opportunities.

2.3.1 Provision of light

There has been outstanding impact of renewable energy in the upgrading of provision of light in a lot of families and societies. Studies revealed that some of the development of solar energy on rural development in India, include the provision of energy for children to light when they study and this could result in major enhancement in their learning journey (Breyer, 2022). The scholar further argues that solar energy grants students in the remote regions an opportunity to have plenty of time to do their school work in the evening with improved quality of light. Scholars such as Yenneti (2015) also view community electrification as vital for lighting up schools for improved education achievement. Renewable energy has with its social benefits as well and can increase security by providing light. In Togo, renewable energy is used up for the lighting, cooking, business applications and applications for the advancement of new

sustainable technologies, which is essential bearing in mind that Togo is presently one of the countries which is in the highest emitters of greenhouse gas emissions (Susser, 2017). Moreover, the literature revealed that there is development of renewable energy sources, as well as the wind power sector, improved the energy security through expansion and distribution of electric power production in Comoros (Lu, 2019). It has been argued that in Comoros few very large power plants produce electric power. In case of a failure of any of them, electric power would not be available to even a few hundred thousand houses. The power cut is becoming a more common incident in Comoros because of violent atmospheric phenomena triggered by the climate change (Lu, 2019).

2.3.2 Health Benefits

There is no uncertainty that the usage of renewable energy is beneficial in terms of preventing international destruction and reducing the influence of climate change on both humans an environment. Renewable energy sources, which are crucial to health problem mitigation, specifically air pollution-related health issues such as TB, asthma and chronic bronchitis can reduce pollutants and thereby improve air quality and human health (Fotourehchi, 2017). Different scholars have pointed out the impact of renewable energy on health enhancement in the remote areas. In India renewable energy is vital in enhancing the health of the disadvantaged places that are not joined to the main electricity grid (Walwyn, 2015). Renewable energy where it has been applied in those regions has shown to be very useful specifically solar energy. In India, literature on the impact of renewable energy in rural development shows that solar lighting has aided various families to conquer health issues which lead to kerosene use and candle burning in the closed rooms (Wlokas, 2015). It is claimed that renewable energy in particular solar energy has an essential healthiness advantage because it decreases air pollution more especially in the house and the risk of fire since it alternates the usage of kerosene (Bulavskaya, 2016).

2.3.3 Environmental Benefits

Literature revealed that the role of renewable energy is also reducing greenhouse gas. A study on a housing department in Bangladesh, revealed in housing sector, secretions of greenhouse gases are mostly produced from gas oil (kerosene) and biomass (Fotourehchi, 2017). Yenneti (2015), also perceives the way out to the environmental complications as renewable energy especially wind energy and solar energy. The scholar provides the main root of climate change being among other reasons is the use of biomass therefore there are a lot reasons to move away from the use of biomass to wind and solar energy. The scholar further speaks of the environmental complications existing depending on fossils fuels and provide that the dependence on unsustainable energy sources is no longer required. Moreover, the solution over fossil fuels being the shift to a sustainable energy system based on a high efficiency and renewable sources as well as smart grid and storage solutions (Yenneti, 2015).

Moreover, the studies have shown that biomass such as oil, gas and coal are mainly used by a lot of countries in Africa to meet their energy needs. These sources of energy have been well-known as having very bad consequences for environment. As, in Ghana the major cause of climate change is known as the use of biomass in unvented cooking stoves facilitates indoor air pollution (Fotourehchi, 2017).

In addition, Walwyn (2015) observes the significance of renewable energy by observing at the risks and the threat caused by fuel burning that accumulates the already existing greenhouse gases which result in global warming. The scholar sees solar concentrator energy in Cameroon as a solution and that it is predestined to a bright future because of its ability to power the globe. However, the scholar also provides that harnessing this free energy at high efficiencies is considered as a challenge even to the engineers.

2.3.4 Economic and Business Opportunities

Renewable energy has a direct connection to economic growth. Lu (2019) argues that in Bangladesh renewable energy contributes to creation of jobs and granting people an opportunity to work for lengthy hours nightly. The literature revealed that economic activities operate lengthy hours in the evening ever since the installation of solar home systems and this result to the enhancement of economic activities inside and outside families (Yenneti, 2015). The benefaction of solar energy to the growth of the economy is as well observed in terms of the part it takes to eliminate the price of energy to the people who are not within urban areas, and this result to the costumer excess and the way it aids to encourage the growth of home business therefore an improvement to the household's income growth (Yenneti, 2015). The research on solar energy and rural development which was carried out in Rema, Ethiopia, it shows that the establishment of the growth of home business which result to the strengthening of the households' income in Rema (Walwyn, 2015).

Moreover, studies on the cost analysis of concentrated solar power plant with thermal energy storage system in Tanzania, states that concentrating renewable energy power plants with thermal storage system can lead to economic benefits for the developing countries because of its less business expense (Walwyn, 2015). The scholar further states that this sort of power plant is not adversely affected from fuel price instability. Furthermore, the literature reviewed shows that in Botswana renewable energy entices investments into the society and also generate chances for local businesses already existing in the society (Delicado, 2016). The scholar further mentioned that various types of services and contracts benefit from renewable energy development: large renewable projects generate tax revenues to the local government, eventually benefitting a number of societies by decreasing the tax problem and permitting increased public service and economic and society development.

2.3.5 Job Opportunities

In China, renewable firms have turn out to be the world's largest solar photovoltaic producers, by 300,000 people hired in this division (IEA, 2015). The literature revealed that the solar heating and cooling account for around 800,000 occupations, and China is considered as the world front-runner in solar energy with 80% of universal installations. The concentrated solar power is still in its early phase as matched to photovoltaic solar heating, as it can boast only 37.000 jobs even though most of the jobs are indirect jobs. Moreover, studies have shown that Europe has been the front-runner in wind energy, both in the manufacturing of wind turbines and parts and the development and operation of wind energy in the areas in so doing generating a lot of direct and indirect green jobs commonly in the operation divisions and maintenance divisions (Fotourehchi, 2017). According to IEA (2015) the renewable business is growing rapidly to other parts of the world such as in countries like United State and India. Furthermore, some nations, for instance Japan, Australia, Brazil and Mexico are gradually increasing their wind energy and also generating jobs in those regions. Furthermore Yenneti (2015) investigated about the distributional justice concerns in energy and development in India. The study revealed that in India, solar plant energy was seen as development, which resulted in a lot of unskilled and skilled people being hired for the project. Even though most of the jobs were generated by the solar plant energy in India, they were mostly low-skilled and paid little.

According to Bulavskay (2016) renewable energy projects in some of the regions in Madagascar created a lot occupation in early and impermanent phases of projects mostly during construction, installation and manufacturing. However, few positions were long-lasting, forming the incentive for workforce employment planning and coordination. These means that, they created several jobs with a lasting benefit for a country and its workforce.

The scholar further argue that these include positions in the areas of development and planning, engineering, financing, instalment, operation and management.

In South Africa, the initial contribution of the solar plant to the people was in solar plant building, in the middle of November 2013 and November 2014. The project hired almost 1 000 home-grown village members, of which 92 % were uneducated labourers with no education qualifications in the society and 26 people were permanently employed and this comprised an engineer, 15 semi-skilled security guards, and ten unskilled general labourers (Ndlela, 2020). Further, the South African independent power producer had to look for employees from neighbouring cities because they could not get enough local people to carry out other of the duties. In Lesotho, during construction of Muela hydroelectricity power plant a lot of people close to the project got employed. A lot of people got jobs in the initial phase of the project, though they were temporary positions (LHWP, 2015). Positions which were offered in the first phase of the project were, security guard positions, cleaning positions, labourers. As time goes on the construction started searching for expertise for different fields in the projects such as architectures, plumbers, welders and community liaison officers and still people who were considered first were community members nearby the Muela hydroelectricity power plant (LHWP, 2015).

2.3.6 Capacity Building and Community Empowerment Opportunities

When people turn out to be more specialized and accumulate abilities in the new business, their ability to acquire and create is improved. Quite a lot of rural areas have advanced specific organizations and the ruling classes to work with renewable energy deployment, often in reaction to large investments and top-down national policies (Delicado, 2016). This dynamic has been seen both in areas where home-grown residents completely support renewable energy, and in areas where the residents are contrary to potentially dangerous developments. The scholar further states that the case studies disclose the establishment of a new authority

model in which people are becoming highly vocal and visible to hand over decision-making influence to traditional institutions, as well as local governments. In Senegal for example, rural residents have started electing contrary to wind energy nearly twenty years back, as they did not want to host new turbines in their landscape. Therefore, it is no more possible to install new wind turbines or to replace the old ones in some of Senegal provinces, regardless of the good quality of the local wind resource (Delicado, 2016).

A lot has been researched on renewable energy and community development in general by different scholars however not much has been studied on the contribution of solar energy projects as part of renewable energy to economic development specifically in Lesotho. There is there is a literature gap hence this research seeks to examine the creation of employments and income generation activities that are associated with renewable energy in Mafeteng with specific reference to Haramarothole solar plant project.

2.4 Solar Energy and Development

A lot of o solar energy project inventors work with the governments to finance in development like broadband internet, roads and bridges profiting home-grown businesses as well as the project. They as well offer compensation that turn out to be an extra stable source of income for landowners (Breyer, 2022). Literature has revealed that solar energy has positively impacted growth of community in many places where various solar energy developments have been executed. Solar energy has impacted development through among others road construction and community electrification.

2.4.1 Road construction

Globally, the Charanka solar energy park has led to development such as construction of roads in India. People of various communities in Charanka India emphasized that there was a need for the basic facilities therefore the project provided the people of Charanka with some basic development such as paved roads, schools, clinics (Yenneti, 2015). Because of

the improvement of the site and delivery of solar panels to it, a 30kms road was built from beginning to connect the solar park site and the National Highway (Yenneti, 2015)

2.4.2 Community Electrification

Solar energy can eliminate the fuel shortage which can be a usual characteristics of rural areas, by permitting remote communities to produce their own energy rather than to purchase expensive conventional fuels (Susser, 2017). In Morocco, more than one-third (35%) of all families living in fuel shortage , this implies that families need to use more than 10% of their income on heating; 13% of families have to use more than 20% of their whole income on keeping warm (Susser, 2017). The development of off grid renewable energy systems, especially for heating has aided in finding the solution to this issue. The same cases were seen in the DRC areas, where the use of solar heating has reduced local energy costs by 30% (Susser, 2017). In the DRC mostly in the remote areas, where job opportunities are scarce the use of solar energy has been of great use as people do no longer struggle about energy use more especially for lighting and cooking and many more.

Lesotho is extremely reliant on biomass such as wood, animal dung, coal trade in South Africa, and petroleum for energy (UNDP, 2018). The studies have shown that the Muela hydropower station under the Lesotho Highlands Water Projects is the only current working rural electrification station in Lesotho which generate 72 megawatts through the usage of water as a renewable source. As a result, the Lesotho Electricity Company still remains to be the only power station that procures more than half of the country's electricity requirement but it is non-renewable energy. In 2006, Lesotho presented the Renewable Energy Based Rural Electrification Project supported by the UNDP and this kind of projects were done mostly in the rural areas of Lesotho with the aim of promoting rural community electrification as it is cost effective and environment friendly The project, which was completed in 2013, intended to promote off-grid renewable energy access in three districts Mokhotlong, Thaba Tseka, and

Qacha's Nek (LEC, 2016). The development was not successful where only 1,537 of the 5.000 Tier 1 solar home systems targeted were rolled out by 2012 (LEC, 2016). Moreover, the literature revealed that One Power Africa which is the main player in the market of the solar energy have signed the first and only mini-grid concession in Lesotho, for a trial mini-grid in Ha Makebe, a village in the Berea District of Lesotho (UNDP, 2018). As a result, Lesotho with its stakeholders such as Ministry of Natural resources have made a lot of initiatives in promoting community electrification through solar energy for better development of the communities. Although scholars have studied on solar energy and development, studies on solar energy and economic development have not been done in Lesotho therefore, the researcher seeks to investigate the role of solar energy projects to the economic development of Haramarothole community.

Studies have been carried out on by different scholars on solar energy and development but not much has been studied on the infrastructure development by solar energy projects. The researcher seeks to analyse and identify the infrastructure development of Haramarothole community by Haramarothole solar plant project. The findings will be measured against the lifestyles that were lived by the Haramarothole community before the installation of the Haramarothole solar plant.

2.5 Chapter summary

The reviewed literature reflects that renewable energy has its own benefits and opportunities and these are provision of light, health benefits, environmental benefits, job opportunities, economic and business opportunities and capacity building and community empowerment opportunities. Reviewed studies also reviewed that solar energy is viewed as a channel to development especially for people who are living in remote areas. It led to development such as road construction and community electrification. As a results, the revealed literature reflects that renewable energy and development are two interdependent concepts and have long been

there with their remarkable impacts on the communities, the literature also revealed that there are so many benefits and opportunities through renewable energy for community development which makes the renewable energy the most cost effective and reliable source to be use by the community mostly in the remote areas. Lastly the revealed literature reflects that solar energy projects as a type of renewable energy plays a vital role to the development of the community with reference to the infrastructural development.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research procedures which were applied in carrying out this study. It explains how the proposed study objectives were reached and attained under this research. This chapter consists of; research design, research approaches, study area, sampling procedures and techniques, data collection methods, data analysis, ethical considerations.

3.2 Area of study

The research was conducted in Haramarothole in the district of Mafeteng, Lesotho. Mafeteng district is one of the ten administrative districts of Lesotho. Mafeteng is situated in the southern part of the lowlands of Lesotho. Mafeteng district lies about 80km southwest of Maseru. It is one of the district that is graded as prone to high crime rate due to high rate of unemployment. There were 49% economically active people in Mafeteng and this include Haramarothole community (Bureau Statistics, 2016). Haramarothole village consist of four hundred and twenty-six people this include two hundred and five male population and two hundred and twenty-one female populations (Bureau Statistics, 2016). Haramarothole village in Mafeteng has one of the biggest renewable energy plant which uses sunlight to generate energy. Haramarothole Village is situated 15km east of Mafeteng town. The Haramarothole solar plant project is situated about 20km from Mafeteng main road. The project is owned and operated by two Chinese construction company namely: Sinoma International Engineering and TBEA Xinjiang New Energy.

3.3 Research Approach

This research used qualitative approach. This approach was used for the reason that the nature of the study is descriptive. The concentration of the research also revolved around obtaining an in depth understanding of how the Haramarothole solar plant project has contributed to economic development of Haramarothole community. According to Marshall and Rossman (2016), qualitative methods are utilised to discover the meaning of people's world. It aims at gathering information in natural settings rather than artificial and it works inductively building

up theory from observations. The suitability of the qualitative methodology to this study was premised on the understanding that the approach allows subjective and in depth understanding as well as assessment of the perceptions of the people of Haramarothole on the concept of solar energy and economic development.

3.4 Research Design

The researcher utilised the descriptive design in the form of a case study. Research design a blue print for carrying out scientific study on what questions are to be responded, how partakers are to be nominated, how data is to be collected and interpreted and how valid conclusion can be drawn (Mortari, 2015). The study involved an in-depth study of a single case study of Haramarothole community. The reason for adopting the case study design simply was the need to get a deeper understanding of issues or phenomena from their natural setting, that is, the context of Haramarothole solar plant project. Moreover, adopting case study in this research permitted the investigator to have an in-depth analysis of o sources where the data was obtained. According to Marshall and Rossman (2016) research design helps a research to be as efficient as possible yielding maximal information. As a road map, it helps to decide the best way to reach the target.

3.5 Study Population

The research was carried out in Haramarothole community in Mafeteng. The target population of the study consists of community leaders, construction workers and their families, project management, local business community as well as Ministry of Natural Resources. Mortari (2015), defines population of the study as a collection of people or items with similar characteristics. He further adds that study population refers to the whole set of people or items to which researchers are concerned in generalizing the conclusions.

3.6 Sampling Procedure

To obtain respondents suitable for my study, a purposive sampling was utilised. The purposive sampling or judgement selective is a one of the category of non-probability sampling in which

a researcher depend on her own judgment when selecting members of population to take part in the research (Belotto, 2018). This non-probability sampling technique was selected because it focused on particular characteristics of a population that were of interest, respondents who met the objectives of the study. It is through purposive sampling that the researcher managed to select key respondents. Taherdoost, (2021), defines a sample as a representative group of a large population. The researcher chose to deal with an optimal sample size for the purposes of obtaining quality data. The sample size of sixteen participants were selected.

The researcher purposively selected households who benefited from the project through employment for the research because of their experience with life during the time when the project in phase one was still operating as well as after retrenchment. These households had experienced both the benefits and challenges of the project. Moreover, the researcher purposively selected the non-beneficiary households as they are the members of the community of Haramarothole and they also experience and witness the impact of the project on the community. The researcher selected the community leaders being the chief and the councillor because they are custodians of the community values and had relevant information on the projects done in their communities. The project manager or representative is also involved in the day to day administration at the project hence, he was a key respondent of the study. The Ministry of Natural Resources under the government of Lesotho was purposively selected as they are the main stakeholders of Haramarothole solar plant energy project.

3.7 Data Collection methods

The data was collected through in-depth interviews. The researcher among other data collection methods used in-depth interviews. Maree (2016), defined in-depth interview as the qualitative data collection method that involves conducting intensive interviews with a small number of respondents to explore their perspectives on a particular idea or situation. The advantage of in-depth interview in this research study is that it allowed the interaction between the researcher

and the respondents for the purpose of producing knowledge on how Haramarothole solar plant project has contributed to the economic development of Haramarothole community. Moreover, the researcher adopted this method to this study because of its flexibility which allowed the researcher to make some follow up questions to get more in-depth and accurate information as well as seeking clarifications on unclear responses. Furthermore, as the means to address the unclear responses from the respondents the researcher used probing. In this study, a total of sixteen (16) respondents were engaged through interviews. These included, the representative from the Ministry of Natural Resources, the representative from Haramarothole solar plant project, ten households, two community leaders, two shop owners

3.8 Data Collection procedure

Data collection process involves the techniques that the researcher is expected to observe during data gathering. The researcher sought the permission for carrying out the study and the introduction letter from the Department of Development Studies based at the National University of Lesotho was processed. The researcher used the introductory letter from the National University of Lesotho to seek permission from the community leadership Moreover, the introductory letter from the National University of Lesotho was used to seek permission from the project management and the Ministry of Natural Resources. Thereafter the community leadership approved the request from National University of Lesotho and the permission was granted to the researcher. The selected households which were involved in the study were given the interview guide before the visit, for the respondents to be familiar with questions. Voice recorder during the interview was used for capturing data.

3.9 Ethical Considerations

Ethics is a matter of moral understanding to the rights of others (Maree, 2016). Observing ethics or rather moral values is a critical component of the research process because it contributes to the reliability, authenticity and validity of the data that the researcher obtains

(Maree, 2016). Ethics are generally conceptualized as relating to human conduct, whether it is good or bad. If ethical considerations are disregarded, the outcome of the whole research project may be academically pathetic. Ethical issues that the researcher observed include debriefing, informed consent, confidentiality and anonymity as well as the right of withdrawal of participation.

The researcher observed the principle of debriefing under ethical consideration. Debriefing refers to the process of sharing information about the research with the participants (Belotto, 2018). Under debriefing, the researcher made sure participants were made aware of the objectives of the study and intention of the research so that they would contribute with clear conscience. It was during this stage that the researcher clarified any doubts within the participants and make them feel comfortable in participating in the research. Participants at times would ask about the benefits of study to them. The research was clear to the participants by way of telling them that the research was purely academic and would help people within the Ministry of Natural Resources in the policy and regulation making. The researcher also observed the principle of voluntary participation of the informants. Voluntary participation means that all the participants are free to choose to participate or to take part in the research without pressure or coercion (Maree, 2016). During the research participants were guaranteed of the right to their privacy.

The re searcher also observed the principle of informed consent. Informed consent is one of the principle of research ethics which its intent is that participants can take part in the research freely with information about what it means for them to take part and they give consent before they participate in the research (Belotto, 2018). This was to make sure that participants would contribute freely and voluntarily. In other words, the participants were not forced to contribute their views. In most cases, the researcher produced the informed consent forms which he explained to the participants before they signed to agree with the contents. Signing means the

respondents agree to take in the investigation. The researcher even though still emphasized to participants that they still had freedom to withdraw from or continue with participating even if after having signed the informed consent forms.

The principle of confidentiality and anonymity were also of important value during the data collection process and were strictly observed by the researcher. The principle of confidentiality and anonymity means keeping secret by not identifying, the ethnic or cultural background of the respondent, and refrain from referring to them by their names or divulging any other sensitive information about a participant (Belotto, 2018). The scholar, proposed that researchers should guarantee that collected data remains confidential and that sources of information should be kept anonymous. In this study, the names of respondents were not requested. Moreover, their identities were also removed from the information they provided for security reasons. The names of the community leaders, representative from the Ministry of Natural Resources were also protected.

Lastly, the researcher also observed the principle of right to withdrawal under ethical consideration. Right to withdrawal is one of the research ethics which means that the participants may discontinue or withdraw to participate at any time without facing any challenges (Maree, 2016). The researcher assured the respondents that the intention of the study or goal is for academic purpose only so they have to feel free to participate and if they want to withdraw during the interview process they are free to do so.

3.10 Data Analysis

The researcher used thematic data analysis method to analyse data. Thematic data analysis is a qualitative analytic method for identifying, analysing, and reporting patterns (themes) within data and it minimally organizes and describes the data set in detail and interprets various aspects of the research tittle (Belotto, 2018). The researcher sort data according to themes and phrases that the participants repeated. This thematic analysis of data also helped the researcher

to arrange the collected data into discrete themes which would eventually make sense for the reader as compared to reading disunited and broad information. The referred themes that the researcher used when analysing data were: contribution of Haramarothole solar plant project to income generation in Haramarothole community, the role of Haramarothole solar plant project in employment creation and contribution of Haramarothole solar plant project to infrastructure development.

3.11 Chapter Summary

The chapter basically provided the research methodology whereby the elements under this chapter were also mentioned. Issues such as area of the study, the research approach, the research design, study population, sampling procedures were also discussed in this chapter. The study also dealt with data collection methods and data procedures. Moreover, ethical considerations were taken into account in this study. Lastly the study provided the data analysis.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter on data presentation, analysis and discussions, presents research findings obtained through interviews in assessing the contribution of Haramarothole solar plant project in improving economic development of the local community. The thematic analysis has been used to analyse data, that is, patterns and trends chosen within obtained research responses were reviewed to create themes used in the presentation of this data. This has been done to improve clear presentation of data analysis, while at the same time making the selection of the relevant responses in answering the main research questions guiding this research easy.

This chapter entails discussions on three themes being; the contribution of Haramarothole solar project to infrastructure development in the community, the role of Haramarothole solar plant project in employment creation and the contribution of Haramarothole solar plant project in income generation. The last section of this chapter is the chapter summary, which simply serves as an overview of the content shared by this chapter in particular.

4.2 Contribution of Haramarothole solar plant project to infrastructure development in the community

This section highlights the infrastructural development brought by the Ha-Ramarothole solar plant project and its impact on economic development of the local community. The research findings generally show the positive contribution by the solar plant project towards the infrastructural development of Ha-Ramarothole community, and how such development positively contribute in the economic growth of the community. The main infrastructural development established by the Ha-Ramarothole solar plant project include road networks, water supply, and community electrification. Responses from the local population indicate extreme appreciation for these developments, with majority of local residents emphasizing that these developments have satisfied their basic needs quite cheaper and easier, and have also

enhanced their means of income generation in a variety of ways. For clarity purposes, the presentation of the findings related to such developments has been categorized as follows;

4.2.1 Road Construction

Responses from the local community indicate that because of the solar project located in their community, their local road networks have been rehabilitated and extended. Some local residents explained that before the solar project, the local road network was in very poor conditions and also failed to reach some of the neighbouring villages such as Ha-raliemere. The local community leader also highlighted that since the construction and rehabilitation of Ha-Ramarothole road networks, the local residents are able to cheaply source their individual and household necessities from Mafeteng town. In relation to this, some of the local residents also explained that because of the poor local conditions that were prevailing before the solar project, no means of public transport were available in the area. They further explained that this delinked them form major economic activities located in Mafeteng town, and also hindered their access to some of the most essential services such as health. In relation to this, one household participant said;

> *The development of Haramarothole solar plant led to infrastructure development in the community such as construction of roads that connects Haramarothole and other places such as Mafeteng town. This has helped the local residents of through easy movement to and from different places* (Interview with household participant from Haramarothole, March 2023).

Moreover, one of the community members who witnessed the contribution of solar plant to the local villages through the construction of roads indicated that:

> *The main infrastructure that our community needed most was the roads, some of the roads were supposed to be fixed while some were supposed to be constructed from the*

> *start. Haramarothole solar plant used its construction machinery to construct and fix roads which connect Haraliemere and Haramarothole, whereby some of the community members were given temporary jobs to help when constructing those roads (*Interview with household participant from Haramarothole, March 2023).

One of the community leaders also explained that before the introduction of Haramarothole solar plant project, there was a challenge of roads and it was a big challenge for villagers to access the nearest health facility which is located in Mafeteng town, as a result some people passed on from curable illnesses or small wounds just because they could not receive medical help on time. The research findings revealed that as a result of Haramarothole solar plant project, there was road construction in Haramarothole village that has helped the local population. Local taxis are now using those constructed roads to do their daily businesses and passengers no longer travel long distances to get transport.

In addition, one community leader also explained that there has been some development in agricultural productivity in the area because the availability of easily accessible and reliable road that has encouraged people to farm more with the hope of selling at Mafeteng urban market. It has been explained that lack of proper roads prior to the Haramarothole solar plant project in Ha-Ramarothole discouraged some investments in local production activities as the unavailability of reliable roads did not only delink local villagers from urban settings, but also delinked them from their own local farms which served as the main means of sustaining economic development. Regarding this, one household participant said;

> *Since the inception of Haramarothole solar plant project through its infrastructural development such as road construction, this year I have been able to access some of the roads to my fields that I was not using the past 7 years (*Interview with participant from Haramarothole village, March 2023).

The discussed research findings are also in line with those shared by Susser (2017) on the perception and assessment of community transition induced by renewable energy project, who emphasizes that infrastructural development such as road brought by solar projects are important public assets that communities rely on, as the basis to access jobs, health and education

4.2.2 Communication networks

Some of the local residents explained that the presence of Haramarothole solar plant project which has led to construction of roads in Haramarothole also encouraged the development of communication networks at local shops. Solar energy project has contributed to presence of communication services such as Mpesa and Ecocash technology that requires use of energy. This further contributed to economic development in that through these financial services the local population can now easily and cheaply access financial grants from their loved ones working in urban areas. To put more emphasis on this, one household participant said;

> *The availability of solar energy has allowed the local business people to have reliable source of power to modern technology such as mobile phones and therefore has improved the availability of mobile financial application such as Mpesa and Ecocash. In addition, the availability of those financial applications has encouraged growth and productivity of those businesses and also improved access to funds for the local people (*Interview with household participant from Haramarothole, March 2023).

4.2.3 Energy Provision

The study findings indicate that prior the Ha-Ramarothole solar plant project, very few households within Ha-Ramarothole area had power. This is because majority of households lacked the necessary funds to draw electricity from Makeneng village which is about a kilometre and a half away. The villagers also highlighted that availability of solar energy in the area has increased productive hours for local people as it provides the necessary light for them

to continue with various productive tasks even after the sunlight has faded. One local shop owner also explained that the availability of solar energy in the area has increased the hours of operation for his shop. This is because solar energy allows him to easily serve his clients even during late hours. He further mentioned that the availability of solar energy has also allowed him to increase security for his business, mainly by installing more lights and an alarm system. In relation to this, one local leader explained that availability of solar energy has improved their access to national security agencies such as the police, and as a result people are more motivated to invest and start businesses. To put more emphasis on this, one local shop owner said;

> *I really appreciate the presence of Haramarothole solar plant in our village. Installation of solar plant energy has helped us as business men to feel secured due to the light provided by solar energy. We are now safe even at night. This is because business people are the primary targets of most criminal activities in the area (*Interview with shop owner from Haramarothole, March 2023).

Responses from Haramarothole households who are mainly farmers further indicated that the availability of solar energy has enhanced their agricultural productivity. The household respondents emphasized that the provision of energy allows them to use modern electric-powered farming equipment such as modern farm irrigation systems. They further explained that solar energy also allows them to diversify their agricultural activities, mainly emphasizing that it has encouraged the growth of poultry farms and those specializing in chicken and piggery businesses. In relation to this, one of the community leader explained that there has been some promising emergence of small local businesses as the availability of energy has not only expanded the already-established means of production, but has also diversified means of income generation in the area. A local shop owner further highlighted that the availability of solar energy allows local shops to sell perishable goods such as meat products. This is because

it becomes quite easier and cost-effective for them to keep such commodities in quality through proper refrigeration. To add on this, one shop owner said;

> *The Haramarothole solar plant project has made things easier for us as business people by providing the village with power as it is the effective source of power for us as shop owners because it promotes multi-tasking. The solar plant served as a source of energy for multiple electrical appliances at the same time. For instance, I am now able to have sufficient light in my shop when its dark, which is very important for security purposes, while at the same time using electrical appliances such as the refrigerators (*Interview with the shop owners from Haramarothole, April 2023).

Moreover, the research findings indicated that the availability of solar energy in the Haramarothole area has also positively contributed to the number of people owning mobile phones in the area. This has made the transfer of information for the local villagers much easier. This therefore also allows the villagers to easily communicate and share ideas with the outside world, as well as enhancing access to better employment opportunities which are mostly located in urban areas. To add on this, one of the community leaders indicated that:

> *The availability of solar energy allows the local people to have gadgets that allowed them to have access to information. As a result, Haramathole community is now informed about some of the latest national events through news. That also allowed the villagers to participate more on national matters* (Interview with the community leader from Haramarothole, April 2023).

In addition, the study findings further revealed that the provision of solar energy in Ha-Ramarothole area has saved the villagers from exclusively relying on environmentally-harmful energy sources which include wood, coal and fuels. Before the availability of solar energy in the village, majority of local villagers relied upon wood to cook and perform other household

duties such as preparing water. This put their health at a great risk of smoke-related illnesses, and also failed to provide enough energy for other necessities such as providing light in the evening. However, it should also be noted that responses from some villagers indicated that despite the current availability of solar energy in Ha-Ramarothole area, a significant number of households still prefers to use wood for cooking purposes as they find it much more cheaper compared to the solar energy which normally function well when there is sun. As one of the household participant indicated:

> *Ever since the inception of solar energy in Haramarothole, the village became a smoke free zone as people are no longer heavily relying on the use of cow dung, wood, coals and many more which mainly contributed to the climate change. Solar energy became the main source of fuel to the community of Haramarothole (Interview* with household participant from Haramarothole, April 2023).

One of the project staff members also explained that through the use of solar energy local residents are able to use modern technologies and enhance their productivity. The project staff mainly attested that this has boosted local economy as the project authorities are able to source most of the necessary commodities locally, such commodities include vegetables as well as construction material like sand and bricks. In relation to this, the community leader highlighted that since the installation of solar energy in the area, there has been a significant improvement in the local non-farm sector. This is because availability of solar energy has motivated and encouraged some of the farmers to try new means of developing their livelihoods. One community leader indicated that such non-farm economic activities that are emerging in the area include tailoring, barbershops and saloons, as well as baking. To put more emphasis on this, one household participant said;

> *The availability of power provided by the Haramarothole solar plant project in the area has helped me and my friends open a barbershop business. The costs of running our operations using this kind of power are quite affordable. Our business also offers hair dressing and beauty services for ladies, and through it, we are also able to teach some interested local youth on how they can utilize hair-dressing and beauty to provide food for their families* (Interview with the shop owner from Haramarothole, April 2023).

The discussed research findings support those of Delicado (2016), on community perception of renewable energies, who indicates that access to solar energy expands the number of businesses and job opportunities available. The scholar further highlighted that solar energy leads to new markets, businesses and job openings which provide more opportunities for individuals to earn income. These findings are further in line with those by Ndlela (2020), who argues that availability of solar plant energy provides local businesses with access to power whereby they can use it to access online information and resources. The scholar further indicates the availability of solar energy provides businesses with information that critical to operating their business successfully whether that information is about local or national markets, new economic policies or tax regulation.

4.2.4 Water Supply

Responses from the community indicate that because of the availability of solar energy in their community, it led to construction of water sources in the community such as standpipes and tanks for irrigation. The study revealed that some of the villagers use solar energy to connect their irrigation systems and this assisted in watering their crops. One of the community leaders explained that the availability of solar energy helped in the production of water for Haramarothole community and resultantly farmers have benefited a lot because their agricultural yields increased. Haramathole farmers benefited and they used farm produce at

household level and also engaged in commercial farming. Regarding this one community leader said;

> *Solar energy led to supply of plenty and safe water by providing standpipes and tanks located in village which has resultantly saved the time of villagers from travelling long distances to fetch water for drinking and for feeding animals* (Interview with the community leader from Haramarothole, April 2023).

Furthermore, responses from the field revealed that solar energy has helped the community of Haramarothole by construction of several water sources more especially women who used to fetch water from far places to their home. This is because access to solar energy paved a way for reliable water sources which produce clean and plenty water for household chores and health benefits. Resultantly being closer to water sources saved women's time and they can perform other household duties. As a result of the construction of several water sources, access to reliable water has allowed some businesses to increase their working hours as they now have plenty of water which serves as the source of their income to their businesses. Relating to this, research responses indicated that the availability of solar energy which led to construction water sources has improved economic development of some of Haramarothole residents:

> *Ever since the availability of solar energy whereby it helped in the construction of several water sources around the village I have now increased working hours as I now opens at 7amand close at 6pm as a results my business has greatly improved economically* (Interview with shop owner from Haramarothole, April 2023).

The study further revealed that the solar energy has helped the community by producing water using standpipes and the huge water tanks to keep water and this allowed many households to have small gardens and grow some produce that can be used for commercial and feeding purposes. This is because reliable access to solar energy paved way for proper crop-watering

which serves as a basic requirement for most agricultural food products to effectively grow. In essence, through the usage of solar energy whereby community use it to pump water, local vegetable production and consumption have been boosted, and has also diversified crop production. Relating to this, research responses indicated that advantages of solar energy with regards to water generation has ultimately boosted and improved local economic development, and also aid in the fight against issues related to intense poverty and unemployment in the area. To put more emphasis on this, one of the community leaders said;

> *Majority of Haramarothole households have one or more small gardens in their residential areas where they plant vegetables for feeding and for commercial purposes. This is as a result of water generated by solar energy through standpipes and tanks supplied water (*Interview with community leader from Haramarothole, April 2023).

Moreover, responses from other household participants also highlighted that the use of solar energy to generate and pump water also helped Ha-Ramarothole residents who rely on agriculture, either through livestock or crop-production, to produce more for the market. The Haramarothole residents also indicated that solar energy allows them to use some of the latest production-machinery and technologies, which often require a lot of water to function and also for cooling purposes, so that such machinery does not over heat. Study findings discovered that such machinery includes modern brick-making equipment as well as modern irrigation systems Data from the field also revealed that through the use of solar energy which help in producing clean and plenty water, proper levels of hygiene are being followed for profitable livestock production, especially for livestock farmers specializing in chicken or piggery businesses. To add on this, some participants who are local farmers also emphasized that the use of solar energy which has improved the supply of water in Ha-Ramarothole area has allowed them to

shift from subsistent farming to commercial farming, mainly by enabling them to grow cash-crops which often require reliable and consistent irrigation or watering systems.

These research findings support those obtained by Breyer (2022) on history and future of 100% renewable energy system who argues that the availability of solar energy in the communities can assist in enhancing and developing some of the fundamental infrastructures that determine the economic growth of communities such as availability of clean water. In addition, this is in line with sentiments from UNDP (2018) that in most of the developing countries solar energy is considered as an essential element that is cost effective and reliable to use in the development of community infrastructure such as improved water system.

4.3 The role of Haramarothole solar plant project in employment creation

This section discusses the role played by the Ha-Ramarothole solar plant project towards improved job creation in the community. The section discusses the job opportunities that were established by the project authorities specifically for the local population. Research findings highlight that only people between the ages of 18 and 55 years were hired by the project. The project representatives explained that people within the set age range are still physically energetic and active enough to fulfil the required construction-related duties. In connection to this, responses from the field indicated that a total of about 138 people were hired at Haramarothle solar plant project during the project's first phase. It was established that a lot of these people were from Ha-Ramarothole villagers, while the remainder consisted of residents from other nearby villages such as Makeneng and Ha-raliemere. Interviews with the project staff member revealed that the project created jobs for unskilled labourers from three communities which were affected by the project due to their arable land. These affected villages are Haramarothole, Haraliemere and Makeneng as shown in Table 4.1 below:

Table 4.1 show the number of people employed by the project per village.

Name of villages	Number of Males	Number of Females	Total

Haramarothole	67	18	85
Haraliemere	28	0	28
Makeneng	25	0	25
Total	**120**	**18**	**138**

The data generated and responses from participants highlighted that even though the solar plant project benefited other local communities, Haramarothole residents were given first preference in employment since they are in the vicinity of the location of the project. Data findings also revealed that the project began hiring local people in 2021 when it began its operations until 2023 when the phase 1 was completed. However, one of the project staff explained that the project has 2 phases, the first phase has been completed while the second phase is yet to start.

Interviews with project personnel and local community also revealed that the local people were employed on part-time basis for different unskilled posts. These posts are construction labourers, cleaners and painters as shown in Table 4.2 below:

Table 4.2 Summary of unskilled jobs

Types of jobs	**Number of Females**	**Number of Males**	**Total**
Construction labourers	0	120	120
Painters	11	0	11
Cleaners	7	0	7
TOTAL			**138**

Research findings further revealed that the unskilled workers were mostly hired on three months contracts, mainly using batches ranging from 20 to 30 people at time. It was highlighted that every three months, a new batch or group of unskilled workers were hired for the project.

Responses from the Haramarothole community further indicated that as a result of being employed at Haramathole solar project, some of the local residents were financially capacitated and bought modern technologies such as popcorn machines, incubators. The machines were

means of generating income for the local community. It was highlighted that the popcorn machine uses solar energy and it produces popcorns within a short time and they are packaged in the medium plastics whereby each packet is sold at 5Maluti. The egg incubators which also use solar energy incubates 96 eggs a time and produce chicks whereby each chick is sold after 2weeks at 50Maluti. One of the community leaders confirmed that this has helped the community to have extra income in addition to their salaries. The community leader further highlighted that since Haramarothole solar project has created jobs for the local people, there has been a significant improvement in the lives of the people. Some of the community members employed at the solar plant project confessed that being employed had motivated them to improve their standards of living. One community member indicated that with the salary that he gets in the project he has managed to engage in poultry project and he explained that:

> *When I got employed, I used my second month salary to buy 50 broilers and 50 layers and their feed. Since I was still working in the project I had to hire someone who will take care of them* (Interview with the household participants from Haramarothole, April 2023).

One of the project staff members indicated that even though the project operated just for two years in phase 1, most people who were hired had developed their family economic status. During their time in the project, they engage in other means of generating money apart from monthly salaries. Some local people invested their money and they are receiving interests from their investments. As one of the household participant emphasized;

> *Haramarothole solar plant project helped me with a well-paying job and my life has improved. I can now take care of myself rather than depending on my parents* (Interview with household participant from Haramarothole, April 2023).

The findings further revealed that, there were eighteen women from Haramarothole who were hired as cleaners and painters for a duration of three months. One of the household participant indicated that:

> *Ever since I was given this job as a cleaner at Haramarothole solar plant project, I was able to pay my children's school fees. Before being employed, I was always seeking for help in paying my children's school needs* (Interview with household participant from Haramarothole, April 2023).

Haramarothole residents who worked at the project indicated that they were satisfied with their wages, and the project helped their community to fight issues of extreme poverty and unemployment that were prevailing before the project. To put more emphasis one of the community leader said:

> *The Haramarothole solar plant project came at right time to the community of by creating jobs for the local residents since the community was facing high unemployment rate due to COVID-19 related work retrenchments. Therefore, the project came in to rescue the community through providing jobs o our community* (Interview with community leader from Haramarothole, April 2023).

The research findings are in line with the sentiments from IEA (2020) that revealed that most of the solar projects create jobs during and after the project development stage in operation and maintenance of these projects on completion.

4.4 Contribution of Haramarothole solar plant project to income generation in Haramarothole community

This section highlights the income generation projects which were brought by Haramarothole solar plant project and their economic contribution to the community of Haramarothole. The major income generation project which was seen after the Haramarothole solar plant project is

the increased entrepreneurial activities which entails among others, opening of barber shops, opening of phone charging businesses, increased retail shops, catering businesses and house renting. As a result, of the increased business activities following the Haramarothole solar plant project, the community of Haramarothole has seen this project as an economic source to their newly opened businesses.

The study findings indicate that ever since the presence of the Haramarothole solar plant project, a lot of businesses were established. Since majority of the people in Haramarothole were not working, businesses were the only viable economic activity. The findings revealed that retail shops saloons, and phone charging shops were established as a result of the solar plant project. Interviews with local community revealed that the local people established new businesses since now there is availability of solar energy to aid in the operation of their businesses to the appliances such as fridges, popcorn machines, and hairdryers and phone charges. These new established businesses saloons, and charging shops as shown in Table 4.2 below:

Table 4.3 Small-scale businesses established.

Types of businesses	**New emerged businesses**
Retail shops	3
Saloons	3
Phone charging	1
Total	**7**

The responses from Haramarothole community further indicate that the solar project had employed a number of construction workers who also need to buy their daily needs and as a result the available businesses were no longer enough for the whole community. The findings of the research support those obtained by Bulavskaya (2016), on economic impact of renewable

energy who highlights that renewable project attracts investors and also create business opportunities for local business which are already existing in the communities.

One of the project staff members indicated that the project took the arable land of some the community members for the operation of the plant and the project compensated the affected community members of Haramarothole with money. Some of the Haramarothole residents decided to invest such compensations by opening up businesses. As one of household participant highlighted:

> *Since the inception of this solar project, our lives have been much easier as people of Haramarothole have opened various shops in the village. We no longer travel to town to buy gas for cooking as all these are available in the shops. This also saved our money for transport fares* (Interview with household participant from Haramarothole, April 2023).

One community leader indicated that the availability of different shops following the solar plant project in his village has saved the time for his community to travel to town for some of the services which were not available before the solar plant project. The community leader further indicated that these established different types of shops have reduced transport fares for the local communities to emphasis on this, one of the household participant highlighted that;

> *In our community there were only two retail shops, and these shops were failing to properly cater for the needs of the local community. However, the presence of this solar project has made people to think out of the box and make a living out of this project. Now we have five shops which are fully packed with almost every need of local community (*Interview with household participant from Haramarothole, April 2023).

Furthermore, the responses from the community revealed that after the compensation from the project some small local farmers collaborated and bought the greenhouse for the production of fresh vegetables which will be sold at the enhanced urban markets and also in the local villages. The obtained data further indicates that this green house was the first one to operate in the village, as a result local people are now getting fresh and affordable vegetables close to them. Regarding this, one household participant said;

> *After we have received the compensation from the Haramarothole solar plant project, we collaborated with some small farmers and bought the green house for production of fresh vegetables. The irrigation system for the greenhouse uses solar and water is also generated and pumped using solar energy* (Interview with household participant from Haramarothole, April 2023).

Data revealed that the emergence of new shops has boosted the Haramarothole economy as the community of Haramarothole no longer travel to town for shopping. Responses from the Haramarothole community further indicated that some of the local residents were financially capacitated through the compensations they received for their arable land taken by the project. As a result, the availability of solar project whereby it compensated some of the local communities encouraged the local business owners to improve their businesses which were already existing by purchasing some of the appliances that operate with solar energy such as fridges for meat and cold drinks. Furthermore, some of the businesses bought televisions for their shops so as to attract the customers since there is solar energy to operate such appliances. In relation to this, one of the local shop owners said:

> *Since the presence of Haramarothole solar plant project the existing shops have improved as they now meet most needs of the local community by selling most needed*

products such as maize meal, paraffin, eggs, gas and many more (Interview with the shop owner from Haramarothole, April 2023).

4.5 Chapter summary

This chapter further discussed infrastructure development brought by Haramarothole solar plant project. Data from the field indicated that infrastructure development done by the solar project include the provision of energy, supply of water, communication networks and road construction. The discussed research findings highlighted that the solar project supplied the local communities with various sources of water such as standpipes and water tanks which operate with solar energy to pump and generate water. Data from the field further revealed that the solar plant project provided local communities with energy which helped the existing and established businesses to operate some of the appliances that needed energy. Moreover, the discussed findings of the research revealed that Haramarothole solar plant project encouraged the development of communication networks such as Mpesa and Ecocash at local shops. These communication services require use of energy. The study further revealed that the local community's roads were constructed with the help of solar project. As a result, there is easy movement for businesses to operates, such as to purchase the business stock from town.

The chapter further discussed contributions of Haramarothole solar plant project to employment creation. The Ha-Ramarothole solar plant project provided or created for the local population. Data from the field indicated that 138 people from Makeneng, Ha-raliemere and Ha-Ramarothole were hired as unskilled workers on the posts such as construction labourers, painters and cleaners. This allowed a lot of local population to work and earn money so as to improve and develop their families while others bought technical machine for small-scale businesses such as the popcorn making and incubation of eggs.

This chapter discussed the economic contributions of Haramarothole solar plant project to local communities under the theme of income generation. Discussed findings of the research indicate

that the solar project has encouraged the establishment of many entrepreneurial activities in Ha Ramarothole area, mainly saloons, retail shops and phone charging businesses. Since the establishment of these new businesses which operate with solar energy, local people are no longer travelling to town to purchase services that are brought by saloons and phone charging shops as they are now found in their community.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The purpose of this chapter is on presenting conclusions drawn from this study on assessing the contribution of solar energy project on economic development of local communities. This chapter further explains the relevance of capability theory of development to the findings, and also present recommendations. The study has assessed the contribution of solar plant project in improving the economic development of local communities. In an attempt to address the objectives of the study, research fieldwork was conducted and this was mainly through the use of in-depth interviews. The data collection method allowed the researcher to understand how the solar plant project has contributed to the economic development of local communities.

The capability theory of development used in this study forms a significant part of the base where the role played by solar plant energy project establishment towards economic development of community can better be understood. The study revealed a link between availability of tools for people to use so as to live a fulfilling live and the human development economy. Furthermore, study revealed that it is challenging when there is unavailability of tools for community to use in order live an economically developed lives than it is for communities with available and improved tools to make a living. In this study the establishment of solar plant project to local communities is important towards providing and creating economic opportunities for the community. It also led to establishment of small businesses for sustaining economic development in the local communities. Therefore, the capability approach of development observes availability and human development as the main basics to any economic development project. Therefore, the capability theory of development is relevant to the findings of this research as it revealed that availability of Haramarothole solar plant project has economic contribution on the lives of communities.

5.2 Conclusion

One of the main objectives of the study was to assess the contribution of Ha-Ramarothole solar plant project to income generation in local communities. The study concludes that the Haramarothole solar plant project has boosted local economy and entrepreneurship. This is mainly through the compensations that people got for the fields used for setting up the project. The study concludes that most of the people who were compensated for their land used such funds to start businesses in the local communities. As a result, the establishment of new businesses initiated a spike in local entrepreneurship skills. The study concludes that the Haramarothole solar plant project has helped majority of the local communities with capital to start businesses, and even those who did not sell their farms enjoy benefits related enhanced local businesses.

The study also examined the role played by Haramarothole solar plant project towards employment creation in the local community. The study concludes that Haramarothole solar project has helped the local communities to fight unemployment rate. This is mainly through the job opportunities created for the local communities. The study concludes that Haramarothole solar plant project has helped the majority of the local communities through creation of job opportunities as some invested part of their salaries while others bought equipment machines like popcorn machine and egg incubator to generate more money.

Moreover, the study further assessed the contribution of Haramarothole solar plant project to infrastructure development in the local communities. The study concludes that the Haramarothole solar plant project led to infrastructure development in the local communities. The study concludes that Haramarothole solar plant project has helped the majority of the local small scale businesses through the provision of energy for the operation of some of the appliances and to light up their business. The study further concludes that the project has helped the majority of small scale businesses through supply of water as most of the businesses rely

on water for the improved economy. The study concludes that the provision of these infrastructural developments allowed the local small scale businesses to improve economically.

5.3 Recommendations

The study makes recommendations towards improving the economic development by the solar plant projects in Lesotho and these are:

- The Haramarothole solar plant project should lengthen the working duration of unskilled laboures from 3months to a year
- The Haramarothole solar plant project should avoid nepotism and favouritism during hiring procedures. The study recommends fairness and transparency when allocating jobs. The Haramarothole Solar Plant project is considered as community project as a result it is supposed to serve all the local community members equally to avoid putting the project in jeopardy.
- Local community members who have given away their arable land for the operation of the solar plant project should be trained on other economic developing activities in other to improve their economy.
- The study recommends Haramarothole Solar Plant Project to capacitate or train the local communities with skills and knowledge on how to use solar energy efficiently and profitably.
- The study recommends Haramarothole Solar Plant Project to hire equal number of construction workers from all three local communities.

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APPENDICES

APPENDIX I: INFORMED CONSENT FORM

RESEARCH TOPIC: THE CONTRIBUTION OF HARAMAROTHOLE SOLAR PLANT PROJECT TO THE ECONOMIC DEVELOPMENT OF LOCAL COMMUNITIES

I _____(names of participant) hereby confirm that I have been briefed about the nature and purpose of this research and therefore agree to participate as a research respondent. I also confirm that I have been made aware of my rights as a participant, which include my freedom to withdraw my participation at my own discretion and to also not answer any questions which I may deem as offensive or too personal. I understand this research is for academic purposes only and no personal penalties or benefits are associated with my participation. I further agree that I have been given a signed copy of this informed consent.

Date and Time: _____

Signature of participant: _____

Signature of investigator: _____

For further Information, please contact;

Ms Mamakhotla Tlali: +266 58408543/63338375

: mamakhotla@gmail.com

Master of Arts in Development Studies student
Faculty of Humanities
National University of Lesotho

APPENDIX II: INTERVIEW GUIDE QUESTIONS

My name is '**Mamakhotla Tlali**, a student from The National University of Lesotho, pursuing Masters of Arts in Development studies. The major aim of my presence in this village is to undertake the study on the **Contribution of Haramarothole Solar Plant Energy Project in the economic development of local communities**.

I would like to have your full cooperation and participation in this study by freely responding to the questions I will ask. This study is meant for academic purpose and not otherwise. I therefore ensure the anonymity and confidentiality of the higher standard. The responses given under this study will remain a secret between you and me as a researcher.

Thank you for your cooperation.

Signature.....

Date.....

Questions for Haramarothole residents

1. What is your main source of energy in this village?
2. For how long have you been using this source of energy?
3. What do you use it for?
4. What was the level of community's participation in the process of the project implementation?
5. How do you differentiate your life before Haramarothole solar plant project and the time after solar energy project in the village?
6. Has the Haramarothole solar plant project been able to change your life?
7. What are economic development which have been created out of this project in local communities?
8. What of kind income generation activities that have been led as result of the solar energy project?

9. How did the project benefit the local community?
10. Are there any employment opportunities that were created as a result of the solar energy?
11. To what extent has that this project been able to help the local communities?
12. How has Haramarothole solar plant project helped in the improvement of infrastructure in the village?
13. What are your recommendations on the administration of the day to day activities of this project?

Questions for local chief

1. How did you know about Haramarothole solar plant project?
2. Has the project brought any economic development in your community?
3. Ever since the establishment of Haramarothole solar plant project whereby it created jobs the local communities how is the crime rate in your area?
4. As one of the village leaders looking at your people how do they feel about Haramarothole solar plant project?
5. Has Haramarothole solar plant project brought any development infrastructure in your village?

Questions for local community councillor

1. How did you know about Haramarothole solar plant project?
2. Has the project brought any economic development in your area?
3. Ever since the establishment of Haramarothole solar plant project whereby it created jobs for the local communities, how is the crime rate in your area?
4. Has Haramarothole solar plant project brought any development infrastructure in your village?

Questions for Shop Owners

1. How important is Haramarothole solar plant project to your business?
2. How important is your business to community ever since the establishment of Haramarthole solar plant project?
3. How is your business status ever since the establishment of Haramarothole solar plant project to date?
4. What is your target group?
5. Does your business meet the needs of local communities and project staff?
6. Ever since the presence of solar energy in your business, how has this affected your business?
7. Are there any development infrastructures brought by Haramarothole solar plant project?
8. If any, what are they and how important are they to your business?

Questions for Community Liaison Officer

1. How is solar energy contributing to the development of the economy of local communities?
2. What is the age range used when employing local community members?
3. How did the project compensate the land of local communities taken by the project?
4. How did the compensation help the local communities?
5. Are there any development infrastructures brought by Haramarothole solar plant project?
6. If any, what are they?
7. How important are those infrastructures in the economic development of the local communities?