CHALLENGES FACE SMALL SCALE INDUSTRIES IN ADOPTION OF SOLAR ENERGY IN TANZANIA: CASE STUDY IN MBEYA CITY

CHALLENGES FACE SMALL SCALE INDUSTRIES IN ADOPTION OF SOLAR ENERGY IN TANZANIA: CASE STUDY IN MBEYA CITY

By

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A Dissertation Submitted in Partial Fulfillment of the Requirements for the Award of the degree of Master of Business Administration in Corporate Management (MBA_CM) of Mzumbe University

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CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by the Mzumbe University, a thesis entitled; **Challenges Facing Small Scale Industries in Adoption of Solar energy in Tanzania: Case Study in Mbeya City**, in partial fulfillment for the degree of Masters of Business Administration in Corporate Management (MBA_CM) of Mzumbe University.

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DECLARATION

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I, **Lena George** declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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Date _____

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My sincere thanks should also go to my research supervisor, Dr. Tasco Luambano for her heedful assistance in guidance and direction on how to go about research proposal writing and dissertation work.

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May the Almighty God bless you all for your contribution

DEDICATION

This work is sincerely dedicated to my entire family; especially to my beloved husband Charles Mlawa for his encouragement in the course of my education achievements especially in the process of accomplishment of this dissertation work.

LIST OF ABREVIATIONS

CCM	Chama cha Mapinduzi
ESMAP	Energy Sector Management Assistance Program
FGD	Focus Group Discussion
GNSD	Global Network for Sustainable Development
ICT	Information and Communication Technology
IEA	International Energy Agency
IEA	The International Energy Agency
MDGs	Millennium Development Goals
OECD	Organization for Economic Cooperation and Development
REA	Rural Electrification Agency
SPSS	Statistical Package for Social Sciences
TANESCO	Tanzania Electricity Supply Company
TASEA	Tanzania Solar Energy Association
UNDP	United Nations Development Program
URT	United Republic of Tanzania
URT-ME	United Republic of Tanzania – Ministry of Energy and Minerals
WHO	World Health Organization
WSP	World Solar Program

ABSTRACT

The study examined the challenges faces small scale industries in adoption of solar energy sources in Tanzania: The specific objective was to assess the cost of solar appliances towards adoption of solar energy, to assess the capacity of solar appliances towards adoption of solar energy and third objective was to assess the SSI's awareness of solar technology towards adoption of solar energy. The study also used both qualitative and quantitative approaches to collect and analyze data; both primary and secondary data were used under this study. The primary data was obtained from a sample of 80 respondents through questionnaires, observation checklist and Focus Group Discussion. Also, secondary data was obtained through documentary review whereby reports, journals, thesis and dissertations documents based on solar power were reviewed. The qualitative data obtained under this study was analyzed through content analysis and the quantitative data analyzed by using Statistical Package for Social Science (SPSS) and interpreted by content analysis to give the general picture of the study. The results findings revealed that, high percentage of entrepreneurs in small scale industries are capable to pay the cost of solar appliances sold in the market for operating their industrial activities but not comfortable with the payment system. As there are fewer investors of solar appliances which can power small scale industries, the mode of payment for big appliances is cash based and many entrepreneurs prefer paying by installment. Also, on the case of capacity of solar appliances, the results revealed that most of the appliances available have low capacity compare to the needs of the entrepreneurs in small scale industry. As the small-scale industries need more powerful batteries and appliances to power their extracting and milling. Last but least the results revealed that the awareness level of solar technology to small scale industries entrepreneurs is still very low to impact the informative decision making of the adoption of using solar energy for industrial activities. industries. Also, the study recommends that more investment should be made in the renewable energy sector including solar energy in particular. That will increase the competition on the service provided and reduce the price of the appliances and solar systems which can be used by small scale industries. This will help the country to run into industrial economy in 2025.

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CHAPTER ONE
INTRODUCTION

1.1 Introduction

This chapter presents an overview of historical background; statement of the problem, objectives of the study, significance of the study, scope of the study and limitations of the study. It has been argued that solar energy is one of the sources of power which is used for both domestic and industrial development processes including small scale industries in developing countries including Tanzania. It is impossible to attain industrial development if the nation invests less in both electricity power and solar energy. The World Health Organization (WHO) and The United Nations Development Program UNDP (2010) assert that the Millennium Development Goals (MDGs) can be attained if energy issue is well addressed in terms of the quantity and quality so as to reach the sustainable industrial development. In order to meet the target for industrial economy in 2025 Tanzania should invest much in both solar energy and grid electricity power to rural and urban areas so as to allow the expansion and investment of small industries for production of goods and services for both social and economic development.

1.2 Background of the Study

Electricity is a vital factor contribution for some, vitality benefits that can add to the activity of businesses and endeavors for both social and financial improvement in a given country. Presently in 21st centuries there are as yet numerous individuals on the planet who don't approach power or different types of current vitality including sustainable power source. The Organization for Economic Cooperation and Development (OECD, 2010) noticed that about 1.6 billion out of the aggregate populace of 6.5 billion around the globe don't approach power, and 2.5 billion are reliant on biomass vitality. It is normally contended that the creating nations need access to present day vitality and that the absence of current vitality is one of the contributing elements prompting monstrous destitution among the general population because of low speculation of little scale ventures in rustic and urban regions (Ahmed, 2003). Along these lines it is trusted that making access to sustainable power source will make it feasible for the poor to enhance their lives by making a salary through setting up little scale ventures (OECD, 2010).

African nations specifically, still experience the ill effects of absence of dependable, powerful and adequate power and sustainable power source in many sub-Saharan nations (Bauner, 2012). Provincial regions and other off-lattice regions experience the ill effects of both power and sustainable power source. North Africa is vigorously subject to oil and South Africa relies upon coal, (Karekezi, 2002). In excess of 650 million individuals in Sub Sahara Africa, depend on conventional biomass for cooking, warming and lighting, regardless of the exertion done to advance charge rate (Karekezi, 2002). These zones of Sub Saharan Africa (SSA) have much sustainable power source assets.

Photovoltaic sun-based vitality is an inexhaustible wellspring of vitality that is produced from the daylight. Photovoltaic sun powered vitality is given as free, needs no fuel and delivers no waste or contamination (Virendra, 2013). Photovoltaic sun powered power has turned out to be the best elective method for charge to the off-network country territories where there is a restricted supply of current vitality (power).

Sasikumar and Jaya Subramaniam (2013) have endeavored to demonstrate the distinction of sun powered vitality from alternate wellsprings of vitality like customary vitality, for example, coal, oil, petroleum gas, and demonstrated that traditional vitality sources are constrained in amount and that in the event that they keep on being drained at the present rate they will be depleted in the coming decades. Sun based vitality offers an alternate measurement as it is perfect, atmosphere well disposed, with bottomless and endless vitality wellspring of humanity and that it is even shoddy as the sun powered boards cost has fallen quickly. Gajare (2013) gave that the utilization of sunlight-based vitality is appealing in light of the fact that it is bounteous and offers an answer for non-solar energy source emanation and worldwide environmental change.

Sustainable power source, for this situation Photovoltaic sun-based vitality framework, is vital for rustic work change because of its dependability, cost viability, and achievability. Photovoltaic close planetary system gives an elective manner by which individuals can appreciate power they can't get from the national matrix

because of the separation accessible and costs engaged with it. As indicated by the (Global Network for Sustainable Development (GNSD), 2007) without supply of reasonable vitality, it is difficult to put resources into various parts of creation including little business, wellbeing, and instruction for neediness decrease. This is likewise worried by Mkunda (2008) who contends that Photovoltaic sun based vitality (sunlight based power) is a productive and practical vitality as it has changed financial lives in towns, towns and urban areas.

In the Tanzanian setting, rustic zap incorporates zap of the region central station, townships, towns, and business focuses. It is important that, the country zap program in Tanzania began since the mid1970s, with the point of giving dependable and astounding power supplies which can be utilized for local, modern improvement and business purposes (Kjellstrom 1992). In government's view, rustic jolt is a key contribution to upgrade of development and financial improvement of the nation and accordingly, addresses it in the system of destitution decrease (United Republic of Tanzania, 2003). Tragically, the effect of the vitality approach has not achieved the grass root level. Actually, the present level of provincial charge in Tanzania is a result of the arrangements embraced by the frontier and early post-freedom governments

The principal national vitality strategy for Tanzania was propelled in April 1992. It was defined with reference to different by and large national arrangement records (the Long Term Perspective Plan, 1981-2000; the Economic Recovery Program; and the Chama Cha Mapinduzi - CCM - Party Program, 1987-2002) and area plan reports for transport, agribusiness, water, science and innovation. The 1992 Energy Policy depicted the principle vitality assets of Tanzania as being biomass (counting fuel wood and agro-ranger service squanders), coal, gaseous petrol, water, sun-oriented power, wind, geothermal and uranium

Notwithstanding, the present-day arrangement incorporates open private organization to put resources into different vitality creations. The legislature trusts that country Tanzania can't be changed into a cutting-edge mechanical economy and change of network business without legitimate venture into current vitality administrations, especially both power and sustainable sun-based power (Amous, 2002). Moreover,

the vast majority of jolted family units utilize power administrations for lighting yet the individuals who don't have power administrations take care of their lighting demand utilizing different alternatives, for example, sun powered PV, lamp fuel, diesel, dry cells, and biogas for every day employments. In this way the investigation tried to fill the strategy hole by looking how inexhaustible sun-oriented power can animate the improvement of little and medium undertakings (SMEs) for social and monetary advancement.

1.3 Statement of the Problem

Currently the Government of Tanzania has been putting more endeavors to influence the province economy to move from being in slightest created nation to center wage nation by 2025. To achieve the objective of modern economy Tanzania has enhanced its vitality strategies with a specific end goal to energize Independent Power Producers-IPP particularly in remote areas as a result of the over the top cost of transporting power from huge scale control plants to country territories. One of the proficient intends to encounter that auxiliary change is by advancing Industrial advancement in the nation, since 2000 Industrialization process has increased more consideration in the National improvement system than even previously (TANESCO, 2013).

As indicated by Tanzania Electricity Supply Company (TANESCO, 2013) announced that power access in Tanzania has ascended from 18.4% of every 2013 to 24% out of 2015. Power age stayed stable in 2013 which contributed 7.3% to the development of the National economy. In 2014 the appraisals demonstrate that the National economy developed by 7.2%, and is anticipated to achieve 7.4% of every 2015. The accessibility of various sources control in Tanzania in both rustic and urban focuses contributes much to the development of national economy and meets the national plan of being a modern economy by 2030 (United Republic of Tanzania, 2015).

Sustainable power source which is filling in as wellspring of power is one among the key factors that Tanzania government has been chipping away at in advancing the

Industrialization improvement forms. Absence of power control in both rustic and urban zones in Tanzania thwarts the improvement procedure of setting up little scale businesses for social and financial advancement.

As explained by Harkema (2015) in his study of challenges in the diffusion and adoption of sustainable energy solutions among SMEs, he explained that the main challenge in relation to diffusion and adoption are high investment cost in Netherlands and Belgium. Knowing that high cost if investment also affected the SMEs in Netherlands and Belgium on adoption of new technology, raised a need for a researcher to analyze the impact of that high investment cost on the adoption of solar energy by small scale industries in Tanzania. In this way this investigation tries to analyze the difficulties faces little scale enterprises in appropriation of sustainable power hotspots for modern advancement in Tanzania and fill the exploration hole towards the current circumstance of shortage of power control in provincial.

1.4 Research Objectives

1.4.1 General Objective

The main objective of this study was to examine the challenges faces small scale industries in adoption of solar energy sources for industrial development in Tanzania:

1.4.2 Specific Objectives

i. To assess the cost of solar appliances towards adoption of solar energy

ii. To assess the capacity of solar appliances towards adoption of solar energy

iii. To assess the small-scale industries' awareness of solar technology towards adoption of solar energy

1.5 Research Questions

i. Do SSIs have ability to pay the cost of solar appliances towards adoption of solar energy?

ii. Do solar appliances have capacity to power SSIs towards adoption of solar energy?

iii. Does solar technology awareness level enough for SSI to adopt solar energy

1.6 Significance of the Study

This study plays the great role to explore the challenges faces small scale industries in adoption of solar energy for industrial development. This study will be potential to the following ways.

i) The study will be useful to Tanzania Ministry of Energy and Minerals (MEM) on the perceptions of solar energy in the development of small-scale industries for socially and economic development

ii) This study also will be potential to solar energy investors in knowing areas to improve on solar appliances which and the need of Small-scale industries in order to adopt the use of solar technology in their industrial activities. It should be noted that both small scale industries and heavy industries are the largest consumers of various sources of electricity power including solar power

iii) The study will be useful to the government of Tanzania in collaboration with private sectors to improve generation, transmission and supply of electricity to the country and to the small-scale industries for production of goods. This is because in Tanzania we still have many small-scale industries with no alternative to electricity supply. Different studies such as Kanagawa and Nakata (2008); Mahmood (2012) have shown the role played by photovoltaic solar energy the way it brings livelihood transformation by improving life standards and reducing income poverty.

iv) The study will be useful to policy makers on formulating investment policies on solar technology which will results to smooth operations of solar companies in Tanzania an. Under smooth operations of solar companies in Tanzania, with pricing strategies of solar appliances will be at affordable rate which small scale industries will be compatible and able to pay for.

v) The study will be useful to scholars on the ground that knowing the challenges that small-scale industries facing on the adoption of solar energy technology, they will find solution so those problems. The process of finding solution will involve more

researches and also more learning and teaching about solar technology land its applicability in Tanzania. Will even open the room for solar technology courses to be introduced in some colleges and vocation trainings so that to meet the needs of small-scale industries and improve the industrialization process in Tanzania.

1.7. Limitation of the Study

The blunders may emerge from different sources incorporating shortcoming in the plan of the survey, distortion of the inquiries, distorting, and absence of information and memory slip by among the respondents. In this investigation, the analyst looked with the deficiency of time and reserve this circumstance ruined the scientist to gather adequate information and data, in this way this issue was limited by visiting couple of territories and choosing couple of respondents in Mbeya City.

Moreover, another constraint, the scientist looked with trouble from respondents by getting surprising answers and dialect boundaries amid information accumulation, this was likewise limited by leading pilot concentrate to taste the legitimacy of research instruments before genuine utilize and make an interpretation of the surveys into recognizable dialect of respondents so as to get the right data in view of the investigation. To manage these confinements' distinctive arrangements was taken in disclosing to respondents what the investigation implied and classification of the examination to make them effectively comprehended the reason for the examination.

1.8 Scope of the Study

The study was conducted in Mbeya City, in selected small-scale industries. The targeted respondents for this study involved the selected solar energy stakeholders such as officers working at solar companies, officers working at SIDO-Mbeya and business men who sell solar appliances in their shops and small scale industries available at Mbeya city council including; Rice milling industries, oil extracting industries, bakery offices, daily offices and flour milling industries. The content of this study was limited to the challenges faces small scale industries in adoption of solar energy (solar energy).

CHAPTER TWO
LITERATURE REVEW

2.1 Introduction

This chapter presents the literature review both theoretical and empirical literature review. The main objective of this chapter is to provide a written literature on what has been done by different scholars on the research topic. Berg (2007), argues that after developing the vague idea for the study, it is important to examine what is already known on the proposed research topic. In view of the above, this chapter it begins by presenting conceptual definitions, followed by empirical literature review from other researchers at global, regional and national levels. In addition, the study provides a synthesis and knowledge gap and ends by conclusion.

2.2 Conceptual Definition

2.2.1 Energy

Energy is the capability of a physical system to do work. Physical system can be machine or human body. There are two types of energy; kinetic energy and potential energy. In electricity energy is a measure of power dissipated over time. Whereby 1 joule = Watt (W) dissipated or radiated for one second. A mostly used unit of energy in electric utilities is the kilowatt-hour(kwh) which means that 1 kilowatt dissipated for one hour.

For the purpose of this study, Energy is one of the principle segments in the improvement of Small-scale businesses and overwhelming ventures without vitality no generation and speculation which should be possible. A sustainable power source asset is one of the principle issues now days which can encourage the activity of little scale enterprises (Kihedu, 2006).

2.2.2 Solar Energy

Solar energy is the sunlight energy collected and used to provide electricity, heating, cooling homes, businesses or industry. It is created by nuclear fusion that takes place in the sun. It is a sustainable source in the sense that it does not provide greenhouse gas emissions and proves to be environmentally friendly sources of

energy (Mwihava, 2011).

Sunshine hours per year in Tanzania range between 2800 and 3500 with global horizontal radiation of 4-7kWh per m2 per day. Up to date about 5.3MWp of Photovoltaic Solar energy have been installed in Tanzania (URT, 2018)

2.2.3 Photovoltaic Solar Energy

Photovoltaic cell is an electrical device that change the solar radiant into electricity. The cell is made of crystalline silicone. WHO and UNDP (2010) argued that Photovoltaic solar energy (PV) can be known as the direct conversion of solar radiation into electricity. Solar PV can be used at any scale, from small scale electronic appliances to decentralized household rooftop systems. Photovoltaic is regarded as a phenomenon in which solar radiation is converted into electricity without using stimulating mechanisms.

In a photovoltaic cell, sunlight detaches electrons from their host silicon atoms. Tiny packets of light energy called photons are captured by electrons, and impart enough energy to kick the electron free of its host atom. Near the upper surface of the cell is a "one-way membrane" called a pn-junction. The pn-junction is formed by diffusing tiny quantities of phosphorus to a depth of about one micrometer into a thin wafer of silicon.

When a free electron crosses the pn-junction it cannot easily return, causing a negative voltage to appear on the surface facing the sun (and a positive voltage on the rear surface). The front and rear surfaces can be connected together via an external circuit in order to extract current, voltage and power from the solar cell.

Solar cells are packaged behind glass to form photovoltaic modules, which have typical service lives of 20 to 40 years.

2.2.4 Cost of solar appliances for industrial uses

Cost of solar appliances means price of solar appliance. In solar systems that are sold by different companies or business men in retails, the most expensive part of the system is battery. Batteries are e81-93% of the system's cost (RG Charles, 2018). From the last decades up to 2018 the cost of processing the solar systems have

dropped highly due to the application of high level mechanism model and not only base on low level mechanism which dealt worth the physical products themselves.

The cost of solar system depends on the ability of the battery to store charge or power, the capacity of solar panel to capture enough sun rays and cells converting into electricity, the power of the battery to run the machines by using inverters and other appliances.

2.2.5 Capacity of solar appliances for industrial uses

Due to high competition in the market of renewable energy sources, in recent years there have been a lot of on-going research and product development. Many larger factories have resulted to industries to enjoy economies of scale and results to more advanced solar technology which can power from domestic uses to industrial uses. In Tanzania, there have been arising in number of solar companies which offer different solar systems for different consumers uses.

For the purpose of this study, the uses of solar systems analyses were ability of solar system to extract oil form sunflower example, ability of solar systems to power the milling machines, ability of solar systems to store milk in dairy industries and ability of solar systems to power different machine used by different small scale industries in Mbeya.

2.2.6 Awareness of Solar Technology for Industrial Uses

The awareness means level of information a person has on something. It has been always said that awareness affects the decision making of individuals. For the purpose of this study, the awareness level analyzed was the information about solar systems which can be used a back for industrial activities in the market.

The awareness in the market is created by conducting PAs, doing radio adverts, conducting solar bonanzas where all the stakeholders might get a chance to learn about solar systems and its power. Most of the time, people in Mbeya get to know about solar products in nane-nane exhibitions which are conducted every year august.

2.3 Theoretical Literature Review

Kothari (2004) defined a theoretical framework as the reasoned set of propositions which derived from a set of knowledge or field and supported by data or evidence. This study will be guided by theory of metabolic rift and Ecological Modernization Theory (EMT) to understand and elaborate well the phenomenon increase of adoption of solar energy due to the relationship of man development processes and available opportunity in his/her environment.

2.3.1 Metabolic Rift Theory

Metabolic rift theory was developed by Grundrisse K Marx in 1973 from the ground of the relationship of exchange within and between nature and humans (Burkett, 2005). The interest of Marx was in the rift/ split in human – nature relationship of exchange within and between nature and humans (metabolism), caused by capitalist economic system of exchange, which results in the pollution of air, water, and land, and discussed this rift particularly in relation to soil, soil quality, and large-scale capitalist agriculture. Marx acknowledged the significance of a balanced energy exchange between human societies and nature, and recognized the disruption of this exchange resulting from industrialization.

2.3.2 Ecological Modernization Theory

Ecological modernization Theory (EMT) Ecological modernization rose in the mid 1980s. In this hypothesis, one of the fundamental suspicions identifies with the ecological re-adjustment of financial development and modern improvement. The natural re-adjustment of financial development and mechanical improvement incorporates assets effectiveness and increment in vitality, item and process advancements, for example, feasible store network administration, ecological administration, clean advances, item plan for condition and substitution of danger substances (Mol, 1995).

Mol (1997) clarified assist that Solar electric innovation selection is developing quickly, as costs proceed to fall and the innovation keeps on progressing. One restriction to reaping the inexhaustible assets accessible from sunlight-based radiation for taking care of worldwide power demand is the capacity of this discontinuous asset,

in spite of the fact that battery stockpiling advances likewise keep on advancing. Moreover, the capacity limit important for little scale sun powered electric frameworks is as of now accessible (Pearce, 2009)

2.3.3 Applicability of Metabolic Rift theory and EMT theory to the Study

Metabolic break hypothesis and EMT hypothesis under this examination is important in investigating the part of sustainable power source and photovoltaic sun-oriented power to the country network business change. This approach it helps in comprehension on the capacity to misuse nonrenewable vitality sources (which coincidently were and are past sun powered assets put away in another frame) is the thing that in a general sense separates people from whatever is left of the plant and creature world. This was an imperative event before vast scale farming or urbanization could happen how photovoltaic sun powered power venture in Mbeya City Council has affected the lives of the general population at the family unit level and the network everywhere regarding growing their chances and decisions on the best way to utilize their accessible sustainable power sources for the advancement of little scale businesses. Because of this reason the appropriation of sustainable power source by mechanical clients have helped them to carry on with the sort of life they need to live by extending individuals' chance by starting little scale businesses by making work to the general population and additionally to be free from neediness lightening (Sen, 1999). The decision of these speculations is importance to the examination since it set out the establishment utilizing sustainable power source and different wellsprings of power for both social and monetary improvement in a given zone. The hypotheses additionally tend to fill the exploration hole towards the current circumstance of utilizing accessible sustainable power sources for mechanical advancement. From the hypotheses, there is additionally an exploration hole seen which is they didn't clarifies the difficulties confronting the little scale enterprises in the reception of sustainable power sources.

2.3.4 Conceptual Framework

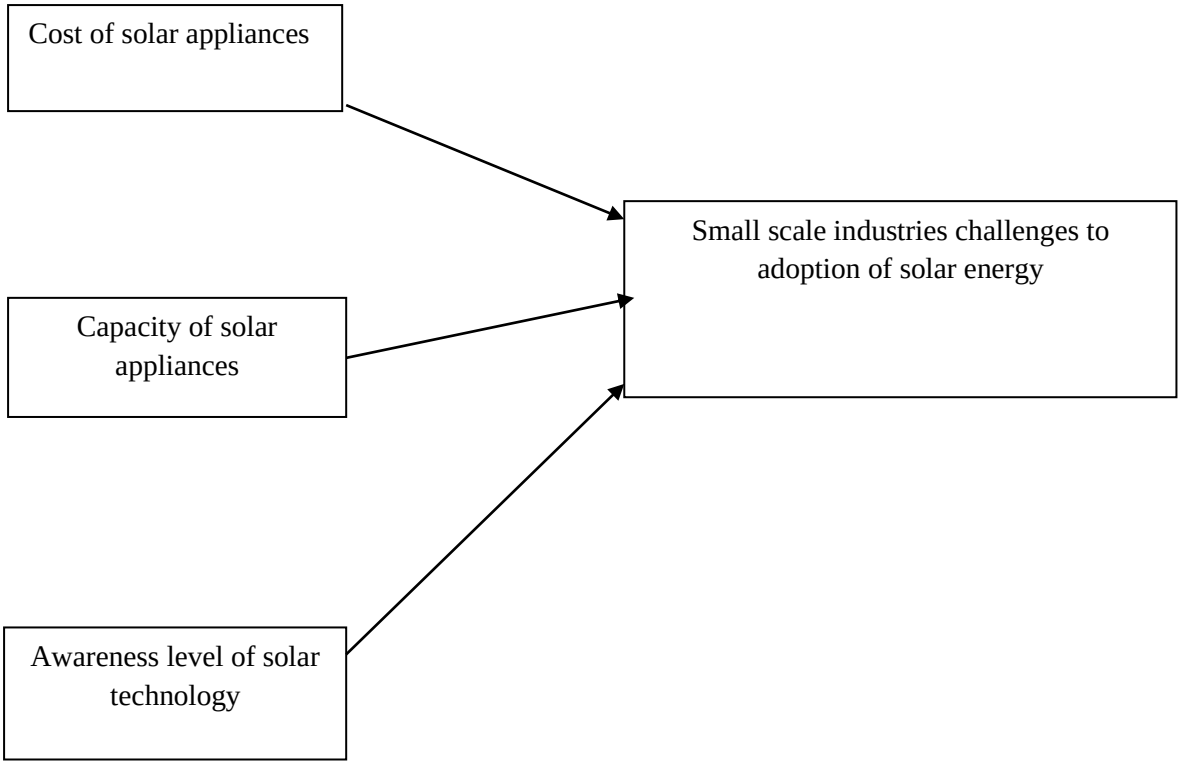
The conceptual framework that guided this study included 3 independent variables and 1dependtant variable. The 3 independent variables are cost of solar appliance, capacity of solar appliances and awareness level of solar technology.

The cost of solar appliance means the price of the solar systems which can power the small-scale industries, how does it affect the adoption of small-scale industries to solar energy. The researcher wanted to know are the small-scale industries comfortable and capable to pay for the cost of solar appliances. If yes or not how does it play a role of challenging adoption level of solar energy by small scale industries.

The capacity of the solar appliance means the ability of solar system to power the small-scale industries machines. How it affecting the adoption level of small-scale industries to sola r energy. When the solar capacity is low or high, how it playa a s a challenge to adoption,

Awareness of the solar appliances means the level of information the small scale industries have on solar technology about the capacity and cost. How does the information level that small scale industries owner has affect the adoption to solar energy? How awareness level plays as the obstacle or challenge to adoption of solar energy by small scale industries.

Figure 2. 1 Conceptual framework



Source base; researcher 2018

2.4 Empirical Literature Review

Energy is one of the main components in the development of any country. Satisfying the energy demand through the use of solar energy resources is one of the main issues now days because of the fossil fuel depletion and environmental impacts. Braden (2012) point out that, the world energy demand is expected to grow at the average annual rate of 1.8% between 2005 and 2030, where wealth generation and drivers for social economic development are the main reason for the increased global energy demand. Barden did not explain the challenges facing small scale industries in the adoption of solar energy, thus it arise a knowledge gap which needs to be filled by conducting this research.

Africa has many energy resources such as hydropower, solar, wind and geothermal but only a small fraction is harnessed for domestic use. In the developing world, Africa has the lowest electrification rate, and the number of rural populations without electricity in Sub Sahara Africa (SSA) is expected to increase. Power utilities

in Africa have failed to provide adequate levels of electricity services especially to poor societies living in rural areas (Braden, 2012).

More than 650 million people in Sub Sahara Africa, rely on traditional biomass for cooking, heating and lighting, despite the effort done to promote electrification rate. These areas of SSA have much solar energy resources for decentralized solar energy technologies which march the dispersed nature of settlements and which are also environmentally friend.

In Tanzania the new energy policy implemented by the government and Tanzania Development Vision- 2025 (TDV) is aiming at raising the generating capacity to 10,000MW by 2025. This will be done by the government itself through it power utility company (TANESCO), and Independent Power Producers- IPP. The empirical evidence from other scholars fill the research gap by identifying the potential uses of both renewable energies and electricity power for industrial development processes. The area where there is heavy installation of electricity power plant and availability of solar energy enhance massive developments of both small scale industries and heavy industries. But the other scholars leave the knowledge gap of what challenges that small scale industries face in the adoption of the solar energy for the development.

2.4.1 Solar energy Electrification in Tanzanian Context

Tanzania like numerous other African nations still experiences absence of adequate vitality for its kin. To date, a staggering offer (right around 90%) of current vitality utilize is still met by conventional biomass (wood fills). The Rural Energy Agency (REA) report of 2013 uncovered that out that under 15% of Tanzania populace has power get to. The foundation of the Rural Energy Agency (REA) by the administration is one of confirmation to demonstrate the administration duty in the rustic regions lighting and empowering the improvement of sustainable power source in the nation. REA's one of the targets among others is to prepare, organize and encourage private and open sustainable power source improvement in country Tanzania.

The IEA, (2011) detailed in their World Energy Outlook 2011 report that only13.9% of the aggregate Tanzanian populace approached power, leaving 37.7 million individuals without access to power in their everyday lives.

Ahmed (2003) contended that sun based vitality is accepted to be the best elective wellspring of intensity in provincial territory on account of the copious accessibility of daylight in numerous parts of the nation. As indicated by TASEA (2005) included that sun based vitality ought to go to individuals, particularly in the off network rustic territories of Tanzania. Bauner (2012) uncovered that the nation's geological area and accessible land make it a high potential for sun based ranches in Tanzania.

The significance of sun based vitality in the rustic family units and networks advancement is obvious. It is the wellspring of vitality which is financially savvy and moderate by the rustic occupants, and a wellspring of vitality that can be gotten to by numerous individuals in the town over their monetary status. Dauda, (2005) saw that photovoltaic close planetary system as vital to the country families since its power is savvy and ecological cordial when contrasted with different wellsprings of vitality.

As indicated by Gwang'ombe (2004) in his sustainable power source advances in Tanzania noticed that there has been use of sun oriented vitality chiefly to heat (water warm) frameworks. He proceeds to demonstrate that sun based cooking, purifying and progressed sun oriented harvest drying advances. Nonetheless, the loathe years has seen Solar photovoltaic (PV) being connected for media transmission, lighting, refrigeration, water pumping and controlling other electronic hardware at singular habitations, schools and wellbeing focuses.

Kihedu (2006) likewise demonstrates the endeavors during the time spent sustainable power source application in Tanzania by giving data that there are a few associations which have effectively drawn in themselves in the sustainable power source advancements. In the rundown noted 21 legislative associations, 21 ventures and improvement accomplices; 73 privately owned businesses and 46 non-administrative associations. The system detailing for the advancement of Solar energy Technology (RETs) advancement in the nation is by all accounts a declaration of aim by the Ministry of Energy and Minerals. In addition, the Tanzania Energy Policy gives more

space to the development and advancement of sustainable power source, sun based vitality being one of them as obviously stipulated under articles 25, 39, 45 and 56, of the present Tanzania Energy Policy, URT-ME It is intriguing in any case, to take note of that Tanzania government is actualizing a National Solar Program under the World Solar Program (WSP).

Tanzania Solar Energy Association (TASEA) and other partners' associations have all effectively occupied with the improvement of sun based vitality application in Tanzania. The administration in addition has followed up on the procedure by the exception of all sun oriented controlled gear and concentrated extras from import obligation for the point of advancing and empowering the use of elective vitality given the vitality emergency in the nation, Mwandosya (2006). Anyway there have been more strides by the legislature is terms of alluring monetary terms for potential speculators to build up the nations sustainable power sources since 1999, URT-VPO (2003).

The above writing survey demonstrates a great deal have been said and examined from various edges by researchers on the advancement of sun powered vitality use for improvement forms. From the writing shows the pretended by various partners in the improvement of sunlight based vitality innovation, favorable circumstances and difficulties that have been confronted. This investigation has along these lines tending to this hole concentrating on inspecting the commitment of sustainable power source (sun based power) towards advancement of Industrial improvement process inside the territory. Additionally, the network individuals' recognitions on the adequacy of the PV sun powered vitality extends in changing people groups life by building up little scale enterprises for improvement.

2.4.2 The use of Solar energy in Transformation of Rural Livelihood

Different studies on sustainable power source, sun oriented vitality specifically, sees the framework as a channel to advancement and occupation change in the provincial regions. It has been demonstrated with almost certainly that Photovoltaic sun oriented vitality can and has decidedly affected the provincial employments. Sun powered vitality in provincial territory has contributed much to advancement change of

instruction, wellbeing, work status, improvement of little scale businesses, electric devises application, and data and media transmission framework. Mwihava (2002) noticed that sustainable power source in Tanzania has brought emphatically effect to financial improvement of the general population living in towns, towns and urban areas. This writing audit fills the examination hole by advancing the utilization of sustainable power source by changing individuals' lives and change social and monetary improvement.

There has been an eminent centrality of sun based vitality in the change of instruction in the greater part of family units and networks on the loose. Buragohain (2012) in her Impact of Solar Energy in Rural Development in India noticed that sun based vitality gives light to kids to learn around evening time as the outcomes it enhance their instruction execution. Nolens (2010) additionally contends that sun based power in rustic territory enables kids to have more opportunity to learn around evening time with better nature of light; henceforth they can enhance their training execution. ESMAP (2003) report demonstrates the absence of power in Peru came about into reduced personal satisfaction and poor training accomplishment.

As indicated by ESMAP reports, town zap empowers the utilization of ICT for better training improvement. For instance youngsters in energized family units have advanced education levels than those without power as uncovered in the ESMAP Philippines ESMAP (2003). Zap is accepted to directly affect instruction change as it were that it can affect training by enhancing the nature of schools. This writing audit it include the information hole under this examination with certainty that the presence of sun based energies inside he zone can invigorate the improvement of training forms since individuals can utilize light from power for contemplating and notwithstanding setting up electronic libraries

Likewise it has noticed that sustainable power source is a basic in enhancing individual’s wellbeing in the fringe and burdened zones which are not associated with the principle power network. Sun based vitality in such zones is vital and has ended up being extremely useful in a large portion of the zones where it has been connected. Concentrates over the effect of sun oriented vitality in provincial improvement in

India demonstrates that sunlight based lighting has helped distinctive families to beat medical issues which results from lamp fuel utilize and flame consuming in the shut rooms, Buragohain (2012) It is contended that sun powered vitality has a critical medical advantage as it decreases in house air contamination and the peril of flame as it substitutes the utilization of lamp fuel World Bank (2008)

What's more Solar power also adds to the change of wellbeing mindfulness by giving individuals access to media as the wellspring of data, (Braden, 2012). PV sun powered innovation has demonstrated achievement in high-innovation uses of correspondence. It is additionally a perfect option for fueling antibody refrigeration in provincial remote facilities. Immunizations can drastically enhance the soundness of the rustic poor Kerekezi (2005). The IEA (2008) give that entrance to better medicinal offices, antibody refrigeration, hardware cleansing, working theaters and lighting for neighborhood wellbeing focuses is basic in the change of wellbeing administration in the provincial zones. For example sun based PV introduced at Lugala Lutheran Hospital (3000Wp) in Ulanga, Morogoro enhanced wellbeing administrations by driving low vitality gear and lighting for implantation unit, theater, outpatient division, organization hinder, in patients wards, restorative cooling in the drug store and security lights TASEA (2005). Besides the above writing audit fill the exploration hole under this examination since it address the critical parts played by sustainable power source in helping the advancement of people groups' wellbeing in rustic zone. Hence without power no wellbeing administrations which will be given in a given region.

Moreover the sustainable power source including PV sun based power's commitment to monetary development is obvious and has been given in various investigations. Braden (2012) sees the commitment of sun based vitality by looking on its commitment to creating jobs through building up little scale enterprises and enabling individuals to work for extend periods of time around evening time. The World Bank (2009) report uncovers that Solar Home Systems (SHS) increments financial exercises inside and outside family units since business exercises work extend periods of time at night. The investigation by Braden (2012) on sun based vitality and provincial improvement which was led in Rema, Ethiopia, demonstrates the production of the

development of home business which prompts the fortifying of the family units' wage. This writing likewise fills the examination hole under this investigation by pointing out the utilization of sustainable power source for mechanical advancement. In this way if Tanzanian government put more exertion in contributing on both sun based vitality and lattice power plant it will helps in headway of little scale ventures for neediness decrease.

2.4.3 Limiting Factors to Solar energy Adoption in Tanzania

For the purpose of this study, limitations have been viewed as challenges facing the development and growth of solar energy in Tanzania. A number of studies have been documented on the limitations facing photovoltaic solar energy. Therefore this study provides some of the limitations which have been discussed by different scholars as they are given hereunder.

2.4.3.1 Minimal Institutional Support

Despite the growth and development of solar energy in Tanzania, this energy sector still faces inadequate institutional support for its prosperity. The promotion, investment and development of solar energy seem to have been left to the private sector alone which hinders its development. It is argued that the development, investment and promotion of solar energy require support from efficient institutional framework (Laing and Rosseli ,1999). The promotional of solar energy can therefore be attained if the government, the donors and the private sector can work together in undertaking a number of programs of which aim is harnessing solar energy potentials in the country.

2.4.3.2 Financial Limitations

Like in many other development projects, the growth of solar energy also encounters financial problem. This is the major problem for the development of solar energy in Tanzania. Despite being hailed as a cheap energy and even sometimes free, the initial costs involved in buying the materials and the installation devices makes it difficult for the technology to grow to the required standards hence inadequate supply of energy in rural Tanzania (Dauda 2005).

Mwihava (2002) sees that financial problem as the major problem for solar energy technology development and believe that solar energy can only be developed if the cost of photovoltaic volume is reduced. Studies show that the main obstacle in the implementation of solar energy practices is not only due to their technical feasibility, but also due to the absence of long term financing resources.

2.4.3.3 Policy and Legal Challenges

The success of any development project depends primarily on the policy guiding the process. Likewise, the promotion and development of solar energy technologies is to a large extent depending on the existing government policies. Government policies are important tools and factors in terms of their ability to create an enabling environment for RETs dissemination and mobilizing resources, as well as encouraging private sector investment (Mwihava, 2002).

The promotion and development of solar energy suffers from the lack of clear cut policies and legal framework which gives the direction towards the growth and implementation of different projects. Like Karekezi (2003) argues that most governments do not have clear cut policy on the development and promotional of RETs which continue to be undertaken within an energy planning vacuum. This led to the lack of clear link between the RETs and the national power master plan. This literature review discussed by other scholars it add the knowledge gap by identifying the hindrance factor toward the development processes of expanding opportunities in investment and establishing solar energy for social, economic and industrial development in Tanzania. If at all this challenges can be removed will improve and promote the influx of renewable energies for industrial development.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter is all about the research design and methodology that the researcher employed in conducting this study. It is argued by Kothari (2004) that research methodology is a systematic way applied to solve the research problem. Therefore this chapter covers the information about research design and approach used, study area, target population, sampling procedures and methods employed in data collection. Other aspects in this chapter include data analysis and presentation and ethical issues.

3.2 Research Design

As indicated by Koul (2006) contended that exploration configuration is a glue that holds the greater part of the components in look into venture together. The specialist in this examination utilized cross-area look into approach that included both subjective and quantitative strategies. The cross-sectional research was suggested in light of the fact that it is relative simple in spellbinding insights, costs, efficient and legitimate asset utilize. The cross-sectional research chose in this investigation since it utilizes an assortment of systems in information gathering and information examination. Moreover this exploration helped the scientist to make various inquiries to respondents at a solitary point in time while looking at the difficulties confronting little scale businesses in adjustment of sustainable power source (sun based) for Industrial advancement process in Mbeya City. The analyst under this examination utilized both Quantitative and Qualitative methodologies because of the way that the numerical information from documentations utilized for factual information investigation while the non-numerical information utilized just for content examination.

3.3 Area of the Study

Denscombe (1998) argued that area of the study refers to a small inclusive and extensive study of an individual(s) or area whereby an investigator employs all his/her skills and methods so as to allow systematic gathering of enough information about

the phenomenon at hand to permit one to understand how it functions as unit of ociety. This study conducted at Mbeya city council, the choice of this area was that, Mbeya City council has many respondents working in solar companies and also the city have workers who are working on small scale industries including, food processing industries and assembling Industries.

Mbeya city lies between latitudes 7^0 and 9^o South of Equator and between longitudes 33^o and 35^o East of Greenwich. The City includes the newly established Mbarali District which is now in operation. It is bordered by Iringa region to the East, Rungwe and Ileje Districts to the South. Mbeya city council is estimated to have a total population of 385,279 of which males are 182,620 and females are 202,659 (Tanzania National Census, 2012)

3.4 Target Population

Mugenda (2012) define population as that group of individuals, objects, or events to which the researcher wants to generalize the results of the study. In this study the targeted population comprised of 102 people of which 49 was the small scale industries workers, 15 business men who sell solar systems in retails, 28 workers form solar companies existing in Mbeya city, 10 SIDO officials.

3.5. Sampling Techniques and Sample Size

3.5.1 Sample Size

Sample refers to a small group selected from the identified population from which generalization are made (Keya, 1989). Therefore, a total of eighty (80) respondents were selected as the sample in this study; the sample size of this study was enough to capture the information needed for the study. These 80 respondents selected basing on the reference from Krejcie and Morgan (1970) sampling method.

3.5.2 Sampling Techniques

Both purposive and simple random sampling techniques used to obtain the sample population for this study. In this study, the scientist utilized non-likelihood testing system particularly purposive inspecting procedure in the determination of representatives from little scale enterprises. As indicated by Kombo et al (2006)

contended that purposive testing is utilized to focus on a gathering of individuals accepted to be dependable for the examination. All respondents chose in this investigation since they are partners of Small scale businesses. The purposive inspecting utilized just for officers and workers from SIDO, Mobisol and Zola solar service based organizations.

In basic arbitrary inspecting, people were chosen so that every respondent had an equivalent shot of being chosen and every one chose autonomously. This strategy made freeness to the two respondents and the scientist. A sum of 80 respondents was chosen from little scale ventures, sun based organizations and SIDO in view of age, sex and training levels inside the examination territory. The example estimate class and organization in this investigation included 80 respondents of which of 12 workers (Staffs and freelancers) were taken from Mobisol Solar Company and 10 workers from Zola Solar Company. 11 business men who sell solar in their retail shops in Mbeya City, 7 specialists from SIDO and 40 entrepreneurs who work in small scale industries.

Table 3.1 Distribution of the Study Respondents (n=80)

Institutions/ area	Respondents	Total
Mobisol Solar Company	Officers /Workers	12
Zola Solar Company	Officers/workers	10
Solar retail shops	Business men	11
SSI entrepreneurs	Workers	40
SIDO	Workers	7
Total		80

Source: Field Data, 2018

3.6. Methods of Data Collection

The study used two sources/ methods of data collection namely, primary and secondary source of data to gather information based on challenges facing small scale industries in adoption of solar energy sources for Industrial development in Mbeya City. Under these two sources of data both quantitative and qualitative data was obtained whereby quantitative data involved numerical presentation and qualitative data a non-numerical data was obtained and analyzed by content analysis.

3.6.1 Field Data Collection

The primary data was collected by using three field data collection tools. These includes: questionnaires, Focus Group Discussion and Direct Observations tools.

3.6.2 Documentary Review

Documentary review involves deriving information by studying written documents. In documentary analysis, the following were used as sources of data records: minutes of meetings, reports, recording by phone recorder, circulars, and policy documents (Creswell 2009). In this study, statistics on customer users and workers were observed based on the uses of solar energy to small scale industries.

3.7 Tools for Data Collection

This study employed both quantitative and qualitative data because the numerical data from documentations will be used for statistical data and non-numerical data will be used for content analysis. The following tools were used as the primary field data sources.

3.7.1 Questionnaires

Koul (2006), defines questionnaires as devices consisting of a series of questions dealing with some psychological, social, educational and the like, whereby questions was given to an individual or group of individuals to obtain data under problem of investigation. The study used structured questionnaires as the main data collection tool whereby both open and closed questions were structured to allow respondents to express themselves when examining the challenges facing small scale industries in adoption of solar energy sources for Industrial development in Mbeya City.

The researcher chose this tool due to the nature of respondents who were mid- literate and express their views with no fear of being judged. The tools used mostly to small officials of selected offices to be visited at SIDO, Mobisol and Zola and entrepreneurs working in small scale industries and solar customers.

3.7.2 Focus Group Discussion (FGD)

Powel and Single (1996) defined group discussion as a group of individuals selected and assembled by a researcher to discuss and comment on from personal experience the topic that is the subject of the research. It is considered to be useful method for collecting information through an organized discussion. The FGD was randomly selected from a sample population in selected solar companies, owners of small scale industries, officials form SIDO for discussion. This tool used to get more elaborations on how cost, capacity of solar systems and awareness level play as challenges for adoption of solar energy by small scale industries.

The focus group discussion was conducted in two groups of 15 members each. The invitations were sent to the respondent one week before, and the discussion started early in the morning. The recorder was used to record the discussion for critical analysis by researcher.

3.7.3 Direct Observation

Direct Observation enables the researcher to see things that might otherwise be unconsciously missed and therefore data collected through observation are more tacit (Cohen 2000). When using this technique, the role of the observer varies from a non-participant to a complete participant in the group that is being observed (Creswell 2009). In this study, the researcher systematically observed how solar energy and other solar energy sources are used in production process. The choice of this tool under this study it helps to see whether or not the applicability of solar energy is suitable or not in operation of small scale industries.

3.8 Data Processing Analysis and Presentation

Data was collected and edited immediately to detect errors before coding. Data was coded before analysis. Describe the process of transcribing data that collected by the

Researcher. The researcher makes a distinction on analysis of qualitative and quantitative data to make the study meaningful and realistic.

3.8.1 Analysis of Quantitative Data

Veal (1997) revealed that, data analysis is done to sort and evaluate gathered information in relation to posed questions and identified concepts. In this study, quantitative data was analyzed with the help of the Statistical Package for Social Science (SPSS) whereby the descriptive analysis was conducted and cross tabulation was also conducted to give accurate information on the challenges facing small scale industries in adoption of solar energy sources Mbeya City. The qualitative data which was analyzed by using content analysis gave more summary of each topic discussed under the stated objectives.

3.8.2 Data Presentation

The quantitative data was coded in the programs SPSS for analysis. The findings from the analyzed data were presented by using tables, figures, pie and word statements. On the other hand, the Qualitative data was coded before interpretation. This was done by using content analysis whereby several issues on the uses of renewable solar energy interpreted along the themes and reported along with the statistical data. Multiple responses from interviews was coded and presented in statistical form in accuracy manner. Therefore, presentation and discussion of the findings, conclusions and recommendations was made based on results findings from the field.

3. 9 Validity and Reliability

3.9.1 Validity

Validity refers to quality that an instrument used in research is accurate, correct, meaningful and right. According to Koul (2006), validity checks whether a study measures what is supposed to measure. Creswell (2009) asserts that validity is one of the strengths of qualitative research, and it is based on determining whether the findings are accurate from the standpoint of the researcher, the participant or the reader of an account. To ensure validity of the expected data in this study, supervisor of the researcher read the research instruments and validated them in terms of

relevance, coverage and consistence. All ambiguity was corrected and all useful comments incorporated before writing the final report

3.9.2 Reliability

Borg and Gall (2003), defines reliability as the extent to which results are consistent over time and an accurate representation of the total population under the study and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. The reliability involved the ability of respondents in participating in the study; the nature of the constructs was measured and clarity of instruction given to those using the instrument. Therefore, before data collection process the researcher ensured the research instrument and tools are correct to deliver the result findings of the study.

3.10 Ethical Considerations

Ethical considerations involve abiding to principles of social values and scientific investigation when conducting a research. Research Clearance to carry on with this study obtained from the Mzumbe University from the respective Faculty Dean. Furthermore, during the field more cooperation was given not only from solar companies but also form SIDO and other respondents. Therefore, confidentiality of information was observed.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND DISCUSSION OF THE FINDINGS

4.0 Introduction

The main objective of this chapter is to present, analyze and discuss the data collected from empirical field research on each of the specific objectives and research questions mentioned under chapter one of the study. The chapter begins by presenting a profile of respondents who participated in the study as well as their key characteristics. The findings from this study were presented in line with the specific objectives, including: (i) to assess the cost of appliances towards adoption of solar energy sources in Taznaia. (ii) tto assess the capacity of solar applainces towards adoption of solar energy sources(iii) to assess the SSI's awareness oof the solar technology towards adoption of solar energy sources The objectives of the study covered the research intention towards the challenges faces small scale industries in adoption of solar energy sources in Tanzania:

4.1 Demographic Characteristics of Respondents

The demographic characteristics of respondents under this study are categorized into five main areas such as sex, age, education level, marital status and working experiences. The study involved a total of 80 participants to assess challenges faces small scale industries in adoption of solar energy sources for industrial development in Tanzania: The demographic characteristics of respondents, research objectives and sample size of respondents contributed in the provision of actual picture of the study.

4.1.1 Sex of Respondents

Gender identity it plays a great role in social, political and economic developments with the fact that every individuals should involve in production activities for the welfare of the family, community and nation at large. The results findings in Table 4:1 indicates that 44 (55%) of total respondents' were females and 36 (45%) were males. The researcher considered gender issues by involving both sexes equally as they were selected randomly from the visited area. With regard to the study, it can be noted that female from the households and economical activities are the mostly users of solar energy for economic production activities rather than men. Larger number of

women both in Mbeya region engages into small businesses for income generating activities.

Table 4.1 Sex of Respondents (n=80)

Description	**Results Finding**	
Sex	**Frequency (n=80)**	**Percentage (%)**
Female	44	55.0
Male	36	45.0
Total	**80**	**100**

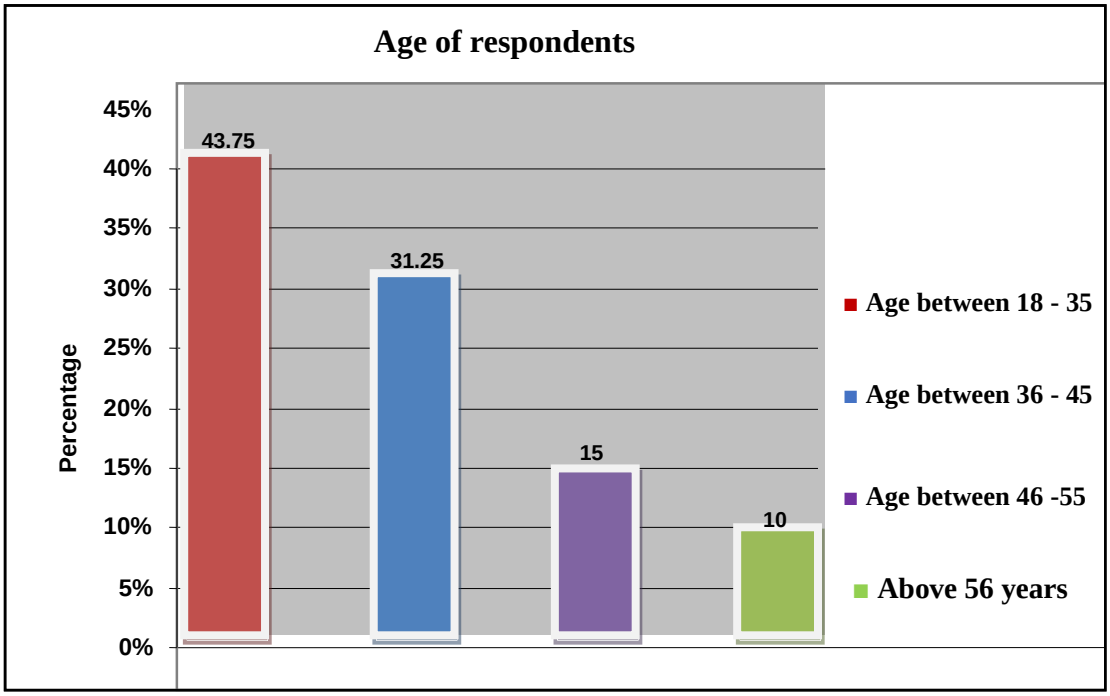
Source: Field Data, 2018

4.1.2 Age of Respondents

Age is an important demographic variable and the primary basis for demographic classification as vital statistics, census, and surveys (URT, 2005). Age group is an important variable in services provisions at any place from family to nation level because it can determine the ability, work performance and experiences of individuals. The results finding in Figure 4: 2 indicated that a large proportion of the respondents 35 (43.75%) were aged between 18 to 35 years old. This was followed by the age group of 36 to 45 years old who proportioned to 25 (31.25%) of the total respondents. Other 12 respondents' equivalents to (15%) were aged between 46 to 55 of total respondents and 8 respondents equivalents (10%) were 46 years and above.

The age group between 18 to 35 and 36 to 45 were almost young people and adults who depended on electricity from solar energy sources for income generating activities. *One respondent the owner of rice milling machine at Ruanda ward said that "I depend much on hydroelectric power for the running of my rice milling machines at my store here at SIDO area. When the grid electricity runoff, I get a big loss due as my production has to stop and the only alternative we have for now is using the big generators which I cannot afford to buy" for studying*".

Figure 4. 1 Age category of Respondents (n=80)



Source: Field Data, 2018

4.1.3 Education Level of Respondents

URT (2009) mentioned education as an important determinant of the decision for people to participate in social and economic developments in any society. The results finding in Table 4:3 revealed that the majority of respondents 26 equivalent to (32.5%) were primary school holders followed by 24 respondents equivalent to (30%) who were secondary school. Furthermore 18 respondents corresponding to (22.5%) were diploma level of education, while 8 respondents equivalent to (10%) owned degree level of education and 4 respondents corresponding to (5%) were master level of education.

This finding imply that the majority of interviewed respondents owned their education level ranging from primary to university level participated in income generating activities and good in reasoning. Therefore, the satisfactory level of education of an individual it create enabling environment towards the knowledge and skills on how to use solar energy for income generating activities among individuals. This study supported by Braden (2012) who argued that formal education stimulates social-

economic growth if there is inequality in educational endowments, the returns from household income earning would likely to remain low for poor businessmen.

Table 4. 2 Education Level of Respondent (n=80)

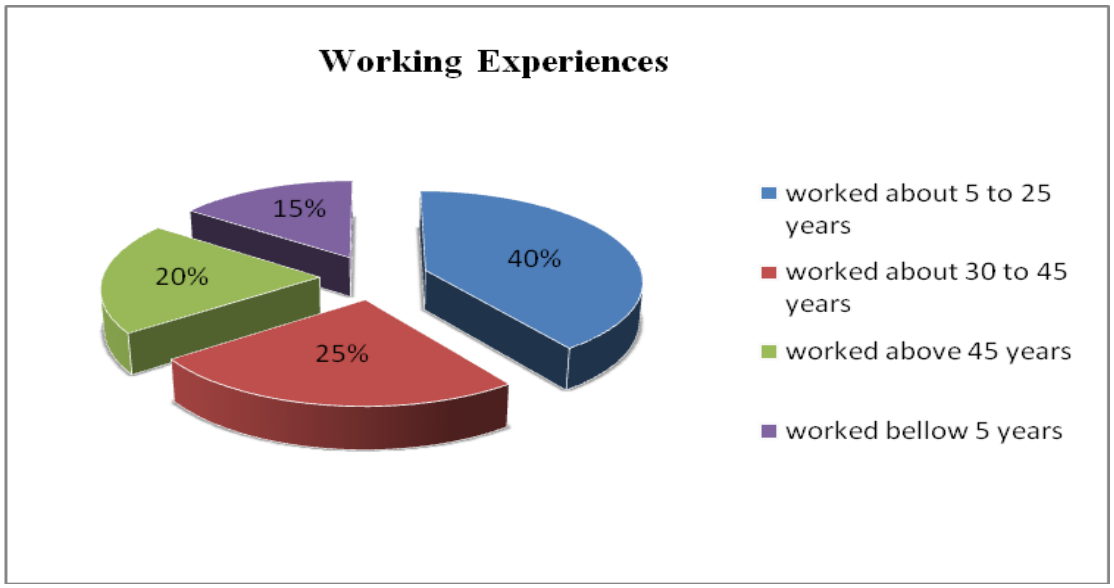
Description	**Results Finding**	
Education level	**Frequency (n=80)**	**Percent (%)**
Primary school	26	32.5
Secondary	24	30.0
Diploma	18	22.5
Degree	8	10.0
Master	4	5.0
Total	**80**	**100**

Source: Field Data, 2018

4.1.4 Working Experiences

The researcher wanted to know working experiences of respondents within the council and how direct involved in the use of solar power for income generating activities. The result finding in Figure 4:4 below indicate that majority of interviewed respondents 32 (40%) had worked in Mbeya City as the businessperson for about 5 to 25 years, followed by respondents 20 (25%) worked in income generating activities as the entrepreneurs for about 30 to 45 years period. Also 16 respondents corresponding to (20%) worked above 45 years in the city as businessmen and 12 respondents corresponding to (15%) worked below 5 years. This implies that most of the interviewed household especially entrepreneurs had enough time and experience as the small entrepreneurs and businessmen. Therefore, these respondents were suitable for the study as they had enough information on using various source of power including solar energy for income generating activities. According to Kimambo and Mwakabuta (2005) argued that solar energy should go to people, especially in the off grid rural areas of Tanzania. Solar energy is believed to be the best alternative because of the abundant availability of sunlight in many parts of the country. Bauner (2012) reported that the country's geographical location and available land make it a high potential for solar farms in Tanzania.

Figure 4. 2 Working Experiences (n=80)



Source: Field Data, 2018

4.2 Cost of solar appliances towards adoption of solar energy

The researcher through questionnaire questions and observation methods wanted the respondents to identify types of solar energy sources used most by the small scale industries in their activities.

4.2.1 Analysis from Questionnaires

The questionnaire was employed to the sample size of 50 which included small scale industries and business men in Mbeya city who sell solar appliances. The respondents were required to out viewed their preferences on how does cost of solar appliance affect the adoption of solar energy. By choosing either agree, disagree, or neutral selections on the question asked if they are comfortable and capable of paying the existing cost of solar appliances which can power their industries. From the cross tabulation table 4.2.1 which was run by SPSS the results revealed that those who were comfortable to pay and capable to pay were 56% and neutral 16.7% and those who disagree were 27.8%

Those who disagree with the comfortability to pay for the cost but capable to pay were 47%, neutral 23.5 and agreed 29.4%. This indicated that, 47% of 50 respondents were capable to pay for the cost of solar appliances in the market but not comfortable with the payment systems. 23.5% of 50 respondents were neutral on that capacity to

pay for the cost and comfortability to pay for the cost.29.4% of the 50 respondents agreed that they were comfortable with payment process and capable to pay for the cost of appliances in the market.

All of that results in summary means that entrepreneurs working in small scale industries are able to pay for the cost of appliances in adoption of using solar energy as alternative but they are not comfortable with the payment systems which is available in the market. More explanations about the payment systems which they are not comfortable with will be shown on Focus group discussion.

Table 4. 3 Cost of solar appliances towards adoption of solar energy sources towards (n=50)

Are you comfortable with payments process of the solar appliances? * Are you capable paying for solar appliances which can power your SSI? Cross tabulation

			Are you capable paying for solar appliances which can power your SSI?			Total
			Agree	Neutral	Disagree	
Are you comfortable with payments process of the solar appliances?	Agree	Count	10	3	5	18
		% within Are you comfortable with payments process of the solar appliances?	55.6%	16.7%	27.8%	100.0%
		% within Are you capable paying for solar appliances which can power your SSI?	47.6%	23.1%	31.3%	36.0%
	Neutral	Count	3	6	6	15
		% within Are you comfortable with payments process of the solar appliances?	20.0%	40.0%	40.0%	100.0%

		% within Are you capable paying for solar appliances which can power your SSI?	14.3%	46.2%	37.5%	30.0%
		Count	8	4	5	17
	Disagree	% within Are you comfortable with payments process of the solar appliances?	47.1%	23.5%	29.4%	100.0%
		% within Are you capable paying for solar appliances which can power your SSI?	38.1%	30.8%	31.3%	34.0%
		Count	21	13	16	50
Total		% within Are you comfortable with payments process of the solar appliances?	42.0%	26.0%	32.0%	100.0%
		% within Are you capable paying for solar appliances which can power your SSI?	100.0%	100.0%	100.0%	100.0%

Source: Field Data, 2018

4.3.1 Analysis from the Focus Group Discussion

The FGD was conducted at the SIDO office, where by entrepreneurs working in small scale industries staffs working at Mobisol, Zola and SIDO were invited and attended. The total sample size attended was two groups of 15 people each. Respondents were required to respond to various discussion questions concerning the challenges faces small scale enterprises in adoption of solar energy.

4.3.1.1. Analysis from GROUP I of FGD

The group was composed of 15 attendants where by 2 officer from SIDO, 2 officer from Zola Company, 2 officer for Mobisol Company, 5 entrepreneurs from small scale industries and 1 from welding activities, 2 business men who sell solar appliances, The

discussion guide was used to ask questions to the group and exploring more information from the respondents.

The results findings revealed that respond stated and agreed that solar energy requires high capital for investments. They further explained that, the solar appliances are much expensive than hydroelectric appliances, and thus require a lot of capital approximately not less than Tsh 10 million for small scale industry to adopt it. This situation hinders small scale industries in adoption of the solar energy especially solar technologies as the results the majorities of businessmen and entrepreneurs depend on hydroelectric power for the provision of goods and services. One respondent said that "*I once inquired the information on the price of solar system which can power my small rice milling industry and I was told it cost not less than 20 million and is supposed to be paid on cash"*

Also the result finding indicates that cost of solar appliances is very expensive for example the cost of appliance which is used to change the electricity from DC to AC it is very expensive for small scale industries to afford and use solar power for provision of goods. Furthermore the group discussion revealed that solar energy industry is faced with lack of technicians and expertise who can operate the machines and other solar inputs as the results small scale industries fails to adopt solar energy for the provision of goods and services for social and economic development.

4.3.1.2 Analysis from the Group II of FGD

On the other hand, a researcher conducted a FGD to the other group which composed of 15 representative from SIDO (2), Zola (2), Mobisol (2) and 6 entrepreneur each from small scale industries, soap making industry and agro- processing, 2 business men who sell solar appliances. Also, the guide was used to explore more information from the respondents through questions asked in the discussion.

Respondents revealed that few big investors in the solar energy sector in Tanzania seem to be the challenge for the adoption of solar energy source. The presence of few investors to invest in solar electricity, wind power, and other sources fails to compete with the hydroelectric power due to monopolism of the current hydroelectric power supplier. One respondent said "*It is so disappointing when you cannot get service or*

offer service to your customers because the hydroelectric power has shut down and there is no other alternative to use"

In addition, respondents confirmed that low capacity of solar energy also is another challenge which faces small scale industries to adopt solar technologies for the provision of gods and services to the community. Solar electricity cannot afford to run and generate big machines like rice milling machines due to its capacity as the results small scale industries depend on hydroelectric power for production of goods. One respondent from sunflower oil milling industry said that "*solar panel cannot support to run the machines due to low voltage as the results solar electricity remain for domestic uses and not for industries".*

Furthermore, respondents confirmed that lack of awareness on other solar energy sources was another challenge which faces small scale industries in adoption of solar energy as the sources of power. The study revealed that most of households and residents are not much aware on the uses of solar power for the provision of goods and services to the community. One respondent from said that "*education should be given to the community on the importance of solar power to social and economic development in order to make the community aware of the use of solar electricity in income generating activities as well as for domestic uses"*

Sasikumar (2013) added that Photovoltaic solar electricity has proved to be the alternative way of electrification to the off-grid rural areas where there is a limited supply of modern energy (electricity) for social and economic development.

4.3.1.3 Summary from Focus Group Discussion

From both group discussions, it has been found out that; still small scale industries face many challenges in the adoption of solar energy. The most mentioned challenges were High capital of investments due to high cost of appliances and inputs for small scale industry to adopt and power their machines, lack of technicians and experts for maintenances. Also, respondents urged that few numbers of big investors in solar

industry limit the choices of customers to the available products and results to few choices which are not suitable substitute. The also mentioned that the available solar systems are of lower power to meet the needs of the small scale industry and last but not least , the awareness of the solar industry to small scale industry is still very low and education need to be spread to more entrepreneurs on the benefits of using solar power and its capacity .

4.2.3 Summary of both Questionnaires and Focus Group Discussion

The findings from both questionnaires and observation revealed that still large number of entrepreneur population in small scale industries sector uses hydroelectric power for the production activities. Solar energy is second solar energy which used most by small scale industries because the cost of solar appliances is very high and there are entrepreneurs who are capable to pay for it but not comfortable to pay for it because of payment systems. As they cannot pay by installments.

It has also been responded that solar energy is used mostly for simple production activities and storage because most of the available systems cannot power the existing machines used by small scale industries. Also, the respondents urged that hydroelectric power supplies is not enough for sustainable production, and more efforts should be directed to improve other sources of solar energy a such as solar energy so that they can be able to meet the needs of entrepreneur in small scale industries.

4.3 Capacity of Solar Appliances Towards Adoption of Solar Energy Sources

Solar energy in Tanzanian context can no longer be ignored by the energy sector development as it provides an alternative source of energy which can benefit a larger number of people in the marginalized areas due to its availability, affordability, cleanliness and safety. Therefore, local enterprises can be encouraged to use solar energy for social- economic development. The researcher under this study also sought of need to assess the capacity of solar appliances towards adoption of solar energy by using questionnaires, focus group discussion and observation.

4.3.1 Analysis from Observation

Observation tool was also employed by the research to find out the challenges faces small scale industries in adoption of solar energy. The analysis results were that, high power consuming machines are used by entrepreneurs in small scale industry and they are not capable of being run by the available renewable resources in Mbeya such as solar systems from different existing companies. Refer to figure 4.3.2.1, figure 4.3.2.2, figure 4.3.2.3 in appendix I.

Also, from the observation, it was analyzed that still there is a challenge of using solar energy for heavy production because of its low power and limited technical appliances to power the machines such as rice milling machines, sunflower oil extraction machines.

4.3.2 Analysis form the Questionnaires

The questionnaire was employed to the sample size of 50 which included small scale industries and business men in Mbeya city who sell solar appliances. The respondents were required to out viewed their preferences on how are they agreeing or disagree on the capacity of solar appliance to power the machines of small scale industries in adoption of solar energy. The descriptive analysis was run by SPSS and the results are as shown in the following table.

Are the solar appliances in the market able to power the SSI?

		Frequency	Percent
Valid	Agree	16	32.0
	Neutral	15	30.0
	Disagree	19	38.0
	Total	50	100.0

Source: Field Data, 2018

The number of respondents who agreed that the capacity of solar appliances is enough to power the machines of small scale industries was 16 (32%). Out of 50, 15 respondents (30%) chose neutral which means that they find the capacity of solar

appliances to power the machines depends on the industry level, there are some solar systems which can power and other which cannot.

The rest of the respondents which make a major percent 19 respondents (38%) disagree with the capacity of solar appliance to power the small scale industries machines. This means that, entrepreneurs in the small scale industries do not see solar systems available as capable as they are supposed to be in order to run their industries

4.3.3 Analysis from Focus Group Discussion

In FGD, respondents confirmed that low capacity of solar energy also is another challenge which faces small scale industries to adopt solar technologies for the provision of gods and services to the community. Solar electricity cannot afford to run and generate big machines like rice milling machines due to its capacity as the results small scale industries depend on hydroelectric power for production of goods. One respondent from sunflower oil milling industry said that "*solar panel cannot support to run the machines due to low voltage as the results solar electricity remain for domestic uses and not for industries".*

4.3.3 Summary of Questionnaires, FGD and observation

To summarize, the findings from both questionnaires, observation and focus group discussion revealed that, entrepreneurs working in small scale industry still see the capacity of solar appliances available in the market is low to power their machines and run the production activities. That capacity hinders the adoption of small scale industries to using solar energy and decide to stick with hydroelectric power as source of their energy. As data revealed, most of the challenges that small scale industry face are low capacity of the solar systems to meet the needs of the machines used by entrepreneurs for activities like oil extraction, rice milling.

4.4 SSIs awareness of solar technology towards adoption of solar energy sources

The researcher through questionnaires and FGD wanted the respondents to reveal their level of awareness about solar technology to making decision of adopting the solar

energy for industrial activities. The FGD was employed to officials from SIDO, solar companies and questionnaires were distributed to entrepreneurs in small scale industries

4.4.1 Analysis from Questionnaire

The questionnaire was employed to the sample size of 50 which included small scale industries and business men in Mbeya city who sell solar appliances. The respondents were required to out viewed their preferences on the level of information on solar technology, are they able to make decision of adoption the solar energy to industrialization activities basing on the information that they have. Also, the cross tabulation was conducted to analyze the awareness level of solar technology and capacity to pay for the cost of solar appliances. By choosing either agree, neutral or disagree, the results are as following.

Table 4. 4 Is Awareness Level of Solar Technology Enough for Adoption in Small Scale Industries?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	22	44.0	44.0	44.0
	Neutral	16	32.0	32.0	76.0
	Disagree	12	24.0	24.0	100.0
	Total	50	100.0	100.0	

Source: Field Data, 2018

From the descriptive analysis, table 4.4.1 it showed that 22 respondents which make a majority of 44% agreed that the information about solar technology is enough to make them make decision about adopting the solar energy for industrialization activities. 16 respondents (32%) were neutral on the level of information and its impact on adopting the use of solar energy for small scale industries. Which means that, they see as it is somehow enough and somehow need to be improved and more spread so that entrepreneurs can make informative decision on the adoption process. The rest of the respondents which are 12 (24%) disagree that the awareness of solar technology is

enough for them to make decision on adopting the sola energy for small scale industrial activities.

From the cross tabulation on table 4.4.2 which was run by SPSS the results revealed that, with the available level of awareness about solar technology, there are 45.5% respondents who agree that they can be able to pay for cost of solar appliances under the information level that they have. 27.3% of respondents agreed with the awareness level to enough and can make payment to the cost of solar appliances with that level. 27.3% respondents were neutral.

50% of the respondents disagree with the level of awareness being enough to make decision but agreed to be capable to pay for the cost of appliances in the market. 16.7% were neutral about the awareness level and decision to pay for the cost. 33.0% disagreed about the awareness level being enough and disagree that the ability to pay for the appliances in the market with that level of awareness.

All of that means that, majority are saying the level of awareness or information concerning solar technology is not enough to affect the capacity to pay for the cost of solar appliances in the adoption of solar energy.

Table 4. 5 Table 4.4.2 Is awareness level of solar technology enough for adoption in small scale industries? * Are you capable paying for solar appliances which can power your SSI? Cross tabulation

			Are you capable paying for solar appliances which can power your SSI?			Total
			Agree	Neutral	Disagree	
To what extent you are aware with alternative source of energy in SSI?	Agree	Count	10	6	6	22
		% within To what extent you are aware with alternative source of energy in SSI?	45.5%	27.3%	27.3%	100.0%
		% within Are you capable paying for solar appliances which can power your SSI?	47.6%	46.2%	37.5%	44.0%
	Neutral	Count	5	5	6	16
		% within To what extent you are aware with alternative source of energy in SSI?	31.3%	31.3%	37.5%	100.0%

		% within Are you capable paying for solar appliances which can power your SSI?	23.8%	38.5%	37.5%	32.0%
		Count	6	2	4	12
		% within To what extent you are aware with alternative source of energy in SSI?	50.0%	16.7%	33.3%	100.0%
	Disagree	% within Are you capable paying for solar appliances which can power your SSI?	28.6%	15.4%	25.0%	24.0%
		Count	21	13	16	50
		% within To what extent you are aware with alternative source of energy in SSI?	42.0%	26.0%	32.0%	100.0%
Total						

% within Are you capable paying for solar appliances which can power your SSI?	100.0%	100.0%	100.0%	100.0%

Source, field data 2018.

4.4.3 Summary

The findings from questionnaires on both descriptive and cross tabulation analysis which were done on if the awareness level of solar technology enough for adoption of solar energy by small scale industries solar energy, revealed that still there is the room of increasing the awareness of solar technology and its power and importance to small scale industries' entrepreneurs so that it affects their capacity and comfort ability to pay for the solar appliances in adoption of solar energy.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This Chapter is divided into four sections which include summary of the findings, conclusion, recommendations and suggested areas for further studies. The study centered on understanding the effectiveness of using solar energy sources specifically solar electrification on the communities' livelihood transformation, understanding the readiness and acceptance of adopting the new solar technology.

5.1 Summary of the Major Findings

The summary of the finding of this study presented into three categories first the summary on cost of solar appliances towards adoption of solar energy, then summary on capacity of solar appliances towards adoption of solar energy and last but not least, the summary on the small scale industries awareness level towards adoption of solar energy in promotion of small scale industries

5.1.1 Cost of Solar Appliances Towards Adoption of Solar Energy

The findings from both questionnaires and observation revealed that still large number of entrepreneur population in small scale industries sector uses hydroelectric power for the production activities. Solar energy is second solar energy which used most by small scale industries because the cost of solar appliances is very high and there are entrepreneurs who are capable to pay for it but not comfortable to pay for it because of payment systems. As they cannot pay by installments.

It has also been responded that solar energy is used mostly for simple production activities and storage because most of the available systems cannot power the existing machines used by small scale industries. Also, the respondents urged that hydroelectric power supplies is not enough for sustainable production, and more efforts should be directed to improve other sources of solar energy a such as solar energy so that they can be able to meet the needs of entrepreneur in small scale industries.

5.1.2 Capacity of Solar Appliances Towards Adoption of Solar Energy

To summarize, the findings from both questionnaires, observation and focus group discussion revealed that, entrepreneurs working in small scale industry still see the capacity of solar appliances available in the market is low to power their machines and run the production activities. That capacity hinders the adoption of small scale industries to using solar energy and decide to stick with hydroelectric power as source of their energy. As data revealed, most of the challenges that small scale industry face are low capacity of the solar systems to meet the needs of the machines used by entrepreneurs for activities like oil extraction, rice milling.

5.2.3 SSI S Awareness of Solar Technology Towards Adoption of Solar Energy

The findings from questionnaires on both descriptive and cross tabulation analysis which were done on if the awareness level of solar technology enough for adoption of solar energy by small scale industries solar energy, revealed that still there is the room for increasing the awareness of solar technology and its power and importance to small scale industries' entrepreneurs so that it affects their capacity and comfortability to pay for the solar appliances in adoption of solar energy.

5.2 Overall Conclusions

The study concluded that various challenges face small scale industries in adoption of solar energy technologies such as high cost of appliances and inputs, low power capacity of solar systems, low number of investors in the solar energy sector which can produce big solar systems to be used by small scale industries activities. Also, the findings from this study show if more education and awareness provided to the community people's attitude and perceptions will be positive to use solar electricity for social and economic development.

5.3 Recommendations

The following recommendations were made based on the result findings and conclusions of the study. From the findings, it is recommended that more investment should be made in the renewable energy sector including solar energy in particular. The investment in the solar energy will help to be used as a substitute for hydroelectric power to small scale industries to operate their activities

such as milling activities, oil extracting activities, agro-processing, dairy processing industry and livestock keeping activities. All of those will light up the living standards of the people, create employments and provide equal opportunity for the entire population in the country. This will help the country to run into industrial economy in 2025. It is important to encourage the different people in the societies to invest in solar energy and see it as an important area for their development. Having people from the societies investing in solar energy will strengthen the economy and fight for poverty alleviation

The study also it recommends that some entrepreneurs have invested in the use of solar energy, but only for selling solar panels and other solar energy devices. If these people can be trained and supported to the extent of getting them to stand alone and go beyond selling devices, then the revolution in the solar energy sector will compete with the study also sees that there is still a room for solar stakeholders to prepare other solar exhibitions in the year so that entrepreneurs in small scale industries can get a chance to learn more and collect information about existing solar systems in the market also the solar companies can get to identify the needs of entrepreneurs in the industry .To have 2 solar exhibitions in Mbeya will motivate the uses of solar energy in the city as many people will be interested and already get the information which will help to ma the informative decisions on the adoption of solar energy.

Furthermore, it is recommended that the government should promote conducive investment environment such as reducing tax to the investor who wishes to invest and run solar power industry in order to broaden the market for customers to use solar electricity for income generating activities. Electricity access is still very low in Tanzania to date only 18% of Tanzanians have access to electricity and the situation is worse in rural areas where only 2% have access to electricity (TANESCO, 2014). Therefore other sources of electricity such as biomass, wind, geothermal and solar should be given high priority to fill the gap to the area where there is off grid electricity.

5.4 Recommendations for Further Studies

This study covered only one District and therefore quite limited in generalizing the findings to the Tanzanian rural and urban population.

(i) It is suggested that there is a need to conduct a study on the challenges of using other solar energy sources (biomass, geothermal and wind) for social and economic development.

(iii) There is a need to conduct a study on the challenges faces hydroelectric power source to the development of industrial sector.

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APPENDICES

APPENDIX I

Figure 4.2.2.1 Entrepreneur uses solar for lightning at her working plac

Source: Field Data, 2018

APPENDIX I

Figure 4.2.2.2 Entrepreneur uses hydroelectric power for extraction of sunflower oil form the machine (n=80)

APPENDIX I

Figure 4.3.2 Rice Milling machine whereby solar power cannot support its operation due to low capacity, so it use only hydroelectric power for productions

Source: Field Data, 2018

APPENDIX - II

Questionnaire Questions for entrepreneurs who work in small scale industries (SSI)

I, Lena George a student from Mzumbe University – Mbeya Campus, I'm conducting a study about examining the challenges facing small scale industries in adaption of solar energy towards contribution of development in Tanzania, the case study of Mbeya city. The information obtained will be treated confidentially for academic purposes and not otherwise.

Put [√] in the brackets provided appropriately

1. Age of respondent ……

(a) 18-25 [ ] (b) 26- 30 [ ] (c) 31- 39 [ ] (d) 40+ [ ]

2. Sex of respondent ……..

(a) Male [ ] (b) Female [ ]

3. Marital statuses

a) Single [ ]

b) Married [ ]

5. Working experiences

(a) Bellow 5 years [ ]

(b) Between 5 and 15 [ ]

(c) Between 25 and 45 [ ]

(d) Above 45 [ ]

6. Are you comfortable with the cost of solar appliances in the market?

Agree [ ]
Neutral [ ]
Disagree [ ]

7. Are you capable to pay for the cost of solar appliance in the market?

Agree [ ]
Neutral [ ]
Disagree [ ]

8. The capacity of solar appliance in the market is powerful enough to power the small scale industries' machines

Agree [ ]
Neutral [ ]
Disagree [ ]

9. The information on solar technology is well spread to small scale entrepreneurs

Agree [ ]
Neutral [ ]
Disagree [ ]

10. With the level of awareness that you have of solar technology, you are comfortable and able to pay for the cost of solar appliances

Agree [ ]
Neutral [ ]
Disagree [ ]

11. With the level of awareness that you have on solar technology, the capacity of solar appliances is enough to power the small scale industries machines?

Agree [ ]

Neutral [ ]

Disagree [ ]

APPENDIX III

Focus Group Discussion (FDG) Guide

I, Lena George a student from Mzumbe University – Mbeya Campus, I'm conducting a study about examining the challenges facing small scale industries in adaption of solar energy towards contribution of development in Tanzania, the case study of Mbeya city. The information obtained will be treated confidentially for academic purposes and not otherwise.

Respondents Characteristics; Male ……Female…….

1. What is your main energy for; lighting, cooking, charging and listening to radio or watching a TV or video?
2. Do small scale industries use the solar energy at your area for income generating activities?
3. What are the business activities undertaken by small scale industries by using solar energy?
4. Is there any applicability of solar energy in promoting of small scale industries at your community? Yes ( ) No ( )
5. What is the level of people's participation in the whole process of the solar electricity project implementation?
6. Does solar energy contributes the improvement of house hold living standards?
7: Do you face any challenges in utilization of grid electricity services?
8. What is the cost of solar appliances which can power small scale industries machines?
9. Is the capacity of existing solar appliance in the marketable to power the machines of small scale industries?
10. Are entrepreneurs in smalls scale industries comfortable and able to pay for the cost of solar appliances?

11. Is the awareness level of solar technology enough for entrepreneurs in the small scale industries to make decision on adoption of using solar technology?

APPENDIX IV

Observation Checklist for Households and Customers

I, Lena George a student from Mzumbe University – Mbeya Campus, I'm conducting a study about examining the challenges facing small scale industries in adaption of solar energy towards contribution of development in Tanzania, the case study of Mbeya city. The information obtained will be treated confidentially for academic purposes and not otherwise.

Fill in the aspects to be observed and rank it, categorize and/ or tick appropriately

No	House hold's income	Items to be observed	Tick appropriately
1.	The uses of solar energy	For academic purposes For lightning at night For business activities	( ) ( ) ( ) ( )
2.	Importance use of renewable solar energy	Income generating activities Improvement of life standards Growth of cities and towns Improvement of academics among student	( ) ( ) ( ) ( ) ( ) ( )
4.	Activities undertaken by small scale industries by using solar energy.	Welding Soap making Agro-processing Cutlery Industry Other business activity……..	( ) ( ) ( ) ( )