



SOLAR ENERGY INSTALLATION SKILLS AND EMPLOYMENT GENERATION IN JOS NORTH LOCAL GOVERNMENT AREA OF PLATEAU STATE

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ABSTRACT

Given the increasing demand for renewable energy and the pressing need for job creation in Jos North Local Government Area (LGA) of Plateau State and Nigeria in general, this study examined the effect of solar energy installation skills on employment generation in Jos North LGA of Plateau State, Nigeria. The study assessed the relationship between key predictors (labour absorption, skill acquisition and technical know-how, job sustainability, and income levels) and employment generation. A descriptive survey design using a structured Likert-scale questionnaire was used to collect data from solar energy entrepreneurs, technicians, installers, and other employees in solar energy projects in Jos North Local Government Area. Questionnaires were administered to 387 respondents in Jos North LGA of Plateau State. The collected data were analysed using multiple linear regression analysis. Findings revealed a positive and significant relationship between labour absorption and employment generation; Skill acquisition and technical know-how also had a positive and significant relationship with employment generation, while job sustainability had a negative and significant relationship with employment generation. Income level showed a positive and significant relationship with employment generation. In conclusion, solar energy installation contributed significantly to employment opportunities, particularly through training, entrepreneurship, and increased household income. This implies that scaling up solar energy projects in Jos North would enhance job creation, reduce unemployment, and foster sustainable development. Thus, it was recommended that private investors and the government should support solar energy development, especially by providing training opportunities and favourable policies to encourage job creation in the sector.

Keywords: Solar Energy, Installation Skills, Employment Generation, Jos, Plateau State

JEL Classification: Q49, J24, E24

1. Introduction

Unemployment has remained one of the most critical challenges in most developing countries, including Nigeria. Despite Nigeria's abundant human and natural resources, in addition to policy interventions and programmes geared towards generating employment, the country has struggled to generate sufficient employment opportunities for the increasing labour force. According to the National Bureau of Statistics (NBS) (2023), Nigeria's unemployment rate stood at 4.1% as of Q2 2023. Although the official unemployment figure appears low, widespread underemployment, informal work, and job insecurity persist, particularly among the youth population. This has affected social stability and economic growth, thus significantly contributing to increasing poverty, insecurity, income inequality, and declining standard of living. The inability of the formal sector to absorb the rapidly increasing labour force has prompted the search for alternative sectors capable of generating employment opportunities.

The renewable energy sector, particularly solar energy, has gained considerable prominence in addressing both energy and employment generation challenges. World Bank (2023) noted that Nigeria struggles with a chronic power shortage, with over 50% of the population lacking access to reliable electricity. The challenges within the Nigerian power sector, characterised by frequent national grid collapses, insufficient power generation, and high costs of fossil fuel as a result of subsidy removal, despite being endowed with significant oil and gas resources, necessitated the adoption of solar energy as an alternative energy source. According to the International Energy Agency (IEA) (2024), solar power accounted for 5.2% of global electricity generation in 2023, with projections suggesting it could supply 35% of global electricity by 2030 under current policy scenarios. Moreover, solar energy adoption not only solves energy challenges, but it also creates a massive demand for human capital by generating employment, thereby creating a two-sided benefit to solve both energy and job crises.

The solar industry is labour-intensive, requiring skilled workers for manufacturing, distribution, installation, operation, maintenance, and servicing of solar systems. Among these activities, solar energy installation has become particularly important because it requires skilled labour for system design, panel installation, wiring, troubleshooting, and maintenance services, which generate employment opportunities. Ejiofor and Okoye (2025) observed that these skills in solar energy installation form the foundation of a resilient and employable workforce in the growing solar energy sector. The solar photovoltaic sector employed 4.9 million people globally in 2023, with China alone accounting for 2.8 million jobs (57% of the total) due to its dominance in manufacturing and large-scale installation campaigns (International Renewable Energy Agency (IRENA), 2024). The United States (US) has been central to solar energy's evolution since Bell Labs engineers developed the first practical silicon solar cell in 1954 (Perlin, 2021). Today, solar energy provides 5.6% of U.S. electricity generation while supporting over 340,000 American jobs, thus making it one of the nation's fastest-growing energy sectors (Solar Energy Industries Association (SEIA), 2024). The International Renewable Energy Agency (2023) noted that solar energy installation in Africa has created over 350,000 jobs, which shows how solar energy could positively change Africa's systemic challenges. This global trend suggests that the acquisition of solar energy installation skills possess potentials for employment generation.

In Nigeria, the recognized significance of acquiring solar energy installation skills for employment generation has led successive governments and non-governmental organisations to establish programmes focused on training individuals in solar energy installation techniques. There has been a noticeable increase in the

installation and use of solar systems by households and businesses in Plateau State, which is attributed to its solar potential. The state enjoys relatively high levels of solar radiation, particularly in the dry season, making it a suitable location for solar energy adoption. Consequently, the Plateau State Government has partnered with the Rural Electrification Agency (REA) to implement solar-powered projects in underserved areas. Notably, a 234KW solar hybrid mini-grid was commissioned in Shimankar Community, Shendam Local Government Area, providing electricity to thousands of residents (GVE Projects, 2020).

With the adoption of solar energy in Plateau State, several local companies have emerged, offering services in solar installation, maintenance, and the development of solar-powered systems. Companies such as SunCraft Energy Center Limited, Adel Ecotech Engineering Ltd, Astrum Energy, and Solartron Energy Systems are actively operating in Jos North Local Government Area of Plateau State, providing solar energy solutions, training, and contributing to job creation in the region. As solar energy continues to gain popularity due to its potential to address both energy access and unemployment, skill acquisition in solar energy installation becomes increasingly imperative. However, the prevailing economic structure in Jos North LGA, which is characterised by limited training infrastructure, inadequate funding, and weak industry linkages, may affect employment generation in relation to skill acquisition in solar energy installation. Thus, this study aims to explore the effect of solar energy installation skills on employment generation using Jos North Local Government Area of Plateau State as a case study. This study is organised as follows: Section 1 presents the study, while Section 2 reviews relevant literature. Methodology is carried out in Section 3; Section 4 presents results and discusses findings, and Section 5 concludes with policy recommendations.

Research Questions

This study aims to address the following research questions:

- a) What is the effect of labour absorption in solar energy installation skills acquisition on employment generation in Jos North Local Government Area?
- b) What is the effect of skill acquisition and technical know-how in solar energy installation on employment generation in Jos North Local Government Area?
- c) Does job sustainability in solar energy installation skill acquisition have any effect on employment generation in Jos North Local Government Area?
- d) What effect does income level from solar energy installation skill acquisition have on employment generation in Jos North Local Government Area?

Objectives of the Study

The main objective of this study is to examine the effect of solar energy installation skills on employment generation in Jos North LGA of Plateau State. Other specific objectives are to:

- a) Determine the extent to which labour absorption in solar energy installation skills acquisition affects employment generation in Jos North Local Government Area of Plateau State.
- b) Examine the effect of skill acquisition and technical know-how in solar energy installation on employment generation in Jos North Local Government Area of Plateau State.
- c) Assess the effect of job sustainability in solar energy installation skills acquisition on employment generation in Jos North Local Government Area of Plateau State.
- d) Evaluate the effect of income levels associated with solar energy installation skills on employment generation in Jos North Local Government Area of Plateau State.

2. Literature Review

2.1 Conceptual Literature

Solar energy involves the conversion of sunlight into usable electricity through photovoltaic systems and other solar technologies. According to Oluka and Agu (2025), solar energy is radiant light and heat from the sun that can be harnessed using a range of ever-evolving technologies like solar photovoltaic and solar thermal energy. In terms of solar energy installation, Asgari, Hayibo, Groza, Rana, and Pearce (2025) referred to it as the integration of photovoltaic systems with other technologies, such as heat pumps, to optimize energy efficiency in applications like greenhouse heating. This definition underlines the combination of other systems with solar PV to improve efficiency. Yang (2024) described solar energy installation as the process of deploying solar energy systems, including photovoltaic panels and solar thermal collectors, to harness solar radiation for electricity generation and heating, thereby reducing reliance on fossil fuels. This description dwells on the place of solar installations in the transition to clean and renewable energy sources. National Renewable Energy Laboratory (NREL) (2023) defined solar energy installation as the planning, design, and deployment of solar panels and associated infrastructure to convert sunlight into electrical energy, supporting the growth of renewable energy adoption. This definition by NREL (2023) emphasizes the complete stages entailed in setting up solar energy systems. Solar energy installation skills refer to the learned abilities or specialised knowledge to install, operate, and maintain solar photovoltaic systems with other solar energy technologies. According to IRENA (2003), solar energy installation skills involve the competencies required to deploy and maintain solar technologies efficiently and safely in residential, commercial, and industrial settings. This definition emphasises the practical ability to effectively install solar energy systems across different environments. International Labour Organization (ILO) (2022) defined solar energy installation skills as the technical and vocational competencies needed to install, operate, and maintain solar energy systems. These competencies are necessary for employment creation. Therefore, solar energy installation skills are considered in this paper as the competencies required for the deployment and assembly of equipment and solar technologies such as solar panels, thermal collectors, batteries, charge controllers, and inverters to harness the sun's energy effectively such that electricity can be generated.

Various researchers have viewed the concept of employment generation differently. For instance, the ILO (2022) defined employment generation as the creation of decent and productive work opportunities that provide individuals with adequate income, security, and social protection. In the view of Anyanwu (2014), employment generation is the process of increasing the number of people engaged in productive economic activities through investment, entrepreneurship and skill acquisition programmes. Similarly, according to Adebayo (2013), employment generation is the creation of opportunities that enable individuals to participate in productive activities either as employees or self-employed entrepreneurs. This definition sees skill acquisition as an instrument for generating employment. This study defines employment generation (as it relates to solar energy installation skills) as the competencies required for the deployment and assembly of equipment and solar technologies such as solar panels, thermal collectors, batteries, charge controllers, and inverters to harness the sun's energy effectively such that electricity and job opportunities can be generated.

2.2 Theoretical Literature

The Human Capital Theory is a relevant theory to this study. The theory was introduced by Schultz (1961) during the post-World War II era, a time when many economies were focused on rebuilding through education and

workforce development. Schultz (1961) emphasized that education, training, and healthcare are crucial investments that enhance productivity and economic growth. Later, Becker (1993) expanded this idea, arguing that just as businesses invest in physical capital to improve production, individuals and societies benefit from investing in human capital to improve skills, efficiency, and innovation.

A central idea of this theory is that individuals with higher education and specialized skills tend to have better job opportunities, earn higher wages, and contribute more significantly to economic development. This perspective has influenced labour market policies, prompting governments to invest in public education, vocational training, and health programs to build a skilled workforce (Psacharopoulos & Patrinos, 2018). In addition, the theory highlights that knowledge-based economies, where intellectual and technological skills are prioritized, tend to experience faster economic progress and lower unemployment rates. The main strength of the Human Capital Theory is its long-term impact on the economy.

By focusing on continuous learning and skill acquisition and development in solar energy installation, the theory provides a foundation for policies aimed at reducing unemployment and increasing workforce productivity. A major demerit of this theory is its assumption that education and training guarantee better employment results. In reality, labour market conditions, economic structures, and technological advancements may undermine the assumptions of human capital theory. For instance, if there is an oversupply of graduates in a particular field, or if automation reduces demand for certain jobs, individuals may struggle to find employment despite their qualifications (Acemoglu & Autor, 2011).

In the area of solar energy, this theory stresses the need to be provided with skills in the installation, maintenance, and operation of solar systems. The implementation of vocational training initiatives in Jos North on solar energy technologies can prepare the labour force to satisfy the demands of the industry. The development of human capital in the solar energy sector goes beyond technical abilities. Customer care, sales, and management are also vital in the industry to make solar technologies widely known and liked. For example, greater use of solar technologies can be enhanced by those trained to educate communities on the advantages and maintenance of solar systems while creating sustained jobs.

2.3 Empirical Literature

The greater adoption of solar energy installation skills in Nigeria is becoming highly acknowledged as a major strategy for tackling unemployment. Various studies have investigated its potential to create jobs, especially in areas such as installation, maintenance, and services.

Oluka and Agu (2025) carried out research to determine basic solar energy installation and maintenance skills required by students in technical colleges for sustainable employment and job security in Enugu State using mean and t-test. Findings revealed that skills in wiring solar panels, inverters, and batteries, ability to implement safety measures while working with electrical systems, proficiency in using the right tools and equipment specific to solar installation, skills in replacing faulty components, and ability to analyse potential risks during maintenance tasks are skills required by students.

Chijioke, Ajayi, Salihu and Barrie (2024), using a review method, synthesizing existing literature and careful studies, revealed that the solar industry has created tens of thousands of jobs across various sectors, particularly in construction, operations, and maintenance. This is evident in their analysis of the Solar Foundation's National Solar Jobs Census, which showed that the solar industry employed over 250,000 workers in 2021, indicating a substantial increase in employment opportunities within the sector.

Grace, Eze and Ibrahim (2024) researched the impact of renewable energy projects on job creation and poverty reduction in rural communities within Doma Local Government Area, Nasarawa State, Nigeria. Data were

collected through a closed-ended questionnaire administered to 100 respondents in selected rural communities in Doma LGA, with 20 respondents randomly selected from each community. Percentages and frequencies were used to analyze the research questions, and their hypotheses were tested using Pearson correlation. The study found a significant positive relationship between renewable energy projects and poverty alleviation. However, a significant negative relationship was revealed between renewable energy projects and job creation. Zuzana, Olatunji and Bello (2023) examined the jobs generated by the Nigeria Electrification project by adopting the theory of change and using a qualitative interview of the professionals involved in the construction and rollout of solar-installed mini-grids, as well as the beneficiaries such as contractors and MSMEs (Micro Small and Medium Enterprises). According to the researchers, the project provides direct, indirect, and induced jobs. The direct jobs were estimated based on interviews with four developers responsible for the mini grids' design, construction, maintenance, and operations. The indirect jobs were estimated using a ratio of indirect to direct domestic jobs found in the literature. Induced jobs were estimated based on a separate study that surveyed approximately 1,200 households to assess the effects of mini grids on employment opportunities in the project areas. They found that the project generated a total of 398 job-years, with 192 of these jobs classified as domestic jobs in Nigeria. The researchers also noted that some of the challenges include: barriers to scaling up mini-grids as a result of high import duties on components, lack of credible market data, low financing, and difficulties sourcing skilled labour, particularly in Northern regions of Nigeria. These challenges affected the recruitment process and the overall quality of jobs created.

Osei (2023) examined the impact of renewable energy projects on Ghana's rural electrification and local revenue generation. The study employed a case study approach, focusing on mini-grid solar projects implemented in off-grid communities. Data were gathered through surveys of 300 households and interviews with energy sector officials. The results revealed that renewable energy expansion increased local business activities, with 65% of surveyed businesses reporting revenue growth due to improved electricity access. Additionally, findings showed that local government revenue increased by 9% due to new business registrations and taxation from energy-related enterprises. However, the study noted that high costs of renewable energy infrastructure limited widespread adoption.

Adebayo (2023) adopted a regression analysis to investigate the economic impact of solar energy expansion on employment and revenue generation in Lagos, Nigeria. Findings revealed that a 10% increase in solar energy adoption resulted in a 5% increase in employment opportunities in Lagos' energy sector. Additionally, solar businesses contributed significantly to local revenue through taxes and licensing fees, with Lagos State recording a 12% increase in tax revenue from the renewable energy sector between 2019 and 2022.

Mokgoro (2022) analyzed the role of South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) in job creation and economic development using longitudinal analysis of employment data from 2015 to 2022 and in-depth interviews with industry stakeholders. Findings indicated that the REIPPPP facilitated the creation of over 60,000 direct jobs, primarily in solar and wind energy projects. Moreover, the study highlighted that renewable energy projects contributed an estimated \$5.2 billion in local revenue, strengthening South Africa's economic resilience. However, the study noted challenges such as skill shortages and limited local manufacturing capacity, which hindered the full potential of job creation.

Nwankwo, Adeyemi and Yusuf (2022) examined technical training and renewable energy employment in Plateau State, using a quasi-experimental design. The study involved 300 participants from Plateau State who underwent technical training in solar energy. The researchers analyzed employment data before and after the training using both descriptive and inferential statistics and found that 75% of the participants gained employment within six (6) months of completing the training program.

Although several studies have explored the relationship between solar energy and employment generation, most have taken a broad national or regional approach without focusing on localized impacts at the local government level. Some research examined solar energy employment in Plateau State and Northern Nigeria, respectively, but did not isolate the specific effects within Jos North Local Government Area. Similarly, others investigated mini-grid projects but relied on employment estimates rather than direct empirical measurements. Furthermore, studies like Adebayo (2023) assessed economic and revenue contributions of solar energy without a targeted focus on employment generation through installations.

This leaves a gap in understanding the direct, empirical relationship between solar energy installations and employment creation in Jos North. Given the area's high unemployment rate, it is important to determine the extent to which skills in solar installations contribute to job opportunities at the grassroots level. Therefore, this study seeks to fill this gap by empirically examining the impact of solar energy installation skills on employment generation in Jos North, providing localized, data-driven insights that can inform both policymakers and industry stakeholders.

3.Methodology

This study adopted both qualitative and quantitative approaches by employing a structured questionnaire that consisted of closed-ended questions. The questionnaire was developed by reviewing relevant literature in renewable energy and employment generation. This process helped in identifying key themes, variables, and commonly used question formats. The closed-ended questions were structured using a five-point Likert scale, coded as follows: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1). This format allowed for the quantification of attitudes and opinions, and supported statistical analysis. For the analysis, responses were analysed using descriptive statistics (frequencies and percentages) and regression analysis with the Statistical Package for the Social Sciences (SPSS). This ensured that the study produced reliable results and meaningful insights on the impact of solar energy installation projects on employment in the study area. This study used both primary and secondary sources to obtain information by combining original information from the field with established knowledge from other sources.

The population of the study includes all individuals in Jos North LGA who have acquired or are currently acquiring skills in solar energy installation, among which are graduates of solar energy training programmes, solar installation technicians and apprentices, owners and employees of solar installation firms, and individuals who have used solar installation skills for employment generation. The inclusion of this wide range of respondents allows for a thorough examination of the direct and indirect employment generated through solar energy interventions.

The method of sample size determination by Yamane (1967) was adopted for this study, since the population of people in Jos North LGA is estimated to be 437,217 according to the National Population Census (NPC, 2006). Yamane (1967) suggested a simplified formula for calculating sample size from a population, which is an alternative to Cochran's formula. For a 95% confidence level and $p = 0.05$, the sample size is:

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

Where,

n = sample size

N = the population size = 437,217

e = allowable error (that is, for a 95% level of confidence) = 0.05 (5%)

1= Unity (a constant)

Therefore,

$$n = \frac{437,217}{1 + 437,217 \cdot 0.05^2}$$

$$n = \frac{437,217}{1 + 437,217 \cdot 0.0025}$$

$$n = \frac{437,217}{1 + 1093.04}$$

$$n = \frac{437,217}{1094.04}$$

$$n = 399.64 \approx 400$$

Given the result of the Yamane (1967) sample size formula, which gave 400 as the sample size, a total of 400 respondents were selected randomly from the population of the study. Given the absence of a comprehensive sampling frame for all individuals in Jos North LGA who have acquired or are currently acquiring skills in solar energy installation and considering the study's reliance on purposive sampling within stratified wards, the size of 400 was also considered appropriate. It provided enough data to reflect diverse perspectives across the 14 electoral wards, averaging approximately 28 to 29 respondents per ward.

To ensure adequate representation across Jos North Local Government Area, the study adopted a multi-stage sampling technique. First, stratified sampling was used to account for the 14 electoral wards that make up the LGA. These wards include: Abba Na Shehu, Ali Kazaure, Garba Daho, Gangare, Ibrahim Katsina, Jenta Adamu, Jenta Apata, Jos Jarawa, Naraguta 'A', Naraguta 'B', Sarkin Arab, Tafawa Balewa, Tudun Wada - Kabong, and Vanderpuye. From each of these wards, purposive sampling was applied to identify and select individuals who have acquired or are currently acquiring skills in solar energy installation. The purposive approach was necessary because there is no central list of such individuals, and the study needed to target respondents with relevant knowledge and experience. By combining stratified and purposive sampling, the study was able to achieve both geographical spread and topic-specific relevance in its data collection.

Data collected through the structured questionnaire were analysed using Multiple Linear Regression (MLR) in SPSS (Statistical Package for Social Science) version 27.0 to establish the relationship between the variables in the study as well as test the hypotheses of the study. The choice of MLR is justified on the grounds that MLR provides insights into the relative contribution of each predictor variable, thereby facilitating a deeper understanding of the factors influencing employment generation in the context of solar energy installation skills. Descriptive statistics such as frequency and percentages were used to summarize the demographic characteristics of respondents.

Model Specification

Linear Specification of the effect of solar energy installation skills on employment generation

$$EMP = \beta_0 + \beta_1 LAS + \beta_2 SAT + \beta_3 JST + \beta_4 ILV + \varepsilon$$

Where:

EMP = Employment Generation from Solar energy installation (Dependent Variable)

β_0 = Intercept (value of EMP when all predictors are zero)

$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients showing the effect of each independent variable on employment generation

LAS = Labour Absorption in solar energy installation skills

SAT = Skill Acquisition and Technical Know-how in solar energy installation

JST = Job Sustainability in solar energy installation skills

ILV = Income Level in solar energy installation skills

ε = Error term

Decision Rule

This study was tested at the 0.05 (5%) significance level. Therefore, the decision rule is as follows:

- i. If p-value < 0.05 → Reject the null hypothesis (H_0). This implies that solar energy installation skills have a significant effect on employment generation in Plateau State.
- ii. If p-value $\geq$ 0.05 → Do not reject the null hypothesis (H_0). This implies that solar energy installation skills do not have a significant effect on employment generation in Plateau State.

Table 1: A Priori Expectations

Variable	A Priori Expectation	Justification
LAS (Labour Absorption)	$\beta_1 > 0$	Higher labour absorption in solar energy installation projects is expected to increase employment generation.
SAT (Skill Acquisition and Technical Know-how)	$\beta_2 > 0$	Skill acquisition equips individuals with employable skills, thus increasing employment.
JST (Job Sustainability)	$\beta_3 > 0$	Sustainable jobs ensure long-term employment rather than short-term contracts.
ILV (Income Level)	$\beta_4 > 0$	Higher income from solar employment can attract more participants and retain workers, thereby boosting employment.

Source: Authors' Compilation.

4. Results and Discussion of the Findings

4.1 Presentation of Results

A total of four hundred (400) copies of the questionnaire were administered, but only three hundred and eighty-seven (387) questionnaires were successfully collected from the respondents for the study, with no missing values. The questionnaire was analysed by applying descriptive and quantitative analysis.

Descriptive Statistics

Table 2: Demographic Distribution of the Respondents

Variable	Frequency	Percentage (%)
Gender		
Male	365	94.3
Female	22	5.7
Total	387	100
Age		
18 – 29 years	142	36.7
30 – 39 years	124	32.0
40 – 49 years	89	23.0
50 years and above	32	8.3
Total	387	100
Education		
No Formal Education	0	0
Primary	31	8
Secondary	182	47
Tertiary	174	45
Total	387	100
Occupation		
Graduates of solar energy training programmes	59	33.9
Owners and employees of solar installation firms	48	12.4
Solar installation technicians/apprentices	149	38.5
Other solar energy installers	131	15.2
Total	387	100

Source: Field Survey, 2026

Table 2 shows the demographic distribution of the 387 respondents. The gender distribution result revealed that 365 respondents representing 94.3% are male, while 22 respondents representing 5.7% are female. This result showed that solar energy installation is a male-dominated sector. This result implies that most of the

employment in solar energy installation in Jos North is given to males; females' involvement in the sector is still minimal.

Table 2 also showed that 142 respondents representing 36.7% are between the ages of 18 – 29 years, 124 respondents representing 32.0% have an age range between 30 – 39 years, while 89 and 32 respondents representing 23.0% and 8.3% are between the ages of 40 – 49 years and 50 years and above, respectively. This indicated that 68.7% of the respondents are between the ages of 18 – 39 years, which is a young age, implying that the skills in the solar energy installation sector are acquired more by the active labour force. Hence, the sector employs more youth than older adults.

It revealed that 31 respondents representing 8% attended primary school, while 182 and 174 respondents representing 47% and 45% have secondary and tertiary education, respectively. Thus, it can also be concluded that all the respondents have one form of formal education or the other, thereby making skill acquisition easy. The Table also displayed the occupation distribution of the respondents, which showed that 59 respondents representing 15.2% are graduates of solar energy training programmes, 149 respondents representing 38.5% are solar installation technicians/ apprentices, 48 respondents representing 12.4% are owners and employees of solar installation firms, while 131 respondents representing 33.9% are other solar energy installers. This occupation distribution shows that all areas of the solar energy installation are adequately represented in this study.

Quantitative Analysis

Table 3: Multiple Linear Regression Result of the effect of solar energy installation on employment generation in Jos North LGA of Plateau State

Model: EMP							
	Coefficient	P-value	r ²	F*	F*(P-value)	DW	N
C	-1.253	< 0.001	0.624	158.188	0.001	2.020	387
LAS	0.156	< 0.001					387
SAT	0.507	< 0.001					387
JST	-0.106	0.003					387
IVL	0.677	< 0.001					387

Source: SPSS version 27.0

Table 3 shows the multiple regression results for the four explanatory variables formulated for this study. The F-test for the model at the 0.05 level of significance showed that the p-value is 0.001. This is an indication that there is a strong linear dependency between the independent and the dependent variable. This implies that labour absorption (LAS), Skill acquisition and technical know-how (SAT), job sustainability (JST), and Income level (ILV) of solar energy installation jointly have a strong impact on employment generation in Jos North LGA of Plateau State. The coefficient of determination, which is the value of r² for the model, is 0.624. Indicating that 62.4% of the changes in the dependent variable, employment, are as a result of the changes in the independent variables: labour absorption, Skill acquisition and technical know-how, job sustainability, and Income level.

For labour absorption (LAS), the regression result in Table 2 revealed that there is a positive and significant effect of labour absorption (LAS) on employment (EMP) with a coefficient of $\beta = 0.156$, P-value < 0.001, at the 0.05 level of significance. Thus, labour absorption has a significant effect on the employment generated. That is, a 1% increase in the rate of labour absorption significantly increases employment by 15.6%.

The regression result in Table 2 revealed that there is a positive and significant effect of skill acquisition and technical know-how (SAT) on employment generation (EMP) in the study area with a coefficient of $\beta = 0.507$ and P-value < 0.001 , at the 0.05 level of significance. This showed that skill acquisition and technical know-how significantly increase employment generation in the study area by 50.7%.

The regression result in Table 2 also revealed that there is a negative and significant effect of job sustainability (JST) on employment generation (EMP) in the area with a coefficient of $\beta = -0.106$, P-value = 0.003, at the 0.05 level of significance. This indicated that job sustainability in solar energy installation significantly affects employment generation negatively. That is, a review of solar energy installations' job sustainability in the study area reduces employment by 10.6%.

For Income level (ILV), the regression result in Table 2 showed that there is a positive and significant effect of income level from solar energy installation on employment generation (EMP) with a coefficient of $\beta = 0.677$, P-value < 0.001 , at the 0.05 significance level. This implies that an increase in income significantly increases employment from solar energy installation in the study area by 67.7%.

Therefore, from the multiple regression result in Table 2, the regression line (equation) is written as follows:

$$EMP = -1.253 + 0.156(LAS) + 0.507(SAT) - 0.106(JST) + 0.677(ILV) + \varepsilon$$

Since the four explanatory variables account for 62.4% of the variation in employment from solar energy installation, the error term (37.6%) accounts for all other variables that affect employment in the study area, which this study did not cover, as well as the 0.05 error margin allowed for the study. The constant (-1.253) implies that when all four explanatory variables are equal to zero, the employment generation level will be declining. In other words, unemployment in the area will increase.

4.2 Discussion of Findings

This study examined the impact of solar energy installation skills on employment generation in Jos North Local Government Area of Plateau State. Four main explanatory variables, which are labour absorption (LAS), skill acquisition and technical know-how (SAT), job sustainability (JST), and income level (ILV), were assessed in relation to employment (EMP).

The study revealed that labour absorption in solar energy installation has a positive and significant effect on employment generation in Jos North Local Government Area of Plateau State ($\beta=0.156$, $p<0.001$). That is, a unit increase in the labour absorption rate will result in a 15.6% increase in employment generation. The result aligns with the a priori expectation of this study for labour absorption ($\beta>0$), which expects employment to increase as the labour absorption rate increases. Thus, solar energy installation skill acquisition has contributed to absorbing available labour in Jos North, particularly by creating direct jobs such as panel installation, wiring, and maintenance. However, the low explanatory power indicates that job absorption alone is not sufficient to drive broad-based employment growth. This agrees with the findings of Kale (2019), who noted that Nigeria's labour market requires structural transformation for sustainable job creation. The implication of this is that, while solar energy installation skills can create direct, hands-on jobs (installers, technicians, maintenance staff), they cannot by themselves solve the broader employment challenges of the region.

The study also revealed that Skill Acquisition and Technical Know-how in solar energy installation have a positive and significant effect on employment generation in Jos North Local Government Area of Plateau State. Skill acquisition and technical know-how emerged as a stronger predictor of employment compared to labour absorption ($\beta=0.507$, $p<0.001$). That is, an increase in the training available in solar energy skills and technical know-how will result in a 50.7% increase in employment generation. The result also aligns with the a priori

expectation of this study for skill acquisition and technical know-how ($\beta > 0$), which expects employment generation to increase if there is an increase in skill acquisition and technical know-how. This finding suggests that solar energy installation in Jos North has positively influenced the development of technical skills, particularly in renewable energy technologies, system design, installation, and maintenance. The result of this study supports Becker's (1993) human capital theory, which emphasizes the role of training and education in improving productivity and employability. The implication is that skills development is a stronger pathway for solar energy to drive sustainable employment generation in Jos North. Unlike labour absorption, which provides modest and sometimes temporary opportunities, skill acquisition creates long-term, transferable, and entrepreneurial opportunities, aligning with human capital theory.

The study further showed that job sustainability in solar energy installation skills has a negative and significant effect on employment generation in Jos North Local Government Area of Plateau State. Job sustainability showed virtually no predictive power for employment ($\beta = -0.106$, $p = 0.003$). That is, the perception of solar energy installation's job sustainability reduces employment generation by 10.6%, which goes against the A priori expectation for job sustainability ($\beta > 0$), because it is expected that sustainable jobs ensure long-term employment rather than short-term contracts, thereby attracting more employment. This suggests that while solar energy installation skills in Jos North generate jobs, many of these are temporary, project-based, or contract-oriented. For instance, most installation projects create short-term opportunities for technicians and labourers, but these jobs often end once installation is completed. Maintenance-related jobs exist but are limited in scope and frequency. Kale (2019) observed similar patterns in Nigerian labour markets where temporary or casual jobs dominate, leading to poor employment stability. This outcome also agrees with IRENA (2017), which observed that the sustainability of renewable energy jobs depends on policy support, local industry growth, and service-based models. This finding reflects a key limitation of the solar energy sector in its current state, that is, it generates jobs, but not necessarily long-term or sustainable employment.

Finally, the study also revealed that Income levels associated with solar energy installation skills have a positive and significant effect on employment generation in Jos North Local Government Area of Plateau State. Income level turned out to be the most influential predictor of employment ($\beta = 0.677$, $p < 0.001$). That is, for every increase in the income level from solar energy installation, 67.7% more employment is generated. The result also supports the a priori expectation of this study for income level ($\beta > 0$), which expects that higher income from solar employment can attract more participants and retain workers, thereby boosting employment. This indicates that solar energy-related employment in Jos North significantly enhances income generation for those who have acquired skills in solar energy installation. Higher earnings not only provide livelihoods but also incentivize more individuals to enter the sector. This result is consistent with the findings of Fields (2011), which highlighted that wages and income are central to employment outcomes. This finding reinforces the central role of income in employment generation through solar energy installation skills. The implication is that boosting income levels in the solar energy sector is not only critical for sustaining workers but also acts as a strong avenue for expanding employment.

5. Conclusion and Recommendation

5.1 Conclusion

This study concludes that solar energy installation has a positive impact on employment generation in Jos North LGA, though with varying degrees of effectiveness across different dimensions. Labour absorption contributes positively but weakly, indicating that while solar energy installation skills create jobs, the effect is modest. Skill acquisition and technical know-how have a stronger effect, emphasizing the importance of capacity building and

technical training. Income level is the most influential driver of employment, suggesting that the sector contributes meaningfully to livelihoods and income generation. However, job sustainability remains weak, underscoring the need for long-term strategies to ensure continuity of employment opportunities. Overall, the findings suggest that skill acquisition in the solar energy sector holds significant potential for employment generation in Jos North, especially when complemented with supportive policies in training, income enhancement, and job stability.

5.2 Recommendations

Based on the study's findings, it is recommended that:

Government and development institutions should complement the employment opportunities created through solar energy installation skills with initiatives in other key sectors such as agriculture, ICT, manufacturing, and small-scale enterprises by training and financing schemes that will encourage youth participation, establishing solar-powered digital hubs, alongside skills development in coding, digital marketing, and data analytics. In manufacturing, the promotion of local solar equipment assembly plants and the provision of solar-powered mini-grids to industrial clusters will reduce costs and create skilled employment opportunities. By integrating solar energy with these complementary sectors, broader employment opportunities can be created to absorb the wider unemployed population.

Technical and vocational training institutes should be expanded to build local capacity in solar panel installation, repair, and system maintenance. This will equip youths with practical skills, reduce dependence on external expertise, and create sustainable employment opportunities in the renewable energy sector.

The private sector should promote long-term job sustainability in the solar energy sector through structured maintenance contracts, cooperatives, and renewable energy service companies.

Income enhancement for solar entrepreneurs and technicians should be supported through tax relief, subsidies, and micro-credit schemes. Such support should be provided by government agencies through favourable policy frameworks, including tax incentives and import duty waivers on solar equipment. Development partners and international organizations can complement these efforts by offering grants, concessional financing, and technical assistance to small-scale solar businesses. In addition, financial institutions such as banks, cooperatives, and microfinance organizations should design affordable loan packages tailored to the needs of solar entrepreneurs. Together, these measures will strengthen the viability of solar enterprises, improve income generation, and enhance the sustainability of employment opportunities within the renewable energy sector.

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