

# Peer Influence, Environmental Awareness, and Social Pressure as Determinants of Solar PV Adoption among SMEs in Akinyele LGA, Oyo State

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**Abstract**—This study examined the social and behavioral determinants of solar photovoltaic (PV) adoption among Small and Medium Enterprises (SMEs) in Akinyele Local Government Area of Oyo State, Nigeria. The study employed a quantitative research design using structured questionnaires administered to SME operators. Principal Component Analysis (PCA) was used to identify the major social and behavioral factors influencing solar PV adoption. The results showed that the dataset was suitable for factor analysis with a Kaiser-Meyer-Olkin (KMO) value of 0.744 and a significant Bartlett's Test of Sphericity ( $p < 0.05$ ). The PCA extracted nine major components explaining 76.519% of the total variance. The identified determinants include environmental and cost awareness, peer and neighbour influence, knowledge and awareness of solar energy, social and stakeholder pressure, organizational and gender influence, educational influence, business cluster influence, financial planning for solar adoption, and technical capability and network influence. The findings revealed that peer influence, environmental awareness, and social pressure significantly shape SME solar PV adoption decisions. The study concludes that social and behavioral factors are important drivers of renewable energy adoption among SMEs. The study recommends increased awareness campaigns, peer learning initiatives, and stakeholder engagement programs to encourage wider solar PV adoption among SMEs.

**Index terms:** Solar PV Adoption, SMEs, Peer Influence, Environmental Awareness, Social Pressure, Renewable Energy, Akinyele LGA, Nigeria.

## I. INTRODUCTION

Small and Medium Enterprises (SMEs) contribute significantly to economic growth, employment generation, and business development in Nigeria [1, 2]. However, unreliable electricity supply remains a major challenge affecting the productivity and

sustainability of many SMEs [3]. Frequent power outages, rising electricity tariffs, and dependence on petrol and diesel generators have increased operational costs for businesses, especially in semi-urban areas such as Akinyele LGA of Oyo State. As businesses seek alternative energy solutions, solar photovoltaic (PV) systems have emerged as a cleaner and more sustainable source of electricity. Despite the increasing awareness of renewable energy technologies and Nigeria's high solar energy potential, solar PV adoption among SMEs remains relatively low [4].

Renewable energy adoption has increasingly attracted scholarly attention due to the growing need for sustainable and reliable energy solutions for businesses and households [5]. Solar photovoltaic (PV) systems are widely recognized as important technologies for reducing dependence on fossil fuels and improving energy sustainability [6]. Studies have shown that solar PV adoption is influenced not only by economic considerations but also by social and behavioral factors such as environmental awareness, peer influence, social norms, and stakeholder expectations [7–9].

Previous studies on renewable energy adoption indicate that environmental concern and perceived long-term benefits significantly influence firms' willingness to adopt solar technologies [10–13]. SMEs that are aware of the environmental and economic benefits of solar PV systems are more likely to support renewable energy transition [13]. In addition, social influence and subjective norms have been identified as important determinants of adoption behavior, particularly where firms observe neighboring businesses successfully using renewable energy

systems [10, 14, 15]. Research on technology adoption further suggests that peer influence and business cluster behavior contribute significantly to innovation diffusion among firms [16]. SMEs often rely on information obtained from neighboring businesses, trusted networks, and industry peers when making investment decisions relating to renewable energy technologies [17]. This supports the argument of the Diffusion of Innovations, which explains how innovations spread through social systems and organizational networks [18]. Similarly, the Theory of Planned Behavior explains that social pressure, attitudes, and perceived behavioral control influence behavioral intentions toward technology adoption [19]. Firms experiencing social expectations regarding environmental responsibility may therefore be more willing to adopt clean energy technologies such as solar PV systems.

Methodologically, some energy adoption studies such as [20] employ quantitative research designs to obtain information on behavioral and adoption variables. Questionnaire surveys are widely used because they allow researchers to collect standardized responses from business owners and managers regarding their awareness, attitudes, and adoption intentions toward renewable energy technologies. Studies such as [21] employ Principal Component Analysis (PCA) to identify the major underlying factors influencing renewable energy adoption. PCA is particularly suitable for studies involving multiple behavioral and social variables because it reduces large datasets into smaller interpretable components that explain the highest proportion of variance within the data. The method has been widely used in renewable energy and technology adoption studies to identify behavioral, social, technical, and financial determinants of adoption decisions. The present study adopts a

quantitative questionnaire-based approach and Principal Component Analysis (PCA) to examine the social and behavioral determinants of solar PV adoption among SMEs in Akinyele LGA, Oyo State, Nigeria. This methodological approach aligns with the structure of the dataset and the factor-based analysis conducted in the study. The Principal Component Analysis (PCA) conducted in this study identified major social and behavioral determinants of solar PV adoption, including environmental and cost awareness, peer and neighbour influence, knowledge and awareness of solar energy, social and stakeholder pressure, organizational and gender influence, educational influence, business cluster influence, financial planning for solar adoption, and technical capability and network influence. Despite the importance of these factors, limited studies have specifically examined their influence on SME solar PV adoption in Akinyele LGA of Oyo State. Therefore, this study examines the influence of peer influence, environmental awareness, and social pressure on solar PV adoption among SMEs in Akinyele LGA, Oyo State, Nigeria.

#### 1.1. Conceptual Framework

The conceptual framework for this study explains the relationship between the identified social and behavioral determinants and solar PV adoption among SMEs in Akinyele LGA, Oyo State, Nigeria. The framework assumes that environmental awareness, peer influence, social pressure, organizational dynamics, and technical awareness influence SMEs' decisions to adopt solar photovoltaic systems.

Solar PV Adoption = f (Environmental Awareness, Peer Influence, Social Pressure, Knowledge and Awareness, Organizational Influence)

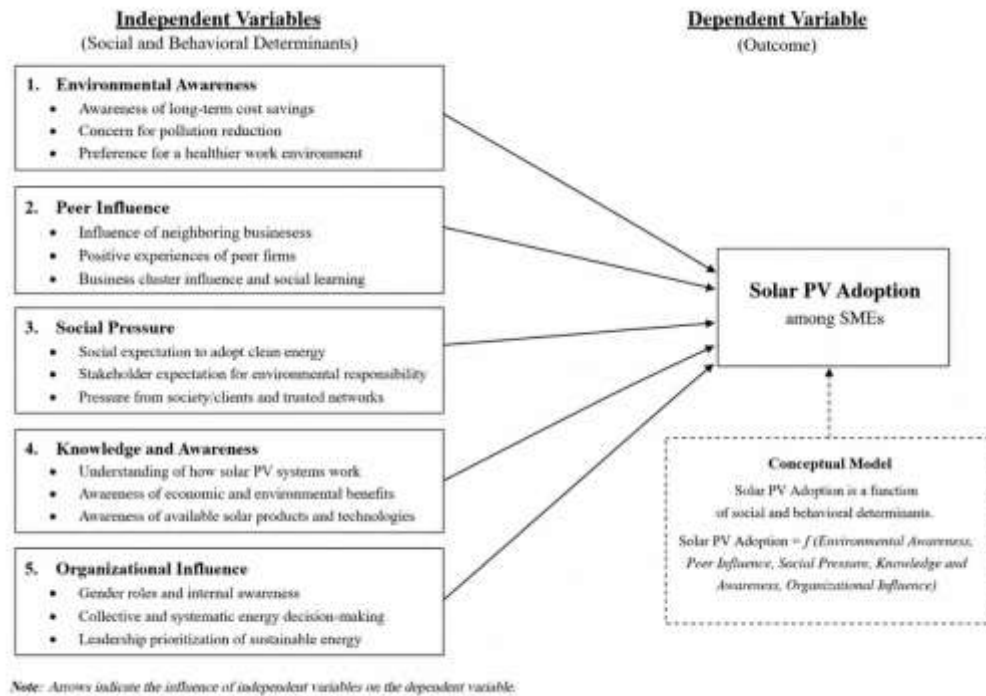


Figure 1: Conceptual Framework

## II. METHODOLOGY

This section describes the research design, data collection procedures, variable measurement, and analytical techniques used to examine the social and behavioral determinants of solar PV adoption among SMEs in Akinyele LGA, Oyo State, Nigeria. The study employed quantitative methods and Principal Component Analysis (PCA) to identify the major factors influencing adoption.

### 2.1 Research Design

The study adopted a quantitative research design using structured questionnaires to examine the social and behavioral determinants of solar PV adoption among SMEs.

### 2.2 Data Collection

Primary data were collected through the administration of structured questionnaires to SME operators in Akinyele LGA, Oyo State. The questionnaire contained items relating to environmental awareness, peer influence, stakeholder pressure, organizational dynamics, and solar PV adoption.

### Measurement of Variables

The dependent variable was solar PV adoption, measured by whether SMEs currently use solar energy systems.

The independent variables included:

- environmental and cost awareness,
- peer and neighbour influence,
- knowledge and awareness of solar energy,
- social and stakeholder pressure,
- organizational and gender influence,
- educational influence,
- business cluster influence,
- financial planning for solar adoption,
- technical capability and network influence.

### 2.3 Data Analysis

Principal Component Analysis (PCA) was used to identify the major social and behavioral determinants influencing solar PV adoption among SMEs. Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS).

### III. RESULTS AND DISCUSSION

This section presents and discusses the findings of the study on the social and behavioral determinants of solar PV adoption among SMEs in Akinyele LGA, Oyo State, Nigeria. Principal Component Analysis (PCA) was used to identify the major social and behavioral factors influencing solar PV adoption among SMEs.

#### 3.1 KMO and Bartlett's Test

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity were used to determine the suitability of the dataset for factor analysis.

Table 1: 3.1. KMO and Bartlett's Test

| Test                               | Value    |
|------------------------------------|----------|
| KMO Measure of Sampling Adequacy   | 0.744    |
| Bartlett's Test Approx. Chi-Square | 1912.774 |
| df                                 | 465      |
| Sig.                               | 0.000    |

The KMO value of 0.744 and the significant Bartlett's Test ( $p < 0.05$ ) indicate that the dataset was suitable and adequate for Principal Component Analysis.

#### 3.2 Communalities Result

The communalities result shows the proportion of variance in each variable explained by the extracted components.

| Selected Variables                                                              | Extraction |
|---------------------------------------------------------------------------------|------------|
| Seeing neighboring businesses use solar energy system encourages us to adopt it | 0.882      |
| Peer firms' positive experiences motivate us to consider solar energy solutions | 0.840      |
| Our firm understands how solar energy systems function                          | 0.834      |

| Selected Variables                                                        | Extraction |
|---------------------------------------------------------------------------|------------|
| Firms with more educated managers are more likely to use renewable energy | 0.842      |
| We have budgeted for solar installation in our future investment plans    | 0.871      |
| We prefer solar energy because it promotes a healthier work environment   | 0.869      |

The communalities values ranged from 0.619 to 0.882, indicating that the extracted components explained a substantial proportion of the variance in the social and behavioral variables.

#### 3.3 Total Variance Explained

The PCA extracted nine major components with eigenvalues greater than 1, collectively explaining 76.519% of the total variance.

| Component | Eigenvalue | % Variance | Cumulative % |
|-----------|------------|------------|--------------|
| 1         | 7.251      | 23.389     | 23.389       |
| 2         | 5.664      | 18.272     | 41.661       |
| 3         | 2.470      | 7.969      | 49.630       |
| 4         | 1.783      | 5.753      | 55.383       |
| 5         | 1.632      | 5.264      | 60.647       |
| 6         | 1.472      | 4.747      | 65.394       |
| 7         | 1.229      | 3.964      | 69.358       |
| 8         | 1.165      | 3.758      | 73.116       |
| 9         | 1.055      | 3.404      | 76.519       |

The result indicates that the extracted components effectively summarize the major social and behavioral dimensions influencing solar PV adoption among SMEs. □ filecite □ turn1file2 □

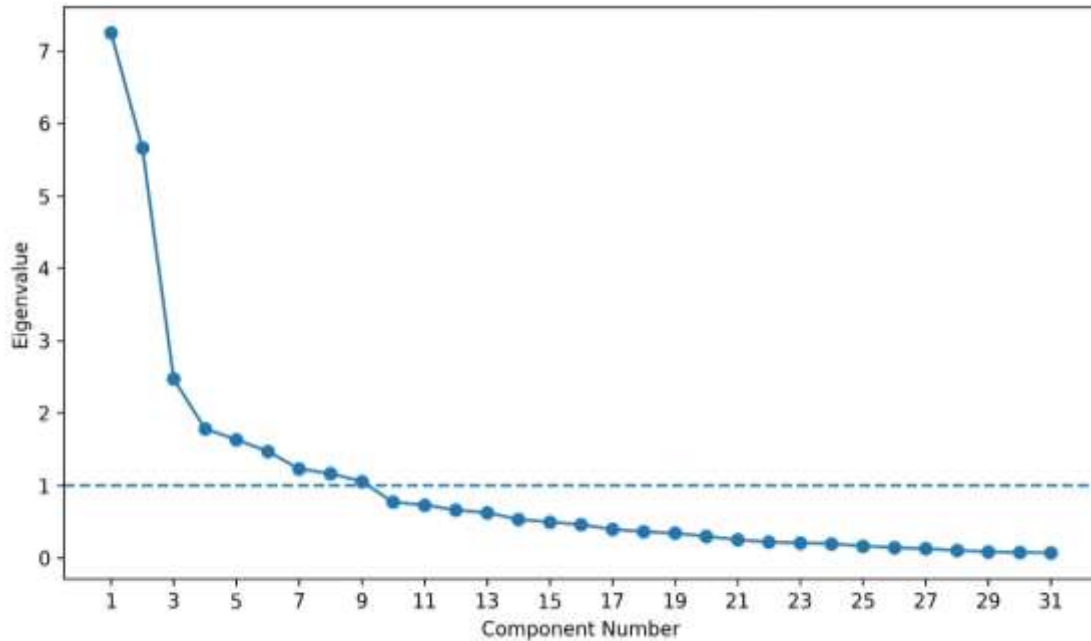


Figure 2: Scree Plot of Social and Behavioral Determinants of Solar PV Adoption among SMEs in Akinyele LGA, Oyo State

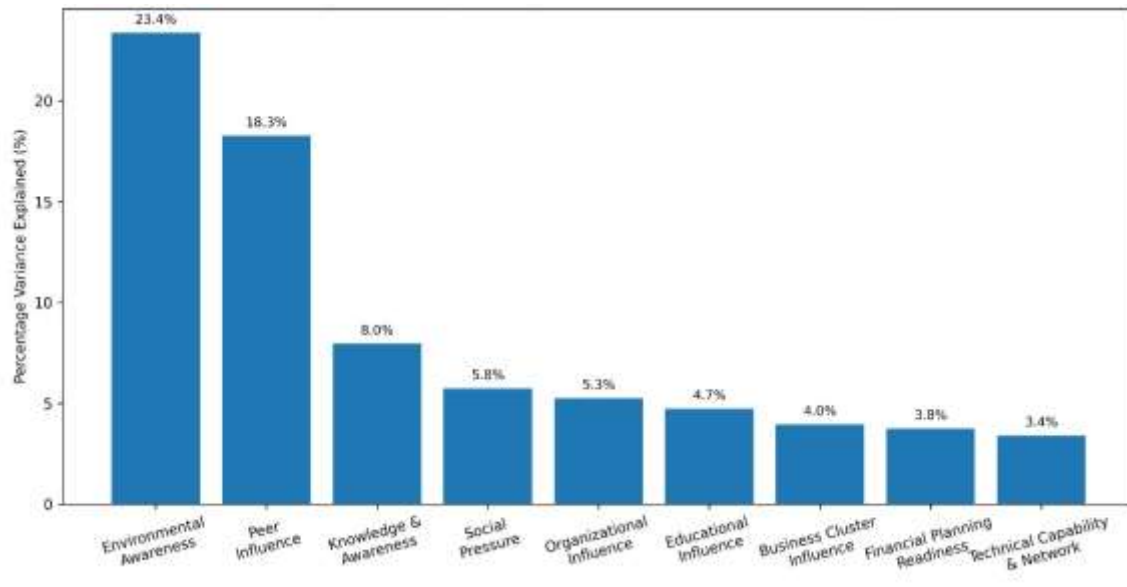


Figure 3: Percentage Variance Explained by Extracted Social and Behavioral Components

### 3.4 Extracted Social and Behavioral Components

#### Component 1: Environmental and Cost Awareness

| Variable                                                                                  | Factor Loading |
|-------------------------------------------------------------------------------------------|----------------|
| Our firm believes that adopting solar energy system will reduce long-term energy expenses | 0.814          |
| We prefer solar energy because it promotes a healthier work environment                   | 0.895          |
| Our firm's energy decisions consider pollution reduction                                  | 0.847          |

The findings indicate that environmental sustainability and long-term energy cost savings strongly influence SMEs' decisions to adopt solar PV systems. Firms increasingly associate renewable energy adoption with healthier business environments and pollution reduction.

#### Component 2: Peer and Neighbor Influence

| Variable                                                                        | Factor Loading |
|---------------------------------------------------------------------------------|----------------|
| Seeing neighboring businesses use solar energy system encourages us to adopt it | 0.926          |
| Peer firms' positive experiences motivate us to consider solar energy solutions | 0.891          |

The findings suggest that SMEs are strongly influenced by neighboring firms and peer experiences regarding renewable energy adoption. The visibility of solar PV systems within business clusters increases confidence and encourages wider adoption among SMEs.

#### Component 3: Knowledge and Awareness of Solar Energy

| Variable                                                                  | Factor Loading |
|---------------------------------------------------------------------------|----------------|
| Our firm understands how solar energy systems function                    | 0.853          |
| We are aware of the economic and environmental benefits of energy systems | 0.785          |

This result shows that technical understanding and awareness of the benefits of solar energy significantly

influence adoption decisions among SMEs. Firms with greater awareness are more likely to support renewable energy transition.

#### Component 4: Social and Stakeholder Pressure

| Variable                                                                     | Factor Loading |
|------------------------------------------------------------------------------|----------------|
| There is growing social expectation for firms to adopt clean energy          | 0.734          |
| Our stakeholders expect us to use environmentally responsible energy sources | 0.725          |

The findings indicate that social expectations and stakeholder influence positively contribute to solar PV adoption among SMEs. Firms increasingly experience pressure from clients, society, and stakeholders to adopt environmentally responsible business practices.

#### Component 5: Organizational and Gender Influence

| Variable                                                                       | Factor Loading |
|--------------------------------------------------------------------------------|----------------|
| Gender roles within our firm influence awareness of renewable energy solutions | 0.845          |
| Energy decisions in our firm are made collectively and systematically          | 0.762          |

The result suggests that internal organizational structures and decision-making processes influence renewable energy adoption among SMEs. Organizational culture and leadership orientation may therefore affect solar PV investment decisions.

#### Component 6: Educational Influence

| Variable                                                                  | Factor Loading |
|---------------------------------------------------------------------------|----------------|
| Firms with more educated managers are more likely to use renewable energy | 0.876          |

This finding indicates that educational exposure and managerial competence positively influence openness toward renewable energy adoption among SMEs.

Component 7: Business Cluster Influence

| Variable                                                           | Factor Loadin<br>g |
|--------------------------------------------------------------------|--------------------|
| Firms in our business cluster are gradually embracing solar energy | 0.791              |

The result suggests that solar PV adoption spreads gradually within business environments where firms observe neighboring enterprises successfully adopting renewable energy systems.

Component 8: Financial Planning for Solar Adoption

| Variable                                                               | Factor Loadin<br>g |
|------------------------------------------------------------------------|--------------------|
| We have budgeted for solar installation in our future investment plans | 0.915              |

This finding indicates that strategic financial preparation positively influences SMEs' readiness to adopt solar PV systems. Firms that include solar installation within their investment plans are more likely to adopt renewable energy technologies.

Component 9: Technical Capability and Network Influence

| Variable                                                                   | Factor Loadin<br>g |
|----------------------------------------------------------------------------|--------------------|
| Recommendations from trusted networks influence our solar energy decisions | 0.594              |
| Our firm has the technical know-how to operate energy systems efficiently  | 0.608              |

The findings indicate that trusted networks and technical capability contribute to SMEs' confidence in adopting solar PV systems. Access to technical knowledge and reliable recommendations may therefore improve renewable energy adoption among firms. The findings revealed that social and behavioral factors significantly influence solar PV adoption among SMEs in Akinyele LGA, Oyo State. The PCA extracted nine components explaining 76.519% of the total variance, showing that the identified factors strongly explain SME adoption decisions. Environmental and cost awareness emerged as major determinants of adoption, as SMEs associate solar energy with long-term cost savings, pollution reduction, and healthier work environments. Peer and neighbour influence also strongly affect adoption, as firms are more likely to adopt solar PV systems when nearby businesses successfully use them. This supports the Diffusion of Innovations. Knowledge and awareness of solar technologies positively influence adoption, while social and stakeholder pressure encourages firms to adopt environmentally responsible energy practices. Organizational dynamics, educational exposure, financial planning, and technical capability also contribute to adoption decisions.

The findings are relevant for renewable energy providers and policymakers. Solar companies can use peer-based marketing, demonstration projects, and awareness campaigns to increase adoption, while policymakers can support renewable energy education and stakeholder engagement among SMEs.

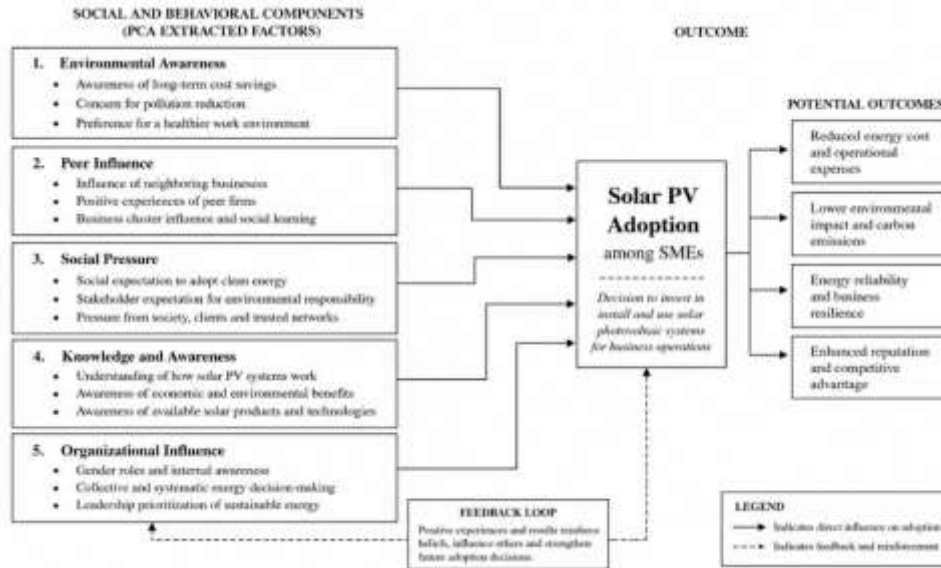


Figure 4: Components Relationship Diagram Showing How Social and Behavioral Factors Influence Solar PV Adoption among SMEs

#### IV. CONCLUSION

This study examined the social and behavioral determinants of solar PV adoption among SMEs in Akinyele LGA, Oyo State, Nigeria. The findings revealed that environmental awareness, peer influence, social pressure, knowledge of solar technology, and organizational dynamics significantly influence SME solar PV adoption decisions.

The study showed that SMEs are increasingly influenced by environmental sustainability concerns, neighboring business experiences, and stakeholder expectations regarding clean energy adoption. The study therefore concludes that social and behavioral factors are important drivers of renewable energy adoption among SMEs.

##### 4.1 Recommendations

1. Awareness campaigns on the environmental and economic benefits of solar PV systems should be strengthened among SMEs.
2. Peer learning and business cluster initiatives should be encouraged to promote solar PV adoption among SMEs.
3. Stakeholder engagement programs should be developed to encourage environmentally responsible business practices.

4. SMEs should be provided with technical education and information on solar energy technologies.
5. Renewable energy agencies should strengthen community-based awareness and social mobilization programs to improve solar PV adoption.

##### 4.2 Recommendation specifically to Renewable Energy Providers

Renewable energy providers can use the findings of this study strategically to improve solar PV adoption among SMEs because the results show that adoption is strongly influenced by social behavior, peer influence, awareness, and trust, not just price alone. Here are the major practical implications:

1. Use Peer-Based Marketing Strategies  
Since neighboring businesses and peer experiences strongly influence adoption, solar companies should use: testimonial marketing, case studies, referral programs, and business-cluster campaigns. For example: showcasing SMEs already using solar PV, “business next door” success stories, or cluster demonstrations in markets and commercial areas. This works because SMEs trust what similar businesses are already using.

## 2. Focus Advertising on Long-Term Savings and Health Benefits

The study showed that SMEs associate solar energy with: long-term cost reduction, pollution reduction (noise and CO<sub>2</sub>) and healthier work environments. Therefore, marketing messages should emphasize: “reduce generator fuel cost,” “save long-term electricity expenses,” “cleaner and quieter business environment.” Instead of advertising only the technology itself, providers should advertise: business benefits and operational advantages.

## 3. Use Demonstration Projects and Visible Installations

Because visibility influences adoption, renewable energy providers should: install pilot systems in popular SME clusters, sponsor demonstration businesses, and create visible solar success examples. When SMEs physically see nearby firms benefiting from solar systems, adoption confidence increases.

## 4. Invest in Awareness and Educational Campaigns

The findings show that knowledge and awareness significantly affect adoption. Providers can therefore increase adoption through: workshops, market sensitization programs, business seminars, social media education, and practical demonstrations. Simple educational content explaining: how solar works, maintenance requirements, and expected savings can reduce fear and uncertainty.

## 5. Build Trust Through Networks and Partnerships

Trusted recommendations influence SME decisions. Solar companies should therefore partner with: SME associations, market leaders, cooperatives, local business unions, and respected community figures. This improves credibility and trust.

## 6. Target Business Clusters Instead of Individual Firms

Since business cluster influence was significant, providers should adopt: cluster-based marketing approaches. Examples: targeting markets, industrial clusters, mechanic villages, agro-processing hubs, or shopping complexes. This creates social diffusion effects where adoption spreads from one business to another.

## 7. Promote Flexible Planning and Future Readiness

The study showed that SMEs that budget for solar adoption are more likely to adopt. Providers can therefore encourage: phased installation, installment plans, scalable systems, and future upgrade options. This reduces psychological and financial barriers.

The major implication of your findings is that SMEs adopt solar PV systems not only because of economics, but because adoption becomes socially trusted, visible, environmentally meaningful, and organizationally accepted.

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