

A Study on Consumer Awareness and Attitude towards Solar Energy Adoption in Rural Households of Krishnagiri District

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Abstract— This study focuses on consumer awareness and attitudes towards solar energy adoption among rural households in Krishnagiri District, Tamil Nadu. Solar energy is a clean and renewable source that plays an important role in sustainable development, especially in rural areas facing energy challenges. The main objective of the study is to examine the level of awareness about solar energy systems and to understand consumer attitudes towards their adoption. The research is based on primary data collected through a structured questionnaire from rural households, along with secondary data from journals and reports. A descriptive research design is used to analyze awareness levels, attitudes, and sources of information influencing consumer decisions. The findings indicate that most respondents are aware of solar energy, but their knowledge about its usage, cost, and maintenance is limited. The overall attitude towards solar energy is positive due to its environmental and economic benefits. However, high initial investment, lack of technical knowledge, and insufficient awareness programs are major barriers to adoption. The study suggests that increasing awareness, providing subsidies, and improving access to information can promote solar energy adoption among rural households.

Index Terms— Solar Energy, Consumer Awareness, Attitude, Rural Households, Adoption, Renewable Energy, Sustainable Development

I. INTRODUCTION

Energy is a fundamental requirement for economic development and improving the quality of life. In recent years, the increasing demand for energy, depletion of conventional energy resources, and environmental concerns have led to a growing

emphasis on renewable energy sources. Among these, solar energy has emerged as one of the most promising and sustainable alternatives due to its abundance, eco-friendliness, and cost-effectiveness in the long run. India, being a tropical country, receives ample sunlight throughout the year, making it highly suitable for solar energy utilization. The government has also introduced various schemes and subsidies to promote the adoption of solar energy, particularly in rural areas. Rural households often face issues such as irregular electricity supply and rising energy costs, which make solar energy a viable and attractive option. Despite its advantages, the adoption of solar energy in rural areas is still limited. One of the key reasons is the lack of adequate awareness and understanding among consumers regarding solar energy systems, their benefits, installation, and maintenance. Additionally, consumer attitude plays a crucial role in influencing the decision to adopt new technologies. Krishnagiri District, located in Tamil Nadu, has significant potential for solar energy adoption due to its climatic conditions and rural composition. Therefore, it is important to study the level of awareness and attitudes of rural households towards solar energy. This study aims to analyze these factors and provide insights to promote the effective adoption of solar energy in the region.

II. REVIEW OF LITERATURE

Shakeel et al. (2023) conducted a systematic review on solar photovoltaic (PV) adoption at the household level and identified a wide range of factors influencing adoption, including economic, environmental, social,

and technical aspects. The study highlighted that consumer awareness and demographic characteristics play a crucial role in shaping adoption decisions. Duque Oliva and Atehortua Santamaria (2025) examined solar energy adoption in developing countries and found that awareness, behavioral factors, and social norms significantly influence household adoption. Their study also emphasized that affordability constraints and weak infrastructure act as major barriers in rural areas. Li et al. (2024) conducted a meta-analysis on the determinants of solar photovoltaic adoption intention and found that perceived benefits, environmental concern, and behavioral control strongly influence consumers' intention to adopt solar energy systems. The study also noted that awareness indirectly affects adoption through attitude formation. Scheller et al. (2021) analyzed residential solar adoption behavior and found that social influence, perceived benefits, and environmental awareness significantly impact consumers' attitudes and intentions. The study highlighted that positive attitudes are largely driven by both financial and environmental benefits. McKenna et al. (2021) studied stakeholder dynamics in solar energy adoption and concluded that knowledge level and awareness are key drivers influencing decision-making among households. The research also emphasized the role of local stakeholders and government support in promoting solar adoption. Rai and Beckman (2020): Examined household adoption and post-adoption use of solar photovoltaic systems and found that awareness and proper utilization significantly enhance economic benefits and energy savings. Their study emphasized that users with better knowledge of system operation achieve higher efficiency and returns. Palm (2017): Studied residential solar adoption and highlighted that social networks and peer influence play a crucial role in spreading awareness and motivating households to adopt solar energy systems. Balcombe et al. (2014): Analyzed consumer decision-making in solar adoption and identified financial incentives, environmental concern, and trust in technology as key determinants influencing adoption behavior. Wolske et al. (2017): Found that environmental values and social norms strongly shape consumers' willingness to adopt solar energy, indicating the importance of psychological and social factors. Islam (2014): Emphasized that lack of awareness and insufficient technical knowledge act

as major barriers to renewable energy adoption, particularly in rural areas. Yadav and Pathak (2016): Studied adoption intention towards renewable energy and concluded that attitude, subjective norms, and perceived behavioral control significantly influence consumer decision-making. Jager (2006): Explained that consumer behavior in energy adoption is influenced by habits, social interactions, and personal values, which affect long-term adoption patterns. Sovacool (2014): Highlighted that policy support, awareness programs, and strong institutional frameworks are essential for promoting renewable energy adoption and overcoming barriers.

III. RESEARCH GAP

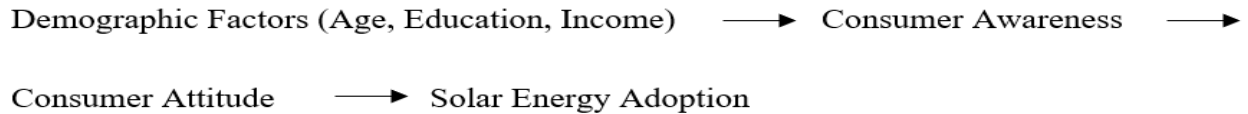
Previous studies have extensively examined the factors influencing solar photovoltaic adoption, including economic, environmental, social, and behavioral aspects. However, several gaps still exist in the literature. Most studies focus on general determinants of adoption, with limited attention given to the level of awareness among rural households and its direct influence on adoption decisions. While awareness is considered an important factor, there is insufficient exploration of its sources, such as media, government schemes, and social networks. In addition, existing research highlights demographic influences, but there is a lack of region-specific studies analyzing how factors like age, education, and income affect awareness levels. Furthermore, many studies emphasize adoption intention rather than actual adoption behavior, leaving a gap between awareness and real implementation. Moreover, limited research has addressed practical challenges at the grassroots level, particularly in rural areas, including issues related to accessibility, infrastructure, and post-adoption support.

IV. RESEARCH HYPOTHESES

- H1: There is a significant relationship between demographic factors (age, education, and income) and the level of awareness about solar energy.
- H2: Consumer awareness has a significant positive influence on the attitude towards solar energy adoption.
- H3: There is a significant relationship between consumer attitude and the adoption of solar energy.

H4: Sources of information (media, government schemes, and social networks) significantly influence the level of awareness among rural households.

V. CONCEPTUAL FRAMEWORK



VI. RESEARCH METHODOLOGY

The research methodology outlines the systematic procedures and techniques used for collecting, analyzing, and interpreting data for the study titled “A Study on Consumer Awareness and Attitude towards Solar Energy Adoption among Rural Households in Krishnagiri District, Tamil Nadu.” This section provides a clear framework to ensure the reliability and validity of the research findings. The study adopts a descriptive research design to understand the level of awareness and attitude of rural households towards solar energy adoption. Both primary and secondary data are used in the study. Primary data is collected through a structured questionnaire distributed to 100 respondents selected from rural areas of Krishnagiri District. The sampling method used is convenient sampling due to ease of access and time constraints. Secondary data is collected from journals, research articles, government reports, and websites related to solar energy and renewable energy adoption. The collected data is analyzed using simple statistical tools such as percentage analysis to present the findings clearly. The results are further represented through tables, charts, and graphs for better understanding. The study focuses on key variables such as awareness level, attitude towards solar energy, sources of information, and demographic factors like age, education, and income. Proper care is taken to ensure accuracy and consistency in data collection and analysis. This methodology helps in drawing meaningful conclusions and provides useful insights into solar energy adoption among rural households.

Research Design

The study adopts a descriptive research design, which is appropriate for understanding and describing the level of consumer awareness and attitudes towards

solar energy adoption. This design helps in identifying patterns, opinions, and perceptions of rural households regarding solar energy usage. It also enables the researcher to present a detailed picture of the current situation without manipulating any variables.

Nature And Sources of Data

The study is based on both primary and secondary data sources.

- **Primary Data:** Primary data is collected directly from rural household respondents in Krishnagiri District. A structured questionnaire is used as the main tool to gather information about awareness levels, attitudes, and factors influencing solar energy adoption.
- **Secondary Data:** Secondary data is collected from various sources such as academic journals, books, government publications, reports on renewable energy, and reliable websites. These sources help in building a theoretical foundation and understanding previous research findings.

VII. DATA COLLECTION METHOD

The primary data is collected using a structured questionnaire method. The questionnaire is designed with simple and clear questions to ensure easy understanding by rural respondents. It consists of both closed-ended questions (such as multiple-choice and yes/no questions) and a few open-ended questions to capture opinions and suggestions. The questionnaire covers areas such as demographic details, awareness about solar energy, attitude towards its usage, and sources of information.

Sampling Technique

The study employs a convenience sampling technique, where respondents are selected based on their availability and willingness to participate. This

method is suitable due to time and resource constraints and allows the researcher to collect data efficiently from rural households.

Sample Size

The sample size for the study consists of 100 rural household respondents from different villages in Krishnagiri District. The sample size is considered adequate to represent the general awareness and attitudes of rural consumers in the study area. (Note: You can modify the sample size based on your actual survey.)

Study Area

The study is conducted in the rural areas of Krishnagiri District, Tamil Nadu. This region is selected due to its rural population and high potential for solar energy utilization, given the availability of sunlight throughout the year.

Variables Of the Study

The study mainly focuses on the following variables:

- Independent Variables: Demographic factors such as age, education, income, and occupation.
- Dependent Variables: Consumer awareness and attitude towards solar energy adoption.

Tools For Data Analysis

The collected data is analyzed using simple statistical tools to derive meaningful conclusions. The tools used include:

Percentage Analysis: Used to calculate and present data in percentages, making it easier to understand the level of awareness and responses of respondents.

Tabulation: Data is organized into tables (rows and columns) to present information clearly and systematically.

Charts and Graphs: Visual tools like bar charts and pie charts are used to represent data, helping in easy comparison and better understanding.

Chi-Square Test (Optional): A statistical method used to find whether there is a significant relationship between demographic factors (like age, income, education) and awareness levels.

Period Of Study

The research is conducted during the academic year 2025–2026, and the data collection process is carried out over a specific period within this timeframe.

Limitations of the Study

- The use of convenience sampling may not fully represent the entire population.
- The sample size is limited to 100 respondents due to time constraints.
- Responses may be subject to personal bias or lack of complete knowledge among respondents.
- The study is restricted to Krishnagiri District and may not be generalized to other regions.

Scope of the Study

- The study focuses on rural households in Krishnagiri District, Tamil Nadu.
- It examines the level of awareness about solar energy systems.
- It analyzes consumer attitudes towards solar energy adoption.
- It identifies the main sources of information influencing awareness.

VIII. DATA ANALYSIS AND INTERPRETATION

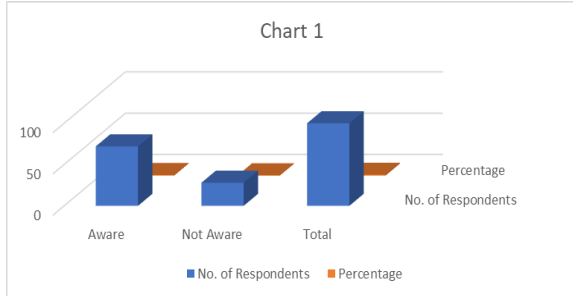
The data collected from 100 rural household respondents in Krishnagiri District was systematically analyzed using the percentage method to ensure clarity and simplicity in interpretation. This method helped in converting raw data into meaningful percentages, making it easier to understand patterns and trends in respondents' awareness and attitudes towards solar energy. The analysis focuses on key variables such as awareness level, sources of information, and demographic characteristics. The results are organized and presented in a structured manner using tables and charts. The interpretation of data is carried out in line with the objectives of the study to draw meaningful conclusions.

IX. OBJECTIVES OF THE STUDY

- ❖ To examine the level of awareness about solar energy systems among rural households.
- ❖ To study the attitude of consumers towards the use of solar energy.
- ❖ To identify the sources of information influencing awareness (such as media, government schemes, and social networks).
- ❖ To analyze the relationship between demographic factors (age, education, income) and awareness level.

Table. No-1 Awareness about Solar Energy Systems

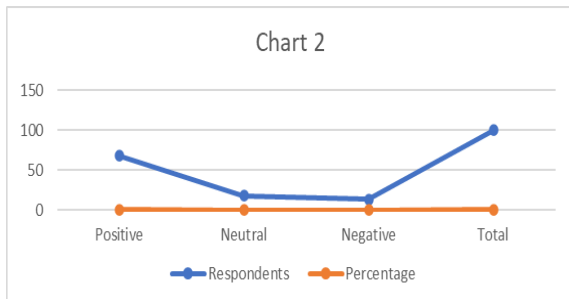
Awareness Level	No. of Respondents	Percentage
Aware	72	72%
Not Aware	28	28%
Total	100	100%



Interpretation: The table indicates that 72% of respondents are aware of solar energy systems, whereas 28% are not aware. This shows that a majority of rural households possess some level of knowledge about solar energy. However, the presence of a significant portion lacking awareness suggests that knowledge is not yet universal. This gap highlights the need for increased awareness programs, better information dissemination, and targeted initiatives to improve understanding and encourage wider adoption of solar energy systems among rural households.

Table. No-2 Attitude towards Solar Energy

Attitude Level	Respondents	Percentage
Positive	68	68%
Neutral	18	18%
Negative	14	14%
Total	100	100%

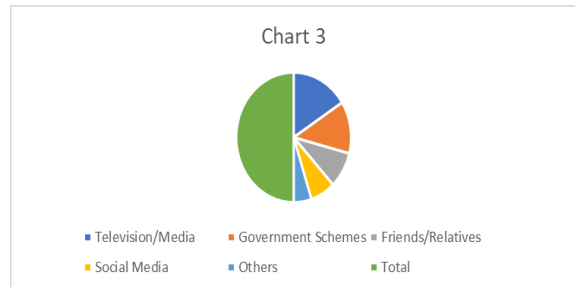


Interpretation: The interpretation shows that 68% of respondents have a positive attitude towards solar energy, indicating a strong level of acceptance and interest in adopting renewable energy solutions. This suggests that most rural households are willing to consider solar energy as an alternative source.

However, a smaller proportion still remains neutral or negative, highlighting the need for further awareness and motivation to strengthen positive attitudes and encourage wider adoption of solar energy systems.

Table. No-3 Sources of Information

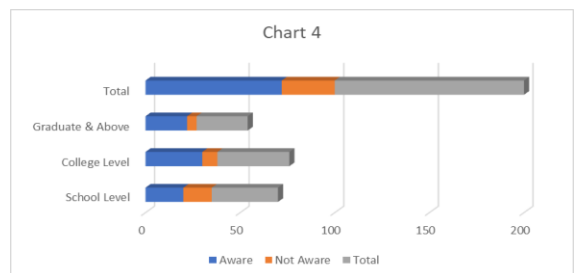
Source	Respondents	Percentage
Television/Media	32	32%
Government Schemes	26	26%
Friends/Relatives	18	18%
Social media	14	14%
Others	10	10%
Total	100	100%



Interpretation: The data reveals that television and media serve as the primary source of information for 32% of respondents, followed by government schemes. This indicates that mass media plays a significant role in creating awareness about solar energy among rural households. Additionally, government initiatives also contribute notably to information dissemination. Together, these channels are effective in influencing awareness levels and can be further utilized to promote solar energy adoption more widely.

Table. No-4 Relationship between Demographic Factors and Awareness-Education vs Awareness

Education Level	Aware	Not Aware	Total
School Level	20	15	35
College Level	30	8	38
Graduate & above	22	5	27
Total	72	28	100



Interpretation: The table indicates that respondents with higher levels of education demonstrate greater awareness of solar energy systems. This suggests a clear positive relationship between education and awareness, where increased educational attainment enhances understanding and knowledge about renewable energy. Educated individuals are more likely to access information, evaluate benefits, and make informed decisions. Therefore, improving education and awareness programs can significantly contribute to increasing solar energy adoption among rural households.

Finding

- Most rural households have moderate awareness about solar energy.
- Consumers show a positive attitude towards using solar energy.
- Television and government schemes are the main sources of awareness.
- Higher education leads to higher awareness of solar energy.

X. SUGGESTIONS

- Increase awareness through rural campaigns and educational programs.
- Promote government schemes more effectively among rural households.
- Provide financial support and subsidies to reduce initial cost.
- Use media and social networks to spread information widely.

XI. CONCLUSION

The study concludes that rural households in Krishnagiri District have a moderate level of awareness and a generally positive attitude towards solar energy adoption. However, the actual adoption remains limited due to factors such as high initial cost, lack of detailed knowledge, and limited access to information. Improving awareness through effective campaigns, providing financial support, and enhancing technical guidance can significantly increase the adoption of solar energy. Overall, solar energy has strong potential to promote sustainable development and energy security in rural areas.

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