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Consumer Awareness towards Solar Home System: Special Reference to Gurugram District

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Abstract:
India is the world's third-largest energy user. Renewable energy accounts for 20% of India's total installed power capacity. Renewable energy sources include solar cells, wind energy, water energy, and biomass. India is endowed with an abundance of solar energy potential. As a result, the Indian government took the initiative to exploit these bountiful resources effectively. Solar energy is one of the cleanest, environment-friendly forms of energy. Due to its effectiveness in supplying the household's demands, a solar power system is in great demand. This research paper aims to explore the awareness and factors affecting the purchase intention of consumers for a solar home system. This study includes several factors related to respondents like their age, residential status, education, and income level to explore their impact on the awareness and purchase intention of consumers. 89 responses were collected using a questionnaire and further Pearson chi-square test was applied to study the association between demographical variables and awareness. The study concluded that education, residential status, and gender have association with awareness and purchase intention. Further, there is a need to create awareness among the masses and advertise the benefits of solar home systems for fastening the adoption rate.

Keywords: *Solar Home System, Solar Home Panel, Rooftop Panel*

1. Introduction

The world is moving towards the Solar Revolution. Solar energy is not only the most plentiful and environmentally friendly energy source in the world; due to its broad adoption, it has also taken on the role of the primary energy source for international climate action. With India leading the way, several nations are lining up to accept solar energy, providing it the scope and accessibility that global climate action demands. The nation's energy portfolio fight considering the cost of using traditional energy and the changing climate. The sun is the planet's most potent energy source and also the one that people use the least. A clean, environmentally beneficial form of energy is solar power. Due to its effectiveness in supplying the household's demands, solar power is a system that is in great demand.

Solar energy is crucial for addressing energy access and security issues in developing nations, as well as for facilitating the energy transition in wealthy nations. India intends to reach a renewable energy target of 500 GW by 2030. Solar energy could become the cornerstone of the net zero carbon emission target by 2070. The government of India has developed many solar programs in India to promote the application of solar power systems on rooftops in both rural and urban regions. The government provides a 30% subsidy on solar energy systems to encourage individuals to adopt solar panels for power generation. Users of solar energy systems can potentially save up to 90% on their electricity costs.

Solar energy is produced by using the technique of concentrated solar power or solar photovoltaic. Solar power would be the biggest source of power generation in India and China due to their location prominence and being tropical nations. The Solar Home System (SHS) is a small-scale, independent power source for residences that are off the grid or have intermittent access to energy. In order to utilise it at night or on cloudy days, it harvests solar energy and stores it in a battery. Fans, tiny TVs, radios, lights, phone chargers, and other electrical goods may all be powered by direct current (DC) generated by SHSs. SHSs can reduce indoor air pollution and replace fossil fuel-based energy sources such as candles, dry batteries, and kerosene while also saving money on energy bills. The demand for electricity has surged, but power shortages are common. Solar energy products face drawbacks like high costs and space requirements. Despite these, they offer abundant energy benefits for the environment and humans. Rapid technological advancements and increasing complexity present opportunities and

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challenges in marketing, prompting a study on customer awareness on solar energy (Kowsiga & Tharangini, 2020).

2. Literature Review

Aggarwal et al. (2020) assessed factors driving Indian consumers' purchase intentions in metropolitan cities through a survey that revealed several factors via performance expectancy, concern for the environment, cost and performance expectancy, and social influence all have an impact on consumers' purchase intention and behavior. While Akroush et al. (2019) investigated the leading factors that persuade a consumer to buy a product. Perceived benefits of a product have a positive impact on purchase intension of consumers. In his research, he discussed the factors that positively affect the consumer's purchase intention and attitude towards solar energy are its environment friendliness and energy cost-saving. However, price affects the purchase intention negatively. Prasad et al. (2020) conducted a study in Kerala to study the factors that affect households' solar adoption. Government subsidies, knowledge & awareness, and financial motivation all had a positive effect on solar adoption among the household. While subsidies provided by the government are the primary motivators.

Atulkar (2022) confirmed that home demand for residential PV technology is quite low and that the technology is still in its early stages of development. According to this study, in order to encourage consumers to voluntarily indicate their desire to acquire solar PV equipment, service providers should give additional incentives in the form of subsidies and programmes.Similarly, Kumar et.al (2020) argues the need for more advertising efforts for changing the perception of consumers towards solar energy. They validated that government incentives and green purchase behavior significantly impacted consumer purchase decisions for a solar home system. The papers provide insights into consumer awareness towards solar home systems. Urpelainen & Yoon (2015) found that higher household income, education levels, and access to electricity were predictors of awareness and willingness to pay for solar home systems in rural Uttar Pradesh, India. Wolske et al. (2017) proposed a theoretical framework integrating behavioral theories to explain interest in adopting residential solar systems in the United States, highlighting factors such as trust in installers, perceived personal benefits, and pro-environmental personal norms. Luckett & Needham (2021) identified the lack of marketing information as a barrier to

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consumer awareness and emphasized the potential for marketing strategies to promote solar energy systems as a clean and affordable alternative. Faiers & Neame (2006) explored consumer attitudes in the UK and found that while the early majority demonstrated positive perceptions of the environmental characteristics of solar power, financial, economic, and aesthetic factors limited adoption. In summary, the papers collectively suggest that factors such as income, education, access to electricity, trust in installers, perceived personal benefits, and effective marketing strategies play a role in consumer awareness and interest towards solar home systems.

3. Objectives

1) To study the association of demographic variables and consumers' awareness towards the solar home system.
2) To study the factors driving the consumer to adopt the solar home system.

4. Research Methodology

To accomplish this goal, the study utilised both primary and secondary data altogether. Online questionnaires were used to obtain data from 85 respondents of the Haryana state district of Gurugram. Further, the tables and charts are formed based on age, educational level, income level, and residential status impact on awareness of the solar home system. Past literature published in reputed journals focusing on factors affecting consumer purchase intentions was analyzed. In this paper, simple percentages and tables were employed in data analysis. Further, to test the association of demographics variables and awareness towards Solar Home System chi-square test is used.

Table.1 Demographic Information of the Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Female	36	40.4	40.4	40.4
	Male	53	59.6	59.6	100.0
	Total	89	100.0	100.0	
Age	18-25 years	42	47.2	47.2	47.2
	26-35 years	26	29.2	29.2	76.4

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	36 above years	21	23.6	23.6	100.0
	Total	89	100.0	100.0	
Educational Qualification	Schooling	23	25.8	25.8	25.8
	Graduate	26	29.2	29.2	55.1
	Post Graduate	40	44.9	44.9	100.0
	Total	89	100.0	100.0	
Income	Below 3,00,000	40	44.9	44.9	44.9
	3,00,000-6,00,000	24	27.0	27.0	71.9
	Above 6,00,000	25	28.1	28.1	100.0
	Total	89	100.0	100.0	
Residential Status	Rural	29	32.6	32.6	32.6
	Semi Urban	23	25.8	25.8	58.4
	Urban	37	41.6	41.6	100.0
	Total	89	100.0	100.0	

Table 1 displays the demographic characteristics of the 89 respondents. The majority of respondent (59.6%) were male and 40.4% were female. It also reveals that approximately 47.2% of respondents fell within the 18-25 age bracket, while 29.2% were in the 26-35 age group and 23.6% were beyond the ages of 36. 25.2% of the respondents were completed schooling, 29.2% of the respondents were graduate while 44.9% were postgraduate. In the status of income level, the majority of respondents (44.9%) earn below 3 lakhs, with 27% earning between 3-6 lakhs and 28.1% earn more than 6 lakhs. 32.6% of the respondents were from rural area, 25.8% were from semi urban and 41.6% were from urban area.

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5. Research Analysis

5.1 Mode of Awareness

Table.2 Mode of Awareness

	Number of Respondent	Percentage(%)
Friends	18	20.2
Newspaper	27	30.3
Social Media	28	31.5
Television	16	18.0
Total	89	100.0

According to Table.2, when compared to other mode such as friends and television the creation of awareness is more influenced by newspaper (30.3%) and social media (31.5%). The usage of social media is increasing gradually and becoming the most important source of knowledge among consumers. There is tremendous need for marketers to use these platforms and encourage more people to use solar home system. Marketers must aware masses the about the advantages of using the solar home system and its long lasting contribution in the environment protection.

5.2 Motive for using Solar Home System

Table.3 What attracts you to use solar home system?

	Frequency	Percent
Economical (save electricity bill)	36	40.4
Electricity issues in Your Locality	19	21.3
Environment Friendly	9	10.1
Government Incentives (subsidies, tax deduction etc.)	23	25.8
Latest technology	2	2.2
Total	89	100.0

From table.3, it is clear that majority of people use solar home system in view of saving their electricity bills (40.4%). Government incentives (25.8%) and electricity issues in the locality (21.3%) also persuade people to use solar home system in their home. Only 10.1% of the respondent use solar home system due their concern towards environment. And the last only 2.2% of the respondent were technology savvy and their motive to use solar home system is latest technology.

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5.3 Impact of Demographical variables:

The chi-square test of independence is employed to examine the relationship between categorical data. It analyzes the group difference when dependent is measured at nominal level.

5.3.1 Gender and Awareness

H_0: There is no significance difference between gender and awareness towards solar home system.

Chi-square test:

	(a) Chi-Square	(b) LR (Likelihood Ratio)	(c) Linear-by-Linear Association	(d) No. of respondents
Value	10.383[a]	10.600	10.230	89
Degree of Freedom	2	2	1	
Sig. (2-sided)	.006	.005	.001	

Interpretation: Since the p-value (0.006) is lower than the significance level (0.05), we reject the H0. Based on the above analysis there is a significant difference exists between gender and awareness. Specifically, there is a disparity in awareness between males and females regarding solar home systems.

5.3.2 Age and Awareness

H_0: There is no significance difference between age and awareness towards solar home system.

Chi-square test:

	(a) Chi-Square	(b) LR (Likelihood Ratio)	(c) Linear-by-Linear Association	(d) No. of Respondents
Value	.566[a]	.566	.270	89
Degree of Freedom	4	4	1	
Sig. (2-sided)	.967	.967	.603	

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Interpretation: the above p- value of chi-square = .967 is greater than the designated alpha value (0.05). The H0 is accepted, there is no association between the age and awareness of the respondents. Age has no association with the awareness of respondents.

5.3.3 Educational Qualification and awareness

H_0: There is no significance difference between educational qualification and awareness towards solar home system.

Chi-square test:

	(a) Chi-Square	(b) LR (Likelihood Ratio)	(c) Linear-by-Linear Association	(d) No. of Respondents
Value	10.077[a]	10.028	9.142	89
Degree of Freedom	4	4	1	
Sig. (2-sided)	.039	.040	.002	

Interpretation: the above p- value of chi-square = .039 is less than the designated alpha value (0.05) . Ho is rejected, there is no association between the education and awareness of the respondents. Educational Qualification has association with the awareness of respondents.

5.3.4 Income and Awareness

H_0: There is no significance difference between income and awareness towards solar home system.

Chi-square test:

	(a) Chi-Square	(b) LR (Likelihood Ratio)	(c) Linear-by-Linear Association	(d) No. of Respondents
Value	5.587[a]	5.689	2.487	89
Degree of Freedom	4	4	1	
Sig. (2-sided)	.232	.224	.115	

Interpretation: the above p- value of chi-square = .232 is greater than the designated alpha value (0.05).H0 is accepted. Income has no association with the awareness of respondents.

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5.3.5 Residential status and awareness

H_0: There is no significance difference between residential status and awareness towards solar home system.

Chi-square test:

	(a) Chi-Square	(b) LR (Likelihood Ratio)	(c) Linear-by-Linear Association	(d) No. of Respondents
Value	11.112[a]	11.142	.883	89
Degree of Freedom	4	4	1	
Sig. (2-sided)	.025	.025	.347	

Interpretation: the above p- value of chi-square = .025 is less than the designated alpha value (0.05) . H0 is rejected. Residential status has association with the awareness of respondents.

6. Research Implication

Understanding consumer awareness and perceptions of Solar energy systems is crucial for policymakers, energy providers, and stakeholders involved in India's solar energy mission. The findings of this research can guide the development of targeted awareness campaigns, educational programs, and policy interventions to overcome barriers and accelerate the adoption of solar energy system. By empowering consumers with knowledge and highlighting the benefits of Solar energy system, India can progress towards achieving its renewable energy targets while improving energy access and livelihoods in rural and underserved communities.

7. Conclusion

Solar energy systems offer enormous growth potential in India. Government policies, initiatives, and programs play an important role in educating masses regarding solar home system and stimulating them to use solar home systems through subsidies, tax incentives and other benefits. From the study it examines that people want to use solar home system due to government incentives, they face electricity issues in their locality, and to save their electricity bills. This study investigates awareness level and factors that influence public knowledge of solar energy systems in rural, semi-urban, and urban people based on age, education qualification and income level. This research study concludes two major points: persons with a higher education level

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have greater information and awareness of solar energy and its technological components, as well as a more favorable attitude toward solar energy systems than those with less understanding. Residential status and gender also associated with awareness of respondent. However, Income and age has no association with the awareness towards solar home system. This survey also discovered that the internet is the most influential source of information since, currently, everyone has easy access to it. Due to this social media is the most important source of creating awareness for the marketers. The study shows that there is huge potential of solar home system market in the near future. The study is helpful for marketers in understanding the factors affecting awareness of consumers and help them in creating advertisement to aware masses. There is need to aware masses and persuade them for using solar home system.

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