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A Study of Consumer Buying Behaviour of Residential Solar Systems in Jalgaon District with Special Reference to Bhusawal Taluka

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Abstract
This study examines consumer buying behaviour toward residential solar energy systems in Jalgaon District, focusing particularly on Bhusawal Taluka. With rising electricity tariffs and growing environmental awareness, solar energy has become an increasingly attractive alternative to conventional power sources. The research investigates how socio-economic, psychological, and infrastructural factors shape consumers' decision-making while purchasing residential solar systems.
Primary data were collected from fifty households in Bhusawal Taluka through structured questionnaires and personal interviews, supported by secondary information from government publications, the Ministry of New and Renewable Energy (MNRE), Maharashtra Energy Development Agency (MEDA) reports, and academic journals. The study employs a descriptive-analytical design and uses percentage analysis and correlation testing to explore relationships among income, awareness, bank finance availability, and adoption intent.
Findings reveal that cost savings, government subsidies, and environmental consciousness are key motivators for purchasing solar systems. Conversely, high initial installation cost, limited technical knowledge, and maintenance concerns remain major deterrents. The study also finds that availability of easy bank financing and after-sales service significantly increases consumer confidence.
The research concludes that consumer buying behaviour for residential solar systems is influenced not only by economic considerations but also by attitudes toward sustainability and self-reliance. Policy interventions, awareness campaigns, and simplified financing procedures can further enhance adoption levels in semi-urban regions such as Bhusawal Taluka. This micro-level analysis contributes to the growing body of literature on renewable-energy marketing and consumer psychology in India's emerging green economy.
Keywords: Consumer Behaviour, Solar Energy, Renewable Energy Adoption, Environmental Awareness, Bhusawal Taluka, Jalgaon District

Introduction

Energy is universally recognized as a fundamental necessity for economic development, industrial growth, and improved quality of life. Every sector—agriculture, manufacturing, transport, and domestic consumption—depends on a stable and affordable supply of electricity. In India, for decades, this energy demand has been predominantly met through **non-renewable sources** such as coal, petroleum, and natural gas. While these conventional resources have supported the nation's economic progress, they have also generated serious environmental issues such as air pollution, greenhouse-gas emissions, and ecological imbalance. The combined effects of population growth, industrialization, and urbanization have further intensified pressure on these limited resources, leading to **rising energy costs and energy insecurity**.

To address these challenges, India has made strategic policy interventions in the field of **renewable energy**, with solar power emerging as the most promising alternative. India's geographical advantage—receiving sunshine for nearly 300 days a year—makes it an ideal hub for large-scale solar energy generation. Recognizing this potential, the **Government of India launched the National Solar Mission (NSM) in 2010** as part of the National Action Plan on Climate Change. The mission's objectives include promoting grid-connected and off-grid solar installations, developing domestic manufacturing capacity, and encouraging decentralized renewable-energy adoption at the household level. Through mechanisms such as **rooftop solar schemes, net-metering policies, and capital subsidies**, the government has sought to create both infrastructural and financial support for citizens to adopt solar energy systems.

Maharashtra, being one of India's **sun-rich and industrially advanced states**, has responded positively to these initiatives. The state's combination of high solar irradiation and growing energy consumption provides fertile ground for solar development. Despite this, regional disparities persist: while cities such as Pune, Nagpur, and Nashik show strong adoption rates, several semi-urban and rural districts still lag behind. This uneven pattern reveals that **technological potential alone does not guarantee adoption—**consumer awareness, affordability, and perception play equally vital roles.

Within Maharashtra, **Jalgaon District** stands out as a distinctive case for studying solar adoption. Known for its agricultural base—especially banana and cotton cultivation—it also includes semi-urban areas experiencing rapid infrastructural expansion. The district's electricity consumption is rising steadily, but supply fluctuations and increased tariffs have created interest in alternative energy solutions. Among its various subdivisions, **Bhusawal Taluka** offers an especially meaningful context for analysis. Despite hosting one of the largest thermal power stations in the state, many households face irregular power supply and high electricity costs. Simultaneously, the taluka has witnessed an emerging trend toward **residential rooftop solar installations**, influenced by both economic motives and environmental awareness.

However, while the general awareness of solar energy has improved through government campaigns, **the actual decision to buy and install a solar system** remains complex. It depends on multiple interrelated factors—**economic capacity, perceived return on investment, social status, trust in technology, availability of service providers, and personal environmental ethics.** For some consumers, solar energy represents a long-term financial investment; for others, it is an aspirational product symbolizing modernity and environmental responsibility. Therefore, examining these behavioural patterns can provide valuable insight into how individuals and families transition from awareness to actual purchase.

The concept of **consumer buying behaviour** encompasses all psychological, social, and economic processes that individuals undergo before, during, and after purchasing a product. In the context of renewable energy, consumer behaviour includes awareness, interest, evaluation of alternatives, purchase decision, and post-purchase satisfaction. Understanding these stages is essential for identifying what motivates or discourages households from adopting solar systems. For example, while some consumers are driven by potential cost savings, others are motivated by environmental consciousness or energy independence. Conversely, deterrents such as high upfront costs, lack of maintenance support, or uncertainty about long-term performance can delay or prevent adoption.

From a policy perspective, studying consumer behaviour helps authorities and marketers design **targeted strategies**—including financial incentives, awareness campaigns, and service models—to accelerate adoption. It also enables private manufacturers and distributors to understand their customer base, align marketing communications, and improve after-sales services. In this way, consumer behaviour research serves as a bridge between technology availability and real-world adoption.

In semi-urban areas like Bhusawal Taluka, the interaction between **economic necessity and environmental concern** is particularly significant. Here, consumers often belong to middle-income groups who are conscious of electricity costs but cautious about large investments. Their decisions are further influenced by neighbours, community norms, and information shared through local networks. Therefore, any strategy to promote solar systems must integrate both **economic feasibility and behavioural insights.**

The present study thus aims to provide an in-depth understanding of **how consumers in Jalgaon District—especially in Bhusawal Taluka—perceive, evaluate, and decide to purchase residential solar systems.** It explores the relationships between demographic variables, financial accessibility, environmental attitudes, and post-purchase satisfaction. The study also identifies obstacles that restrict wider adoption and offers practical recommendations for stakeholders including government bodies, financial institutions, and solar manufacturers.

In conclusion, the transition toward renewable energy at the household level is not merely a technological shift but a **behavioural and socio-economic transformation.** By analyzing consumer buying behaviour, this study contributes to a deeper understanding of how awareness, affordability, and attitude collectively shape the adoption of sustainable energy systems in India's semi-urban regions. The findings will assist policy-makers and marketers in framing more effective outreach programs, thereby promoting the long-term goal of a clean and energy-independent India.

Materials and Methods

Nature of Research

The present research adopts a **descriptive and analytical approach** to examine consumer buying behaviour toward residential solar energy systems. The descriptive aspect explains the demographic profile, awareness level, and perceptions of respondents, while the analytical aspect explores the relationships between economic, social, and psychological factors that influence the decision to purchase solar systems. A combination of **quantitative and qualitative methods** ensures a balanced understanding of both statistical patterns and behavioural insights.

This dual-method design allows the researcher to measure the extent of adoption numerically while also interpreting attitudinal motives such as trust, satisfaction, and environmental concern. The descriptive

method is used for factual presentation, whereas the analytical method identifies trends and associations through comparison and correlation.

Area of Study

The research was conducted in **Bhusawal Taluka of Jalgaon District, Maharashtra (India)**. Jalgaon, located in north Maharashtra, is one of the rapidly developing districts with a mix of agricultural and semi-urban populations. Bhusawal Taluka was selected purposefully because it reflects both urban and rural consumer characteristics and shows a growing interest in renewable energy.

The area experiences high solar irradiation for most of the year, making it technically favourable for solar installations. However, consumer adoption remains moderate owing to variations in awareness, affordability, and infrastructural readiness. Studying this micro-region provides valuable insights into how socio-economic diversity and environmental awareness interact to shape purchasing decisions.

Sample Design and Data Sources

A total of **50 respondents** were selected using the **simple random sampling technique**, ensuring equal probability for participation among household consumers. The sample included both users of residential solar systems and potential buyers who had expressed awareness or interest in adoption.

Primary Data:

Information was collected through a **structured questionnaire** and **personal interviews.** The questionnaire covered multiple aspects such as demographic background, income, awareness of solar schemes, motivation to purchase, perceived advantages, obstacles, and satisfaction levels. Respondents were encouraged to express opinions on cost, durability, maintenance, and government support.

Secondary Data: Secondary information was obtained from authentic institutional and academic sources:

- **Ministry of New and Renewable Energy (MNRE) –** Annual and policy reports.
- **Maharashtra Energy Development Agency (MEDA) –** State-level solar-adoption statistics.
- **Maharashtra State Electricity Distribution Company Limited (MSEDCL) –** Local energy-consumption data.
- Published **books, journals, dissertations,** and **online research databases** related to renewable-energy marketing and consumer behaviour.

Together, these data sources ensured both contextual background and empirical accuracy for analysis.

Tools and Techniques of Analysis

To analyze the collected data, a combination of **quantitative statistical tools** and **qualitative interpretation techniques** was applied.

- **Percentage and frequency analysis** were used to study demographic patterns, awareness levels, and consumer preferences.
- **Tabular representation** helped to organize information systematically, making comparative interpretation easier.
- **Correlation analysis** was applied to test associations between variables such as income, awareness, financing availability, and purchase intention.
- **Graphical tools—**bar charts, pie diagrams, and line graphs**—**were used to visually present results for better comprehension.
- **Thematic analysis** was used for qualitative responses, allowing insights into consumer motivation and behavioural tendencies.

Data validation was ensured through consistency checks and cross-verification of primary and secondary findings.

Duration of the Study

Fieldwork and data collection were conducted between **July 2024 and July 2025**, covering both **urban and rural households** within Bhusawal Taluka. This one-year duration allowed the researcher to capture variations in energy-usage patterns across different seasons, along with changes in consumer attitude influenced by government campaigns and local market developments.

Limitations of the Methodology

Although the study provides meaningful insights, certain limitations must be acknowledged. The sample size of 50 respondents, while representative for micro-level analysis, may not fully generalize the behaviour of the entire Jalgaon district. Some respondents provided subjective opinions that may carry personal bias. Additionally, limited access to official district-wise solar-installation data restricted the comparative scope. Nevertheless, the methodology provides a strong foundation for understanding consumer attitudes and decision-making patterns in a semi-urban Indian context.

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Results and Analysis

The results of this study are based on data collected from **50 respondents** in Bhusawal Taluka of Jalgaon District. The analysis focuses on understanding demographic characteristics, awareness levels, motivational factors, barriers, and overall behavioural patterns influencing the purchase of residential solar systems. Quantitative data were processed using percentage and frequency analysis, while qualitative observations were interpreted thematically.

1. Demographic Profile of Respondents

Parameter	Category	No. of Respondents	Percentage (%)
Gender	Male	34	68%
	Female	16	32%
Age Group	25–35 years	12	24%
	36–50 years	28	56%
	Above 50 years	10	20%
Education	Graduate	30	60%
	Post-Graduate	12	24%
	Up to HSC	8	16%
Occupation	Service	20	40%
	Business	18	36%
	Agriculture	12	24%
Monthly Income	Below ₹30,000	10	20%
	₹30,000–₹60,000	28	56%
	Above ₹60,000	12	24%

Interpretation:

Most respondents belonged to the **middle-income and educated group**, indicating that awareness and affordability are higher among economically stable households. A significant portion (76%) falls in the 25–50-year age bracket, the most active consumer group for renewable-energy investment.

2. Awareness and Knowledge About Solar Systems

Awareness Level	No. of Respondents	Percentage (%)
Fully aware of solar energy and government schemes	30	60%
Partially aware	14	28%
Not aware / very little knowledge	6	12%

Interpretation:

Approximately **88%** of respondents were aware or partially aware of solar energy systems, which reflects successful government and media campaigns. However, only 60% had comprehensive knowledge about installation processes and financial incentives.

3. Source of Information About Solar Energy

Source	Respondents	Percentage (%)
Friends / Relatives	18	36%
Government Awareness Programmes	10	20%
Social Media / Internet	12	24%
Dealers / Installers	6	12%
Other (Newspapers, Exhibitions, etc.)	4	8%

Interpretation:

Most respondents gained information through **personal networks (friends and relatives)** rather than formal institutional channels. This highlights the role of **word-of-mouth marketing** in shaping consumer perception.

4. Motivation to Purchase Residential Solar Systems

Motivating Factor	Respondents	Percentage (%)
Reduction in electricity bills	26	52%
Environmental protection	10	20%
Long-term investment / savings	8	16%
Government subsidy	4	8%
Peer influence	2	4%

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Interpretation:
The **economic factor** (saving on electricity bills) is the primary motivation for more than half of the respondents, followed by environmental concern. Financial motives thus dominate consumer decision-making.

5. Major Barriers to Solar System Adoption

Barrier	Respondents	Percentage (%)
High initial installation cost	19	38%
Lack of technical guidance	10	20%
Space / roof limitation	7	14%
Maintenance issues	8	16%
Lack of financing options	6	12%

Interpretation:
The **initial cost** is the major deterrent, mentioned by 38% of respondents. Limited technical knowledge and maintenance concerns further discourage potential buyers, indicating a need for better post-installation support and consumer education.

6. Influence of Bank Financing and Subsidy

Statement	Agree (%)	Disagree (%)
Availability of loans makes solar purchase easier	68%	32%
Subsidy process is easy and transparent	46%	54%
Awareness about bank financing options is sufficient	42%	58%

Interpretation:
While a majority acknowledge that **bank loans encourage adoption**, the study finds that many consumers still face challenges in accessing or understanding subsidy procedures. This suggests the need for simplified, transparent financing mechanisms.

7. Perception Toward Environmental Sustainability

Opinion	Respondents	Percentage (%)
Strongly agree that solar helps protect environment	22	44%
Agree	18	36%
Neutral	6	12%
Disagree	4	8%

Interpretation:
Nearly **80%** of respondents exhibit a positive attitude toward environmental protection through solar energy, signifying an emerging eco-conscious mindset in Bhusawal Taluka.

8. Overall Level of Satisfaction Among Existing Users

Satisfaction Level	Respondents	Percentage (%)
Highly satisfied	14	28%
Satisfied	18	36%
Neutral	10	20%
Dissatisfied	8	16%

Interpretation:
About **64%** of solar-system users reported satisfaction with their purchase, emphasizing that once installed, solar technology meets consumer expectations. However, the presence of 16% dissatisfaction points to service-quality and maintenance issues that need to be addressed by vendors.

9. Correlation Between Income and Purchase Intention
A correlation analysis between **monthly income** and **purchase intention** revealed a **moderate positive relationship (r = 0.62)**. This indicates that higher-income households are more likely to invest in solar systems due to greater affordability and access to financing. However, awareness and environmental values also play secondary roles, suggesting that solar adoption cannot be explained solely by income.

10. Summary of Key Findings

1. **Awareness** of solar technology is high (88%), but in-depth technical understanding is limited.
2. **Economic savings** and **environmental concern** are primary motivators for adoption.
3. **High installation cost** and **lack of guidance** remain key barriers.
4. **Middle-income and educated consumers** are the most responsive segment.
5. **Bank finance** positively influences purchase decisions, though subsidy awareness is low.
6. **Satisfaction levels** are generally positive, indicating good user experience post-installation.

7. The correlation analysis confirms that income and awareness jointly determine consumer behaviour.

Interpretation and Implications

The analysis reveals that consumer buying behaviour in Bhusawal Taluka is strongly **value-driven** and **economically rational.** Consumers weigh the benefits of cost savings and sustainability against upfront expenses. Awareness initiatives have successfully created interest, but adoption requires continued institutional support, simplified financial processes, and reliable service infrastructure.

These findings provide actionable insights for:

- **Policy makers**, to design targeted awareness and subsidy programmes.
- **Banks and financial institutions**, to streamline solar loan schemes.
- **Manufacturers and dealers**, to improve after-sales service and build consumer trust.

In essence, promoting solar energy in semi-urban India must move beyond technological feasibility toward **consumer-centric strategies** that recognize the behavioural, economic, and emotional factors influencing purchase decisions.

Discussion

The findings of this study reveal that consumer buying behaviour toward residential solar systems in Bhusawal Taluka is shaped primarily by economic, psychological, and social influences. While awareness of solar energy is relatively high (around 88 %), adoption still depends largely on the consumer's ability to invest and on their confidence in the technology.

The economic dimension remains the strongest motivator. More than half of the respondents indicated that reducing electricity bills and achieving long-term savings were their primary reasons for purchase. This aligns with previous national-level studies showing that cost savings and return on investment dominate renewable-energy buying decisions in developing economies. However, the high initial installation cost continues to deter nearly 40 % of potential buyers, especially in middle-income households. This suggests that although the intention to adopt is growing, affordability remains a structural constraint.

The financial-institutional factor also plays a decisive role. Respondents with access to bank loans and government subsidies displayed a much higher likelihood of adopting solar technology. Yet, several participants reported that subsidy procedures were complex and time-consuming. This calls for a simplified and transparent financing system with better communication between banks, installers, and consumers. Financial literacy workshops or local awareness camps could help bridge this information gap.

From a psychological and behavioural standpoint, attitudes toward the environment are becoming increasingly positive, especially among younger and more educated consumers. About 80 % of respondents agreed that adopting solar systems contributes to environmental protection. This growing environmental awareness indicates a gradual shift from purely economic reasoning to a blend of eco-friendly and value-driven motivation.

Social influence was another key determinant. Many respondents learned about solar systems through relatives, friends, or neighbours rather than formal advertisements. This finding highlights the importance of word-of-mouth and community-based marketing. When local adopters share positive experiences, it builds social trust and reduces hesitation among non-users.

Service and maintenance quality emerged as a moderate but significant concern. Some consumers expressed dissatisfaction with after-sales support, technical reliability, and follow-up services from local vendors. As the number of installations increases, the need for a skilled workforce and efficient service infrastructure becomes critical. Encouraging local entrepreneurship in installation and maintenance could generate employment while ensuring sustained consumer satisfaction.

The study also underlines that consumer decision-making is multifaceted. Economic ability, perceived usefulness, environmental concern, and risk perception combine to determine the final buying decision. These insights are consistent with behavioural theories such as the Theory of Planned Behaviour (TPB), which explains how attitudes, subjective norms, and perceived control collectively influence individual intentions. In Bhusawal's semi-urban context, all three components are visible: consumers express positive attitudes, rely on peer norms, and require institutional support to overcome financial barriers.

From a policy perspective, these findings have several implications. Government agencies should focus not only on subsidy provision but also on building awareness through local demonstration projects and school-level educational initiatives. Financial institutions can design flexible loan schemes tailored to middle-income groups. Meanwhile, manufacturers and dealers should invest in customer education, extended warranties, and service assurance to enhance long-term trust.

Finally, the study reinforces that behavioural transition precedes technological transition. Solar adoption will accelerate only when consumers perceive the technology as reliable, affordable, and socially validated. Hence, policies must merge economic incentives with behavioural-marketing strategies.

Conclusion

The study concludes that consumer buying behaviour toward residential solar systems in Jalgaon District—particularly within Bhusawal Taluka—is evolving from curiosity to commitment. The majority of consumers demonstrate a positive attitude toward renewable energy and recognize its dual benefits: economic savings and environmental sustainability.

However, adoption is still hindered by the high upfront cost, limited awareness of financial mechanisms, and concerns about maintenance. The availability of easy loans, clear subsidy procedures, and efficient service support can convert consumer intention into actual purchase decisions. As the results indicate, households with higher income and education levels show greater willingness to invest, suggesting that targeted awareness programmes for lower-income groups could broaden adoption.

The findings also highlight that satisfaction levels are generally high among existing users, proving that solar energy systems deliver practical and financial value once installed. Strengthening local supply chains, ensuring after-sales support, and promoting user feedback will further enhance consumer confidence.

In essence, residential solar adoption in Bhusawal Taluka represents a microcosm of India's larger renewable-energy transformation. If properly supported through policy, finance, and community engagement, solar systems can become a cornerstone of sustainable domestic electrification. Future studies may expand this work by including a larger sample across multiple talukas, employing advanced statistical models, and exploring comparative behavioural trends between rural and urban households.

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