

India Renewable Energy Transition: Public Awareness and Acceptance

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Abstract

India's growing energy demands and its commitments to address climate change, faces a critical need to transition towards green energy sources. This paper explores the complex landscape of public awareness and acceptance of green energy in India. Through a public survey on the green energy awareness and acceptance, we examine the factors shaping public perceptions, attitudes, and behaviors towards green energy, identify key challenges and opportunities, and discuss strategies for promoting wider adoption of sustainable energy solutions. Based on a poll approximately seventy people, this study looks at popular knowledge and acceptance of green energy in India. Important factors under investigation are knowledge of renewable energy ideas, support of green energy projects, government policy familiarity, and perceived obstacles to implementing green energy. The results show a strong self-reported awareness of renewable energy and generally favorable opinions of the significance of green energy for the future of India. Mentioning advantages for mitigating climate change and economic development, around 95% of respondents support the use of green energy sources in India. With high initial cost and lack of knowledge each mentioned by 31% of respondents as the main obstacles to adoption, only 19% now use any green energy at home despite this substantial support. Respondents showed some familiarity with government renewable energy projects (e.g., National Solar Mission, PM Surya Ghar solar plan), but there still gaps in thorough understanding. These results complement the body of current research stressing low public knowledge and information gaps in India. The report ends with suggestions for focused awareness efforts, improved information sharing, and expanded incentive schemes meant to raise the acceptance of green energy solutions. Reducing important issues and raising public awareness would help India move toward a more sustainable energy future.

Keywords: Green Energy, Solar Mission, Sustainable, Future Energy, Renewable Energy, Public Awareness, Public Acceptance

Introduction

India's path to energy sustainability has drawn global interest since it exposes a strange combination of developmental need, environmental responsibility, and lofty political aspirations. India, the third-largest emitter of greenhouse gases and one of the fastest growing economies, is the turning point. Its energy demand is expected to double by 2040, and to meet this, the government has pledged to reach 500 GW of non-fossil energy capacity and get 50% of its electricity from renewable sources by 2030, as stated in

its Nationally Determined Contributions at COP26 (Ministry of New and Renewable Energy [MNRE], 2023; IEA, 2021). India's installed renewable energy capacity as of May 2023 was 179 GW, including 67 GW from solar and 43 GW from wind, suggesting fair but modest progress toward its long-term sustainability objectives (MNRE, 2023).

Although these technological and infrastructure developments have taken place, the shift toward green energy calls for much more than just cash in solar panels, wind farms, and grid connection. Less obvious but equally important are public knowledge and acceptability, which directly influence the speed and extent of renewable energy adoption and thereby propel this shift (Esiri .A et al 2023). Although government-led projects like the National Solar Mission, PM Surya GharYojana, and the KUSUM Scheme are meant to promote grid-connected and decentralized renewable energy systems, their impact is determined by public knowledge, attitudes, and confidence in the policymaking process.

Public opinion not only determines the social acceptability of renewable energy infrastructure but also influences the behavioral intention to adopt technologies like biogas units, rooftop solar panels, and energy-efficient systems at the household level (Shalu A. et al. 2020). Often, knowledge gaps, insufficient resources, and ineffective communication strategies increase the disparity between public acceptability and policy objective. Especially in rural and semi-urban regions, high initial installation costs and uncertainty about government incentives continue to be major issues (TERI, 2022). Public opposition based on misleading information, ignorance of technology, or distrust of implementing agencies could delay or interfere with renewable initiatives.

Broad public involvement, targeted awareness efforts, transparency in policy communication, and local capacity-building all help India to decarbonize its economy. Given these information, the present paper uses a micro-level perception survey to explore public awareness and acceptance of green energy in India. It tries to investigate people's knowledge of government initiatives, their knowledge of renewable energy sources, and their perceived obstacles and incentives for adoption. The findings might highlight socially integrated energy improvement opportunities, which are rather vital to ensure long-term sustainability, and help to narrow the communication gap between policy makers and residents.

Review of Literature

Public knowledge and opinions about green energy have been the subject of several studies. Early studies revealed that students in India were well-informed of solar energy, and then followed by hydro power and wind. More general public awareness has been lacking. However, many people lack thorough understanding of policies and advantages related to renewable energy sources. More recent research shows growing awareness but still highlight areas of policy knowledge and practical understanding lacking. Although there is general agreement on the economic advantages of renewable energy—job creation and energy security—concerns over high initial prices and dependability remain. Research already in publication highlights how public education, government incentives, and efficient communication help to raise adoption of green energy sources.

Ram et al. (2024); conducted a first-of-its-kind study examining the technical feasibility and economic viability of a 100% renewable energy system for Delhi, a global megacity within the North Indian grid region. The research presents a multi-sectorial, multi-regional, and cost-optimal energy transition pathway, encompassing power, heat, transport, and desalination. The findings demonstrate that a megacity like Delhi can drive a regional energy transition, leading to significant reductions in primary

energy consumption, energy costs, greenhouse gas emissions, and air pollution, while also creating substantial job growth in the renewable energy sector. This study provides valuable insights into the potential for megacities to achieve a sustainable and secure energy future.

Dhingra H. & Singh S. (2024) examined public awareness and perceptions of renewable energy in India, emphasizing that while many people recognize the term "green energy," there is a significant gap in understanding government policies and economic benefits. The study found that most individuals associate renewable energy with solar power but lack knowledge of incentives and financial support systems.

Luminous Power Tech Survey (2024) conducted a large-scale study on rooftop solar energy adoption in India. The findings revealed that **59% of respondents viewed high installation costs as the main barrier**, while 41% cited **a lack of awareness about subsidies and financial incentives** as a deterrent.

Press Information Bureau (2024), analyzed the impact of **PM Surya Ghar: Muft Bijli Yojana**, a government scheme aimed at promoting solar energy adoption in Indian households. The study found that while there is growing public interest in solar installations, many potential users are unaware of the financial incentives available under this program.

Press Information Bureau (2023), reported that the number of jobs in India's renewable energy sector had reached 1.02 million, demonstrating the economic benefits of green energy adoption. The report also indicated that job creation in this sector plays a role in increasing public support for renewable initiatives.

Global Renewables Alliance (2023) conducted a comparative analysis of public attitudes toward renewable energy in 21 countries. The study found that while **68% of people globally support solar energy**, India's public sentiment toward renewables aligns closely with this global trend. However, the study noted that **financial constraints and lack of awareness are more pronounced in India** than in developed nations.

Kumar and Choudhary (2022) investigated public understanding, attitude, and social acceptance towards renewable energy (RE) in India. Using survey methodology, the study revealed a high level of understanding about RE sources and awareness of the problems associated with fossil fuels. Participants demonstrated a positive attitude towards RE projects in their localities, supported increased use of RE, and desired greater government intervention in addressing climate issues

Borowski (2022), emphasizes the drastic shift in European energy policy as a direct consequence of the gas supply reduction. To mitigate the risk of energy shortages, European nations have resorted to the reactivation of coal and other fossil fuel sources. This reversal directly contradicts the established trajectory of decarbonisations and the pursuit of a zero-carbon economy. The study identifies this phenomenon as a unique and under-researched area, noting the limited existing literature that addresses the slowing down of decarbonisation efforts in the face of acute energy crises. This return to fossil fuels poses a significant threat to climate change mitigation efforts, potentially undermining the progress achieved through the implementation of renewable energy projects.

Smirnova et al. (2021), employed a mixed-methods approach to assess governmental support for renewable energy. The study began with a qualitative phase, involving a survey of 57 experts to identify the key factors driving renewable energy development. This was followed by a quantitative phase, utilizing regression models to analyse the impact of renewable energy on socio-economic indicators and the relationship between governmental support and renewable energy outcomes. The authors focused on the number of renewable energy business entities, facilities, and their total installed capacity as key indicators of renewable energy development. This methodological rigor allows for a comprehensive understanding of both the qualitative and quantitative aspects of state support.

Annida (2021), analyzed the impact of local traditions and beliefs on the acceptance of green energy solutions in India. The documentary showcased how communities in Rajasthan and Gujarat have adapted renewable energy technologies while maintaining their traditional energy practices.

Narula (2014) employed an indicator-based approach to analyse India's energy security and sustainability over four decades, focusing on Availability, Acceptability, Affordability, and Efficiency. The study found that Availability and Efficiency showed improvement, while Acceptability and Affordability declined, providing valuable insights into the multi-dimensional aspects of India's energy security

Objectives

India's ambitious transition towards a sustainable energy future hinge on the widespread adoption of green energy technologies. This research aims to comprehensively evaluate the current state of public engagement with renewable energy in India. Specifically, the study seeks to:

1. The objective of this study is to evaluate Indian public knowledge about green energy ideas.
2. Assess public adoption of green energy technologies.
3. Review knowledge of government policies and programs aimed at renewable energy.
4. List out the obstacles to the acceptance of green energy technology.
5. Compare results with national energy targets and body of current knowledge.

Research Focused on to Test the Following Hypotheses:-

1. Most people know about the idea of green energy and common renewable energy sources.
2. The general population supports the spread of green energy in India and has a good opinion on its acceptance.
3. Public knowledge of certain government renewable energy projects is rather low.
4. Adopting green energy is seen as hampered mainly by high initial cost and lack of knowledge.
5. If green energy is reasonably priced and easily accessible, a lot of individuals are ready to use it for personal needs.

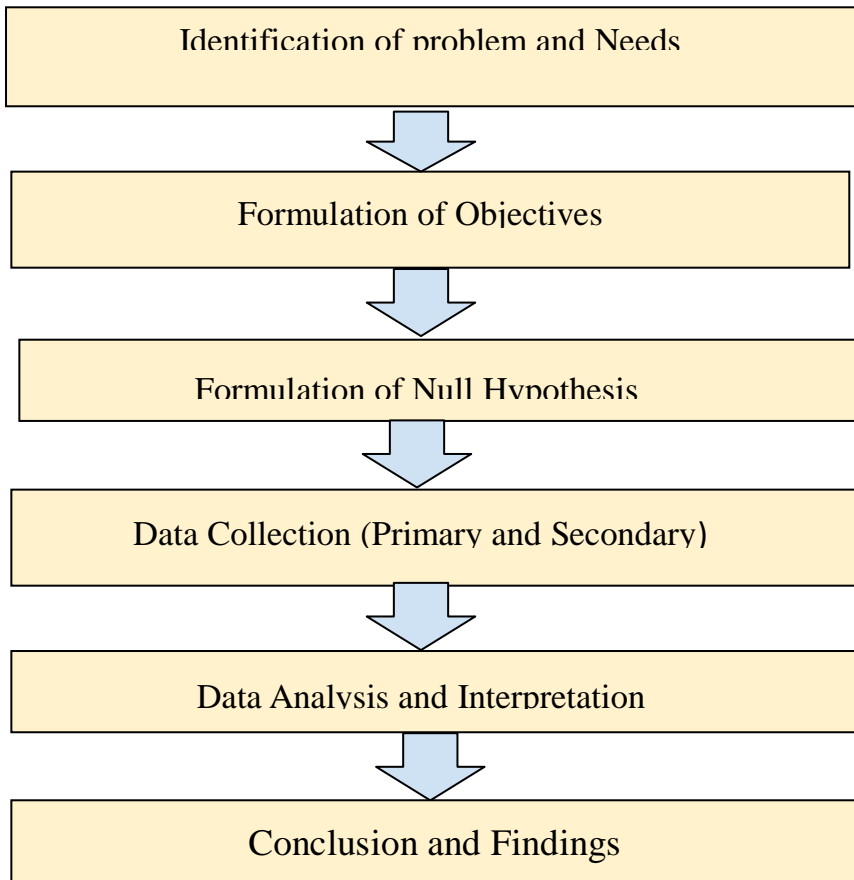
6. Relevance of the Study:

The success of renewable energy initiatives depends much on public knowledge and acceptance. Knowing public opinion can enable legislators create successful outreach initiatives, enhance incentives, and remove obstacles to adoption. Aligned with national and international sustainability targets, this study offers insightful analysis of the awareness, attitudes, and concerns of Indian people about green energy and also Promotes Social Equity and Inclusion.

Research Methodology:-

This study employs a **descriptive survey research methodology** to assess public awareness and acceptance of green energy in India. Data were collected through an **online questionnaire** distributed to **64 respondents** from various states, primarily Rajasthan, along with Madhya Pradesh, Bihar, Gujarat, Maharashtra, Karnataka, Punjab, and Delhi. The questionnaire gathered information on **demographics, energy consumption patterns, knowledge levels, attitudes toward green energy, familiarity with government policies, and perceived obstacles to adoption.**

The sample predominantly consists of **educated urban individuals**, a demographic more likely to be informed about renewable energy trends and policies. The **survey responses were analyzed using descriptive statistical tools**, including frequency counts, percentages, and graphical representations. To analyse the collected data and examine the relationship between variables, various statistical techniques were applied using SPSS and Microsoft excel.



Result and Discussion

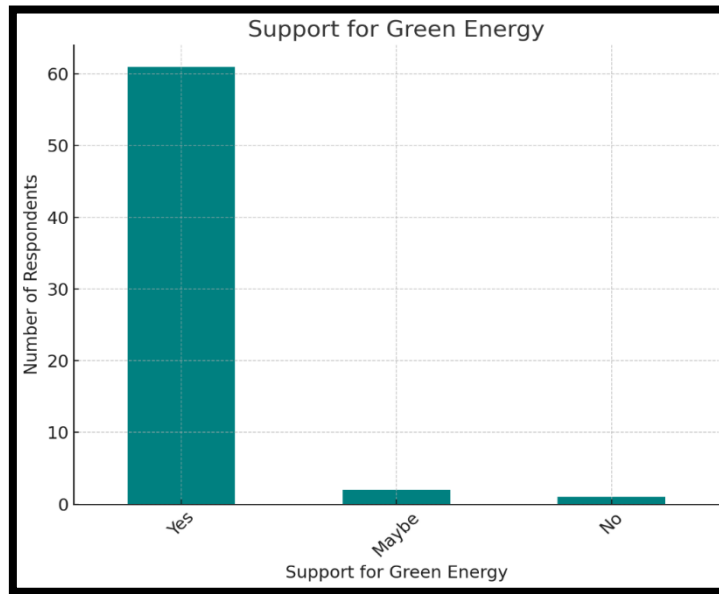
I. Analysis of Public Awareness and Acceptance of Green Energy in India

Based on the generated graphs, we can extract meaningful insights into public perceptions and behaviors regarding green energy adoption.

a. Support for Green Energy

- **Observation:** The majority of respondents **strongly support** the use of green energy in India, with very few expressing opposition.
- **Interpretation:** This indicates **high public acceptance** and a **positive attitude** towards renewable energy. However, support does not always translate into action, which is explored further in the next graphs.

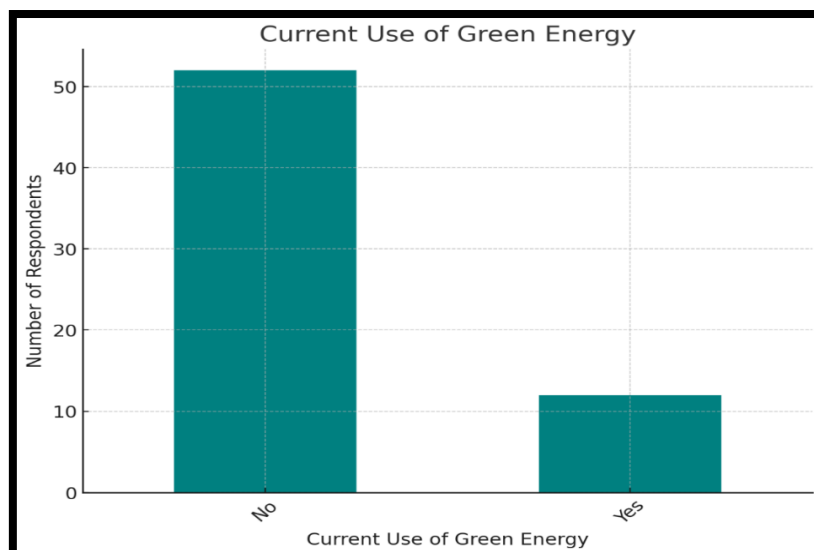
Graph 1: Showing Respondents Support for Green Energy



b. Current Use of Green Energy

- **Observation:** Despite strong support, a **significant gap exists between awareness and adoption** currently uses green energy at home.
- **Interpretation:** This suggests barriers to adoption such as high costs, lack of Result and Discussion infrastructure, and insufficient incentives.
- **Recommendation:** Government subsidies and public-private initiatives can **bridge the gap** between intent and action by making green energy more accessible.

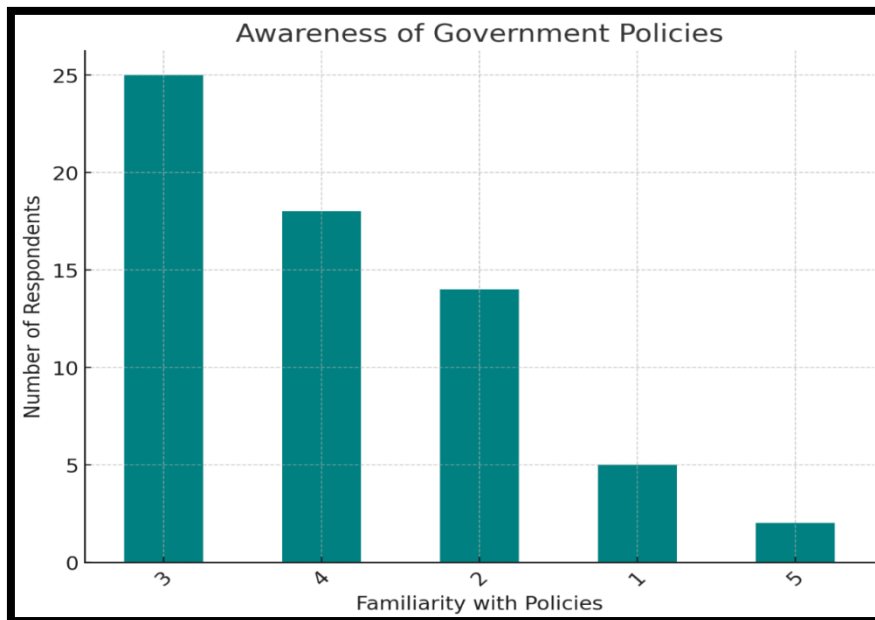
Graph 2: Showing Respondents Current Use of Green Energy



c. Awareness of Government Policies

- **Observation:** Most respondents show **moderate familiarity** with government policies, but a **considerable portion remains unaware** of available incentives.
- **Interpretation:** Awareness levels are not as high as they should be, which might contribute to the **low adoption rates** seen in the previous graph.
- **Recommendation:** The government should **strengthen communication campaigns** through digital media, workshops, and community engagement to inform people about available **grants, tax benefits, and subsidy programs**.

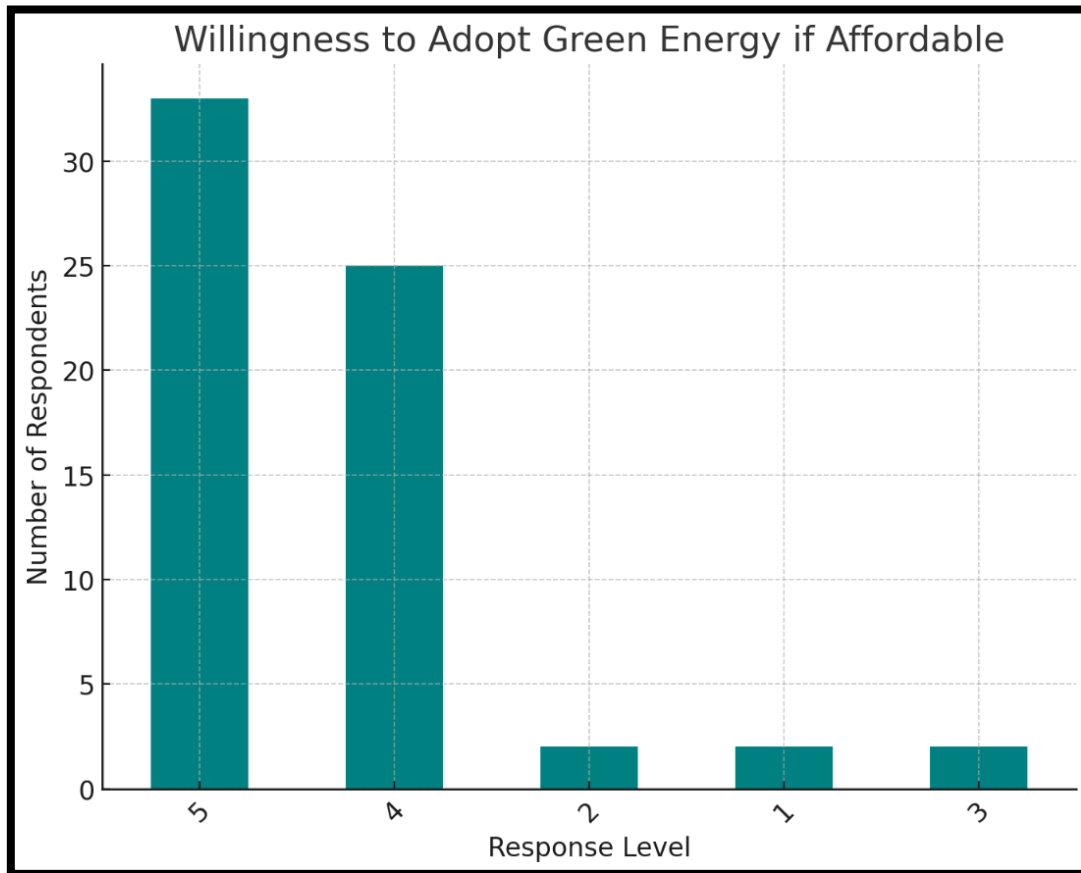
Graph 3: Showing Respondents Awareness towards Government Policies



d. Willingness to Adopt Green Energy if Affordable

- **Observation:** The majority of respondents **are willing to adopt green energy** if it is **affordable and readily available**.
- **Interpretation:** The **cost factor remains the biggest barrier** to adoption rather than skepticism about green energy itself.
- **Recommendation:** Policymakers should focus on **reducing the initial investment costs** of renewable technology (such as solar panels) through subsidies, low-interest loans, and leasing options.

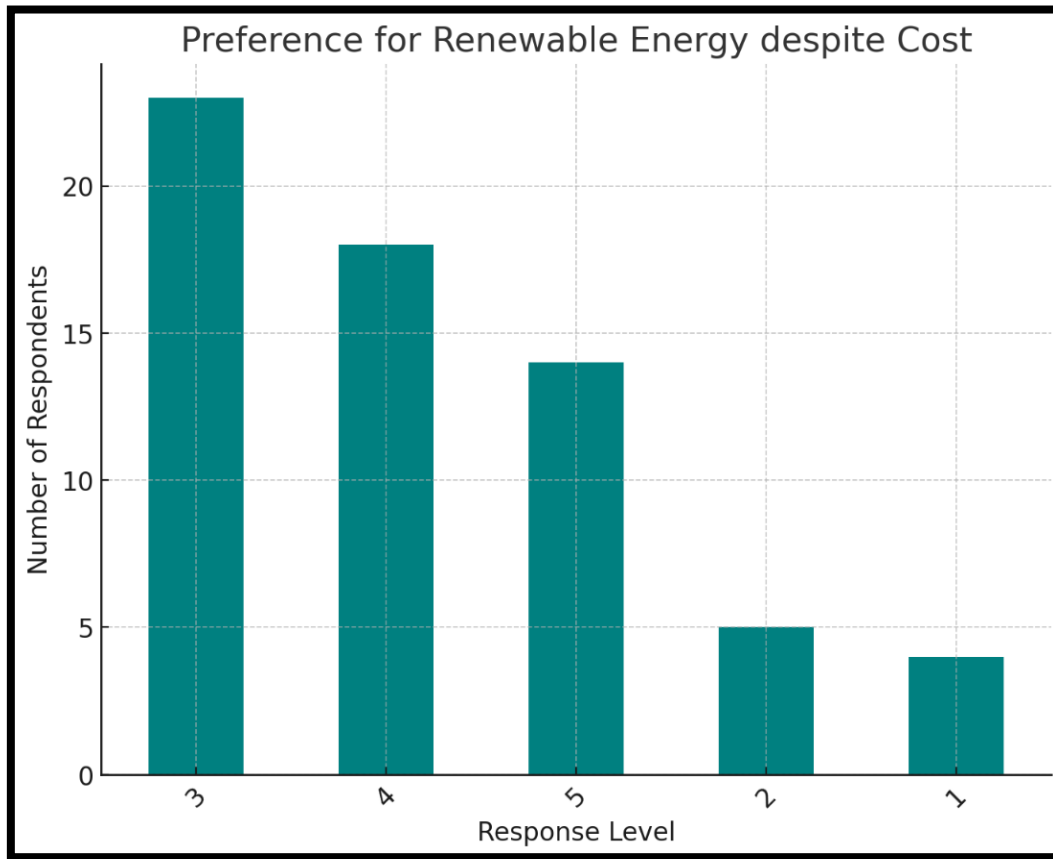
Graph 4: Showing Respondents Willingness to Adopt Green Energy



e. Preference for Renewable Energy Despite Cost

- **Observation:** Respondents **are divided** on this issue. While some prefer green energy even if it is expensive, others hesitate due to financial concerns.
- **Interpretation:** This reinforces the previous insight that **financial feasibility is a key decision-making factor** in energy choices.
- **Recommendation:** Long-term cost savings from green energy (e.g., lower electricity bills) should be **clearly communicated** to consumers, emphasizing the **return on investment (ROI)** rather than just upfront costs.

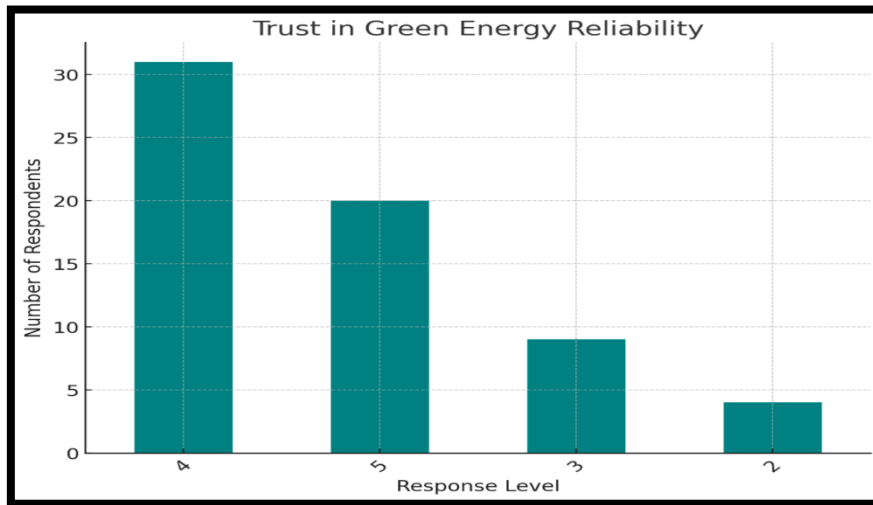
Graph 5: Showing Respondents Preference for Renewable Energy despite its Initial Installation Cost



f. Trust in Green Energy Reliability

- **Observation:** Trust levels are generally **high**, with a majority believing that green energy sources are reliable. However, some respondents still express skepticism.
- **Interpretation:** The **skepticism may arise from misconceptions** about the efficiency of solar and wind energy, or concerns about availability (e.g., reliance on sunlight and wind conditions).
- **Recommendation:** More **public case studies, demonstrations, and success stories** should be shared to boost trust in green energy solutions.

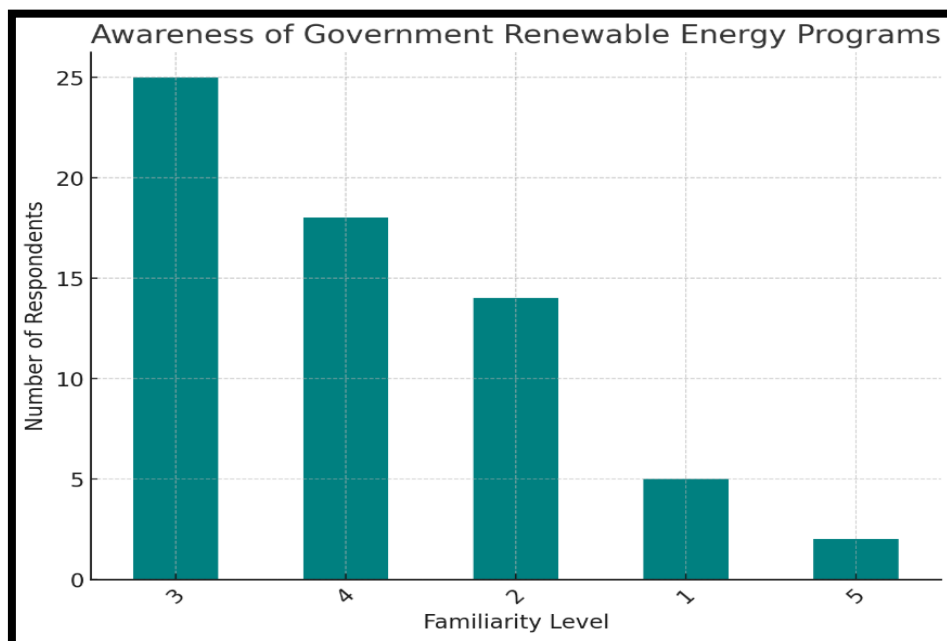
Graph 6: Showing Respondents Trust in Green Energy



II. Awareness towards Government Green Energy Initiatives

- **Observation:** The majority of respondents have low to moderate awareness of government green energy initiatives, with most falling within the lower familiarity levels. Awareness significantly declines as familiarity levels increase.
- **Interpretation:** The limited awareness may indicate inadequate outreach, lack of accessible information, or low public engagement with government renewable energy programs.
- **Recommendation:** Government agencies and environmental organizations should enhance awareness campaigns through social media, educational workshops, and community engagement programs to bridge the knowledge gap.

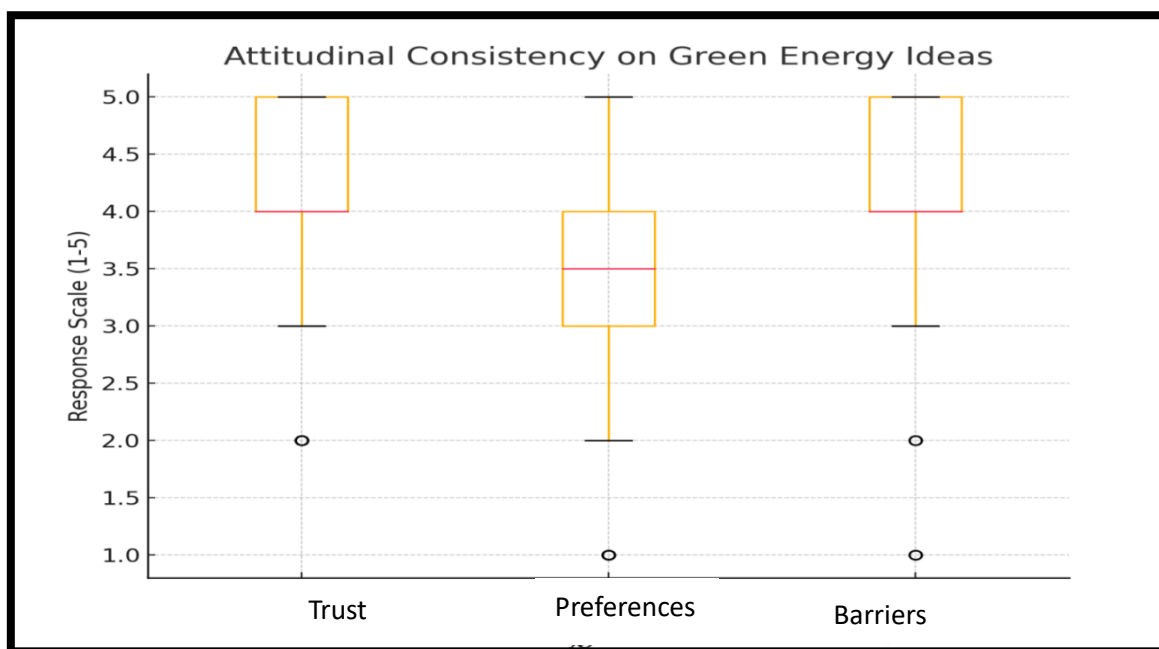
Graph 7: Showing Respondents Awareness towards Government Green Energy Initiatives



a. Attitudinal Consistency on Green Energy Ideas

- **Observation:** Respondents show relatively consistent attitudes toward green energy, with median responses around 3.5–4.0 across dimensions such as Trust, Preferences, and Barriers. However, some outliers indicate skepticism among certain individuals.
- **Interpretation:** While there is general agreement on green energy's benefits, skepticism may stem from concerns about feasibility, costs, or misinformation regarding its reliability and efficiency.
- **Recommendation:** Public education efforts should address common misconceptions, and real-world case studies should be shared to reinforce positive perceptions of green energy.

Graph 8: Showing Attitudinal Consistency on Green Energy Ideas



Correlation Analysis:

The correlation analysis of the survey responses on Public Awareness and Acceptance of Green Energy in India. The correlation matrix shows the relationship between different numerical variables in the dataset. The correlation coefficient ranges from -1 to +1, where:

- +1 indicates a perfect positive correlation.
- 0 indicates no correlation.
- -1 indicates a perfect negative correlation.

Formula for Correlation Coefficient

The Pearson correlation coefficient (r) is calculated as follows:

$$r = \frac{\sum [(X - \bar{X}) * (Y - \bar{Y})]}{[\sqrt{\sum (X - \bar{X})^2 * \sum (Y - \bar{Y})^2}]}$$

Where: X and Y are the two variables being compared

\bar{X} and \bar{Y} are the mean values of X and Y

Σ denotes summation over all data points

Table 1. Showing Variables for Correlation

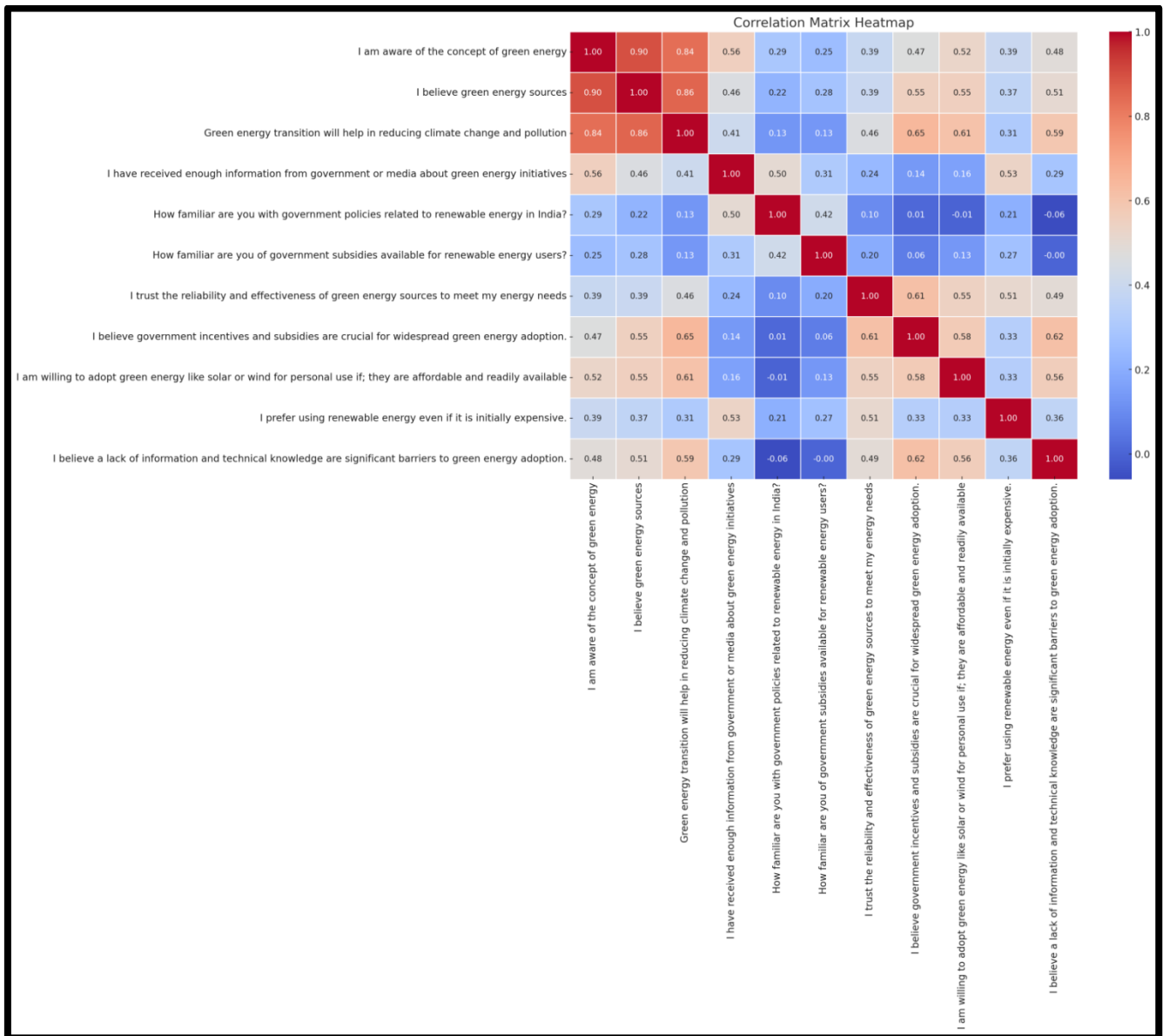
Variables		I Believe Green Energy Sources	Green Energy Transition Will Help In Reducing Climate Change And Pollution	I Have Received Enough Information From Government Or Media About Green Energy Initiatives	How Familiar Are You With Government Policies Related To Renewable Energy In India?	How Familiar Are You Of Government Subsidies Available For Renewable Energy Users?	I Trust The Reliability And Effectiveness Of Green Energy Sources To Meet My Energy Needs	I Believe Government Incentives And Subsidies Are Crucial For Widespread Green Energy Adoption.	I Am Willing To Adopt Green Energy Like Solar Or Wind For Personal Use If; They Are Affordable And Readily Available	I Prefer Using Renewable Energy Even If It Is Initially Expensive.	I Believe A Lack Of Information And Technical Knowledge Are Significant Barriers To Green Energy Adoption.
I am aware of the concept of green energy	1.0000	0.8991	0.8351	0.5558	0.2929	0.2512	0.3900	0.4671	0.5238	0.3937	0.4828
I believe green energy sources	0.8991	1.0000	0.8571	0.4585	0.2186	0.2764	0.3929	0.5490	0.5538	0.3652	0.5070

Green energy transition will help in reducing climate change and pollution	0.8351	0.8571	1.0000	0.4062	0.1287	0.1313	0.4582	0.6451	0.6089	0.3117	0.5912
I have received enough information from government or media about green energy initiatives .	0.558	0.4585	0.4062	1.0000	0.5018	0.3093	0.2412	0.1356	0.1627	0.5328	0.2854
How familiar are you with government policies related to renewable energy in India?	0.2929	0.2186	0.1287	0.5018	1.0000	0.4186	0.0982	0.0093	-0.0060	0.2052	-0.0601

How familiar are you of government subsidies available for renewable energy users?	0.2512	0.2764	0.1313	0.3093	0.4186	1.0000	0.1955	0.0631	0.1322	0.2686	-0.0000
I trust the reliability and effectiveness of green energy sources to meet my energy needs	0.3900	0.3929	0.4582	0.2412	0.0982	0.1955	1.0000	0.6150	0.5483	0.5149	0.4931
I believe government incentives and subsidies are crucial for widespread green energy adoption.	0.4671	0.5490	0.6451	0.1356	0.0093	0.0631	0.6150	1.0000	0.5763	0.3296	0.6157

I am willing to adopt green energy like solar or wind for personal use if; they are affordable and readily available.	0.5238	0.5538	0.6089	0.1627	-0.0060	0.1322	0.5483	0.5763	1.0000	0.3259	0.5628
I prefer using renewable energy even if it is initially expensive	0.3937	0.3652	0.3117	0.5328	0.2052	0.2686	0.5149	0.3296	0.3259	1.0000	0.3634
I believe a lack of information and technical knowledge are significant barriers to green energy adoption.	0.4828	0.5070	0.5912	0.2854 ¹	-0.0601	-0.0000	0.4931	0.6157	0.5628	0.3634	1.0000

Correlation Matrix Heat map



Interpretation of Correlation Heat Map:

A. Strong Positive Correlations (Above 0.80)

These indicate a high level of association between the variables.

"I am aware of the concept of green energy" and "I believe green energy is essential for India's future" (0.89):

- This suggests that people who are aware of green energy concepts also strongly believe that it is essential for India's future.

"Green energy transition will help in reducing climate change and pollution" and "I believe green energy is essential for India's future" (0.85):

- Respondents who recognize the role of green energy in mitigating climate change are also likely to consider it essential for India's future.

"I am aware of the concept of green energy" and "Green energy transition will help in reducing climate change" (0.83):

- Awareness of green energy is strongly linked with an understanding of its environmental benefits.

B. Moderate Positive Correlations (0.50 to 0.80)

These indicate a meaningful but not perfect association.

"I trust the reliability of green energy sources" and "Green energy transition will help in reducing climate change" (0.46):

- People who trust green energy are also likely to believe in its positive impact on climate change.

"I believe government incentives and subsidies are crucial" and "Green energy transition will help in reducing climate change" (0.64):

- A significant number of respondents feel that government support is necessary for a successful transition to green energy.

"I am willing to adopt green energy if affordable and available" and "Green energy transition will help in reducing climate change" (0.60):

- People are more likely to adopt green energy if they perceive it as an effective solution to climate change and pollution.

C. Weak or No Correlation (Below 0.30)

These indicate a weak or no meaningful relationship.

"How familiar are you with government policies?" and "Green energy transition will help in reducing climate change" (0.12):

- A weak correlation suggests that awareness of government policies does not necessarily mean that people understand green energy's environmental benefits.

"I have received enough information from government/media" and "I trust the reliability of green energy" (0.24):

- Even though people receive information about green energy, it does not strongly influence their trust in its reliability.

"How familiar are you with government policies?" and "I am willing to adopt green energy if affordable" (-0.006):

- Almost no correlation suggests that knowing government policies does not directly affect one's willingness to adopt green energy.

Conclusion

With 95% of respondents appreciating green energy's importance in reducing climate change and promoting economic development, this survey emphasizes great popular support for it in India. Still, the results expose a startling disparity between awareness and acceptance. Although green energy ideas are generally well-known, thorough understanding of government regulations and financial incentives still lacks. High initial expenses (31%), and lack of understanding (31%), are the main obstacles to adoption that keep people from switching to renewable energy sources despite their will. Reflecting the necessity for more accessibility and cost, only 19% of respondents now use green energy at home.

According to correlation studies, those who see the advantages of green energy are more likely to advocate its development. Policy awareness and readiness to use renewable energy do, however, show a minimal link, suggesting that public behavior is not particularly being influenced by government communication initiatives. Moreover, even although most people have great faith in the dependability of green energy, some doubt still exists probably because of false information on efficiency and reliance on weather conditions. Strengthening financial incentives, improving public education, and increasing local renewable energy projects can help India to close the awareness-to-action gap thereby accelerating its switch to sustainable energy.

Recommendations:-

Based on the findings of this study, several actionable recommendations are proposed to enhance public awareness, acceptance, and adoption of green energy technologies in India. First, it is essential to consolidate public awareness initiatives using a multi-pronged communication strategy. This includes leveraging mainstream media such as television, social media platforms, and grassroots community seminars to spread awareness about key government initiatives like the PM Surya Ghar: Muft Bijli Yojana and the National Solar Mission. To further encourage participation, the government must simplify access to financial incentives by providing clear, user-friendly guidance on how to claim subsidies and tax

benefits. Highlighting real-life success stories of solar and wind energy adoption across rural and urban regions will also help dispel prevalent myths and generate positive public sentiment.

Community-level projects should be implemented to demonstrate the long-term cost savings associated with renewable energy use. Ensuring affordability and accessibility for all income groups is vital. This may be achieved by introducing flexible financing models, such as low-interest loans and leasing schemes, and by scaling up "pay-as-you-go" solar systems targeted at lower-income households. Additionally, fostering public-private partnerships will stimulate innovation, attract private investment, and create employment opportunities in the renewable energy sector. Awareness campaigns should also spotlight the measurable benefits experienced by both households and businesses that have transitioned to green energy solutions.

To sustain this momentum, education and capacity-building must be prioritized. Integrating green energy concepts and energy economics into school and college curricula can instill environmental awareness in younger generations. Alongside this, technical seminars and workshops for local technicians and business owners can enhance practical knowledge of green energy maintenance and performance. These initiatives will help build consumer confidence and technical readiness. Lastly, academic-industry collaboration should be encouraged to drive innovation, support research, and develop scalable, sustainable energy solutions suited to India's diverse regional needs. Together, these recommendations can build a more informed, empowered, and proactive public, essential for steering India toward a greener and more resilient energy future.

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