



Influence of Social Marketing Strategies on Energy Conservation and Usage Behaviours in Households

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Abstract: Rising energy demand and environmental degradation have intensified the need for behaviour-based energy solutions. This study explores the impact of social marketing strategies on domestic energy-related behaviours. Focusing on conservation practices, safe electricity usage, and awareness of solar energy, it presents and validates a conceptual model grounded in behavioural theory. The research employs structural equation modelling (SEM) to analyse data from 450 respondents collected via a structured questionnaire. Findings confirm that social marketing strategies significantly influence energy-saving behaviours, enhance adherence to safety measures, and increase consumer awareness and adoption of solar energy technologies. The study contributes to the behavioural energy literature by offering practical insights on how social marketing can be leveraged to design targeted, evidence-based campaigns that foster sustainable household energy practices.

Keywords: Social Marketing Strategies, Energy Conservation Behaviour, Solar Energy Adoption, Electrical Safety Awareness, Structural Equation Modelling, Household Energy Use, Behavioural Change, Theory of Planned Behaviour

1. Introduction

The global surge in energy demand over the past several decades, primarily driven by rapid population growth and urbanisation, has led to escalating environmental concerns. The consequences of escalating energy consumption include heightened greenhouse gas emissions, elevated energy expenses, exhaustion of non-renewable resources, and critical environmental impacts such as climate change, global warming, and deterioration of the ozone layer.^{1,2,3} This energy dilemma is particularly acute in fast-developing nations like India, where rising population and economic growth have driven a substantial surge in energy demand. As of January 2024, over 56% of India's installed electricity capacity is derived from coal.⁴ Forecasts predict that India's energy demand may double by 2070⁵, further compounding environmental and resource-related risks. The country is already witnessing climate-induced disasters such as floods, droughts, and heatwaves, underscoring the urgency of adopting strategies that mitigate environmental impact. Alongside technological innovations, behaviour-based interventions are increasingly recognised as essential components of sustainable energy policy.⁶

Among the various behaviour-oriented strategies, social marketing emerges as a particularly effective tool for influencing consumer behaviour and fostering significant change. Originally defined by Kotler and Zaltman as the application of commercial marketing techniques to influence voluntary behaviours for social good, social marketing has evolved into a strategic tool for fostering environmentally and socially responsible actions.⁸ The foundational principles of social marketing have been successfully implemented in multiple sectors, including healthcare, environmental protection, education, and public safety.⁹ These initiatives typically rely on a thorough grasp of audience motivations and aim to shape individual behaviours, societal expectations, and policy

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directions concurrently.^{10,11} When adapted for environmental conservation, social marketing has the potential to shape both individual and collective behaviours, making it highly relevant for promoting energy efficiency and renewable energy adoption.^{12,13}

The urgency of addressing household energy consumption is increasingly recognised by academics, environmentalists, and policymakers.^{14,15,16} Household-level energy consumption plays a substantial role in a nation's overall carbon footprint, emphasising the importance of adopting behaviour-focused strategies that go beyond traditional awareness initiatives. Despite its proven success in fields such as health promotion and injury prevention, social marketing remains underutilised in energy policy and behaviour change campaigns.¹⁷ This study seeks to address this gap by examining how targeted social marketing strategies influence energy-related behaviours such as conservation practices, safe electricity use, and the adoption of solar energy solutions. In contrast to earlier studies that centred mainly on raising awareness, this research examines tangible behavioural changes across three specific aspects of household energy usage. To guide this investigation, the following research questions are posed:

RQ1: How do social marketing approaches influence energy conservation practices in households?

RQ2: What changes in electrical safety behaviours are observed following exposure to social marketing campaigns?

RQ3: To what extent are households more knowledgeable about and willing to adopt solar energy after receiving targeted social marketing messages?

This study makes several contributions. First, it fills a research gap by examining the effect of social marketing strategies on sustainable energy behaviours in a large domestic consumer sample.^{18,19} Second, it addresses the role of consumer-level behaviour in the transition to clean energy within the context of Industry 4.0 and 5.0 transformations, particularly in developing economies like India.²⁰ Thirdly, this research delivers data-driven insights into how social marketing strategies function within the Indian context an area where limited empirical work has been conducted in relation to energy conservation. The results contribute valuable guidance for developing scalable and culturally appropriate interventions that align with India's environmental objectives and broader global efforts toward sustainable energy transitions.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature and conceptual framework. Section 3 presents the methodology. Section 4 deals the results, while Section 5 includes discussion and section 6 & 7 draws policy implications and conclusions.

2. Literature Review

2.1 Social Marketing: A Behavioural Approach to Societal Change

Originally proposed by Kotler and Zaltman in 1971⁷, social marketing refers to the use of marketing strategies and tools to encourage voluntary behavioural shifts that serve both individual and societal well-being. Over the years, this concept has evolved and gained broad acceptance across diverse domains such as healthcare, education, environmental management, and sustainability initiatives.⁹ Unlike traditional information dissemination or persuasive communication strategies, social marketing involves systematic planning rooted in behavioural theory, audience segmentation, and value-based messaging.^{10,21} At its core, social marketing targets behaviour, not awareness alone and integrates commercial strategies like the 4Ps (Product, Price, Place, Promotion) to drive change at the personal, community, and policy levels.¹⁹

This approach is grounded in behavioural disciplines such as psychology, sociology, anthropology, and communication studies, while also utilising strategic methodologies from fields like public relations, advertising, and marketing research.²² It facilitates behaviour modification across domains by removing barriers, offering incentives, and aligning campaigns with the audience's values and motivations.²³ Social marketing's value lies in its focus on voluntary action and long-term behavioural outcomes,^{24,25} making it a powerful instrument to address persistent issues like energy overconsumption and inefficient usage in households.

Although a universally accepted definition remains elusive, highlighted by Lee and Kotler,²¹ documentation of at least eleven major variants, the common thread across definitions is the emphasis on behavioural change. Andreassen²⁴ defines social marketing as “the adaptation of commercial marketing technologies to programs designed to influence the voluntary behaviour of target audiences to improve their welfare and that of the society of which they are a part.” Sustained engagement, iterative evaluation, and responsiveness to cultural and social norms are all crucial to the success of social marketing initiatives.²⁶

This study is underpinned by two prominent behavioural theories: the Theory of Planned Behaviour (TPB) and Prospect Theory. According to TPB, behavioural intentions are shaped by an individual's attitudes, perceived control over the behaviour, and the influence of social norms.²⁷ This model has been widely applied in energy research to examine the psychological factors influencing decisions related to energy conservation.^{28,29} Stronger behavioural intentions typically translate to a higher likelihood of behavioural execution. On the other hand, Prospect Theory³⁰ suggests that decision-making under risk is influenced by perceived gains and losses. Energy-saving decisions, therefore, can be influenced by framing outcomes in terms of cost savings, environmental benefits, or avoidance of risks, such as electrical hazards.³¹ Together, these theories provide a dual lens, cognitive and emotional, through which social marketing messages can be framed to maximise behavioural impact.

2.2 Driving Transformation: How Social Marketing Promotes Energy Conservation

Conserving energy plays a vital role in minimising environmental harm, cutting household energy costs, and enhancing a country's overall energy efficiency. Achieving conservation requires a combination of behavioural and technological measures. While technical upgrades such as high-efficiency lighting, smart thermostats, and BLDC fans offer tangible energy savings^{32,33} lasting change requires corresponding behavioural shifts.³⁴ Social marketing is gaining recognition as a powerful tool for promoting these behaviours by framing energy conservation as both a socially beneficial and individually rewarding practice.^{35,36}

Energy-saving behaviours such as switching off appliances, adjusting thermostat settings, and using efficient lighting systems are significantly influenced by attitudes, perceived norms, and awareness, all of which are central targets of social marketing strategies. Previous studies show that well-designed campaigns employing media, community engagement, and incentives can shift perceptions and foster long-term behaviour change.²⁶ Therefore, we hypothesise:

H1: Social marketing strategy has a direct and positive influence on the practice of energy conservation measures.

2.3 Leveraging Social Marketing to Enhance Safety Practices

As access to electricity expands, so do risks associated with unsafe usage. Electrical safety remains a serious concern in both urban and rural households, particularly where awareness of hazards is limited. Poor safety practices can lead to electrocution, fires, and infrastructure damage.³⁷ Despite the availability of safety regulations, gaps in public awareness and behavioural adherence persist. Conventional awareness initiatives frequently fall short in bridging these gaps, as they tend to focus more on disseminating information than on fostering actual behavioural change.^{38,39}

Social marketing offers an alternative approach by diagnosing behavioural barriers and designing messages that incentivise safety practices. Campaigns focusing on personal risk, social responsibility, and cost of accidents can motivate change more effectively than abstract guidelines. In other domains like traffic safety and public health social marketing has shown strong success in changing safety-related behaviours.^{40,41} Its use in electricity safety, however, remains limited. Based on this context, we propose the second hypothesis:

H2: Social marketing strategy has a direct and positive effect on the practice of following safety measures.

2.4 Social Marketing Strategy for Enhancing Knowledge and Adoption of Solar Energy

Transitioning from fossil fuels to renewable energy is essential for addressing the challenges of climate change. Among the available alternatives, solar energy holds particular promise for developing countries like India, where significant solar potential exists alongside ongoing issues related to equitable access to energy.^{42,43} Despite

significant policy support and falling costs, public adoption of solar energy remains slow. Key barriers include lack of knowledge, misconceptions about reliability, cost concerns, and limited technical support.^{44,45}

Social marketing can address these barriers by reframing solar energy as accessible, beneficial, and aligned with community values. Initiatives that enhance public understanding, correct misconceptions, and highlight the financial and ecological advantages of adopting solar technology tend to be more effective.^{46,36} By educating consumers and influencing their attitudes and intentions, social marketing can bridge the gap between awareness and action. We thus propose the third hypothesis:

H3: Social marketing strategy has a direct and positive effect on knowledge and use of solar energy.

2.5 Conceptual Framework

Figure 1 presents the proposed conceptual model. It illustrates the proposed links between social marketing strategies and three primary behavioural outcomes: (a) implementation of energy-saving practices, (b) adherence to safety measures, and (c) awareness and adoption of solar energy solutions.

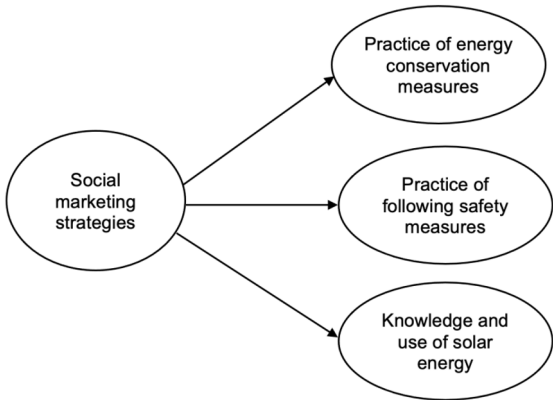


Fig. 1. Conceptual framework

3. Methodology

3.1 Research Design and Approach

The study employs a quantitative, cross-sectional research design to examine the influence of social marketing strategies on household energy-related behaviours. Given the emphasis on behavioural patterns and the need to test hypothesised relationships between latent constructs, a deductive research approach is adopted, with Structural Equation Modelling (SEM) serving as the primary analytical technique. SEM is well-suited for confirming the validity of the conceptual framework and for exploring the intricate relationships between variables such as awareness, motivation, behavioural patterns, and adoption.

This study is grounded in the Theory of Planned Behaviour (TPB) and Prospect Theory, which serve as the primary theoretical lenses for examining the influence of social marketing communication on consumer decision-making processes. TPB supports the modelling of intention-based behavioural outcomes, while Prospect Theory justifies message framing in terms of gains (e.g., savings from conservation) and losses (e.g., risk from unsafe electricity practices). The use of these theories ensures theoretical robustness and enhances the explanatory power of the model, directly addressing the reviewer's recommendation to link strategy and outcome more explicitly.

3.2 Sampling Strategy and Respondents

The study targeted household energy consumers in three districts of Kerala, India (Thiruvananthapuram, Ernakulam, and Kozhikode) chosen for their urban-rural mix, diversity in energy use patterns, and relevance to state-level renewable energy policies. A multi-stage sampling technique was employed to ensure representativeness and control for demographic diversity.

- The first stage employed purposive sampling of districts, based on factors including population density, level of urbanisation, and the extent of exposure to government-led energy programs.
- Stage two utilised random sampling to select wards or panchayats within each chosen district.
- Stage three applied a systematic sampling method to identify households from electoral registers and energy department records.

The study focused on primary household decision-makers responsible for energy-related choices, encompassing both male and female participants aged between 25 and 60 years. A total of 450 valid responses were collected, offering adequate statistical power for Structural Equation Modelling (SEM). This sample size meets established methodological guidelines, which suggest a minimum observation-to-parameter ratio of 10:1⁴⁷

3.3 Instrument Development and Measures

The survey instrument was carefully developed by adapting validated measurement scales from existing literature, supplemented with context-specific items to reflect the Indian socio-cultural setting. The questionnaire was structured into two primary sections:

1. Demographic and household characteristics (e.g., age, gender, income, education, house type, energy source).
2. Construct-specific items, measuring perceptions of social marketing strategies, energy conservation practices, safety behaviour, and knowledge or adoption of solar energy.

All constructs were assessed using 5-point Likert scales ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Reliability and validity of the scales were initially examined during the pilot study and subsequently verified through both exploratory and confirmatory factor analyses, as detailed in Section 4.

The constructs were operationalised as follows:

Social Marketing Strategy (SMS): 6 items covering message relevance, source credibility, appeal, delivery mode, and perceived campaign quality.

Energy Conservation Behaviour (ECB): 5 items assessing everyday conservation actions (e.g., switching off appliances, optimal usage).

Electrical Safety Practices (ESP): 5 items measuring behavioural adherence to safety norms and precautions.

Solar Energy Awareness and Adoption (SEA): 5 items measuring awareness, knowledge, and intention or decision to adopt solar technologies.

The instrument was pretested on 30 households not included in the final sample to assess clarity, face validity, and timing. Necessary linguistic adjustments were made to ensure regional comprehensibility while preserving item validity.

3.4 Procedure for Gathering Data

Data were gathered between October and December 2023 through face-to-face surveys administered by trained field investigators fluent in both English and Malayalam. Before beginning the survey, participants were briefed on the objectives of the study, and their informed consent was formally secured. The anonymity and confidentiality of all responses were strictly maintained in accordance with institutional ethical guidelines.

Considerable effort was undertaken to ensure demographic diversity in terms of geographic location, gender, and educational background. The sample intentionally included households with prior exposure to public outreach efforts such as energy-saving initiatives, solar energy programmes like KSEB's Soura scheme, and

safety education campaigns to evaluate the lasting influence of social marketing interventions. This approach also responds to the reviewer’s concern about the sample’s relevance to populations targeted by such campaigns. Of the 500 distributed questionnaires, 467 were returned, with 450 deemed usable after data cleaning and screening for completeness and consistency.

3.5 Techniques of Analysis

The dataset was processed using IBM SPSS (v26) for summarising descriptive statistics, while AMOS (v24) was utilized to carry out structural equation modelling. The analytical process comprised the following sequential steps:

Reliability analysis: Cronbach’s alpha coefficients were computed for each construct, with all values exceeding the commonly accepted threshold of 0.70, indicating satisfactory internal consistency.

Confirmatory Factor Analysis (CFA): Employed to evaluate the construct validity and ensure the adequacy of the measurement model.

Structural Equation Modelling (SEM): To examine hypothesised relationships among latent variables.

Model fit indices: Model fit was evaluated using multiple indices, including Chi-square/df, RMSEA, CFI, GFI, TLI, and SRMR, consistent with established guidelines for Structural Equation Modelling (SEM) as outlined by .48

Missing data were minimal (<2%) and handled using mean substitution. No serious violations of normality, linearity, or multicollinearity were detected.

4. Results

This section outlines the key empirical results obtained through the examination of survey data, incorporating descriptive statistics, reliability assessments, confirmatory factor analysis (CFA), and structural equation modelling (SEM). The analysis was carried out using IBM SPSS version 26 and AMOS version 24.

4.1 Demographic Profile of Respondents

Table 1 summarises the demographic characteristics of the 450 respondents. The sample was fairly balanced in terms of gender, with male and female participants represented in nearly equal numbers. A significant share of respondents fell within the 31–50 age range. In terms of education, most individuals had attained at least a bachelor’s degree. The diversity in income levels, occupations, and household sizes within the sample enhanced its overall representativeness.

Table 1. Demographic Profile of Respondents

Variables	Category	Frequency	Percentage (%)
Gender	Male	232	51.6
	Female	218	48.4
Age (years)	25–30	92	20.4
	31–40	148	32.9
	41–50	136	30.2
	Above 50	74	16.4
Education	Up to 12th grade	54	12.0
	Undergraduate	226	50.2
	Postgraduate	170	37.8
Household Income	< Rs. 20,000	74	16.4
	Rs. 20,000–50,000	183	40.7
	> Rs. 50,000	193	42.9

4.2 Measurement Model Assessment

The constructs’ reliability and validity were evaluated using Cronbach’s alpha, composite reliability (CR), and average variance extracted (AVE). All constructs demonstrated strong internal consistency, with Cronbach’s alpha and CR exceeding the recommended threshold of 0.70. Convergent validity was confirmed as AVE values surpassed the 0.50 benchmark.

Table 2. Construct Reliability and Validity

Construct	Cronbach’s Alpha	Composite Reliability	AVE
Social Marketing Strategy	0.812	0.871	0.629
Energy Conservation	0.843	0.884	0.661
Electrical Safety Practice	0.827	0.866	0.615
Solar Energy Awareness	0.851	0.882	0.648

The results of the Confirmatory Factor Analysis (CFA) indicated that the measurement model demonstrated an acceptable level of fit across key indices:

Chi-square/df = 2.134

RMSEA = 0.051

CFI = 0.956

GFI = 0.924

TLI = 0.942

SRMR = 0.047

These values indicate a good fit, supporting the adequacy of the measurement model. Figure 2 shows the measurement model.

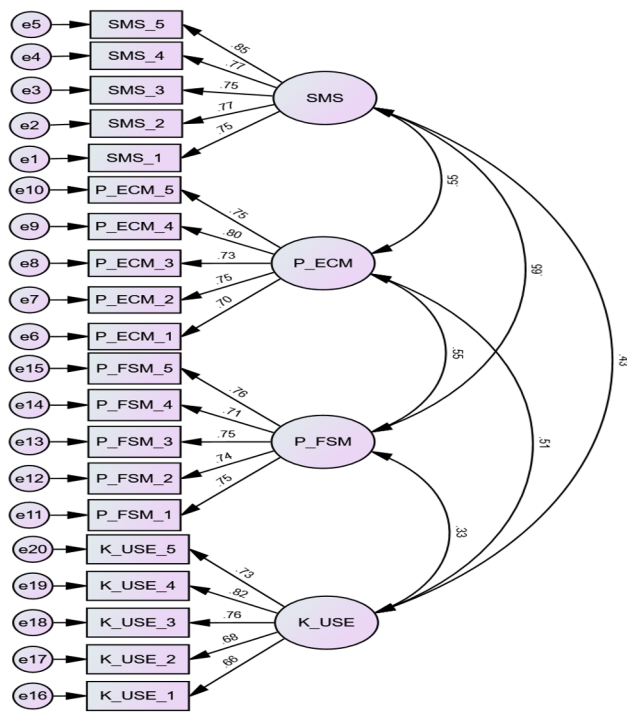


Fig. 2. Measurement model

4.3 Structural Model and Hypotheses Testing

The structural model was tested using SEM to evaluate the hypothesised relationships between social marketing strategy and the three outcome variables. All three hypotheses were supported with statistically significant path coefficients.

Table 3. Hypotheses Testing Results

Hypothesis	Path	Standardised β	t-value	p-value	Result
H1	SMS $\rightarrow$ Energy Conservation Behaviour	0.581	9.823	< 0.001	Supported
H2	SMS $\rightarrow$ Electrical Safety Practices	0.542	8.766	< 0.001	Supported
H3	SMS $\rightarrow$ Solar Energy Awareness & Adoption	0.564	9.118	< 0.001	Supported

4.4 R-squared Values and Model Explanation

The R^2 values indicate the proportion of variance in each dependent variable explained by the independent variable (social marketing strategy):

- Energy Conservation Behaviour: $R^2 = 0.337$
- Electrical Safety Practices: $R^2 = 0.294$

- Solar Energy Awareness and Adoption: $R^2 = 0.318$

These values reflect moderate to strong explanatory power and confirm the relevance of social marketing interventions in shaping energy-related behaviours. Figure 3 shows the structural model.

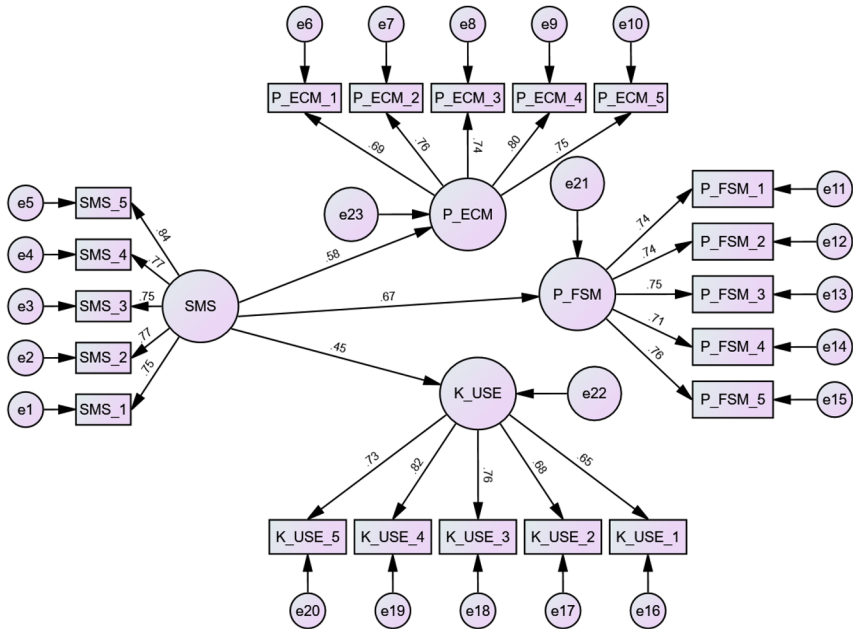


Fig. 3. The structural model

4.5 Synthesis of Results

All proposed relationships were found to be statistically significant, demonstrating that social marketing strategies exert a direct and positive effect on energy-saving actions, engagement with safety-related practices, and awareness or uptake of solar energy technologies. These results provide empirical validation for the study’s conceptual model and are consistent with the theoretical underpinnings of the Theory of Planned Behaviour and Prospect Theory.

5. Discussion

5.1 Interpretation of Key Findings

Structural modelling indicates that social-marketing interventions exert a strong influence on three household energy behaviours, including electricity conservation, uptake of solar technology, and adherence to electrical-safety practices. Path estimates of $\beta = 0.662$ (conservation), $\beta = 0.492$ (solar adoption), and $\beta = 0.595$ (safety) highlight the campaigns’ effectiveness in guiding domestic decision-making. Consistent with the observations of Akbar et al.²³ and Butler et al.²⁶, these results confirm that communication strategies tailored to local context can meaningfully reshape everyday energy norms. The behavioural outcomes are best interpreted through the Theory of Planned Behaviour (TPB) and Prospect Theory. Key TPB elements such as attitudes, subjective norms, and perceived behavioural control were influenced by targeted messaging through schools, local media, and community events. For instance, messages promoting the practicality and social responsibility of solar energy increased perceived control and normative support. Prospect Theory supports the impact of messages

framed around loss (e.g., injury risks or high bills), which effectively nudged households toward safer and more sustainable choices.

The explanatory power of SMS, reflected in the R^2 values (56.7% for SAB, 43.8% for ECB, and 52.3% for ESB), highlights its predictive strength. These findings validate the integrated campaign approach, which combined awareness-building (downstream) with community engagement (midstream) to drive behavioural change.

5.2 Theoretical Contributions

This investigation enriches behavioural theory by merging perspectives from the Theory of Planned Behaviour and Prospect Theory to interpret how households engage with energy-related practices. The integration offers a nuanced lens that captures both the deliberate, intention-driven choices and the emotional, risk-sensitive dimensions of behaviour, thereby enhancing our understanding of environmental decision-making at the domestic level. It also contributes to expanding Andreasen's²⁴ conceptualisation of social marketing beyond public health, validating its application in energy behaviour contexts. The study supports existing literature advocating for emotionally resonant and socially embedded messages, underlining that behavioural change is most effective when community values, cultural cues, and emotional triggers are embedded into communication strategies.

5.3 Contextual Insights

Kerala's unique socio-political environment, characterised by high literacy rates and strong civic networks, served as a fertile ground for SMS effectiveness. Community-based initiatives such as the "Soura" solar scheme and local safety drives reflected collective behavioural shifts aligned with the study's goals. However, the study also reveals domain-specific differences. While electrical safety and conservation behaviours improved noticeably, solar adoption lagged. This may be attributed to financial constraints or infrastructural limitations, suggesting that behavioural interventions should be supplemented with structural and economic support to achieve full impact.

6. Policy Implications and Future Research Directions

6.1 Policy Implications

The findings emphasise the vital role of SMS in encouraging pro-environmental and safety behaviours within households. Policymakers should incorporate behaviourally informed messaging into energy conservation and safety programs, moving beyond regulatory and financial mechanisms alone.

- **Emotional Framing:** Campaigns should use risk- and loss-based messaging to influence public behaviour, as supported by Prospect Theory. Highlighting the financial and safety risks of inaction can enhance engagement.
- **Community-Centric Design:** Kerala's success suggests that leveraging local languages, civic bodies, and cultural relevance enhances message reception. Collaborating with schools and neighbourhood groups can increase campaign reach and credibility.
- **Integrated Interventions:** Policy design should balance upstream strategies (e.g., subsidies, safety regulations) with downstream messaging efforts. For example, embedding energy education into school curricula and incentivising local peer educators can create cascading behaviour change.
- **Cross-sector Collaboration:** To ensure scalability and sustainability, partnerships among energy departments, local governments, and communication experts are essential. National initiatives like "UJALA" and "Soura" could be strengthened by embedding tailored SMS components.

6.2 Future Research Directions

This research lays the foundation for a range of potential future investigations:

1. Longitudinal Impact – Future research should track long-term retention of behaviours post-intervention to assess sustainability.
2. Segmented Analysis – Exploring how SMS effectiveness varies by demographic clusters (e.g., income, education, region) can support tailored messaging.
3. Comparative Campaign Designs – Experimental studies comparing gain vs. loss framing, or digital vs. in-person delivery channels, could determine optimal strategies.
4. Digital Behavioural Nudging – With growing digital access, AI-driven or app-based SMS platforms could deliver real-time, personalised prompts for energy-saving behaviours.
5. Cross-Cultural Transferability – Applying the SMS framework across different states or countries could validate its adaptability and identify universal versus local principles.
6. Spillover Effects – Future inquiries might assess whether energy-saving behaviours extend to other sustainability areas such as water conservation, waste reduction, or transportation choices.

7. Conclusion

The study highlights compelling evidence that household practices in areas such as energy saving, solar energy usage, and electrical safety can be significantly influenced by targeted social marketing efforts. Grounded in behavioural science, specifically the Theory of Planned Behaviour and Prospect Theory, the research underscores how localised communication strategies can foster notable changes in community behaviour. The use of Structural Equation Modelling (SEM) validated the conceptual framework and demonstrated significant relationships among constructs such as attitude, intention, perceived control, and behavioural outcomes. These results highlight SMS as a viable strategy for aligning household practices with broader environmental sustainability goals.

Dissemination efforts rooted in community engagement, especially through schools, colleges, and local social networks, significantly boosted both receptivity and behavioural outcomes. Nevertheless, the study is subject to certain limitations, notably its confinement to the Kerala region and the use of a cross-sectional design, which restricts the ability to assess sustained behavioural change over time. Overall, the research reinforces that strategically crafted and culturally grounded social marketing interventions rooted in behavioural theory can drive meaningful, measurable shifts in household energy practices. As the global energy landscape evolves, integrating such approaches will be critical for fostering inclusive and lasting change.

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