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Research paper

Investigating The Factors Affecting The Adoption of Solar Energy: A Synthesis of TAM and TPB among Households

Shampy Dubey [1] *, Kirti [2], Rupinder Katoch [1], Muzzamil Rehman [1], Prabhjeet Kaur [1]

[1] *Mittal School of Business, Lovely Professional University, Punjab, India*
[2] *Chanakya National Law University, Patna*
**Corresponding author E-mail: Shampy952@gmail.com*

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Abstract

The demand of going green with green energy in the global context has risen the significance of household behavioral aspects towards utilization of solar energy. The infrastructural difficulties and behavioral obstacles have influenced the demand of sustainable energy alternatives. Residential areas are adopting solar energy systems as an unconventional energy source. To examine the effects behavioral and technological factors on the adoption of solar energy systems at the household level. In this research, the quantitative method was used and was based on the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB). The model aimed at analyzing the extent to which Solar Perceived Usefulness (SPU), Perceived Ease of Use (PEU), Attitude (A), Subjective Norm (SN) and Perceived Behavioral Control (PBC) had significant effects on Behavioral Intention to Adopt Green Energy (BIAGE) and Use Behavior (UB) among households. SmartPLS was used to test the structural model utilizing the data which was gathered in households in the state of Bihar. The results of the empirical studies showed that the Attitude, Subjective Norm, and Perceived Behavioral Control had a strong impact on the Behavioral Intention that further influenced the Use Behavior. Furthermore, it was discovered that Perceived Ease of Use and Solar Perceived Usefulness positively and significantly affected Attitude and Behavioral Intention account 36.1 percent. The results support the integrative potentials of TAM and TPB in explaining the behavior intentions of adopting solar energy. Through the research work, a contribution has been made to the extant discourse on the energy shifts to sustainability, with the social influence, attitudinal positivity and perception and control of behavior all playing a composite role toward establishing the intent towards household adoption.

Keywords: *Solar Energy Adoption; Technology Acceptance Model (TAM); Theory of Planned Behavior (TPB); Behavioral Intention, Renewable Energy; Household Adoption.*

1. Introduction

In light of ongoing energy challenges and rising environmental issues, the Government of India, with the backing of international organizations, has progressively advocated for solar energy as a practical and sustainable alternative for traditional energy sources (Raihan et al., 2024). (Elkhatat and Al-Muhtaseb., 2024) state that numerous regional and national programs have been implemented to reduce energy dependence and advance environmental sustainability in the long term. The government has launched household-focused solar energy projects in an effort to promote a transition to sustainable energy and alleviate the strain on centralized systems (IEA, 2023; UNDP, 2022). As a result, patterns of energy usage have shifted among individuals, impacting routine behavior and attitudes. Particularly, the shift in user behavior has highlighted the critical roles that awareness have in driving the use of solar energy (Wall et al., 2021; Awais et al., 2022).

It is noteworthy that the research on sustainable technology adoption suggests that behavioural patterns evolve in response to national policy changes and global environmental constraints (Baum and Gross, 2016; Sovacool et al., 2022; Kumar et al., 2024; Zaidan et al., 2025). To comply with this, solar technology has been incorporated to combat power scarcity and maximize the level of power independence by a number of ways (Yadav et al., 2019). Although the use of solar technologies in many households was due to economic or infrastructural demand, others showed skepticism despite access and availability (Karakaya and Sriwannawit, 2015; Kyere et al., 2024; Qureshi et al., 2017). The ambiguity points out to the need to explore behavioral factors that are not necessarily about financial or technological aspects. Thus, the shift towards solar energy on the household level may not only be observed as a reasonable economic choice but, in fact, as the expression of various values and attitudes (Muwanga et al., 2024; Poier, 2021).

Solar technology has therefore become a viable option to access energy. Although technologies have contributed to making solar systems more visible and functional, a gap remains in relation with perspectives, acceptance, and maintenance of use of such technology by the user. Limited studies have over the years demonstrated the significance of awareness and affordability in regard to green energy choices. However, the current paper on the adoption of solar energy primarily focuses on the TPB and TAM models among households.

The identified gaps present a valuable opportunity for deeper investigation into user behavior concerning the use of solar energy. The pressing demand for environmental action, linked with the growing availability of solar energy sources, provides a significant framework for analyzing household behavior from technological perspectives. Yet, significant constraints exist within the existing methodology for the distribution of solar energy. Initially, numerous adoption campaigns fail to incorporate personalized engagement and neglect the experiential dimension of utilizing solar energy. Secondly, many initiatives tend to focus on technology or incentives, often neglecting to adequately consider the attitudes of users. The study examines the factors influencing user behavior in the use of solar energy among households.

Thus, the contribution of the study is:

a) To investigate the influence of perceived usefulness and perceived ease of use on household attitude toward solar energy.
b) To explores the effect of attitude, subjective norm, and perceived behavioral control on behavioral intention to adopt solar energy among households.
c) To examine the mediating role of behavioral intention in shaping the use behavior of solar energy within the integrated TAM–TPB framework.

This study conducted empirical investigation among households in selected districts of Bihar, a region identified as strategically important for India's renewable energy goals under Sustainable Development Goal 7 (SDG7). This paper serves as a contribution to the wider discussion of renewable transition by addressing a critical gap in user-focused adoption research. In particular, the study modifies conventional models of technology adoption and explores them empirically. Finally, based on previous research, we examine the effect of technology adoption and use behaviour, in shaping household responses to solar energy systems.

The rest of the paper include theoretical background and development of hypotheses, testing of the model using responses of 385 household subjects, and discussion of the practical and theoretical implications.

2. Theoretical Framework and Hypothesis Formulation

2.1. Solar energy adoption and household use behavior

Solar energy systems represent a decentralized and eco-friendly strategy for addressing urgent environmental and energy security issues (Mperejekumana et al., 2024). They are increasingly advocated as effective energy solutions for households, particularly in areas where traditional electricity supply is inconsistent or harmful to the environment (Bazmi & Zahedi, 2011; Omer, 2007). A diverse array of studies explores the usage of solar energy and patterns in household consumption, covering areas which include rural electrifying (Ukoba et al., 2024), sustainable consumption (Kapoor & Dwivedi, 2020; Spaargaren, 2003), urban energy planning (De Pascali & Bagaini, 2018; Esfandi et al., 2024), and behavioral energy research (Zhou & Yang, 2016). According to this study, households use solar-based solutions to meet their daily energy needs through a process known as adoption of solar energy. Prior studies have observed the behavioral, technological, and socio-economic aspects of solar energy use (Elmustapha et al., 2018; Maqbool & Akubo, 2022).

2.2 The TPB and TAM model

The adoption of solar energy has gained significant attention from scholars in recent years. Researchers have suggested multiple models to elucidate technology adoption and behavioral intention. The study revealed that the (TAM) and the (TPB) are the most extensively studied frameworks. (Davis, 1989) developed TAM by proposing (PU) and (PEU) as core determinants of user acceptance. On the other hand, TPB builds upon the Theory of Reasoned Action (TRA), developed by Ajzen in 1991, includes Attitude, Subjective Norms, and Perceived Behavioral Control as key constructs predictors of intention and behavior (Conner, 2001).

According to our investigation, bibliometric analysis was conducted using VOSviewer software in (Fig. 1). Numerous papers on these model and their integrated application appeared in Scopus-indexed journals. Using these models, cluster analysis revealed that empirical studies were conducted in different contexts and researchers used different constructs such as attitude, intention, motivation, sustainability, sustainable development, perception, user acceptance, survey, survey and questionnaire, trust, innovations, adoption, and humans.

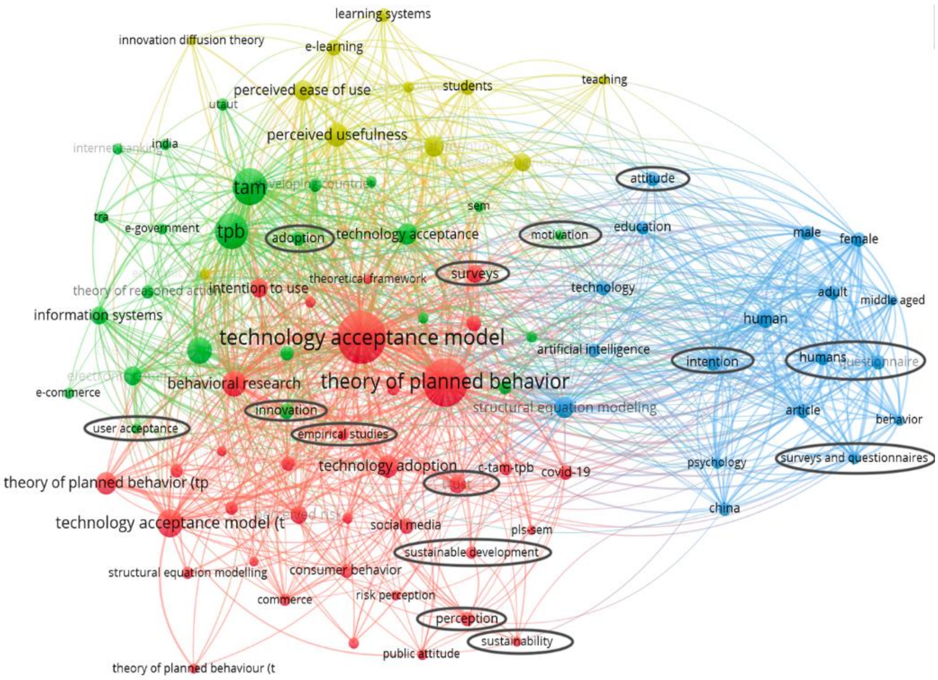

Fig. 1: Keyword Analysis.

However, the (TAM) and the (TPB) offer a robust theoretical framework for examining solar energy adoption, both models include specific limitations pertinent to this research. According to (Benbasat and Barki; 2007), TAM has come beneath concern for their primary attention on technology aspects like SPU and PEU, which may obscure more significant sociocultural and contextual elements that affect household solar decisions. Similarly, TPB posits that ATT, SN, and PBC function as consistent and logical predictors, despite the fact that actual household energy behavior is frequently influenced by structural limitations, habitual patterns, and emotional factors (Sniehotta et al., 2014). This literature review addresses these limitations by categorizing previous findings into technological factors (SPU, PEU), psychological factors (ATT, PBC), and socio-cultural factors (SN), thereby providing a comprehensive foundation for analyzing BIAGE and UB. The present study combined TAM–TPB model is thus used as the theoretical foundation. Figure 2 displays the conceptual framework and the hypothesized relationships among the variables considered. Researcher have revealed a significant role of attitude towards environmental concern on intention behaviour and use behaviour (Fazal et al., 2023; Katoch & A Rana, 2023; O Fatoki, 2022).

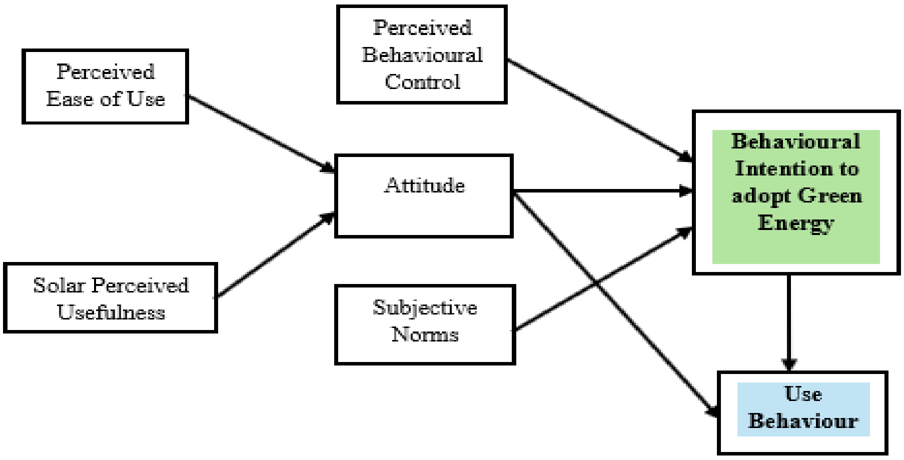

Fig. 2: Conceptual Model (Ajzen, 1991; Davis, 1989).

2.3. Solar perceived usefulness (SPU)

Perceived usefulness (PU) refers to the way in which a person believes that adopting a given technology will enhance task enactment (R. Saadé & Bahli, 2005; R. G. Saadé, 2007. Also, PU reflects the household's belief that installing and using solar systems will significantly improve energy availability, reduce electricity costs, and contribute to environmental sustainability. Indeed, the majority concurred that using green energy may raise living standards and energy security in Bihar while reducing the detrimental impact of fossil fuels.
Thus, we hypothesize:
H1: Solar perceived usefulness favorably influences attitude towards solar energy.

2.4. Perceived ease of use (PEU)

The influence of perceived value on the attitude towards embracing solar energy was remarkably common across all investigations (Asif et al., 2023; Baharoon et al., 2016; Faiers & Neame, 2006; Kim et al., 2014; Muwanga et al., 2024; Zulu et al., 2022). The introduction to the PEU is recognized as a crucial determinant in predicting an individual's intention to use a specific technology (Dadhich et al., 2023). A key impediment to the use of solar energy can be a lack of knowledge and consumer awareness (HARC., 2024). Hence, we hypothesize that:
H2: Attitude toward solar energy is positively influenced by perceived ease of use.

2.5. Attitude toward use

An additional fundamental aspect of technology adoption is that people are more inclined to use technology if beneficial (Sachdeva et al., 2025). Numerous research have demonstrated that actual usage behavior is still significantly influenced by one's attitude toward technology (Au & Enderwick, 2000; Edison & Geissler, 2003; Tavares et al., 2017; Kim et al., 2009). Therefore, households' attitudes are positively shaped when they believe solar technology is beneficial and effortless to include in routine perspective. It is evident that an individual's attitude towards solar energy affects the intention to use green energy technology; yet, certain studies indicate the contrary (Liobikienė et al., 2021).
Thus, we developed the following hypotheses:
H3: The intention to use solar energy is positively influenced by attitude.
H4: Attitude has a positive impact on users' behaviour to use solar energy.

2.6. Subjective norm

Subjective Norms, as defined by Ajzen in 1991, pertain to the notion of social pressure influencing the decision to participate from a particular behavior. The development of these SN is greatly influenced by peers, family, and friends (Wang et al., 2023). SN have been indicated to have a huge impact on people's green purchasing decisions (Chauhan & Bhagat, 2018; Nguyen et al., 2023; Xu et al., 2022). Several research have shown how SN can influence behavior (Fang et al., 2021; Li et al., 2021; Lundheim et al., 2021). Yet, a limited number of investigations have recognized that not all research has identified a notable impact of this structure. For instance, researcher has found that SN insignificantly affect people's intention to adopt renewable energy (Adnan, 2024; Camilleri et al., 2023; Zahari & Esa, 2018).
Thus, it is hypothesized as follows:
H5: Subjective norms favorably influence the intention to adopt solar energy.

2.7. Perceived behavioral control (PBC)

In the TPB, perceived behavioral control refers to an individual's belief regarding the extent of control they possess over a particular behavior (Smith & Doe, 2025). Instead of focusing on the actual control, TPB emphasizes the perceived control, which is defined as the ease or difficulty of performing the behavior (Richards & Johnson, 2014). This is called perceived behavioural control. The core idea is that individuals are more inclined to engage in a behavior if they believe they have control over the factors influencing their decision.

PBC is used in TPB because measuring perceived control is often more practical and sometimes more accurate than measuring actual control. Few studies indicate a significant positive relationship between PBC and behavioral intention. For instance, in Nordic country, PBC was found to be the strongest predictor of intention to adopt solar panels. Similarly, in another study by (Wang et al., 2019), PBC was identified as the most important factor in individual energy-saving intentions in eastern China. Thus, we hypothesized as follows:

H6: Perceived behavioral control favorably influences the intention to adopt solar energy.

2.8. Behavioral intention and adoption

Lastly, an individual's intention, reflecting a belief that a specific action is crucial for achieving a specific behavior, is referred to intention (Ajzen & Fishbein, 1973; Montano & D Kasprzyk, 2015). However, this intention is only meaningful if the individual is both willing and able to act. The intention to adopt a technology varies among individuals, and the strength of this intention dictates the likelihood of the behavior being enacted (Schorr, 2023; Shareef et al., 2013). For instance, a person is more likely to adopt a technology if they are aware of its environmentally friendly attributes (Fatima et al., 2022). A study given by (Bhattacherjee and Lin., 2015), actual usage, on the other hand, shows a user's consistent involvement with green energy systems over time. According to (Venkatesh et al., 2003), a strong behavioral intention to use a particular technology significantly influences user behavior. Similarly, (Mitter et al., 2019) noted that intention-based models are effective in analyzing the ongoing adoption and peer-sharing of eco-friendly in diverse way. If a technology designed for users' benefit is not utilized, it is deemed unsuccessful. Based on the above findings, we propose the following hypothesis.

H7: Behavioral Intention will significantly influence the users' behavior to adopt solar energy

3. Research Methodology

3.1. Instrument development

The research hypotheses were tested using a quantitative technique. For collecting data a structured household survey was carried out between January 12, 2025, and June 10, 2025. Data collection involved both online participation via platforms like Google Forms, WhatsApp, and email, and in-person distribution of questionnaires in division of Bihar i.e., Bhagalpur, Madhubani, Supaul, Gaya, Begusarai, Patna, Purnia, Saran and Purbi Champaran. Before participating in the study, residential households were informed about academic objectives and provided informed consent.

With the novelty of the selection of the TAM and TPB model was based on their widespread use in technology acceptance research at the individual level and their established ability to explain the adoption of green technologies (Dezdar, 2017). In this research, TAM and TPB are selected as the base conceptual models to investigate the adoption of solar energy in households.

Based on the items used to estimate the TAM and TPB model (Ajzen, 1991; Davis, 1989), the TAM and TPB constructs were outlined and adapted to green energy. The constructs and their corresponding items are detailed in Table 1.

Table 1: Construct and Items

Item Code	Construct and items
	Solar Perceived Usefulness
SPU1	I believe solar panel reduces pollution.
SPU5	I believe solar panel saves me money.
SPU6	I believe solar panel provides reliable energy for daily needs.
SPU8	I believe solar energy improves energy efficiency.
	Perceived Ease of Use
PEU1	I can easily learn to use solar panels.
PEU2	I believe solar energy is easy to use.
PEU3	I believe solar energy is easy to maintain
PEU4	I believe solar energy is easy to install.
	Subjective Norms
SN1	Friends using solar energy motivate me to adopt it.
SN2	My peers encourage me to install solar energy.
SN3	People who are important to me think that I should use solar energy
SN8	Using solar energy is becoming a trend in my community.
	Perceived Behavioural Control
PBC3	I have the resources to adopt solar energy.
PBC5	I feel in control of adopting solar energy.
PBC6	I am capable to use solar energy.
PBC7	I have willingness to use solar panel
	Attitude
ATT1	Solar energy is a good choice for my home.
ATT4	Solar energy contributes to a cleaner planet.
ATT5	Using solar energy helps reduce my household's energy costs.
	Behavioural Intention to Adopt Green Energy
BIAGE1	I intend to use solar energy in the future if resources are available.
BIAGE2	I intend to invest in solar energy if technology continues to improve.
BIAGE4	I will consider expanding my solar energy system if financial incentives are available.
BIAGE6	I plan to upgrade my solar system if the technology becomes more efficient.
	Use Behaviour
UB1	I use solar panels as a primary source of energy for my home.
UB3	I monitor my solar panel system's performance to ensure optimal efficiency.
UB4	I actively adjust my household's energy usage to maximize solar power during the day.

3.2. Pre-test and pilot test

To ensure the validity and reliability of the survey instrument, a pre-test questionnaire was employed. The primary aim of the pre-test was to improve the content validity of the questionnaire. The academic experts, energy-related specialists, and solar energy consultants from India and abroad were asked to review the statements for clarity, relevance, and appropriateness of each item in relation to the local household context. Revisions were made to improve item wording, simplify technical terms, and ensure relevance based on their feedback. According to their suggestions and comments new items are also incorporated.

Subsequent to face and content validation, a pilot study was conducted with 16 experts, representing India, Ireland, Nigeria, the Public Sector, and the Private Sector. These experts were selected based on their convenient availability at the time; to evaluate the questionnaire's functionality. In light of the result of the pilot test, minor changes to the questionnaire were made before asking households to participate in this online survey.

The final survey statements consisted of 42 items, out of which 26 were measured on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Additional items captured demographic variables like age, gender, education level, sources of income, households residents and members.

A total of 385 responses were collected from households across 9 division of Bihar, who has adopted solar energy at home. The two statistical software were used in this study. Statistical Package for Social Sciences (SPSS) using descriptive analysis was conducted to report frequencies, means, and standard deviations, while SmartPLS (version 4.0) was used for Partial Least Squares-Structural Equation Modeling to test the model and validate hypotheses, aligning with (Hair et al., 2021). This technique is appropriate for exploratory research involving reflective constructs, small to medium sample sizes, and prediction-focused models. SmartPLS enabled the assessment of both the measurement model (validity and reliability of constructs) and the structural model (path coefficients and hypothesis testing).

4. Empirical Analysis

The demographic report reported the profile of the respondents as indicated in Table 2. The gender distribution of the respondents revealed that males were 50.9 percent, and females were 49.1 percent of the total sample indicating that the participation of both genders in the study was almost equal. In the case of the age distribution, 18.7 percent of the respondents were aged above 18 years, 21.6 percent were aged between 19 and 30 years, 23.4 percent were aged between 31 and 42 years, 20.3 percent were aged between 43 and 54 years and 16.1 percent were above 55 years of age thus representing a diverse age grouping.

In addition, the household residence analysis further indicated that the respondents were spread over the various divisions of Bihar with the major percentage being 16.6 percent in Patna Division, 14.5 percent in Tirhut Division, 11.2 percent in Saran Division, 12.7 percent in Darbhanga Division, and 12.5 percent in Magadh Division. The other divisions like Purnea (9.4 percent), Munger (8.3 percent), Bhagalpur (8.6 percent) and Kosi (6.2 percent) provided contribution to the study sample hence ensuring the diversity of the regions around the state. Moreover, the educational qualification was found that 43.6 percent of the interviewees were of primary school level of education, 10.4 percent were of secondary school level education, 16.9 percent were graduates, 8.6 percent had a diploma, and 20.5 percent were other levels of education. Lastly, when it comes to the sources of income, majority of the respondents (61.3 percent) were involved in business activities, 24.7 percent in agriculture, 6.5 percent in entrepreneurship, 5.7 percent in employment and 1.8 percent as advocates. The distribution of responses indicates that a significant portion of the respondents were self-employed, highlighting a considerable representation of business and agricultural households within the sample.

Table 2: Respondent's Profile (N =385)

Demographic Items	Frequency	%age
Gender		
Female	189	49.1
Male	196	50.9
Age		
31- 42 Years	90	23.4
43-54 Years	78	20.3
Above 18 years	72	18.7
Above 55 Years	62	16.1
Between 19-30 Years	83	21.6
Household Resident		
Bhagalpur Division	33	8.6
Darbhanga Division	49	12.7
Kosi Division	24	6.2
Magadh Division	48	12.5
Munger Division	32	8.3
Patna Division	64	16.6
Purnea Division	36	9.4
Saran Division	43	11.2
Tirhut Division	56	14.5
Education Level		
Diploma	33	8.6
Graduation	65	16.9
Other (Please Specify)	79	20.5
Primary School Level	168	43.6
Secondary School Level	40	10.4
Sources of Income		
Advocate	7	1.8
Agriculture	95	24.7
Business	236	61.3
Employment	22	5.7
Entrepreneur	25	6.5

4.1. Assessment of the measurement framework

RStudio software and Partial Least Squares Structural Equation Modeling (PLS-SEM) were used to test the hypotheses. PLS-SEM is a robust statistical technique that reduces unexplained variance by utilizing weighted composites of indicator variables. This approach effectively minimizes measurement errors, thereby enhancing the precision of outcomes in structural equation modeling (Hair et al., 2017). The model was validated in two stages: first, the measurement model was assessed, and then the structural model was analyzed (Hair et al., 2017). The measurement of Cronbach's alpha and Composite Reliability (CR) was performed to confirm the internal consistency of the reflecting model. These parameters assess the reliability and consistency of each component within each construct.

Thus, the use of factor loadings and Average Variance Extracted (AVE) was used to confirm convergent validity, which shows how accurately a construct is represented by its indicators. The construct in the conceptual model initially comprised 42 items; however, 16 items failed to load correctly and were hence excluded from the analysis. According to Table 3, all of the variables have factor loadings greater than 0.7, and the AVE and CR values are higher than the thresholds i.e., 0.5 and 0.8, respectively (Fornell and Larker, 1981; Hair et al., 2017). The values of all (AVE) were determined to be higher than the inter-construct correlations and thus revealed an adequate level of discriminant validity of constructs (Table 4). Also, according to the suggestion of (Henseler et al, 2015), the Heterotrait-Monotrait (HTMT) proportion of the correlation was utilized as a more rigorous criterion in evaluating the discriminant validity, shown in Table 5. (Kline, 2018) has proposed that the HTMT value should not be more than 0.85 though (Gold et al. 2001) suggested a maximum of 0.90. The findings of the current research shows that all the values of HTMT fell within acceptable ranges, thus supporting sufficient discriminant validity of the measurement model.

Table 3: Measurement Model Convergent Validity and Reliability

	Convergent Validity		Internal Consistency Reliability	
Item	Loading	AVE	C (α)	CR (rhoA)
A1	0.88	0.782	0.861	0.862
A4	0.887			
A5	0.886			
BIAGE1	0.917	0.842	0.938	0.939
BIAGE4	0.921			
BIAGE6	0.922			
BIAGE7	0.911			
PBC3	0.921	0.847	0.94	0.964
PBC5	0.934			
PBC6	0.924			
PBC7	0.902			
PEU1	0.896	0.809	0.921	0.922
PEU2	0.906			
PEU3	0.903			
PEU4	0.893			
SPU1	0.936	0.872	0.951	0.954
SPU5	0.932			
SPU6	0.938			
SPU8	0.928			
SN1	0.926	0.858	0.917	0.918
SN2	0.922			
SN8	0.93			
UB1	0.93	0.87	0.926	0.926
UB3	0.935			
UB4	0.933			

Table 4: Discriminant Validity (Fornell Larcker)

	Atti	Beha_Inte_ado_GE	Perc_behav_cont	Perc_ease_use	Soc_nor	Solr_Perc_usef	Use_Behav
Atti	0.885						
Beha_Inte_ado_GE	0.74	0.918					
Perc_behav_cont	-0.02	0.123	0.92				
Perc_ease_use	0.381	0.354	-0.001	0.9			
Soc_nor	-0.014	0.193	0.006	-0.02	0.926		
Solr_Perc_usef	0.461	0.374	0.021	-0.01	-0.005	0.934	
Use_Behav	0.446	0.56	0.098	0.216	0.108	0.231	0.933

Table 5: HTMT Criterion for Discriminant Validity

	Atti	Beha_Inte_ado_GE	Perc_behav_cont	Perc_ease_use	Soc_nor	Solr_Perc_usef	Use_Behav
Atti							
Beha_Inte_ado_GE	0.822						
Perc_behav_cont	0.039	0.127					
Perc_ease_use	0.427	0.38	0.016				
Soc_nor	0.022	0.207	0.019	0.027			
Solr_Perc_usef	0.508	0.394	0.024	0.025	0.019		
Use_Behav	0.498	0.6	0.104	0.234	0.116	0.245	

4.2. Structural model assessment and discussion of results

As suggested by (Hair et al., 2011), the measures of goodness of fit were assessed based on the coefficient of determination (R^2), and determination of strength and direction of relationships were assessed using the path coefficient values. The R^2 value of BIAGE was determined to be 0.607 (reported in H6), which implies that (A), (PBC), and (SN) explained almost 60.7 percent of variation in BIAGE. The estimates of the contributions to BIAGE of the individual antecedents form the results of the consistent PLS bootstrapping procedure (Table 6; Fig. 3) are of an overall comprehensive nature. Particularly, A (β = 0.745, p = 0.00) and SN (β= 0.202, p= 0.00) have a positive and statistically significant effect on BIAGE. Likewise, PBC (β=0.137, p = 0.00) also has the positive and significant impact on BIAGE.

Moreover, 36.1 percent of the (A) variance is contributed by (PEU) and (SPU), both of them with a positive and significant effect on Attitude– PEU (β= 0.385, p = 0.000) and SPU (β= 0.464, p = 0.000). The total effect of the constructs A and BIAGE will explain about 31.6 percent of actual (UB). But in A (β= 0.069, p = 0.286), the effect on UB is positive and statistically insignificant but in BIAGE (β= 0.509, p = 0.000) there is positive and significant effect on actual use behavior.
It is worth mentioning that, not all of the dependent constructs (A and UB) have been given their values of R^2 in the given excerpt of the table. The R^2 of BIAGE has been obtained using H6 and the R^2 of UB is obtained using H3 as BIAGE and A are postulated antecedents of UB respectively. The table gives R^2 of H1, H3 and H6, but not the hypothesis of Attitude (H5 and H7). H1 has a value of R^2 of 0.361 which would be used to depict BIAGE as the dependent construct with A as a single predictor but not the overall predictive power over BIAGE. Thus, the H6 value of R^2 = 0.607 should be more suitable since it illustrates the overall impact of A, PBC and SN on BIAGE. In the same way, the explanatory power of BIAGE and A in the actual (UB) is represented by the value of R^2 of H3 that is equal to 0.316.

Table 6: Hypothesis Test Results

Hypotheses	Path	Path Coefficient	T-Value	P-Value	R-Square	Results
H1	A -> BIAGE	0.745	34.062	0.0000	0.361	Supported
H2	A -> UB	0.069	1.067	0.286		Not Supported
H3	BIAGE -> UB	0.509	8.445	0.0000	0.316	Supported
H4	PBC -> BIAGE	0.137	4.446	0.0000		Supported
H5	PEU -> A	0.385	10.063	0.0000		Supported
H6	SN -> BIAGE	0.202	6.267	0.0000	0.607	Supported
H7	SPU -> A	0.464	11.678	0.0000		Supported

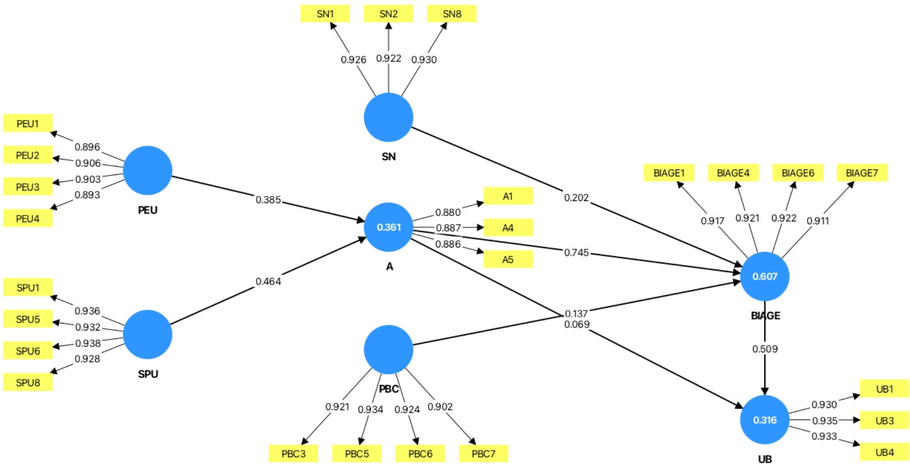

Fig. 3: Analysis of the hypothesized path.

5. Discussion of Findings

The behavioral study of solar energy adoption that is empirically investigated incorporating the rationale of TAM and TPB contributes largely to the factors that determine the usage of renewable energy at the household level. The results indicate that base constructs of TAM (SPU) and (PEU) significantly impact the Attitude, which supports the initial hypothesis that cognitive processing of the technological convenience and benefit by households influences their overall attitude toward adoption. However, the direct impact of Attitude on Use Behavior was deemed statistically inconsequential (β= 0.069, p = 0.286), which means that positive evaluation does not directly turn into behavior action without a strong intention.
Also, the results indicate that (A), (SN) and (PBC) are significant predictors of the Behavioral Intention (R^2= 0.607). This suggests that the intention of the household towards solar energy uptake is simply formed through the aggregate effect of attitudinal assessment, social approval, and perceived control over resources. In particular, the PBC became a significant predictor, which implies that when households believe that they are able to afford, sustain, and operate solar systems, their adoption intentions become steep.
The positive, and significant effect of Behavioral Intention on Use Behavior (β = 0.509, p = 0.000) confirms that intention acts as the most decisive driver of actual solar adoption behavior. The finding correlates with the previous studies emphasizing the idea of behavioral intention as a proximate antecedent of green technology utilization (Gao et al., 2022; Wang et al., 2022). The null relationship between Attitude and Use Behavior implies that whereas households may have a positive assessment of solar energy the assessment needs to be supported with good behavioral intentions and enabling conditions to be made in order to actually adopt it. The analysis demonstrates the empirical findings of the study. This study clarifies that Attitude does not have a direct impact on UB, underscores the significant role of BI in forecasting adoption, and highlights the functioning of PBC and SN within the socio-economic framework of Bihar. These insights enhance the understanding of the results and establish a firm base for the conclusion.

6. Implications and Future Research

6.1. Theoretical implications and future research

Research in the domain of technology adoption has evolved to explain behavioral responses in emerging contexts like renewable energy. However, there have been scanty empirical studies to combine TAM and TPB when explaining the use of solar energy on the household level. The research is among the first that used these theoretical backgrounds to test attitude, intention to use, and actual usage behavior of households in relation to adoption of solar energy in Bihar.
First, this research confirms that the combination of TAM with TPB model partly predicts the solar energy adoption and utilization. A combination of A, SN and PBC predicted 60.7% of variance in behavioural intention with behavioural intention predicting 31.6% of UB,

showing a significant level of predictability. Second, SPU and PEU appeared to be the important determinants of Attitude towards solar adoption such that it explains 36.1% of the variance of Attitude towards solar adoption. Further, (A) was not found to be a significant predictor of UB, which means that positive perceptions might not be followed by behavioral action unless supported by internal control and social pressure. The finding leads to an addition of the TAM-TPB model to include motivational and contextual factors like policy awareness, financial incentives, and infrastructural preparedness in future research. Third, the major contribution of the SN and PBC to the intention indicates the importance of the social and situational factors to technology-related behavioral changes. As such, future conceptualizations might be enhanced by incorporating social capital theory and resource-based perspectives.

Finally, the research was carried out in the context of the geographic and socio-economic environment of Bihar. Therefore, longitudinal and cross-regional studies in the future should challenge the soundness of the model in other emerging economies. Furthermore, post-adoption and satisfaction behavior may be investigated with the use of constructs of Expectation-Confirmation Theory (ECT) and the extent to which solar adoption is long-term sustainable.

6.2. Practical implications

The research has practical implications to policymakers, renewable energy companies, and development agencies interested in developing sustainable energy in India. The findings indicate that although households report a positive attitude towards solar energy, their decisions to adopt solar energy are largely influenced by a strong behaviour intentions that are favoured by social norms and perceived control. Firstly, awareness and outreach initiatives should aim at showing concrete advantages of solar power to increase Perceived Usefulness and Ease of Use. This can be done by local workshops, online stories, and community demonstration projects that render the benefits of technology visible in the community. Secondly, as the fact that SN became a serious predictor of intention, government and non-government agencies ought to make use of peer pressure and social approval through involvement of early adopters as solar ambassadors in the local panchayats. Adoption rates can be significantly enhanced with the help of social reinforcement in terms of trusted networks. Third, there is the decisive factor of the PBC as it means that financial and infrastructural accessibility should be prioritized. credit linkages, simplifying the process of subsidy claims, and guaranteeing maintenance support can enhance perceived capabilities of the users to adopt solar energy. Lastly, this paper shapes the fact that Behavioral Intention is a direct predictor of UB indicating that behavioral intention can be used as a precursor of market readiness. The policymakers can, therefore, use intention-based indicators to predict adoption patterns and implement targeted interventions. This study highlights the necessity for improved awareness initiatives, the significant impact of social norms and local community leaders, the critical importance of enhancing financial and infrastructural access, and the value of behavioral intention as a measure of market readiness. The findings are consistent, relevant to policy discussions, and robustly backed by the empirical evidence gathered in the study.

7. Limitations of The Study

There are some limitations in the study that have to be taken into consideration. Firstly, the data utilized in this study were gathered among the households of the chosen divisions of Bihar, and, this could restrict the generalisability of the results to other regions with other socio-economic and infrastructural landscapes. Despite being geographically limited to Bihar, this state serves as a significant instance for examining household solar adoption. The energy landscape of Bihar marked by inconsistent grid supply, minimal per-capita electricity usage, and significant rural reliance on decentralized solutions offers a valuable framework for examining behavioral influences within infrastructural and socioeconomic limitations (Mongabay-India, 2021). Bihar is vigorously advancing solar implementation through ambitious policy measures; its recently unveiled renewable energy policy aims for significant distributed solar capacity and storage by 2030 (Energetica India, 2025). It serves as a pertinent model for other regions in developing economies that face analogous infrastructural issues, institutional obstacles, and rural energy consumption trends. Hence, the findings may not be globally applicable, they are significantly transferable to situations characterized by grid unreliability, constrained home capacity, and robust policy momentum influencing renewable energy adoption behavior.

Future research can broaden the geographical scope and make interregional comparisons in order to determine the wider extrapolation of the model. Second, the current study utilized cross-sectional type of research, which was used to describe the perception and intention of respondents during one period. Therefore, modal inferences should be understood skeptically concerning the correlation between the constructs. A longitudinal study would have shed more light into behavioral intention changes as time and exposure to solar technologies goes on. Third, the research was based on self-reported data and this can be affected by social desirability bias. Despite the suitable precautions taken to make the research anonymous and reduce the effects of bias in responding, experimental or observation studies would be included in future studies to increase validity of behavioral findings. Fourth, the constructs of (TAM) and (TPB) were limited to the proposed model. Although these frameworks proved to be a strong foundation to the adoption behavior, other contextual factors like policy backing, economic incentives, awareness on the environment or trust on technology vendors may enhance the explanatory capability of the model.

Finally, the paper was anthropocentric in defining adoption at the household level, not to include organizational or community-level factors, which could significantly affect the formation of renewable energy behavior. The future studies would thus be able to investigate the interactions of more levels in order to have a holistic picture on dynamics of solar energy adoption.

8. Conclusion

The empirical investigation of household adoption of solar energy grounded on the integration of the (TAM) and the (TPB) revealed interesting insights. First, although the integrated model has significant explanatory power for behavioral intention and adoption, the results imply that it does not fully capture all the factors influencing household use behavior. The factors such as (SPU) and (PEU) were crucial in shaping (A), which, in addition to (SN) and (PBC), formed the (BIAGE). The results partly align with the previous studies on the adoption of renewable energy and the application of behavioral technologies (Elmustapha et al., 2018). The findings indicate that attitude did not exert a strong direct influence on (UB). On the other hand, Behavioral Intention emerged as a significant and powerful predictor, highlighting the mediating role of intention in transitioning positive attitudes into actual adoption. This finding suggests that yet households may hold favorable attitudes toward solar energy, their willingness to adopt is influenced by the strength of their intentions and perceived ability to implement. The concept of PBC was significant, suggesting that households exhibiting higher confidence in their ability to install, operate, and maintain solar systems are more inclined to adopt such technologies.

Furthermore, the influence of the SN indicates that societal obligations and social approval significantly affect adoption decisions within the Bihar context, where household behavior is often deeply rooted in community social values. This emphasizes the significance of social networks and peer influence in facilitating sustainable energy transitions. Additionally, some researchers in technology and environmental behavior studies have confirmed the conclusions that behavioral intention is a significant factor of use behavior (Tao, 2009; Venkatesh et al., 2012). The study further demonstrates that by incorporating contextual variables such as policy incentives, cost consciousness, and infrastructure readiness, the model's explanatory capacity could be improved. Further studies may explore these variables to ascertain their interactions with behavioral and technological constructs. The result amplifies the study's findings and delineates explicit avenues for future research, encompassing the integration of contextual behavioral factors and the assessment of the model's applicability across various domains.

References

[1] Baum, C. M., & Gross, C. (2016). Sustainability policy as if people mattered: developing a framework for environmentally significant behavioral change. Journal of Bioeconomics, 19(1), 53–95. https://doi.org/10.1007/s10818-016-9238-3.

[2] Elkhatat, A., & Al-Muhtaseb, S. (2024). Climate Change and Energy Security: A Comparative Analysis of the Role of Energy Policies in Advancing Environmental Sustainability. Energies, 17(13), 3179. https://doi.org/10.3390/en17133179.

[3] Raihan, A., Sarker, T., & Zimon, G. (2024). An Investigation on the Prospects, Challenges and Policy Consequences of Renewable Energy Technology Development for India's Environmental Sustainability. WSEAS Transactions on Environment and Development, 20, 365–390. https://doi.org/10.37394/232015.2024.20.35.

[4] Sovacool, B. K., Newell, P., Carley, S., & Fanzo, J. (2022). Equity, technological innovation and sustainable behaviour in a low-carbon future. Nature Human Behaviour, 6(3), 326–337. https://doi.org/10.1038/s41562-021-01257-8.

[5] Tao, D. (2009). Intention to use and actual use of electronic information resources: further exploring Technology Acceptance Model (TAM). *PubMed*, *2009*, 629. https://pubmed.ncbi.nlm.nih.gov/20351931.

[6] Venkatesh, Thong, & Xu. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly*, *36*(1), 157. https://doi.org/10.2307/41410412.

[7] Yadav, P., Davies, P. J., & Sarkodie, S. A. (2019). The prospects of decentralised solar energy home systems in rural communities: User experience, determinants, and impact of free solar power on the energy poverty cycle. Energy Strategy Reviews, 26, 100424. https://doi.org/10.1016/j.esr.2019.100424.

[8] Zaidan, E., Cochrane, L., & Belal, M. (2025). Adapting to change and transforming crisis into opportunity - Behavioral and policy shifts in sustainable practices post-pandemic. Heliyon, 11(10). https://doi.org/10.1016/j.heliyon.2025.e42046.

[9] Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook* . Springer International Publishing. https://doi.org/10.1007/978-3-030-80519-7.

[10] Wall, W. P., Khalid, B., Urbański, M., & Kot, M. (2021). Factors influencing consumer's adoption of renewable energy. Energies, 14(17). https://doi.org/10.3390/en14175420.

[11] Karakaya, E., & Sriwannawit, P. (2015). Barriers to the adoption of photovoltaic systems: The state of the art. Renewable and Sustainable Energy Reviews, 49, 60–66. https://doi.org/10.1016/j.rser.2015.04.058.

[12] Kyere, F., Dongying, S., Bampoe, G. D., Kumah, N. Y. G., & Asante, D. (2024). Decoding the shift: Assessing household energy transition and unravelling the reasons for resistance or adoption of solar photovoltaic. Technological Forecasting and Social Change, 198, 123030. https://doi.org/10.1016/j.techfore.2023.123030.

[13] Qureshi, T. M., Ullah, K., & Arentsen, M. J. (2017). Factors responsible for solar PV adoption at household level: A case of Lahore, Pakistan. Renewable and Sustainable Energy Reviews, 78, 754–763. https://doi.org/10.1016/j.rser.2017.04.020.

[14] Muwanga, R., Namugenyi, I., Wabukala, B. M., Tibesigwa, W., & Katutsi, P. V. (2024). Examining social-cultural norms affecting the adoption of solar energy technologies at the household level. Cleaner Energy Systems, 9, 100164. https://doi.org/10.1016/j.cles.2024.100164.

[15] Poier, S. (2021). Towards a psychology of solar energy: Analyzing the effects of the Big Five personality traits on household solar energy adoption in Germany. Energy Research & Social Science, 77, 102087. https://doi.org/10.1016/j.erss.2021.102087

[16] Mperejekumana, P., Shen, L., Zhong, S., Gaballah, M. S., & Muhirwa, F. (2024). Exploring the potential of decentralized renewable energy conversion systems on water, energy, and food security in africa. Energy Conversion and Management, 315, 118757. https://doi.org/10.1016/j.enconman.2024.118757.

[17] Bazmi, A. A., & Zahedi, G. (2011). Sustainable energy systems: Role of optimization modeling techniques in power generation and supply—A review. Renewable and Sustainable Energy Reviews, 15(8), 3480–3500. https://doi.org/10.1016/j.rser.2011.05.003.

[18] Omer, A. M. (2007). Renewable energy resources for electricity generation in Sudan. Renewable and Sustainable Energy Reviews, 11(7), 1481–1497. https://doi.org/10.1016/j.rser.2005.12.001

[19] Awais, M., Fatima, T., & Awan, T. M. (2022). Assessing behavioral intentions of solar energy usage through value-belief-norm theory. Management of Environmental Quality: An International Journal, 33(6), 1329–1343. https://doi.org/10.1108/MEQ-09-2021-0227.

[20] Ukoba, K., Yoro, K. O., Eterigho-Ikelegbe, O., Ibegbulam, C., & Jen, T. C. (2024). Adaptation of solar energy in the Global South: Prospects, challenges and opportunities. Heliyon, 10(7), 2405–8440. ASSET/09FC09A2-1E92-408B-B64C-FE3480B15AB9/MAIN.ASSETS/GR9.JPG https://doi.org/10.1016/j.heliyon.2024.e28009.

[21] Kapoor, K. K., & Dwivedi, Y. K. (2020). Sustainable consumption from the consumer's perspective: Antecedents of solar innovation adoption. Resources, Conservation and Recycling, 152, 104501. https://doi.org/10.1016/j.resconrec.2019.104501

[22] Spaargaren, G. (2003). Sustainable consumption: A theoretical and environmental policy perspective. Society and Natural Resources, 16(8), 687–701. REQUESTEDJOURNAL:JOURNAL:USNR20;WGROUP:STRING:PUBLICATION https://doi.org/10.1080/08941920309192.

[23] De Pascali, P., & Bagaini, A. (2018). Energy Transition and Urban Planning for Local Development. A Critical Review of the Evolution of Integrated Spatial and Energy Planning. Energies, 12(1), 35. https://doi.org/10.3390/en12010035.

[24] Esfandi, S., Tayebi, S., Byrne, J., Taminiau, J., Giyahchi, G., & Alavi, S. A. (2024). Smart Cities and Urban Energy Planning: An Advanced Review of Promises and Challenges. Smart Cities, 7(1), 414–444. https://doi.org/10.3390/smartcities7010016.

[25] Zhou, K., & Yang, S. (2016). Understanding household energy consumption behavior: The contribution of energy big data analytics. Renewable and Sustainable Energy Reviews, 56, 810–819. https://doi.org/10.1016/j.rser.2015.12.001.

[26] Elmustapha, H., Hoppe, T., & Bressers, H. (2018). Understanding Stakeholders' Views and the Influence of the Socio-Cultural Dimension on the Adoption of Solar Energy Technology in Lebanon. Sustainability, 10(2), 364. https://doi.org/10.3390/su10020364.

[27] Maqbool, R., & Akubo, S. A. (2022). Solar energy for sustainability in Africa: The challenges of socio-economic factors and technical complexities. In International Journal of Energy Research (Vol. 46, Issue 12, pp. 16336–16354). John Wiley and Sons Ltd. https://doi.org/10.1002/er.8425.

[28] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly: Management Information Systems, 13(3), 319–339. https://doi.org/10.2307/249008

[29] Conner, M. (2001). Health Behaviors. International Encyclopedia of the Social & Behavioral Sciences, 6506–6512. https://doi.org/10.1016/B0-08-043076-7/03871-7.

[30] Fazal, S. A., Hayat, N., & Al Mamun, A. (2023). Renewable Energy and Sustainable Development—Investigating Intention and Consumption among Low-Income Households in an Emerging Economy. Sustainability, 15(21), 15387. https://doi.org/10.3390/su152115387

[31] Katoch, R., & A Rana. (2023). Online spiritual meets (OSMs) and user behavior–A divine application of technology during COVID-19 https://www.sciencedirect.com/science/article/pii/S074756322200334X. https://doi.org/10.1016/j.chb.2022.107514
[32] Saadé, R., & Bahli, B. (2005). The impact of cognitive absorption on perceived usefulness and perceived ease of use in on-line learning: an extension of the technology acceptance model. Information & Management, 42(2), 317–327. https://doi.org/10.1016/j.im.2003.12.013.
[33] Saadé, R. G. (2007). Dimensions of Perceived Usefulness: Toward Enhanced Assessment. Decision Sciences Journal of Innovative Education, 5(2), 289–310. https://doi.org/10.1111/j.1540-4609.2007.00142.x.
[34] Asif, M. H., Zhongfu, T., Dilanchiev, A., Irfan, M., Eyvazov, E., & Ahmad, B. (2023). Determining the influencing factors of consumers' attitude toward renewable energy adoption in developing countries: a roadmap toward environmental sustainability and green energy technologies. Environmental Science and Pollution Research, 30(16), 47861–47872. https://doi.org/10.1007/s11356-023-25662-w
[35] Baharoon, D. A., Rahman, H. A., & Fadhl, S. O. (2016). Publics′ knowledge, attitudes and behavioral toward the use of solar energy in Yemen power sector. Renewable and Sustainable Energy Reviews, 60, 498–515. https://doi.org/10.1016/j.rser.2015.12.110.
[36] Elmustapha, H., Hoppe, T., & H Bressers. (2018). Consumer renewable energy technology adoption decision-making; comparing models on perceived attributes and attitudinal constructs in the case of solar water. *Journal of Cleaner Production*. https://www.sciencedirect.com/science/article/pii/S0959652617323478. https://doi.org/10.1016/j.jclepro.2017.10.131.
[37] Faiers, A., & Neame, C. (2006). Consumer attitudes towards domestic solar power systems. Energy Policy, 34(14), 1797–1806. https://doi.org/10.1016/j.enpol.2005.01.001.
[38] Kim, H., Park, E., Kwon, S. J., Ohm, J. Y., & Chang, H. J. (2014). An integrated adoption model of solar energy technologies in South Korea. Renewable Energy, 66, 523–531. https://doi.org/10.1016/j.renene.2013.12.022
[39] Muwanga, R., Ssekakubo, J., Nalweyiso, G., Aarakit, S., & Kusasira, S. (2024). Do all forms of public attitudes matter for behavioural intentions to adopt solar energy technologies (SET) amongst households? Technological Sustainability, 3(1), 96–112. https://doi.org/10.1108/TECHS-08-2023-0031
[40] Zulu, S., Zulu, E., & Chabala, M. (2022). Factors influencing households' intention to adopt solar energy solutions in Zambia: insights from the theory of planned behaviour. Smart and Sustainable Built Environment, 11(4), 951–971. https://doi.org/10.1108/SASBE-01-2021-0008.
[41] Gao, R., Zhang, H., Gong, C., & Wu, Z. (2022). The role of farmers' green values in creation of green innovative intention and green technology adoption behavior: Evidence from farmers grain green production. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.980570.
[42] Wang, X., Wang, Z., & Li, Y. (2022). Internet Use on Closing Intention–Behavior Gap in Green Consumption—A Mediation and Moderation Theoretical Model. *International Journal of Environmental Research and Public Health*, *20*(1), 365. https://doi.org/10.3390/ijerph20010365.
[43] Dadhich, M., Rathore, S., Gyamfi, B. A., Ajibade, S. S. M., & Agozie, D. Q. (2023). Quantifying the Dynamic Factors Influencing New-Age Users' Adoption of 5G Using TAM and UTAUT Models in Emerging Country: A Multistage PLS-SEM Approach. Education Research International, 2023. https://doi.org/10.1155/2023/5452563.
[44] HARC. (2024). Understanding the Impacts and Barriers of Solar Adoption - Houston Advanced Research Center : Houston Advanced Research Center. https://harcresearch.org/news/understanding-the-impacts-and-barriers-of-solar-adoption-a-path-to-equitable-energy-transition/.
[45] Kim, Y. J., Chun, J. U., & Song, J. (2009). Investigating the role of attitude in technology acceptance from an attitude strength perspective. International Journal of Information Management, 29(1), 67. https://doi.org/10.1016/j.ijinfomgt.2008.01.011.
[46] Au, A. K., & Enderwick, P. (2000). A cognitive model on attitude towards technology adoption. Journal of Managerial Psychology, 15(4), 266. https://doi.org/10.1108/02683940010330957
[47] Edison, S. W., & Geissler, G. L. (2003). Measuring attitudes towards general technology: Antecedents, hypotheses and scale development. Journal of Targeting Measurement and Analysis for Marketing, 12(2), 137. https://doi.org/10.1057/palgrave.jt.5740104
[48] Tavares, J., Goulão, A. P. B. A., & Oliveira, T. (2017). Electronic Health Record Portals adoption: Empirical model based on UTAUT2. Informatics for Health and Social Care, 43(2), 109. https://doi.org/10.1080/17538157.2017.1363759
[49] Liobikienė, G., Dagiliūtė, R., & Juknys, R. (2021). The determinants of renewable energy usage intentions using theory of planned behaviour approach. Renewable Energy, 170, 587–594. https://doi.org/10.1016/j.renene.2021.01.152
[50] Ajzen. (1991). The theory of planned behavior. Elsevier. https://www.sciencedirect.com/science/article/pii/074959789190020T.
[51] Adnan, N. (2024). Powering up minds: Exploring consumer responses to home energy efficiency. Energy Reports, 11, 2316. https://doi.org/10.1016/j.egyr.2024.01.048.
[52] Camilleri, M. A., Cricelli, L., Mauriello, R., & Strazzullo, S. (2023). Consumer Perceptions of Sustainable Products: A Systematic Literature Review. Sustainability, 15(11), 8923. https://doi.org/10.3390/su15118923
[53] Chauhan, V., & Bhagat, R. (2018). Analysing Green Purchasing Behaviour through Subjective Norms and Perceived Behaviour Control. MANTHAN Journal of Commerce and Management, 5(1). https://doi.org/10.17492/manthan.v5i01.13044
[54] Nguyen, L. T., Nguyen, H. T., Ngoc, H. N., Dai, L. N., Nguyen, T. T. D., & LE, L. D. (2023). Determinants of green consumer behavior: A case study from Vietnam. Cogent Business & Management, 10(1). https://doi.org/10.1080/23311975.2023.2197673
[55] Wang, C., Ahmad, S. F., Ahmad, A. Y. A. B., Awwad, E. M., Irshad, M., Ali, Y. A., Al-Razgan, M., Khan, Y., & Han, H. (2023). An empirical evaluation of technology acceptance model for Artificial Intelligence in E-commerce. Heliyon, 9(8). https://doi.org/10.1016/j.heliyon.2023.e18349.
[56] Xu, Y., Du, J., Khan, M. A. S., Jin, S., Altaf, M., Anwar, F., & Sharif, M. I. (2022). Effects of Subjective Norms and Environmental Mechanism on Green Purchase Behavior: An Extended Model of Theory of Planned Behavior. Frontiers in Environmental Science, 10. https://doi.org/10.3389/fenvs.2022.779629.
[57] Zahari, A. R., & Esa, E. (2018). Drivers and inhibitors adopting renewable energy: an empirical study in Malaysia. International Journal of Energy Sector Management, 12(4), 581. https://doi.org/10.1108/IJESM-02-2017-0004
[58] Fang, X., Wang, L., Sun, C., Zheng, X., & Wei, J. (2021). Gap between words and actions: Empirical study on consistency of residents supporting renewable energy development in China. Energy Policy, 148, 111945. https://doi.org/10.1016/j.enpol.2020.111945.
[59] Li, B., Ding, J., Wang, J., Zhang, B., & Zhang, L. (2021). Key factors affecting the adoption willingness, behavior, and willingness-behavior consistency of farmers regarding photovoltaic agriculture in China. Energy Policy, 149, 112101. https://doi.org/10.1016/j.enpol.2020.112101
[60] Lundheim, S. H., Vesely, S., Nayum, A., & Klöckner, C. A. (2021). From vague interest to strong intentions to install solar panels on private homes in the North – An analysis of psychological drivers. Renewable Energy, 165, 455–463. https://doi.org/10.1016/j.renene.2020.11.034.
[61] Hair, J. F., Babin, B. J., & Krey, N. (2017). Covariance-based structural equation modeling in the Journal of Advertising: Review and recommendations. *Journal of Advertising*, *46*(3), 454. https://doi.org/10.1080/00913367.2017.1329496.
[62] Richards, J. A., & Johnson, M. P. (2014). A Case for Theoretical Integration. SAGE Open, 4(2). https://doi.org/10.1177/2158244014534830.
[63] Smith, J., & Doe, J. (2025). Perceived Behavioral Control. https://www.sciencedirect.com/topics/psychology/perceived-behavioral-control.
[64] Wang, X., Xiong, Y., Yang, R., & Yu, P. (2019). Social psychological predictors of adoption intention for solar water heaters in rural China. Social Behavior and Personality an International Journal, 47(12), 1. https://doi.org/10.2224/sbp.8549.
[65] Reed, A. H. (2011). Quest for spiritual community: Reclaiming spiritual guidance for contemporary congregations. Bloomsbury Publishing. http://qut.eblib.com.au/patron/FullRecord.aspx?p=661053.
[66] Fornell, C., & DF Larcker. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104
[67] Menon, P., & Sadasivan, A. (2019). A vignette of spiritual intelligence and transformational leadership. International Journal of Innovative Technology and Exploring Engineering, 8(10), 2529–2534. https://doi.org/10.35940/ijitee.J1240.0881019.
[68] James, Sarah., & Lahti, T. (2004). The natural step for communities : how cities and towns can change to sustainable practices. https://books.google.com/books/about/The_Natural_Step_for_Communities.html?id=eXBnB9wBBgYC.

[69] John E. Carroll. (2012). Sustainability and Spirituality. https://books.google.co.in/books?hl=en&lr=&id=_yJm8q5ypZMC&oi=fnd&pg=PR1&dq=Spiritually+inclined+people+actively+engage+in+environmental+initiatives+like+cleanliness+drives+and+tree+planting.&ots=1aXIXih0Bd&sig=n3Ua35pwtw064hGJvZJbsxbnQ_s&redir_esc=y#v=onepage&q&f=false.

[70] Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective . *Journal of Management Information Systems*, *18*(1), 185–214. https://doi.org/10.1080/07421222.2001.11045669.

[71] Csutora, M., & Zsóka, Á. (2013). May spirituality lead to reduced ecological footprint? Conceptual framework and empirical analysis. World Review of Entrepreneurship Management and Sustainable Development, 10(1), 88. https://doi.org/10.1504/WREMSD.2014.058056.

[72] Gupta, K., Agrawal, R., & Sharma, V. (2016). Sustainability from the lenses of spirituality: a new perspective. International Journal of Intelligent Enterprise, 3, 297. https://doi.org/10.1504/IJIE.2016.078633.

[73] HUITT, B. (2019). Spiritual Development : Meaning and Purpose. https://www.academia.edu/64982838/Spiritual_Development_Meaning_and_Purpose.

[74] King, R. (2005). Mysticism and spirituality. In Routledge eBooks (p. 318). Informa. https://doi.org/10.4324/9780203412695-24.

[75] Omoyajowo, K., Danjin, M., Omoyajowo, K., Odipe, O. E., Makengo, B. M., May, A., Ogunyebi, A., & Rabie, M. (2023). Exploring the interplay of environmental conservation within spirituality and multicultural perspective: insights from a cross-sectional study. Environment Development and Sustainability, 26(7), 16957. https://doi.org/10.1007/s10668-023-03319-5.

[76] Malik, S. A., & Ayop, A. R. (2020). Solar energy technology: Knowledge, awareness, and acceptance of B40 households in one district of Malaysia towards government initiatives. Technology in Society, 63, 101416. https://doi.org/10.1016/j.techsoc.2020.101416.

[77] Fatoki, O. (2022). Determinants of Intention to Purchase Photovoltaic Panel System: An Integration of Technology Acceptance Model and Theory of Planned Behaviour. International Journal of Energy Economics and Policy, 12(3), 432–440. https://doi.org/10.32479/ijeep.12931.

[78] Peprah, J. A., Brako, S., & Akosah, N. B. (2018). The Awareness Level of Green Procurement at the District Assemblies in Western Region in Ghana. Journal of Management and Sustainability, 8(1), p46. https://doi.org/10.5539/jms.v8n1p46.

[79] Guven, G., & Sulun, Y. (2017). Pre-service teachers' knowledge and awareness about renewable energy. In Renewable and Sustainable Energy Reviews (Vol. 80, pp. 663–668). Elsevier Ltd. https://doi.org/10.1016/j.rser.2017.05.286

[80] KA Gafoor. (2012). Considerations in the Measurement of Awareness.NANo ranking found for "Human Rights Documents online." ERICKA , 2. https://doi.org/10.1163/2210-7975_HRD-9902-0156

[81] Chan, E. S. W., Hon, A. H. Y., Chan, W., & Okumus, F. (2014). What drives employees' intentions to implement green practices in hotels? The role of knowledge, awareness, concern and ecological behaviour. International Journal of Hospitality Management, 40, 20–28. https://doi.org/10.1016/j.ijhm.2014.03.001.

[82] Rezaei, R., & Ghofranfarid, M. (2018). Rural households' renewable energy usage intention in Iran: Extending the unified theory of acceptance and use of technology. Renewable Energy, 122, 382–391. https://doi.org/10.1016/j.renene.2018.02.011

[83] Aziz, N., Wahid, N., & MA Sallam. (2018). Factors influencing Malaysian consumers' intention to purchase green energy: the case of solar panelNANo ranking found for "International Journal of Academic Research in Business and Social Sciences." Global Business and Management Research, 8(7). https://doi.org/10.6007/IJARBSS/v8-i7/4413.

[84] Alam, S., Omar, N., & AM Ariffin. (2018). Integrating TPB, TAM and DOI theories: An empirical evidence for the adoption of mobile banking among customers in Klang Valley, MalaysiaQ4International Journal of Business and Management Science; H-Index: 10 SJR: Q4 CORE: NA AJG: NA ABDC: NA FT50: NA. International Journal of Business and Management Science. https://www.researchgate.net/profile/Nor-Asiah-Omar/publication/331501885_Integrating_TPB_TAM_and_DOI_theories_An_empirical_evidence_for_the_adoption_of_mobile_banking_among_customers_in_Klang_valley_Malaysia/links/5fc9ba6b92851c00f84cd511/Integrating-TPB-TAM-and-DOI-theories-An-empirical-evidence-for-the-adoption-of-mobile-banking-among-customers-in-Klang-valley-Malaysia.pdf.

[85] Ashinze, P., Tian, J., Ashinze, P., Nazir, M., & I Shaheen. (2021). A multidimensional model of sustainable renewable energy linking purchase intentions, attitude and user behavior in Nigeria. Sustainability. https://www.mdpi.com/2071-1050/13/19/10576. https://doi.org/10.3390/su131910576

[86] Godoe, P., & Johansen, T. S. (2012). Understanding adoption of new technologies: Technology readiness and technology acceptance as an integrated concept. Journal of European Psychology Students, 3, 38. https://doi.org/10.5334/jeps.aq

[87] Zeng, S., Tanveer, A., Fu, X., Gu, Y., & Irfan, M. (2022). Modeling the influence of critical factors on the adoption of green energy technologies. Renewable and Sustainable Energy Reviews, 168, 112817. https://doi.org/10.1016/j.rser.2022.112817.

[88] Fares, R. L., & Webber, M. E. (2017). The impacts of storing solar energy in the home to reduce reliance on the utility. Nature Energy, 2(2), 1–10. https://doi.org/10.1038/nenergy.2017.1

[89] Stern, P. C. (2014). Individual and household interactions with energy systems: Toward integrated understanding. Energy Research & Social Science, 1, 41–48. https://doi.org/10.1016/j.erss.2014.03.003.

[90] Dekoninck, H., & Schmuck, D. (2022). The Mobilizing Power of Influencers for Pro-Environmental Behavior Intentions and Political Participation. Environmental Communication, 16(4), 458–472. https://doi.org/10.1080/17524032.2022.2027801

[91] Schmuck, D. (2021). Social Media Influencers and Environmental Communication. The Handbook of International Trends in Environmental Communication, 373–387. https://doi.org/10.4324/9780367275204-27.

[92] A Borawska. (2017). The role of public awareness campaigns in sustainable developmentNANo ranking found for "Economic and Environmental Studies." Economic and Environmental Studies, 17(44), 865–877. https://doi.org/10.25167/ees.2017.44.14.

[93] Akpahou, R., Mensah, L. D., & Quansah, D. A. (2023). Renewable energy in Benin: current situation and future prospects. Clean Energy, 7(5), 952–961. https://doi.org/10.1093/ce/zkad039.

[94] Diaconescu, M., Marinas, L. E., Marinoiu, A. M., Popescu, M. F., & Diaconescu, M. (2024). Towards Renewable Energy Transition: Insights from Bibliometric Analysis on Scholar Discourse to Policy Actions. Energies, 17(18), 4719. https://doi.org/10.3390/en17184719

[95] Kabir, E., Kumar, P., Kumar, S., Adelodun, A. A., & Kim, K. (2017). Solar energy: Potential and future prospects. Renewable and Sustainable Energy Reviews, 82, 894. https://doi.org/10.1016/j.rser.2017.09.094.

[96] Boulanger, S. O. M., Massari, M., Longo, D., Turillazzi, B., & Nucci, C. A. (2021). Designing Collaborative Energy Communities: A European Overview. Energies, 14(24), 8226. https://doi.org/10.3390/en14248226.

[97] Mlinarič M, Kovač N, Barnes J, & Bocken N. (2019). Typology of new clean energy communities. Deliverable D2. https://www.academia.edu/download/96521648/D2_2_newcomers_typology_of_new_clean_energy_communities.pdf.

[98] Avwioroko, A., & C Ibegbulam. (2024). Contribution of consulting firms to renewable energy adoption. International Journal of Physical Sciences Research. https://www.researchgate.net/profile/Afor-Avwioroko/publication/387893661_Citation_Avwioroko_A_and_Ibegbulam_C_2024_Contribution_of_Consulting_Firms_to_Renewable_Energy_Adoption/links/6780efc918ad70589ea7ced6/Citation-Avwioroko-A-and-Ibegbulam-C-2024-Contribution-of-Consulting-Firms-to-Renewable-Energy-Adoption.pdf.

[99] Kjeang, A. E., Venkatesh, G., Ståhl, M., & Palm, J. (2017). Energy consulting services in the information age - literature review. Energy, Sustainability and Society, 7(1), 1–10. https://doi.org/10.1186/s13705-017-0132-1.

[100] Lai, K. H., Cheng, T. C. E., & Tang, A. K. Y. (2010). Green retailing: Factors for success. California Management Review, 52(2), 6–31. https://doi.org/10.1525/cmr.2010.52.2.6.

[101] Bang, H. K., Ellinger, A. E., Hadjimarcou, J., & Traichal, P. A. (2000). Consumer concern, knowledge, belief, and attitude toward renewable energy: An application of the reasoned action theory. Psychology & Marketing, 17(6), 449–468. https://doi.org/10.1002/(SICI)1520-6793(200006)17:6<449::AID-MAR2>3.0.CO;2-8.

[102] Bouaguel, W., & Alsulimani, T. (2022). Understanding the Factors Influencing Consumers' Intention toward Shifting to Solar Energy Technology for Residential Use in Saudi Arabia Using the Technology Acceptance Model. Sustainability, 14(18), 11356. https://doi.org/10.3390/su141811356.

[103] Díaz, S., Settele, J., Brondízio, E. S., Ngo, H. T., Agard, J., Arneth, A., Balvanera, P., Brauman, K. A., Butchart, S. H. M., Chan, K. M. A., Lucas, A. G., Ichii, K., Liu, J., Subramanian, S. M., Midgley, G. F., Miloslavich, P., Molnár, Z., Obura, D., Pfaff, A., … Zayas, C. N. (2019). Pervasive human-driven decline of life on Earth points to the need for transformative change. Science, 366(6471). https://doi.org/10.1126/science.aax3100.

[104] IPCC. (2022). IPCC III: ird Assessment Report. Summary for Policymakers - Google Scholar. https://scholar.google.com/scholar_lookup?title=Summary%20for%20policymakers&author=IPCC&publication_year=2022.

[105] Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Springer*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8.

[106] Flaksman, A. S., Mozgovoy, A., Lopatkin, D. S., Dikikh, V. A., Shamsov, I. S., Romanova, J. A., Morkovkin, D., & Bovtrikova, E. (2021). Prospects for the development of alternative energy sources in the world energy. IOP Conference Series Earth and Environmental Science, 723(5), 52040. https://doi.org/10.1088/1755-1315/723/5/052040

[107] Gyimah, J., Nyantakyi, G., & Hayford, I. S. (2024). The effect of renewable energy on carbon emissions through globalization. Heliyon, 10(5). https://doi.org/10.1016/j.heliyon.2024.e26894.

[108] Cole, W. J., Greer, D., Denholm, P., Frazier, A. W., Machen, S., Mai, T., Vincent, N., & Baldwin, S. F. (2021). Quantifying the challenge of reaching a 100% renewable energy power system for the United States. Joule, 5(7), 1732–1748. https://doi.org/10.1016/j.joule.2021.05.011.

[109] Feldman, D., Dummit, K., Zuboy, J., Heeter, J., & Xu, K. (2022). Winter 2021/2022 solar industry update. https://www.osti.gov/biblio/1843833.

[110] EIA. (2022). EIA projects that renewable generation will supply 44% of U.S. electricity by 2050 - U.S. Energy Information Administration (EIA). https://www.eia.gov/todayinenergy/detail.php?id=51698.

[111] Tawalbeh, M., Al-Othman, A., Kafiah, F., Abdelsalam, E., Almomani, F., & Alkasrawi, M. (2021). Environmental impacts of solar photovoltaic systems: A critical review of recent progress and future outlook. Science of The Total Environment, 759, 143528. https://doi.org/10.1016/j.scitotenv.2020.143528.

[112] Hastik, R., Basso, S., Geitner, C., Haida, C., Poljanec, A., Portaccio, A., Vrščaj, B., & Walzer, C. (2015). Renewable energies and ecosystem service impacts. Renewable and Sustainable Energy Reviews, 48, 608–623. https://doi.org/10.1016/j.rser.2015.04.004

[113] Panwar, N. L., Kaushik, S. C., & Kothari, S. (2011). Role of renewable energy sources in environmental protection: A review. Renewable and Sustainable Energy Reviews, 15(3), 1513–1524. https://doi.org/10.1016/j.rser.2010.11.037.

[114] Sayed, E. T., Wilberforce, T., Elsaid, K., Rabaia, M. K. H., Abdelkareem, M. A., Chae, K. J., & Olabi, A. G. (2021). A critical review on environmental impacts of renewable energy systems and mitigation strategies: Wind, hydro, biomass and geothermal. Science of The Total Environment, 766, 144505. https://doi.org/10.1016/j.scitotenv.2020.144505.

[115] Yavari, R., Zaliwciw, D., Cibin, R., & McPhillips, L. (2022). Minimizing environmental impacts of solar farms: a review of current science on landscape hydrology and guidance on stormwater management. Environmental Research: Infrastructure and Sustainability, 2(3), 032002. https://doi.org/10.1088/2634-4505/ac76dd

[116] Barron-Gafford, G. A., Minor, R. L., Allen, N. A., Cronin, A. D., Brooks, A. E., & Pavao-Zuckerman, M. A. (2016). The photovoltaic heat island effect: Larger solar power plants increase local temperatures. Scientific Reports, 6(1), 1–7. https://doi.org/10.1038/srep35070

[117] Gunawardena, K. R., Wells, M. J., & Kershaw, T. (2017). Utilising green and bluespace to mitigate urban heat island intensity. Science of The Total Environment, 584–585, 1040–1055. https://doi.org/10.1016/j.scitotenv.2017.01.158.

[118] Visser, E., Perold, V., Ralston-Paton, S., Cardenal, A. C., & Ryan, P. G. (2019). Assessing the impacts of a utility-scale photovoltaic solar energy facility on birds in the Northern Cape, South Africa. Renewable Energy, 133, 1285–1294. https://doi.org/10.1016/j.renene.2018.08.106

[119] Diffendorfer, J. E., Sergi, B., Lopez, A., Williams, T., Gleason, M., Ancona, Z., & Cole, W. (2024). The interplay of future solar energy, land cover change, and their projected impacts on natural lands and croplands in the US. Science of The Total Environment, 947, 173872. https://doi.org/10.1016/j.scitotenv.2024.173872.

[120] Moore-O'Leary, K. A., Hernandez, R. R., Johnston, D. S., Abella, S. R., Tanner, K. E., Swanson, A. C., Kreitler, J., & Lovich, J. E. (2017). Sustainability of utility-scale solar energy – critical ecological concepts. Frontiers in Ecology and the Environment, 15(7), 385–394. https://doi.org/10.1002/fee.1517

[121] Lupp, G., Steinhäußer, R., Starick, A., Gies, M., Bastian, O., & Albrecht, J. (2014). Forcing Germany's renewable energy targets by increased energy crop production: A challenge for regulation to secure sustainable land use practices. Land Use Policy, 36, 296–306. https://doi.org/10.1016/j.landusepol.2013.08.012

[122] Ponitka, J., & Boettner, S. (2020). Challenges of future energy landscapes in Germany - A nature conservation perspective. Energy, Sustainability and Society, 10(1), 1–11. https://doi.org/10.1186/s13705-020-00250-9

[123] Vincent Ugochukwu Oguanobi, & Oloruntosin Tolulope Joel. (2024). Geoscientific research's influence on renewable energy policies and ecological balancing. Open Access Research Journal of Multidisciplinary Studies, 7(2), 073–085. https://doi.org/10.53022/oarjms.2024.7.2.0027.

[124] Macknick, J., Beatty, B., & Hill, G. (2013). Overview of Opportunities for Co-Location of Solar Energy Technologies and Vegetation. https://doi.org/10.2172/1115798.

[125] Walston, L. J., Li, Y., Hartmann, H. M., Macknick, J., Hanson, A., Nootenboom, C., Lonsdorf, E., & Hellmann, J. (2021). Modeling the ecosystem services of native vegetation management practices at solar energy facilities in the Midwestern United States. Ecosystem Services, 47, 101227. https://doi.org/10.1016/j.ecoser.2020.101227.

[126] Tölgyesi, C., Bátori, Z., Pascarella, J., Erdős, L., Török, P., Batáry, P., Birkhofer, K., Scherer, L., Michalko, R., Košulič, O., Zaller, J. G., & Gallé, R. (2023). Ecovoltaics: Framework and future research directions to reconcile land-based solar power development with ecosystem conservation. Biological Conservation, 285, 110242. https://doi.org/10.1016/j.biocon.2023.110242.

[127] RB Kline. (2018). Assessing statistical aspects of test fairness with structural equation modelling. *Fairness Issues in Educational*, *19*(2–3), 204–222. https://doi.org/10.1080/13803611.2013.767624

[128] Hassan, Q., Viktor, P., J. Al-Musawi, T., Mahmood Ali, B., Algburi, S., Alzoubi, H. M., Khudhair Al-Jiboory, A., Zuhair Sameen, A., Salman, H. M., & Jaszczur, M. (2024). The renewable energy role in the global energy Transformations. Renewable Energy Focus , 48. https://doi.org/10.1016/j.ref.2024.100545.

[129] Hernandez, R. R., Easter, S. B., Murphy-Mariscal, M. L., Maestre, F. T., Tavassoli, M., Allen, E. B., Barrows, C. W., Belnap, J., Ochoa-Hueso, R., Ravi, S., & Allen, M. F. (2014). Environmental impacts of utility-scale solar energy. Renewable and Sustainable Energy Reviews, 29, 766–779. https://doi.org/10.1016/j.rser.2013.08.041.

[130] Randle-Boggis, R. J., White, P. C. L., Cruz, J., Parker, G., Montag, H., Scurlock, J. M. O., & Armstrong, A. (2020). Realising co-benefits for natural capital and ecosystem services from solar parks: A co-developed, evidence-based approach. Renewable and Sustainable Energy Reviews, 125, 109775. https://doi.org/10.1016/j.rser.2020.109775.

[131] Schorr, A. (2023). The Technology Acceptance Model (TAM) and its Importance for Digitalization Research: A Review [Review of The Technology Acceptance Model (TAM) and its Importance for Digitalization Research: A Review]. Sciendo eBooks, 55. Sciendo. https://doi.org/10.2478/9788366675896-005.

[132] Shareef, M. A., Kumar, V., Kumar, U., & Hasin, A. A. (2013). Application of Behavioral Theory in Predicting Consumers Adoption Behavior. Journal of Information Technology Research, 6(4), 36. https://doi.org/10.4018/jitr.2013100103.

[133] Ajzen, I., & Fishbein, M. (1973). Attitudinal and normative variables as predictors of specific behavior. Journal of Personality and Social Psychology, 27(1), 41–57. https://doi.org/10.1037/h0034440.

[134] Montano, D., & D Kasprzyk. (2015). Theory of reasoned action, theory of planned behavior, and the integrated behavioral model. Books.Google.Com. https://books.google.com/books?hl=en&lr=&id=9BQWCgAAQBAJ&oi=fnd&pg=PA95&dq=Theory+of+reasoned+action,+theory+of+planned+behavior,+and+the+integrated+behavioral+model&ots=efLb1iwNe-&sig=SifLM3SBzBX7vKV02pgMj1Jn5jo

[135] Fatima, N., Li, Y., Li, X., Abbas, W., Jabeen, G., Zahra, T., Işık, C., Ahmed, N., Ahmad, M., & Yasir, A. (2022). Households' Perception and Environmentally Friendly Technology Adoption: Implications for Energy Efficiency. Frontiers in Energy Research, 10, 830286. https://doi.org/10.3389/fenrg.2022.830286.
[136] Bhattacherjee, A., & Lin, C. P. (2015). A unified model of IT continuance: Three complementary perspectives and crossover effects. European Journal of Information Systems, 24(4), 364–373. https://doi.org/10.1057/ejis.2013.36.
[137] Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly: Management Information Systems, 27(3), 425–478. https://doi.org/10.2307/30036540.
[138] Mitter, H., Larcher, M., Schönhart, M., Stöttinger, M., & Schmid, E. (2019). Exploring Farmers' Climate Change Perceptions and Adaptation Intentions: Empirical Evidence from Austria. Environmental Management, 63(6), 804–821. https://doi.org/10.1007/s00267-019-01158-7.
[139] Dezdar, S. (2017). Green information technology adoption: Influencing factors and extension of theory of planned behavior. Social Responsibility Journal, 13(2), 292–306. https://doi.org/10.1108/SRJ-05-2016-0064.
[140] Kumar, A., King, T., & Ranta, M. (2024). Corporate governance characteristics and involvement in ESG activities: Current trends and research directions. Corporate Governance (Bingley), 24(8), 175–209. https://doi.org/10.1108/CG-09-2023-0397
[141] IEA, "World Energy Outlook 2023 – Analysis - IEA." Available: https://www.iea.org/reports/world-energy-outlook-2023.
[142] UNDP, "UNITED NATIONS DEVELOPMENT PROGRAMME," 2022.
[143] Energetica India. (2025). *Bihar unveils renewable energy policy 2025, targets 24 GW of RE and 6.1 GWh of ESS by 2030*. Energetica India Magazine. Retrieved from https://www.energetica-india.net/news/bihar-unveils-renewable-energy-policy-2025-targets-24-gw-of-re-and-6-1-gwh-of-ess-by-2030 Energetica India.
[144] Mongabay-India. (2021, December 20). *To boost its slow progress on clean energy, Bihar looks at floating and rooftop solar alternatives*. Mongabay-India. Retrieved from https://india.mongabay.com/2021/12/to-boost-its-slow-progress-on-clean-energy-bihar-looks-at-floating-and-rooftop-solar-alternatives/.
[145] Benbasat, I., & Barki, H. (2007). Quo vadis TAM? Journal of the Association for Information Systems, 8(4), 211–218. https://doi.org/10.17705/1jais.00126.
[146] Sachdeva, C., Dubey, S., Gangwar, V.P., Bansal, R., Aziz, A.L., Propheto, A., 2025. Technology adoption and energy conservation: A bibliometric and systematic literature review approach. Taylor & Francis 11. https://doi.org/10.1080/27658511.2025.2551988
[147] Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. Health Psychology Review, 9(2), 113–135. https://doi.org/10.1080/17437199.2015.1022902.
[148] Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. Journal of Marketing Theory and Practice, 19(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202.