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HOUSEHOLDS' PRO-ENVIRONMENTAL BEHAVIOUR DRIVERS OF GREEN ENERGY TECHNOLOGY ADOPTION: APPLYING THE VALUE-BELIEVE-NORM THEORY IN LAGOS STATE, NIGERIA

Andrew Olatubosun Oriola
E-mail:aoriola@ymail.com
National Centre for Technology Management, Federal Ministry of Innovation, Science and Technology, Ile-Ife, Osun State, Nigeria.

ABSTRACT

The progress of adopting green energy technology to mitigate the existential challenges of climate change and energy deficit is off track to achieve the set targets in the Sustainable Development Goals. The study investigated the factors that influence pro-environmental behaviour in adopting green energy technology, particularly solar photovoltaic, to accelerate the uptake in Lagos State with the lens of the value-belief-norm theory. A cross-sectional survey research design was employed with multi-stage sampling technique and structured questionnaire to gather valid responses, totaling 585. The result of the analyses with partial least squares structural equation modelling (PLS-SEM) revealed that social curiosity (β = 0.650, t = 15.613, p =0.000) was the strongest driver of households' interest in green energy technology adoption. Altruism value was found to be the most important value orientation to influence interest in adopting green technology. The study concluded that the factors of the value-belief-norm framework are influential in accelerating the adoption of green energy technology in Lagos State, Nigeria.

Keywords: Pro-Environmental Behaviour, Green Energy Technology, Value-Believe-Norm Theory, Solar Photovoltaic, Social Curiosity

Introduction

The global transition to sustainable energy systems has gained significant momentum with emphasis on the adoption of green energy technologies in recent years. Green energy sources, such as solar, wind, and biomass, offer cleaner alternatives to fossil fuels to reduce greenhouse gas (GHG) emissions, their attendant effect of global warming, and to promote energy independence. Sub-Saharan Africa, particularly Lagos, a microcosm of Nigeria's endemic energy challenges and growing environmental concerns, stands at a critical juncture in this transition process. Despite the potential environmental, economic, and social benefits, and the advancements in green energy technology with the increasing

policy support, the adoption of green energy solutions remains slow in pace to achieve the United Nations sustainable development agenda (IEA, 2024). While financial constraints and infrastructural limitations have been widely studied as barriers to green energy uptake in Nigeria (Dioha & Kumar, 2018; Adepoju et al., 2020), there is growing recognition that behavioral and psychological factors such as perceived responsibility and moral obligation also play a crucial role in shaping household energy decision-making (Yeh et al., 2024).

Given the unique socio-economic and cultural characteristics of Lagos, understanding how environmental values, beliefs, and norms influence green energy adoption may provide critical insights for policymakers, energy providers, and sustainability advocates. To the best of the knowledge of the author, there is no known empirical study that has investigated green energy technology adoption using value-belief-norm theory in Nigeria. This study, therefore, seeks to investigate the households' pro-environmental behavior factors that influence interest in the uptake of green energy technology, particularly solar photovoltaic (PV), with the lens of value-belief-norm (VBN) theory in Lagos State, Nigeria. Solar photovoltaic (PV), being the most sustainable and environmentally friendly green energy generation technology (Ahmad et al., 2017), is advancing the growth of green energy capacity globally (IEA, 2021). Therefore, this study answers the question: *What are the factors of pro-environmental behavior that influence the interest of households to adopt solar PV as green energy technology in Lagos State, Nigeria?* By focusing on psychological and social dimensions, the study aims to contribute to a more comprehensive understanding of energy transition dynamics in sub-Saharan Africa. Furthermore, the findings of this study will inform the development of targeted interventions and policies that go beyond economic incentives to address deeper psychological and social motivators of transition to green energy technology in Nigeria and sub-Saharan Africa.

Literature Review

Concept of Green Energy Technology

Green energy technology is a critical enabler for keeping the average global temperature rise below 1.5°C., enhancing the efficiencies and reducing costs of energy conversion [World Intellectual Property Organization (WIPO) 2024]. Green energy technology is the process of generating electricity using renewable energy resources, such as solar photovoltaic panels to convert solar energy to electricity, and converting wind energy to electricity using wind turbines (Zarnikau, 2003). Kim (2011) see green energy technology as a process, product, or service that creates significantly less waste than conventional technologies by using limited or zero non-renewable resources to deliver

value. Bhardwaj and Neelam (2015) averred that green energy technology is a product or system that uses renewable energy resources, emits low or zero greenhouse gas, minimises environmental degradation, and conserves natural energy resources. Scholars have defined green energy technology from different dimensions of their studies, but the common concepts in their definitions are energy security, environmental friendliness, and sustainability. This study perceived green energy technology as the system that uses renewable energy resources and sustainable practices to generate energy with minimal environmental impact.

Value-Belief-Norm (VBN) Theory

The VBN theory posit that individuals' decisions are influenced by a chain of psychological processes that begin with their values, followed by their beliefs about environmental consequences, and ultimately lead to the activation of personal norms that drive human action (Stern et al.,(1999). The theory asserted that individuals are more likely to engage in pro-environmental behaviours if they hold strong environmental values, believe in the seriousness of environmental problems, and feel a personal responsibility to contribute to the solutions in a causal chain process. According to Wolske et al. (2017), the VBN model explains individuals' motivation towards adopting green energy solutions such as solar PV technology to address their concern about the effect of climate change and its consequences on the environment because they understand it and feel a sense of obligation to address it.

Development of Hypotheses

Values are one of the most stable human psychological characteristics and constructs that influence people's attitudes and their actions in different spheres of life. Booi-Chen et al. (2015) postulated that environmental values indirectly influence the green purchase behaviour of individuals through environmental belief and personal norm. This indicates that individuals can be influenced to respond to climate change and sustainable development challenges by directing motivational communication efforts towards their environmental values (Marshall et al., 2019). Stern et al. (1999), Booi-Chen et al. (2015), Kartz-Ghero et al. (2017), Marshall et al. (2019), and Schwartz and Cieciuch (2021) suggested the measurement of four types of environmental values: Altruism values, Traditional values, Self interest values, and Openness to Change values as antecedences of environmental behaviour. Wolske et al. (2017) measured these four types of values to examine the pro-environmental behavior of homeowners towards solar PV adoption in the United States of America. The findings of the study show that Altruism, self-interest, and Traditionalism values significantly influenced interest in the adoption of Solar PV. On this basis, the study proposed the following hypotheses:

H 1: Altruism values positively and significantly influence households' interest in the adoption of solar PV technology.
H 2: Self-interest values positively and significantly influence households' interest in the adoption of solar PV technology.
H 3: Traditionalism values positively and significantly influence households' interest in the adoption of solar PV technology.
H 4: Openness to change value positively and significantly influence households' interest in the adoption of solar PV technology.

The main underlying structures that guided past studies on value-behaviour relationships are based on the premise that human behaviour is a function of internal and external influences (van Riper et al., 2018), together with how values motivate people's engagement with their environments (Kenter et al., 2019; Braito et al., 2017). One of these internal influences is the "awareness of consequences," which indicates when individuals become aware of the environmental destruction they face if their' value of nature develops as the environment is being damaged (Schwartz, 1992). This awareness will make individuals behave pro-environmentally, driven by consciousness of the negative consequences and the actions they can take to reduce the consequences. The consumers' knowledge of the adverse environmental consequences of their actions can inform the development of positive buying behaviour and green purchasing of eco-friendly products (Rajagopal, 2018). In this regard, regular adoption of a particular innovation to avoid the foreseen consequences can lead to the formation of a norm, thereby creating an appeal that attracts the interest of others to adopt the innovation (Amoako and Wilson, 2017); (Opele et al., 2021). It is expected that high household awareness of consequences may motivate their interest in adopting solar PV technology as green energy technology. Based on this assumption, the study proposed the following hypothesis:

H 5: Awareness of consequences positively and significantly influences households' interest in solar PV technology.
Pro-environmental personal norm is another internal factor that may guide the environmental behaviour of adopting green energy technology. According to Schwartz and Howard (1981) personal norm is an individual's feeling of moral duty to either carry out specific actions or not. An individual's moral obligation to act in an environmentally friendly manner determines the individual's pro-environmental behaviours(PEB) and intentions (Hieu et al., 2021). In this regard, Stern et al. (1999) portrayed personal norm as associated with interest in pro-environmental behaviour (PEB), which implies that the stronger the moral obligation for people to act pro-environmentally, the more their interest and engagement in PEB. Personal norm has a

positive influence on green cosmetic purchase intention, consistent with the findings of Jaini et al. (2019). Hence, this study assumed that households with strong personal norms will have an interest in adopting solar PV as a green energy technology. Built on this assumption, the following hypothesis was proposed:

H 6: Personal norms positively and significantly influence households' interest in the adoption of solar PV technology.

Social curiosity is perceived as the general interest in gaining new social information that motivates exploratory behaviours (Hartung and Renner, 2011). Ozaki and Sevastyanova (2011) found that green electricity adoption behaviour was motivated by a combination of different personal benefits, including personal values, normative beliefs, cost, inconvenience, the availability of clear and accurate information, and social influence in a study on consumer motivation to purchase hybrid vehicles, a green innovation in the United Kingdom. Wolske et al. (2017) introduced social curiosity to the value-belief-norm framework to know the interest in learning about the benefits and costs of Solar PV. The scholars found that values, awareness of consequences, personal norms, and social curiosity influence the interest of households to adopt solar PV in the United States of America. This study extended the VBN model with social curiosity as the penultimate variable to facilitate the gaining of information and knowledge about cost and other benefits from close associates, considering the recency of Wolske et al. (2017) and proposed the hypothesis that:

H7: Social curiosity positively and significantly influences households' interest in the adoption of solar PV technology.

Based on the VBN model, this study assumed that the value-belief-norm determinants consisting of environmenetal values (Schwartz & Cieciuch 2021), awareness of consequences and personal norms, extended with social curiosity will sequentially activate one another in the causal chain effect to trigger individual pro-sustainable behaviour interest in purchasing green energy product particularly solar Photovoltaic system (SPV). In addition, this study assumes that the variables in the causal chain directly influence the next variable and indirectly influence the variables farther down the chain.This study also suggests that a variable in the causal chain may directly influence other variables further downstream, aside from the adjacent variables. For example, values may trigger personal norms and the behaviour.

This study proposed seven hypotheses to investigate the green energy technology adoption using constructs of the VBN framework extended with social curiosity (Figure 1)

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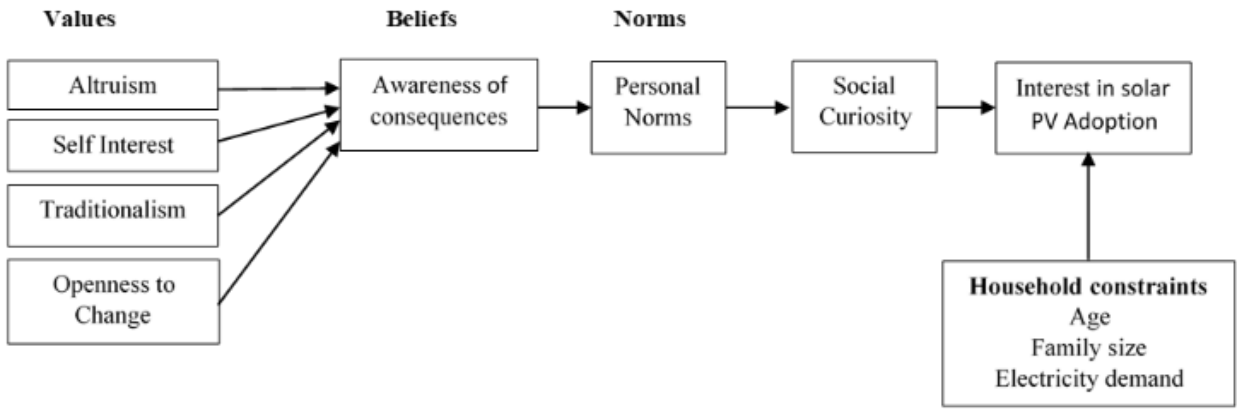


Figure 1. Conceptual Framework adapted from Wolske et al. (2017)

Methodology

To test the research hypothesis, this study employed cross-sectional survey research design and a structured questionnaire to collect data from the respondents. Value orientations were measured with 15 indicators reflecting Altruism, self-interest, traditionalism, and openness to change value orientations. 4 indicators showing awareness of consequences were used to measure environmental beliefs, and personal norms were evaluated with 4 indicators. Social curiosity and interest in solar PV adoption were each measured with 4 indicators. The total 23 indicators were adapted from Wolske et al. (2017) and measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The target population for the study consisted of the solar PV adopter and non-adopter households in the metropolitan area of Lagos state. Multi-stage sampling was employed for the study. The purposive sampling technique was used at the first stage to select the metropolitan area of Lagos state, comprising sixteen local government areas. At the second stage, the proportionate sampling technique was employed to select the household population, after which, at the third stage, the random sampling technique was applied

to select the non-adopter sample, while the Snowball technique was used to select the adopter household samples. The study applied the Yamane (1967) formula to determine the appropriate sample size. A total of 800 questionnaires, consisting of 400 each for adopters and non-adopters, were administered, and 585 comprising 230 adopters and 355 non-adopters were retrieved, resulting in a 73% response rate. 228 responses from adopters and 326 from non-adopters, making a total of 554, were found suitable for analysis.

Descriptive statistics were conducted to analyse the sociodemographic characteristics of the respondents, and partial least squares-structural equation modeling (PLS-SEM) was used to assess the research model. SmartPLS 3.0 was used to analyse the construct relationships of the model. The sample size of 554 was higher than the PLS-SEM sampling threshold of 100 samples (Reinartz et al., 2009) suggesting that the sample size for the research was adequate for the method of analysis.

The first stage of the analysis was the evaluation of the measurement model, which involved internal consistency, convergent validity, and discriminant validity tests for reflective constructs, while convergent validity, collinearity between indicators, and significance and relevance of outer weights tests were evaluated for the formative constructs. This was followed by the structural equation model evaluation.

Results and Discussion

Descriptive Analysis

About two-thirds (65%) of the respondents were male. The lowest percentage of the respondents (17.9%) was below 30 years of age, indicating that most of the respondents were adults above age 30 who may prefer green products. The majority of the respondents (76.5%) were married, while almost all the respondents were educated to an undergraduate level upwards, with about two-thirds (63%) educated to undergraduate level. People at these levels of education seem to have acquired knowledge and have a good knowledge of green products. As regards the ownership of homes, about half (50.9%) of the respondents own the homes that they live in, while about half (50.9%) of the respondents also dwell in flats (Apartments) type of dwellings. Almost all (94.8%) of the respondents' dwellings are connected to the national grid for electricity supply, while most of the respondents earn above N1m and 36.8% earn less than N1m as income per year, and similarly, just a few (32.7%) of the respondents pay less than N5,000 as electricity bill in a month. One could deduce from the foregoing that the respondents were mature, educated, knowledgeable enough to understand and interpret the questionnaire, and could make decisions on vital affairs regarding their households (Adewole & Opele, 2019).

Besides, the respondents consisted of homeowners and tenants with varying numbers of household members, and different categories of dwelling types and sizes, of which almost all were connected to the national grid. These were considered suitable for the study.

Evaluation of Measurement Model

Reflective Measurement Model

Table 1 reveal that all the Cronbach's alpha and the composite reliability values exceeded the minimum acceptable threshold level of 0.70 and were lower than the maximum acceptable threshold level of 0.95, indicating that the reflective constructs have sufficient levels of internal consistency reliability. The average variance extracted (AVE) values range from 0.550 to 0.824 which exceeded the threshold value of 0.5, indicating that the latent variables, on average, explained more than 50% of the variance in the measured construct, therefore suggesting an adequate convergent validity of the reflective measurement model. All the Heterotrait-Monotrait (HTMT) values in Table 2 were lower than the more conservative threshold level of the acceptance value of 0.85, confirming that all the constructs met the requirement of discriminant validity (Hair et al., 2022).

Table 1. Internal Consistency Reliability, Convergent Validity, and Discriminant Validity

Construct Code	Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
cVBNALT	cVBNALT1	0.779	0.733	0.830	0.550
	cVBNALT2	0.770			
	cVBNALT3	0.729			
	cVBNALT4	0.685			
cVBNOTC	cVBNOTC1	0.789	0.751	0.842	0.572
	cVBNOTC2	0.738			
	cVBNOTC3	0.776			
	cVBNOTC4	0.720			
cVBNSI	cVBNSI1	0.760	0.816	0.884	0.719
	cVBNSI2	0.921			
	cVBNSI3	0.855			
cVBNTD	cVBNTD1	0.736	0.726	0.733	0.646
	cVBNTD2	0.823			
	cVBNTD3	0.847			
fSOCU2	fSOCU2	0.908	0.786	0.903	0.824
	fSOCU3	0.906			
gINTRST	gINTRST1	0.874	0.819	0.891	0.733
	gINTRST2	0.888			
	gINTRST4	0.804			

Notes: cVBNALT = Altruism; cVBNOTC = Openness to change; cVBNSI = Self-interest; cVBNTD = Traditionalism; fSOCU2 = Social curiosity; gINTRST = Interest in Solar PV

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Table 2. Discriminant Validity- Heterotrait-Monotrait (HTMT) Ratio Test

	cVBNALT	cVBNOTC	cVBNSI	cVBNTD	fSOCU	gINTRST
cVBNALT						
cVBNOTC	0.543					
cVBNSI	0.092	0.114				
cVBNTD	0.631	0.660	0.151			
fSOCU	0.136	0.151	0.065	0.239		
gINTRST	0.143	0.086	0.056	0.219	0.807	

Notes: cVBNALT = Altruism; cVBNOTC = Openness to change; cVBNSI = Self-interest; cVBNTD = Traditionalism; fSOCU = Social curiosity; gINTRST = Interest in Solar PV

Formative Measurement Model

Table 3 shows that all the VIF values of the formative indicators were clearly below the threshold value of 5, suggesting that there was no potential collinearity problem in the model.

All the formative indicators showed a p-value lower than the threshold value of 0.05 at 5% significance level to establish significant outer weights. Similarly, the t values of all the formative indicators were higher than 1.96 standard values at 5% level of significance, which portend that the indicators were significant and relatively important. The outer loadings were above the threshold level of 0.5 for all the formative indicators, showing that the indicators were relatively important; therefore, the convergent validity of the formative measurement model can be said to be satisfactory.

The model's explanatory power was assessed using the coefficient of determination (R^2 value) and f^2 effect size. Cohen (1988) categorized R^2 values of 0.26, 0.13, and 0.02 for endogenous latent variables as substantial, moderate, and weak, respectively. The model explained a substantial variance (Adjusted R^2 = 0.44) in interest in solar PV adoption. The f^2 effect values of 0.02, 0.15, and 0.35 are classified as small, medium, and large effects of the exogenous latent variable, respectively, on an endogenous variable (Cohen, 1988). The measurement of the f^2 effect size of the exogenous latent variable on the endogenous variable showed that the model has a large effect size (f^2 = 0.723) on the dependent variable. The large effect showed that the model has a 72.3% importance impact on interest in solar PV adoption, suggesting practical significance of the impact of the model.

Table 3: Collinearity, Significance, and Relevance of Formative Model

Relationship	Weights	t-Statistics	*p*-Values*	Loadings	*p*-Values*	VIF	Decision
cVBNBAC2 -> cVBNBAC	0.462	6.184	0.000	0.701	0.000	1.136	RI
cVBNBAC3 -> cVBNBAC	0.552	4.682	0.000	0.867	0.000	1.512	RI
cVBNBAC4 -> cVBNBAC	0.299	2.578	0.010	0.659	0.000	1.367	RI
cVBNNP1 -> cVBNNP	0.370	3.631	0.000	0.670	0.000	1.176	RI
cVBNNP3 -> cVBNNP	0.269	2.847	0.004	0.650	0.000	1.252	RI
cVBNNP4 -> cVBNNP	0.654	7.722	0.000	0.883	0.000	1.258	RI

Note: cVBNBAC =Awareness of Consequences; cVBNNP = Personal Norm; RI = Relevant importance.; * = p< 0.05

Table 4. Collinearity Path Coefficients, t-Values, p-Values

Relationship	Beta	t-Statistics (|O/STDEV|)	*p*-Values*	VIF
cVBNALT -> cVBNBAC	0.259	5.316	0.000	1.343
cVBNALT -> cVBNNP	0.119	2.328	0.020	1.432
cVBNALT -> fSOCU	-0.048	0.827	0.409	1.452
cVBNALT -> gINTRST	0.052	1.281	0.200	1.455
cVBNBAC -> cVBNNP	0.318	5.982	0.000	1.313
cVBNBAC -> fSOCU	0.119	2.236	0.025	1.462
cVBNBAC -> gINTRST	0.083	1.871	0.061	1.477
cVBNNP -> fSOCU	0.073	0.803	0.422	1.475
cVBNNP -> gINTRST	-0.122	2.041	0.041	1.481
cVBNOTC -> cVBNBAC	0.164	3.177	0.001	1.412
cVBNOTC -> cVBNNP	0.242	5.196	0.000	1.448
cVBNOTC -> fSOCU	-0.006	0.102	0.919	1.534
cVBNOTC -> gINTRST	-0.035	0.807	0.420	1.534
cVBNSI -> cVBNBAC	0.137	3.386	0.001	1.015
cVBNSI -> cVBNNP	-0.062	1.339	0.181	1.039
cVBNSI -> fSOCU	0.000	0.000	1.000	1.045
cVBNSI -> gINTRST	-0.048	1.447	0.148	1.045
cVBNTD -> cVBNBAC	0.161	3.119	0.002	1.521
cVBNTD -> cVBNNP	0.067	1.329	0.184	1.555
cVBNTD -> fSOCU	0.139	2.451	0.014	1.562
cVBNTD -> gINTRST	0.051	1.143	0.253	1.582
fSOCU -> gINTRST	0.650	15.613	0.000	1.057

Notes: cVBNALT = Altruism; cVBNOTC = Openness to change; cVBNSI = Self-interest; cVBNTD = Traditionalism; cVBNBAC = Awareness of consequences; cVBNNP = Personal norm; fSOCU = social curiosity; gINTRST = Interest; * = $p < 0.05$

The model's explanatory power was assessed using the coefficient of determination (R^2 Value) and f^2 effect size. Cohen (1988) categorized R^2 values of 0.26, 0.13, and 0.02 for endogenous latent variables as substantial, moderate, and weak, respectively. The model explained a substantial variance (Adjusted R^2 = 0.44) in

interest in solar PV adoption. The f^2 effect values of 0.02, 0.15, and 0.35 are classified as small, medium, and large effects of the exogenous latent variable, respectively, on an endogenous variable Cohen (1988). The measurement of the f^2 effect size of the exogenous latent variable on the endogenous variable showed that the model has a large effect size (f^2 = 0.723) on the dependent variable. The large effect showed that the model has a 72.3% importance impact on interest in solar PV adoption, suggesting practical significance of the impact of the model.

Hypothesis Testing

After controlling for the household constraints, Table 5 shows that altruism value(β = 0.259, t = 5.316, *p* =0.000), Self-interest values (β = 0.137, t = 3.386, *p* = 0.001), Traditionalism value (β = 0.139, t = 3.119, *p* =0.002) and Openness to change value(β = 0.164, t = 3.177, *p* = 0.001) positively significantly and directly influenced awareness of consequences to indirectly predict households' interest in solar PV adoption at 5% significant level through the mediation of awareness of consequences and Social curiosity. In addition, traditionalism value (β = 0.161, t = 2.451, *p* =0.014) positively and directly motivated social curiosity to influence households' interest in solar PV adoption, indicating that H1, H2, H3, and H4 are supported. Awareness of consequences (β = 0.119, t = 2.236, *p* = 0.025) mediated between values and social curiosity to stimulate social curiosity and positively and indirectly influence interest in solar PV adoption at 5% level of significance, showing that H5 is supported. Furthermore, Table 5 reveals that personal norm negatively significantly (β = -0.122, t = 2.041, *p* = 0.041) and directly influenced interest in solar PV adoption at 5% level of significance, indicating that H6 is not supported.

Lastly, the result in Table 6 shows that social curiosity positively, significantly (β = 0.650, t = 15.613, p =0.000) and directly influences interest in solar PV adoption at 5% significance level, indicating that H7 is supported.

Hypotheses	Path	Beta	t-value	*p*-value*	R^2 Adj	f^2	Decision
	cVBNALT -> cVBNBAC	0.259	5.316	0.000	0.23	0.066	H1
	cVBNBAC -> fSOCU	0.119	2.236	0.025	0.04	0.010	Supported
H1	fSOCU -> gINTRST	0.65	15.613	0.000	0.44	0.723	
	cVBNSI -> cVBNBAC	0.137	3.386	0.001	0.23	0.006	H2
	cVBNBAC -> fSOCU	0.119	2.236	0.025	0.04	0.010	Supported
H2	fSOCU -> gINTRST	0.65	15.613	0.000	0.44	0.723	
	cVBNTD -> cVBNBAC	0.161	3.119	0.002	0.23	0.022	
H3	cVBNBAC -> fSOCU	0.119	2.236	0.025	0.04	0.010	
	fSOCU -> gINTRST	0.65	15.613	0.000	0.44	0.723	H3
	cVBNTD -> fSOCU	0.139	2.451	0.014	0.04	0.013	Supported

	fSOCU -> gINTRST	0.65	15.613	0.000	0.44	0.723	
	cVBNOTC -> cVBNBAC	0.164	3.177	0.001	0.23	0.025	H4
	cVBNBAC -> fSOCU	0.119	2.236	0.025	0.05	0.010	Supported
H4	fSOCU -> gINTRST	0.65	15.613	0.00	0.44	0.723	
H5	cVBNBAC -> fSOCU	0.119	2.236	0.025	0.04	0.010	H5
	fSOCU -> gINTRST	0.65	15.613	0.00	0.44	0.723	Supported
H6	cVBNNP -> gINTRST	-0.122	2.041	0.041	0.44	0.018	H6 Not Supported
H7	fSOCU -> gINTRST	0.65	15.613	0.00	0.44		H7 Supported

Notes: cVBNALT = Altruism; cVBNOTC = Openness to change; cVBNSI = Special interest; cVBNTD = traditionalism; cVBNBAC =Awareness of Consequences; cVBNNP = Personal Norm; fSOCU = social curiosity; gINTRST = Interest; * = $p < 0.05$

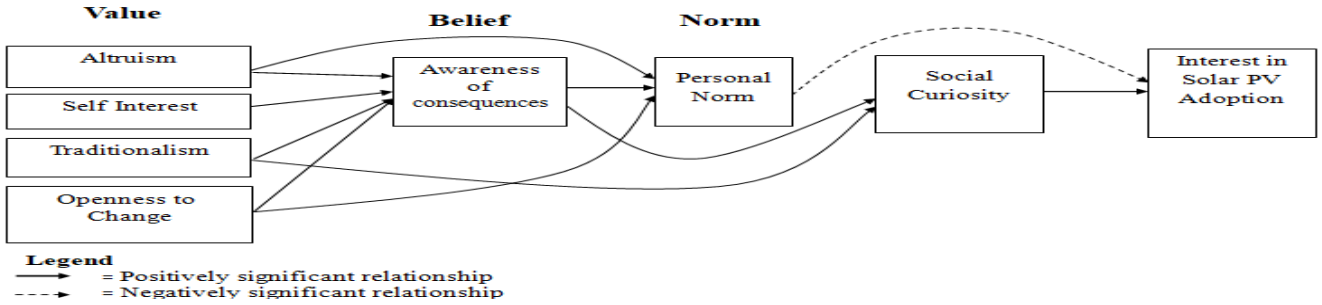


Figure 2 Statistically Significant Paths

Discussion

This empirical study investigated the pro-environmental behaviour factors that drive households' adoption of green energy technology in Lagos state, Nigeria. The study focused on the interest in the adoption of solar PV, a green energy technology, as a case study. The result is in congruence with the expected causal chain sequence linking values, awarenessof consequences, and personal norm as posited by Stern (2000), Woske et al. (2017) and Fornara et al., (2020).

Social curiosity is the strongest and most important factor that influenced interest in the adoption of solar PV as green energy technology among all the tested variables. The strong effect of social curiosity on interest in solar PV adoption illustrates that learning about the cost and benefits of solar PV triggered the households' interest in finding the installers and installing solar PV. Consistent with Wolske et al. (2017), the findings signify the high value of leveraging social curiosity to promote the adoption of solar PV as green energy technology.

Altruism value is the most important value to directly motivate awareness of consequences to influence interest in adoption of solar PV, aligning with past studies (Chen, 2015;Wolske et al., 2017). The result suggests that the households have concerns for the welfare of other human beings, other living things, and the ecosystem when they make decisions concerning the environment. In other words, they value reducing pollution and a clean environment, and have a strong concern for the well-being of future generations. Therefore, it can be said that enhancing households' altruism value is a very effective way to promote interest in the adoption of solar PV as a green energy technology.

Openness to change is the next important value orientation that activates awareness of the consequences of the households' negative actions on the environment to influence their interest in the adoption of solar PV. The result corroborates the findings of Stern et al., (1999), and Kiatkawsin and Han (2017) that openness to change influences awareness of consequences and motivates people to engage in pro-environmental behaviours, and Ghazali et al. (2019) that openness to change motivates pro-environmental actions of green consumers. It can be said that households are willing to accept innovations and have a new experience of solar PV to increase their energy access and to mitigate environmental problems such as climate change. Hence, to accelerate the adoption of solar PV as a green innovation, it is imperative to promote and increase the level of households' openness to change values.

Self-interest value is the third important value orientation to effect awareness of consequences towards interest in the adoption of solar PV. The results show a surprising relationship with self-interest values positively and significantly predict awareness of consequences to influence interest in the adoption of solar PV through social curiosity. This supports the past study of Hieu et al. (2021) that egoistic value positively impacts environmental belief but contradicts past studies (Stern et al., 1999; Wolske et al., 2017; Kiatkawsin and Han 2017; Ghazali et al. 2019; Pop et al., 2020). It can be said that the significant positive direct relationship between self-interest and awareness of consequences is evidence that social, wealth, influential, ambitious, and authoritative power could motivate pro-environmental behaviours. Therefore, in order to advance the progress of adopting solar PV technology, enhancing the self-interest value is a very good approach.
Traditionalism values are found to be the least influential value orientation to influence interest in solar PV technology adoption through the mediation of awareness of consequences and social curiosity. The result is in contrast with Wolske et al. (2017), who found that

traditionalism values directly triggered social curiosity to predict interest in solar PV adoption in the United States of America. This imply that the households have respect, commitment, and acceptance of the customs and ideas that traditional culture or religion provides. Hence, the households could be motivated by communication through cultural, family, or religious traditions to promote interest in the uptake of solar PV technology. Therefore, the level of traditional value can be increased to influence the rapid adoption of green energy technology in the form of solar PV.

The findings show that value orientations influence how households become aware of the adverse consequences of their actions on the environment, such as climate change, global warming, and pollution. This corroborates the assertion Stern (2000) that value orientations directly influence the way in which individuals formulate and structure environmental beliefs and suggest that people's responses to climate change and attitudes could be guided by directing communication efforts towards their environmental values. Therefore, to mitigate climate change and the energy deficit in a sustainable way, by adopting solar PV technology, households could be motivated by stimulating their environmental values. Pro-environmental belief, awareness of consequences of actions on the environment, directly played a mediating role between value orientations and social curiosity to consequently influence interest in the adoption of solar PV technology. This result contradicts the findings Wolske et al. (2017), that awareness of consequences motivated personal norms to trigger social curiosity and consequently influence interest in the adoption of solar PV in the United States of America. The result indicates that the availability of adequate information to households on climate change associated with the use of fossil fuels to generate electricity influence speedy adoption of solar PV technology. In other words, one could say that households with high level of climate change and alternative energy awareness could be interested in developing behavioural change, or plan for change, or have increased motivation to adopt solar PV technology. Therefore, the promotion of awareness of the consequences of negative action on the environment is essential to accelerate urban households' adoption of solar PV as a green energy technology.

Personal norm had significant negative direct effect on interest in adoption of solar PV technology contrary to the expected positive relationship with pro environmental behaviour in past studies (Wolske et al., 2017; Zhang et al., 2020; Yeh et al., 2024).The findings further revealed that when social curiosity was introduced as mediator, personal norm did not have any significant influence, indicating that personal norm (moral norm) of the

households did not translate into interest in solar PV technology adoption. It could be explained that while the households might be aware of the consequences of their actions on the environment, they did not see the actions to mitigate the consequences as an obligation. One could further say that because the households did not see it as their moral duty to mitigate the negative environmental consequences of their action, they are not curious to learn about the costs and benefits of solar PV. Hence personal norm could not be used to promote the interest of households in adoption of solar PV.

Conclusion

The study investigated how pro-environmental behaviour factors influenced households' interest in the adoption of green energy technology, particularly solar photovoltaic, using the value-belief-norm framework in Lagos state, Nigeria. The study established that the constructs of the value-belief-norm model, extended with social curiosity, are influential in promoting interest in the adoption of solar photovoltaic technology in the context of sub-Saharan Africa. The study further emphasises the significance of social curiosity as the most important factor among others, which comprises altruism, self-interest, openness to change, traditionalism values, and awareness of the environmental consequences of their actions to promote interest in the adoption of solar PV technology as a green energy technology. Therefore, policymakers, energy providers, and sustainability advocates should leverage the insights from value-belief-norm theory to create policies, interventions, and programmes to effectively accelerate the adoption of green energy technology in sub-Saharan Africa. This involves fostering altruism, self-interest, traditionalism, and openness to change values, enhancing awareness of consequences, and social curiosity to learn about the costs and benefits of green energy technology. The study investigated solar photovoltaic as case of interest therefore future studies could examine other forms of green energy technology, such as wind turbine technology. The study also focused on Lagos State, Nigeria hence, further investigation could be conducted in other geographical environments within sub-Saharan Africa to generalise the findings. Furthermore, this study used a mix of both retrospective and prospective data of the households' solar PV adopters and non-adopters, respectively. Hence, Further studies could investigate separately and compare how the two household groups' interest in solar PV technology adoption is explained by the VBN model. Additionaly, further studies could also explore the influence of other constructs of the VBN model, such as ascription of responsibility for more comprehensive findings on interest in the adoption of green energy technology.

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