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The Social Construct on the adoption of Green Energy: Evidence with Solar in Ghana

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***Keywords*— Solar-Energy, Environmental concern, Consumer knowledge, Renewable Energy, Theory Reason Action.**

***Abstract*—** *Indicators of global warming encourage us to pursue sustainable consumption, as there is a necessity to resolve the ongoing environmental threat. The best option is to promote green consumption; however, despite varying awareness and contributions on the many benefits of renewable energy, developing countries such as Ghana have yet to fully benefit from it due to skepticism about its exorbitant price. Our study attempted to explore the Theory of Reason action model to understand this phenomenon using five variables (Knowledge, Environmental Concerns, Environmental beliefs, Attitude, and the willingness to pay). We did an in-depth analysis to understand the role each plays in influencing behavior towards green consumption. A partial least squares structural equation modeling (PLS-SEM) methodology was used for statistical analysis. Our results revealed interrelated effects as well as aggregated effects on variables. The domineering element expressed to encourage the willingness to pay for and use solar energy was knowledge and environmental concerns. Ultimately, it provided a framework for the Ghanaian Government and stakeholders on the best strategy to upscale solar energy introduction and to assist decision-makers in developing long-term energy policies to achieve long-term consumption sustainability.*

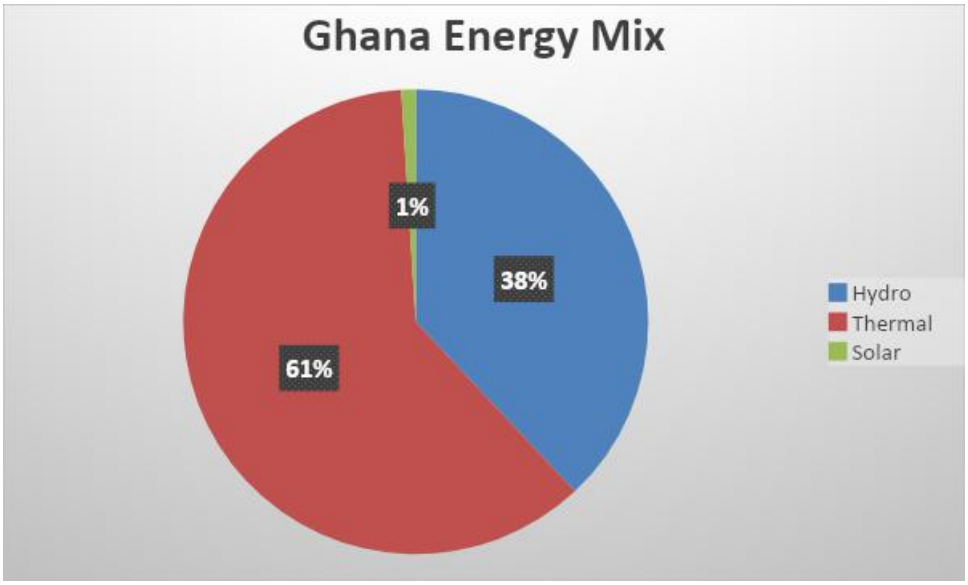
Highlights

1. An alternate to combat climate change is the promotion of green Consumption
2. Solar technology is the fastest growing renewable energy in the market
3. An in-depth analysis to understand the feasibility of the theory of reason action
4. Knowledge plays a critical role in the upscale of solar energy in Ghana
5. Solar technology provides an innovative solution for the global warming

I. INTRODUCTION

The effect of global warming has prompted several countries to propose and enact policy changes aimed at reducing carbon emissions; as a result, economies are turning to alternative(renewable) energy sources (Ivanova, 2012). Considering its relative abundance and eco- friendly character, Solar energy is the best alternative(Malik & Ayop, 2020).Additionally analysts and experts think that

because of its low carbon content, it could aid in the promotion of sustainable development (Hao, Guo, Tian, & Shao, 2019).Ghana is yet to explore this option has it energy mix is highly thermal base. See Fig 1. Ghana's strategic national energy plan (2006-2020) set a goal of increasing renewable energy in the energy mix by at least 10% by 2020, but failure to meet that goal has resulted in an extension to 2030 due to abysmal results of 0.3% as of 2019(Energy Commission %J Main Report, 2006)



Source : Authors computation using Ghana Statistical Service Data

This has been attributed to the idea that developing countries commonly lack environmental knowledge and a sense of responsibility to protect the environment(Chan, 2001). Therefore Chan (2001) argues for contemporary work to be done in developing countries. Besides financial gains, encouraging public interest in Ghana's energy transition has tremendous benefits (Menyeh, 2021). An additional service is promoting energy awareness, climate change debate, and fostering new approaches to combating global warming(Bergman & Eyre, 2011; Bolton & Foxon, 2015; Devine-Wright, 2011). Prior research has also yielded contradictory findings regarding consumers' behavioral responses to green energy sources(Bang, Ellinger, Hadjimarcou, & Traichal, 2000). Another growing concern is the affordability for consumers. As a result, academic and public programs aimed at growing consumer acceptance of renewable energy are rising (Lin & Syrgabayeva, 2016). Widely used indicators are demographic, socio-economic status, and age groupings (E. Moula et al., 2013). However, the alternate module to use would be the Theory of reason attitude or Theory of plan behavior to understand motivation leading to consumption of green energy (Ajzen, 2002; Fishbein & Ajzen, 1977).

Literature has also primarily focused on the ex-post appraisal of the construction of residential solar power (Ahmad, Mat Tahar Razman, Cheng Jack, & Yao, 2017; Alsabbagh, 2019; Haw, Sopian, & Sulaiman, 2009). Besides, because of their particular social, economic, and political structure, research findings from developed countries cannot be applied to developing countries. (Dewan & Kraemer, 2000).In trying to fill the gap, we would study the public's opinion before the large-scale solar introduction in Ghana. Precisely assess to know how the application of Theory of plan behavior and Theory of reason action can foster the transition from fossil fuel to solar technology, imploring a survey tool questionnaire,

Ghana is a prime study candidate, as it could offer insights for neighboring countries to benefit from their experiences in fostering access to energy and overall sustainable growth. Furthermore, the research adds to the discussion on energy change. The successful introduction, production, and deployment of renewable energy, especially solar power, aims to mitigate the electricity crisis and meet the country's 2030 goal. Three goals were tried in this report. Initially, try to understand the features of Ghanaian consumers (the general public) and how they can buy green to counter global warming and reduce environmental damage. Secondly, to create a marketing strategy plan and educational feedback to determines the possible way to enhance the energy performance of Ghana's marketing, public officers, investors, and, most importantly, the governments of Ghana that promote and encourage the use of renewable energies.

The remainder of the analysis is structured as follows. The following section discusses the literature analysis, which explains the methods and evidence used, the findings examined, and the consequences and assumptions of the policy.

II. LITERATURE REVIEW

Numerous studies on the knowledge and appreciation of solar energy have emerged (Abdullah et al., 2017; Adenle, 2020; Agyekum, Velkin, & Hossain, 2020; Baharoon, Rahman, & Fadhl, 2016; E. Moula et al., 2013; Irfan, Elavarasan, Hao, Feng, & Sailan, 2021; Karjalainen & Ahvenniemi, 2019; Rai & Beck, 2015; Sommerfeld, Buys, & Vine, 2017). This has shown that consensus and knowledge are essential, depicting that the public and citizen's attitude significantly affect energy policy planning (Viklund, 2004). The downside has demonstrated that other indicators apart from pure science influence the buying power of consumers. This is in line with Benjamin K. Sovacool and Tambo (2016) notion that green energy consumption can be identified with technological and social spheres providing a lean way for society to contribute to sustainable consumption. Also, Batel and Devine-Wright (2015) illustrated how promoting clean energy sources could be viewed as a social change mechanism rooted in societal values. Therefore several jurisdictions and academics have been working on encouraging good public attitudes toward renewable energy resources through information sharing and education.

Literature indicated that environmentally aware people are liberal with a favorable outlook towards introducing new clean technology such as solar (Bidwell, 2016; Hansla, Gamble, Juliusson, & Gärling, 2008; Longo, Markandya, & Petrucci, 2008; Zyadin, Puhakka, Ahponen, & Pelkonen, 2014). Since they are familiar with environmental degradation harms humans (Longo et al., 2008), developed countries like Sweden, with high knowledge on the ecological issue, are more likely to embrace new clean technology(Ek, 2005).in line with the above, other related studies also affirmed that individuals with higher environmental preference were willing to proceed with the adoption of clean technologies(Di Maria, Ferreira, & Lazarova, 2010; Kollmuss & Agyeman, 2002)

Following from hoping to protect the environment and, by extension, defend themselves, some participants didn't mind paying for more to access such new technology(W. Abdullah, Zainudin, & Ishak, 2018; Alsabbagh, 2019) Though agreeing with the assertion premised on other engagement on the benefits of clean energy. Improved understanding will contribute to improved recognition and corporation in paying for Renewable Energy.

Another strand of studies perused the significance of knowledge on solar energy acceptance. According to (Kontogianni, Tourkolias, & Skourtos, 2013), knowledge is essential to designing energy policies and creating appropriate initiatives to promote sustainable energy sources. Findings from (Bang et al., 2000; Martins, Madaleno, & Dias, 2020) collaborated on such results. They claim that, in general, there is a low degree of energy awareness, pointing out the need to educate customers to enhance their energy-related decisions. Especially young adult students were identified to be influenced most about the information and showed that the mindset of young people towards RE was influenced by RETs awareness (Halder et al., 2012). Young people displayed relatively optimistic attitudes towards solar energy and wind power because they were aware of them; however, they showed pessimistic attitudes because they were ignorant of forest bioenergy (Entele, 2020). Intimating that age influences Attitude towards renewable energy as consumer attitudes towards wind energy decrease with age and income, while optimistic attitudes towards green electricity decrease with age and income.

It was also revealing that demographics influenced awareness of renewable energy. It showed that the public's views on the use of RE were affected by various influences that ranged from country to country(Klick & Smith, 2010; Qu et al., 2011). Some findings also reiterated demographic factors have also been established as a significant factor in deciding the chances of being willing to pay a premium price for green energy. (Wang, Valchuis, Thompson, Conner, & Parsons, 2019)

Invariably decision concerning energy type (fuel) for electricity generation has dire consequences on global geopolitics, economy, and environment (Ahmad & Tahar, 2014). This makes it imperative to gain public support before making such a policy decision since there are critical roles to be played by the citizenry and society in the advancement of innovation regarding the technical and social domain of the generation, consumption, and implementation of clean energy B. K. Sovacool et al. (2015). A role easier executed if the public is well informed on the policy direction and have enough education

Therefore it has become essential to carry the people along if a policy to be implemented is successful. More importantly, when it concerns energy identified as the backbone for development. Sadly knowledge on solar energy technology is not as advanced as it should be (Pagliaro, Ciriminna, Pecoraino, & Meneguzzo, 2016), despite the groundbreaking efforts of Broman and other astute scientists. They argued for increased solar education early in the mid-1980s because of its far-reaching possible contribution to humanity and implication to the old order.

2.1 Theoretical Framework And Hypothesis Development

Underpinning Theory for this study would be the Theory of reasoned action and Theory of Planned Behavior (TPB) which was propounded in the late nineteen's by (Ajzen,

2002; Fishbein & Ajzen, 1977). This provides a basis to evaluate consumer behaviour and why they would take a course of action like paying for solar energy when introduced on a large scale in Ghana. Consumers might consider the implications and prefer to exhibit behaviors associated with beneficial effects before engaging in alternative actions. A broad range of research models have proven to be effective in forecasting and explaining the conduct of consumers using TRA, such as studies from (Alwitt & Pitts, 1996; Lin & Syrgabayeva, 2016; Polonsky, Vocino, Grau, Garma, & Ferdous, 2012). (Lin & Syrgabayeva, 2016; Pagiaslis & Krontalis, 2014) the Bang model was used, which gives greats insights into consumers' knowledge, attitude, environmental concerns, and their perspective on paying more or willing to buy.

2.2. Hypothesis Formulation

2.2.1. Environmental concerns

Due to environmental issues, environmental policies and the spread of environmentally friendly behaviors have become topical and advocated for (McCright, Xiao, & Dunlap, 2014). This serves as an antecedent that can affect their purchasing power(Diamantopoulos, Schlegelmilch, Sinkovics, & Bohlen, 2003). The majority of literature stipulates that environmental concerns are the precursor to others' valid construct like knowledge, convictions, and willingness to pay for more environmentally friendly products (Bang et al., 2000; Pagiaslis & Krontalis, 2014; Tilikidou, 2001; Tilikidou, Adamson, & Sarmaniotis, 2002). They feel a duty of service to protect the environment, leading to an attitudinal change espoused (Tan, 2011). It all boils down to a notion that residents worried about the environment are more likely to practice energy conservation and quality improvements (Urban & Ščasný, 2012). Other complementary studies have shown that environmental interest impacts behavioral and attitudes towards behavior patterns-- a rise in the environmental positive. Attitude influences willingness to purchase environmentally friendly technology (Chen & Tung, 2014; Clark, Kotchen, & Moore, 2003; Kalafatis, Pollard, East, & Tsogas, 1999). According to [48], when a concept has personal significance, such as on health or the future of children, it increases interest, contributing to knowledge seeking on the idea. This showed that customer concern for the environment directly influences renewable energy(solar) awareness. (Pagiaslis & Krontalis, 2014) The contrary opinion also doesn't ascertain a correlation between environmental concerns and attitude, though they agree to be an association (Gill, Crosby, & Taylor, 1986; Shrum, Lowrey, & McCarty, 1994; Stokols & Altman, 1987). Other strains of thought are also of the opinion that environmental concern should, in Theory, be positively related to environmental knowledge; however, empirical results are mixed (Baharoon et al., 2016; Bang et al., 2000). Even so, with knowledge, others believe the level of knowledge may even lead to concern or prejudice against technology (Pagiaslis & Krontalis, 2014; Tilikidou, 2007).

To be able to identify the possible relationship below hypothesis are examined succinctly

H1a. Consumer environmental concerns have a positive effect on Knowledge

H1b. Consumer environmental concerns have a positive influence on environmental beliefs

H1c. Consumer environmental concerns have a positive impact on attitude towards solar Energy

H1d. Consumer environmental concerns have a direct positive effect on willingness to buy solar Energy

2.2.2. Consumers' knowledge of solar energy

Environmental awareness is described as a consumer's awareness of their environment and fundamental relationship with it, which leads to changed perspectives and significant environmental consequences(Lin & Syrgabayeva, 2016). Individuals with a basic understanding of the world have a distinct advantage of an appreciation for renewable energy and its benefit. This was demonstrated by (Mostafa, 2009), who argued that people with a high level of education and knowledge are prone to environmentally friendly products. In another vein, environmental attitudes are thought to shift as knowledge of the environment increases, and environmental knowledge and attitudes affect environmental policy(Arcury, 2008). Other scholars that agree with the assertion include (Egea & de Frutos, 2013; Pagiaslis & Krontalis, 2014; Polonsky et al., 2012). Some were not so convinced that there is a clear-cut correlation between knowledge, attitude, and willingness to purchase green products, as they represented a week correlation from their studies(Laroche, Bergeron, & Barbaro-Forleo, 2001; Pickett, Kangun, & Grove, 1993).

H2a.Consumers' environmental knowledge has a direct positive effect on environmental belief

H2b.Consumers' environmental knowledge has a direct positive effect on attitude towards solar Energy

H2c.Consumers' environmental knowledge has a direct positive effect on willingness to pay

2.2.3. Environmental belief

Theory reason behavior suggested a green behavior, which he described as an attitude influenced by beliefs(Ajzen, 2002). Their attitude shapes consumer attitudes toward the outcomes of their decisions(Bang et al., 2000; Fishbein & Ajzen, 1977). In general, it is essential to investigate the relationship between beliefs (being

behavioral and public) and green consumers. Environmental beliefs influence a broad range of green behaviors, indicate which variables to focus on, and provide a solid foundation for defining different goals(Bamberg, 2003; De Groot & Steg, 2007). Another relevance is that other customers agree that renewable energy slows climate change and global warming and reduces energy dependence, all of which are essential in marketing a green commodity like solar Energy (Hartmann & Apaolaza-Ibáñez, 2012). Other studies also revealed that attitudes about solar energy are positively related to the willingness to pay a higher price for green energy goods(Bang et al., 2000). Prior studies also concluded that public preferences and intentions to use or buy environmental interests are influenced by consumer values(Kalafatis et al., 1999; Mostafa, 2007)

H3a.Environmental beliefs and beliefs towards solar have a direct positive effect on attitude towards solar energy.

H3b.Environmental beliefs and Beliefs toward solar have a direct positive effect on the intention to pay to use solar Energy

2.2.4 Consumers' attitude toward solar Energy and WTP more for solar power

Scholars believe that global attitudes towards renewable energy are generally positive, increasing customers buying premium-priced green electricity.(Ek, 2005; Hansla et al., 2008; Salmela & Varho, 2006) Inherently, consumers participate in green practices because they care for the ecosystem (Bamberg, 2003; Fransson & GÄRling, 1999). The majority of previous research has found a connection between environmental attitudes and pro-environmental or green purchase decisions (Berndt & Petzer, 2011; Egea & de Frutos, 2013; Gerpott & Mahmudova, 2010)

H4.Consumers' attitude toward solar energy has a direct positive effect on their intention to pay a premium price for it

Graphical Representation of hypothesis

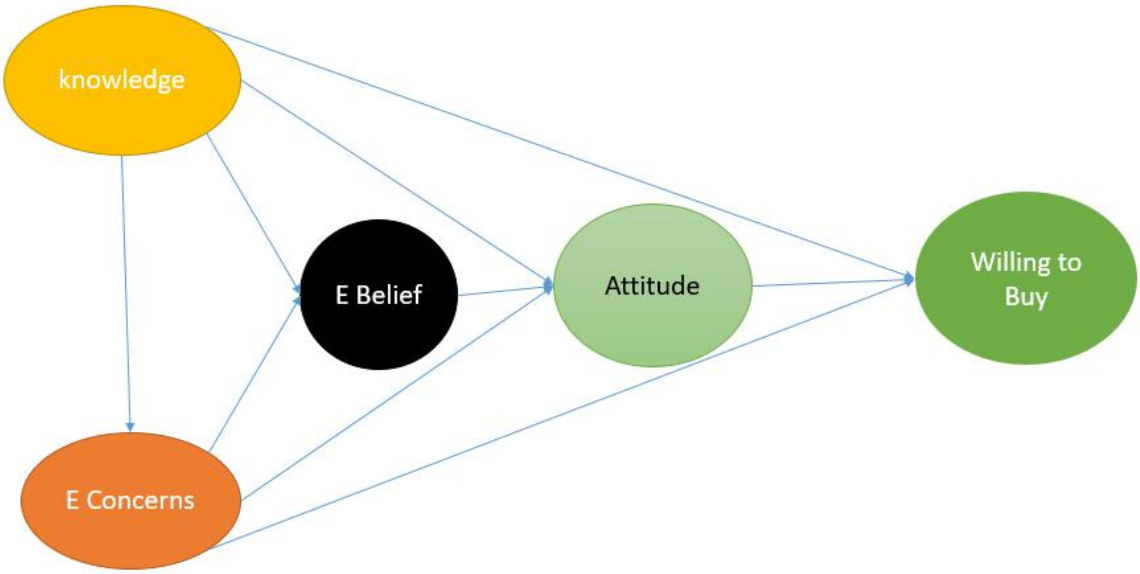


Fig.2: Proposed causal model (sample Picture like that of smart pls)

III. METHODOLOGY

3. Data and Methodology

For this case study approach, the researchers used a comprehensive, cross-sectional approach of self-administered questionnaires. Due to distance constraints, the use of Google Forms was employed to reach respondents in Ghana. This enabled us to solicit the response of the Ghanaian public easily.

3.1 Materials and Methods

3.1.1. Research design

The Author used a 5-point Likert scale was used to test the variables except for the demographics. The question was adopted and revised questions from [3, 11, 12] to be an appropriate scale for my intended work and fit this study's objectives.. Four hundred questionnaires were our intended target, but we collected 372.

3.1.2. Ethical consideration

The respondents were asked for both verbal and written concerns before data was collected. The respondents were made aware that their participation was entirely voluntary, and their privacy was guaranteed.

3.1.3 Statistical analysis and Reliability Test

Data obtained from the questionnaires were coded and analyzed with smart PLS as it provides more valuable results for casual relationships. For data analysis, a partial least squares structural equation modelling (PLS-SEM) technique is used (partial least squares), a type of structural equation modelling (SEM), which can be extremely useful (Lowry & Gaskin, 2014).It ensures that analytic rigor and consistent estimates are fostered comparatively(Sarstedt, Hair, Ringle, Thiele, & Gudergan, 2016).Discrete variables like gender and educational status were described using frequencies and percentages. The research implied the use of Cronbach's alpha testing, mainly because of its usefulness in quantifying information from multiple items in a questionnaire, as indicated by (Christmann & Van Aelst, 2006). The test aimed to assess data accuracy and check for internal consistency from respondents (de Vet, Mokkink, Mosmuller, & Terwee, 2017). Most of the underlying theories were proposed by (Nunnally, 1994)

IV. RESULTS

4. Presentation and discussion of results

4.1Respondent demographic information

There are substantial variations in the socio-economic backgrounds of the study. A total of 372 responses were used for data analysis, which represented an excellent valid rate.

Table 1 shows the profile of the respondents. The table showed more dominant male respondents with 63.4% as against 36.6% for females. 81.8% of males were employed and had one form of university degree with a high score of 95.8%. We also had a very youthful respondent with 75.5% within the bracket 25-34, 35-44.

Table 1. Descriptive Statistics for the Sample. N= 372

Variable	Options	Distribution	
		Frequency	Percent
	Male	236	63.4
	Female	136	36.6
Gender			
Age	18-24	79	21.2
	25-34	239	64.2
	35-44	42	11.3
	45+	12	3.2
Education Status	JHS/ SHS	19	5.1
	Undergraduate	220	59.1
	Postgraduate	133	35.8
Employment Status	Student	112	30.1
	Employed	240	64.5
	Unemployed	20	5.4

4.2. Measurement of Reliability and Validity

Table 2 Variable measurement and descriptive statistics.

Constructs	Items	Factor loadings	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Knowledge	KN1	0.829	0.948	0.961	0.961	0.831
	KN2	0.966				
	KN3	0.959				
	KN4	0.937				
	KN5	0.859				
Environmental concern	ECON1	0.986	0.966	0.969	0.976	0.909
	ECON2	0.955				
	ECON3	0.961				
	ECON4	0.911				
Environmental Beliefs	EB2	0.886	0.956	0.962	0.968	0.884
	EB3	0.965				
	EB4	0.957				
	EB5	0.951				
Attitude	AT1	0.944	0.97	0.97	0.978	0.918
	AT2	0.981				
	AT3	0.941				
	AT4	0.965				
Willingness to pay	WTP1	0.980	0.97	0.971	0.981	0.944
	WTP2	0.953				
	WTP3	0.982				

Cronbach's alpha and composite reliability values were examined to determine validity and reliability of the scale for the research —results of Cronbach's alpha ranged was higher than the recommended value of 0.7, showing desirable scale for research assessment. Given their respective loadings, the scale objects in the measurement model contributed significantly to this study, with a value between 0.829 - 0.986. it depicts excellent internal reliability see Table 2 (Bagozzi & Yi, 1988; Joseph F Hair, 2009). Taking the recommendations from (Fornell & Larcker, 1981), he argued that average variance above 0.50 convergent validity is achieved. The AVEs of all variables met the minimum requirement as the least was 0.831and the highest 0.918. Both reliability and internal consistency of all constructs are also confirmed by rho A and CR values.

Table 3. Construct means, standard deviations, correlations, and the results of discriminant tests.

	Mean	Standard Deviation	1	2	3	4	5
1.knowledge	4.166	0.800	0.912	0.380*	0.764*	0.775*	0.164*
2.Environmental Concerns	4.127	1.064	0.374	0.954	0.219*	0.209*	0.168*

3.Environmental Believe	4.180	0.884	0.734	0.216	0.940	0.694*	0.054*
4.Attitude	4.192	0.884	0.747	0.203	0.672	0.958	0.104*
5.willing to pay	3.934	1.180	0.158	0.163	0.052	0.101	0.972

Note: the lower triangle of the table shows the result of the Fornell-Larcker criterion. The square roots of the average variance extracted are offered in diagonal elements; the upper triangle depicts the results of HTMT.85 indicated with an asterisk.

The findings indicate that the tests are both valid and trustworthy. In variance-based measurement models, such as partial least squares, HTMT is a new indicator for measuring discriminant validity (PLS). Both were used to be on a safer side, despite Henseler's demonstration that the latest method, HTMT, outperforms the conventional Fornell-Larcker criterion (Henseler, Ringle, & Sarstedt, 2015). For the Fornell-Larcker criterion, the Author compared the pairwise correlations between the other latent constructs to the square roots of the AVE values. If the square root of the AVE is higher than the pairwise correlations for each construct of the measurement model, discriminant validity is defined, and this was the case with the results shown in Table 3.

Table 4 Hypotheses testing results

	β	STDEV	T Statistics	P Values	2.50%	97.50%	Remarks
H1a.EC -> KN	0.374	0.061	6.137	0	0.248	0.489	Sig
H1b.EC-> EB	-0.069	0.033	2.07	0.038	-0.134	-0.006	Sig
H1c ECs-> AT	-0.071	0.046	1.538	0.124	-0.167	0.016	Insig
H1d.EC->WTP	0.113	0.065	1.738	0.082	-0.013	0.239	Insig
H2a.KN -> EB	0.760	0.047	16.108	0	0.657	0.844	Sig
H2bKN -> AT	0.583	0.08	7.296	0	0.405	0.726	Sig
H2c.KN-> WTP	0.199	0.085	2.35	0.019	0.023	0.354	Sig
H3a.EB-> AT	0.259	0.083	3.132	0.002	0.103	0.428	Sig
H3b.EB-> WTP	-0.13	0.043	3.043	0.002	-0.205	-0.032	Sig
H4.AT -> WTP	0.017	0.075	0.22	0.826	-0.113	0.187	insig
	R^2	Q^2					
Knowledge	0.14	0.112					
Environmental Believe	0.543	0.474					
Attitude	0.595	0.54					
Willing to pay	0.045	0.039					

1.knowledge – Kn 2.Environmental Concern- EC 3.Environmental Believe –EB 4.Attitude-AT 5.willing to pay-WTP

4.2. Hypothesis result

4.2.1. Consistent PLS

A partial least squares structural equation modelling (PLSeSEM) technique was used to evaluate the proposed hypotheses because we are assured of in-depth outputs as suggested by (Joe F. Hair, Ringle, & Sarstedt, 2011). Hair advises we select PLS-SEM if the study is reflective of an evolution of an emerging classical model. Given that the current research model is a Ghanaian adaptation of Bang's model and interrogation of Lin's approach using PLS-SEM rather than covariance-based structural equation modelling is acceptable. Furthermore, instead of using conventional PLS, this analysis used consistent PLS (PLSc) to evaluate our proposed model(Benitez, Henseler, Castillo, &

Schuberth, 2020; Dijkstra & Henseler, 2015). Smart-PLS 3 evaluates the metric model's construct validity and tests the structural model's parameters.

4.2.2. Report on Relationship

To check the goodness of fitness of the model, we use standardized root mean square residual (SRMR) Henseler et al. (2014), which was 0.041, indicating it was fit for purpose and plausible, as it is less than the 0.08 parameter not to cross (Henseler et al., 2014; Henseler & Sarstedt, 2013). We also had R^2 reported in the table above. The R^2 value for the appropriate variable was used to evaluate each structural path; in general, the R^2 values were acceptable, so the research model's explanatory power was generally satisfactory except for a willingness to pay but the,

On the other hand, this finding is not surprising; it indicates that willingness to pay is affected by a wide range of factors outside the reach of this research. Q^2 was higher than 0. The results of Q^2 also confirm the endogenous constructs' predictive validity. A Q^2 value greater than 0 indicates that the model is predictive.

H1 investigate the relation between environmental concerns and the other variables

We had two distinctive results from the proposed test of the relationship between models, with two supported and vice versa

H1a. The study's findings reveal a positive and meaningful connection between consumers' concerns about solar energy and their awareness of it. (H1a: β=0.374 t= 6.137 p <0.001). H1b also tries to investigate the relationship between environmental concern and Believe. The results findings show there was a negative but significant relationship with (H1b: β= -0.069 t= 2.070 p=0.038). H1c. Although the study predicts a positive relationship between environmental concern and attitude, the result is not statistically significant. (H1c: β=-0.071t= 0.046 p =0.124).H1d. Also, evaluate the relationship between Environmental concerns and Willing to pay. The relationship also reveals the assertion is not supported. (H1d: β=-0.113 t= 1.738 p =0.124)

H2 Investigate the relation between knowledge and other variables

Knowledge showed a positive and significant relation to beliefs, attitudes, and willingness to pay to use solar energy. H2a: β=-0.760 t= 16.108 p <0.001 H2b: β=-0.583 t= 7.296 p <0.001, H2c: β=-0.199 t= 2.35 p <0.019

H3 Investigate the relationship between Environmental Beliefs and 1.Attitude 11. Willing to pay

Environmental believe has a positive influence and significant impact on attitude H3a: β=0.259 t= 3.132 p = 0.002 . Also it has negative impact but significant on willing to pay H3b: β=-0.13 t= 0.22 p = 0.002

H4 investigate the relation between attitude and willingness to pay

According to the study, a favorable customer attitude towards solar energy results in a high willingness to pay more for solar energy.However this was not supported by the results H3b: β=-0.017 t= 0.22 p = 0.826

Table 5 Indirect effects of construct

	Attitude			WTP		
	B	T Statistics	P Values	*B*	T-Statistics	P Values
EC	0.274	5.642	0	0.05	1.914	0.056
Kn	0.197	2.908	0.004	-0.086	1.313	0.189
E.B.				0.004	0.199	0.842

From Table 5 Indirect effects of construct The above results also describe the indirect effect on the attitude and the willingness to pay for solar energy with environmental concerns, knowledge, and environmental belief as parameters. This was inconsistent with what we envisage in our hypothesis; the results show that environmental concerns(β=0.274 t= 5.642 p > 0.001) and knowledge (β=0.197 t= 2.908 p = 0.004) have a significant indirect effect on attitude about solar energy where the same results indicated that Environmental concerns (β=0.050 t= 1.914 p = 0.056) , Knowledge (β=-0.086 t= 1.313 p = 0.189) and environmental Beliefs (β=0.004 t= 0.199 p = 0.842) had no indirect effects on willingness to pay for solar

V. DISCUSSION

5. Discussion

This study attempted three objectives. To begin, try to understand the characteristics of Ghanaian consumers (the general public) and how to engage them in green purchasing as a tool for reducing environmental harm and combating global warming. Second, create a marketing strategy plan and educational feedback to determine the feasibility of large-scale promotion of solar energy into the overall electricity mix as a way of enhancing Ghana's energy performance, and finally, its valuable input for marketers, public officials, investors, and, most significantly, Ghanaian governments seeking to promote and facilitate renewable energy usage within the parameters of Sustainable Development Goal 7

Overall, the findings revealed that the Ghanaian republic has high regard for solar energy. They showed a high degree of knowledge of solar as a clean energy source, which is understandable given Ghana had gotten its electricity from a hydroelectric dam, another renewable energy source, since 1957, rendering them inherently vulnerable to learning about other sources. The respondents also showed a high degree of environmental concern. This isn't surprising, considering that customers being rational looks out for their best - care about their well-being and their children's future (Diamantopoulos et al., 2003; Tan, 2011). Thus, humans are rational creatures who would seek out their well-being if they don't want to see the environment deteriorate. The same can be said for the Environmental belief and attitude about solar energy though lukewarm. The public had a good outlook on environmental beliefs as they were concerned about increasing pollution and degradation. With attitude about solar energy, the receptiveness wasn't bad as well because of good knowledge about solar and the environment, but their effect on willingness to pay or intention to use solar wasn't too apparent and would be further discussed below

The study model showed that seven of the ten hypotheses suggested were accepted, but three were found not to be supported (H1c, H1d, and H4), and two of the seven supported hypotheses had a negative effect. This showed that our conceptual structure model shows comparatively significant support for the preliminary understanding proposed by the TPB than the TRA, implying that beliefs play a more prominent role in buying a green commodity, in this case, solar energy. This is mainly tangent with works (Alwitt & Pitts, 1996; Lin & Syrgabayeva, 2016; Polonsky et al., 2012). Again, the findings supported the hypothesis that consumers' attitudes towards solar energy are influenced more by their environmental beliefs than their environmental concerns(Bamberg, 2003; De Groot & Steg, 2007; Lin & Syrgabayeva, 2016)

Though bang theory(Bang et al., 2000) found concerns and knowledge to be the most important factor influencing buying decisions, our findings have demonstrated counterclaims that knowledge seems to be a dominant factor that leads consumers' decision for green commodities. A consumer with adequate information about the usefulness of solar energy in helping solve the social problem of climate change would aptly love to join the course. Therefore consumers who believe strongly in their duty to safeguard the environment regard environmentally friendly goods favorably and are willing to offer to pay a higher price for them(Kilbourne & Pickett, 2008)

In our research, we found a previously existing relationship. We were aware of the significance of environmental concerns and values(Kilbourne & Pickett, 2008). However, in the context of Ghana, the significance was only partial. We also noticed that ecological issues could positively and negatively impact beliefs because of their partial effects. This demonstrates that as one's knowledge of environmental issues increases, so does one concern for them, and vice versa. The current study also backs up previous research that shows a correlation between high levels of concerns and a desire to improve one's actions to be able to meet concerns

We also found findings that contradicted Chan (2001) assertion that consumers' environmental concerns had no discernible effect on their knowledge of solar energy or their desire to learn more about it. Curiosity is borne out of concern about the environment leading to awareness. Therefore the stakeholders involved would seek information to understand the peculiarly and have an opportunity to know what to do to have a solution to their concerns.

Furthermore, we discovered that awareness, environmental issues, and environmental beliefs all indirectly impacted attitude, indicating a moderation effect of other variables, but this did not influence willingness to pay as perceived by (Egea & de Frutos, 2013). This allows for a more in-depth analysis of attitude to distinctly impact willingness.

The results presented here relate to environmental conservation theory and practice and long-term quality of life. it also provided implication on other their party agencies, which would be discussed in the following chapters

5.1. Managerial implications

Policymakers,government officials, and even companies are enthusiastic about identifying the key determinants or factors on consumers, enabling them to tailor the best communication for people to sway the payment pattern to encourage sustainable consumption. In the broader sense of

environmental sustainability and long-term economic development, marketing can help better understand customer motivation and the various forms of demand influencers for solar energy.

According to the survey findings, the most influential factors driving the intention to make green purchases are knowledge and conviction. However, the negative impact of beliefs on willingness to pay, on the other hand, suggests that prior beliefs must be recognized and discussed in communication strategy. Such convictions may result from human nature's resistance to change; however, consumers' awareness and attitudes must be reinforced for practical and productive behavior change. Advertisers must illustrate to consumers the consequences and costs of depending on conventional energy sources and the real benefits of using renewable energy sources in good faith. Nonetheless, the current findings suggest that the solar industry has a lot of space for growth and development in general. Given that the solar industry and usage are still in their early stages in the energy market,

The Ghanaian society is very conservative and difficult to persuade, let alone persuade to pay more for new technology. As a result, more effective marketing, especially for the already shaped mind, and the education of prospective customers and buyers are needed to facilitate this bias. Another option is if neighboring countries and African states agree to design and implement environmental policies and actions to increase green consumption, especially solar consumption. Solar Energy will be much faster and easier to introduce to the market.

Unfortunately, since 2011 an incorporated law was established to help stimulate the prospect of an improved energy mix with a renewable energy emphasis(premium on solar) - the aim was a rise of 10%. However, by 2019 the target stood still at 0.08%. So the engagement of the stakeholder and public could enable improvement on the target delivery. Finally, education and training incorporation into the marketing campaign, the use of information technology and strategic implications, and the maximization of customer value across a product spectrum can contribute to the efficacy of green marketing.

VI. CONCLUSION

6. Limitations and future research

Our analysis had some shortcomings in sample size, the variable we used, and the unknown bias we received from respondents. However, the drawbacks were largely compensated by the advantages and gains of the critical review and study results. Also, TRA and TPB have other alternate variables that we did not consider in this analysis. This opens the door to further research. Our work allows advertisers to experiment with the best ways to convey persuasive information to persuade many people to switch to green consumption.

As researchers, we are also aware that other influences have a significant impact on actions or behaviors. The introduction of attributes such as societal expectations, materialism, perhaps social interaction, or even political expectations into further investigation would provide insight into their relevance to behavior norms.

Also, the aim is to reduce the effects of climate change while encouraging sustainable consumption; I propose other scholars integrate other social science hypotheses into future studies. Furthermore, the scope of research may be extended if appropriate secondary data sources exist for such tasks.

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