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Article

Drivers of Energy Conservation: Rethinking Household Energy Behaviors

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Abstract: Rising energy crisis and overreliance on fossil fuels pose a significant threat to the environment and intensify climate change risks in emerging economies. Understanding the psychological drivers of energy-saving behavior is crucial for mitigating these risks. Thus, this study uniquely extended Value-Belief-Norm (VBN) theory and offered novel insights into the roles of environmental values, moral norms, and perceived behavioral control (PBC) in energy-saving behavior in Bangladesh. Researchers surveyed energy consumers in Dhaka and Chattogram, two major cities of Bangladesh, using the judgment sampling method preceded by a pilot study. They obtained 467 valid responses and analyzed the data using Structural Equation Modeling in SmartPLS 4. The results show that biospheric and altruistic values positively influence moral norms that, in turn, drive energy-saving behavior. However, the positive and significant impact of hedonic values on moral norms challenges earlier evidence about the motivations for energy conservation. Also, moral norms mediate the relationships between values and energy-saving behavior. Although a positive moderation impact is observed, PBC fails to significantly moderate the association between moral norms and energy-saving behavior. All these unique findings regarding consumers' psychological drivers will enable policymakers and energy-saving advocacy groups to design messaging strategies and behavioral intervention programs in Bangladesh and similar emerging economies.

Keywords: Altruistic Values; Biospheric Values; Climate Change; Emerging Economy; Energy-Saving Behavior; Hedonic Values; Moral Norms; Perceived Behavioral Control; PLS-SEM; Value-Belief-Norm Theory

1. Introduction

Nearly 50 billion tons of greenhouse gases (GHG) are emitted yearly around the globe, 75% of which comes from energy use [1]. Globally, 82% of energy generation in 2023 used fossil fuels [2]. The unchecked use of fossil fuels is one of the key factors contributing to an increase in greenhouse gas (GHG) concentrations in the environment, which ultimately leads to global warming [3]. More to the point, energy-related GHG emissions from residential buildings are almost 11%. In the face of severe climate change challenges, the Paris Agreement has set a limit to the global average

temperature rise to 1.50 °C above the pre-industrial level, which is expected to be realized between 2030 and 2052 [4].

The residential sector was assumed to have a high potential for achieving a significant and cost-effective reduction in energy consumption and greenhouse gas emissions [5]. Promoting household energy-saving behavior is a fruitful, sustainable strategy [6]. Thus, this investigation provided insight into the psychological drivers of energy-saving behavior in households, considering Stern's Value-Belief-Norm (VBN) theory. The theory postulated that moral norms mediate the relationship between individuals' values and pro-environmental actions. People's values influence general environmental beliefs, which include the New Ecological Paradigm (NEP), awareness of consequences (AC), and ascription of responsibility (AR). These beliefs then activate moral norms that encourage pro-environmental behavior. According to the taxonomy of pro-environmental behaviors [7], household energy-saving behavior falls under the category of private-sphere pro-environmental behaviors. Promoting energy-saving behaviors requires understanding the psychological factors that influence these behaviors. Therefore, this theory has been applied in a significant number of energy-related investigations [8–9] and was mainly found valid in this regard. Nonetheless, the current study has developed a parsimonious conceptual model that bypasses beliefs (NEP, AC, and AR). Instead, it directly examines the effects of three types of values (altruistic, biospheric, and hedonic) on moral norms that lead to energy-saving behavior. Additionally, the application of such parsimonious models is not uncommon in analyzing energy consumption and pro-environmental behaviors [10–12].

Values significantly guide human behaviors and behavioral intentions [13]. Researchers [13–15] have identified values of individuals as essential elements to work on while promoting or encouraging pro-environmental behaviors (energy-saving behaviors in this case). Values significantly influence our intrinsic motivation [14], and motivation serves as a driving force for behavior and an essential element in any behavior change [16]. Several researchers [10, 17, 18] have delved into human values and how they influence and guide energy-saving behaviors. Still, further investigations are warranted in multicultural contexts. Next, individuals behave pro-environmentally, guided by their moral norms, because they perceive such behaviors as right [19]. Thus, moral norms play a crucial role in leading individuals toward energy-saving behaviors, even though performing such behaviors is sometimes effortful and costly [10, 12, 20]. The study's novelty lies in investigating the mediation impact of moral norms on the relationships between values and energy-saving behavior. A few researchers have done similar investigations [12, 20], but in a narrow scope.

Furthermore, the study also extended the VBN theory by adding perceived behavioral control (PBC) as a moderator. The extension aligns with Stern's propositions of personal capabilities and contextual factors. Additionally, numerous scholars have examined the role of PBC on various pro-environmental behaviors [21–22] or energy-saving behaviors [23–26]. However, they considered PBC an independent variable or a mediator. Very few studies [27] deemed perceived behavioral control as a moderator in the VBN framework. Therefore, to capture the full spectrum of PBC's impact on energy-saving behavior, there is a need to explore PBC's impact as a moderator. Additionally, the VBN theory has been primarily tested in developed nations. There are still opportunities to test it in developing countries [8] and Asian regions [28]. Thus, the current study used a uniquely modified

form of the Value-Belief-Norm (VBN) theory of pro-environmental behavior in the context of a developing/emerging nation.

With over 1,000 people per square kilometer, Bangladesh is the seventh most populous country [29]. The country's increasing population and transition to an industry-based economy have driven energy demand by an annual growth rate of 10% over the past decade, projected to double by 2030 [30]. More to the point, 98% of the electricity generation comes from fossil fuels [31]. Bangladesh is already one of the world's most vulnerable countries regarding climate change issues, holding 177th out of 180 countries [32]. Therefore, increasing the use of fossil fuels will only worsen the recent climate change issues. Consequently, the country established a target to reduce household GHG emissions by 6.30 percent by 2030 [33]. Such a reduction would be implemented as part of its nationally determined contributions (NDC) under the United Nations Framework Convention on Climate Change.

It was estimated that the energy efficiency and conservation (EE&C) potential in the residential sector is 28.8% of the total consumption [34]. Changing the energy use behavior of households could be a low-cost, practical, and easily achievable demand-side management (DSM) strategy [35]. Through behavior change, it is possible to conserve energy between 3% and 20% [36]. Conscious energy consumption and household savings behaviors can also reduce greenhouse gas emissions [35]. Household energy consumption currently accounts for 52 percent of the total energy consumption in Bangladesh [37]. Therefore, energy-saving behavior at homes can a) help decrease the pressure on the government budget, b) ease the ongoing energy crisis in the short term, and c) improve climate conditions in the long term. Therefore, a study that delves into consumer psychology behind performing energy-saving behavior is essential. Such studies would equip policymakers and practitioners to understand what motivates people to save energy.

Although there is a strong need to motivate consumers to adopt energy-saving behaviors, the psychological factors underlying these behaviors have rarely been investigated in Bangladesh, as this study did. A few studies [36–37] have investigated energy-saving behavior with narrow scopes. A case-study research demonstrated that energy savings at the residential level were achievable through behavioral interventions in consumers [36]. Furthermore, the knowledge and attitude toward energy-saving among residential customers have been studied in a limited scope, i.e., for only one city [37]. Additionally, several studies have been conducted on household energy consumption patterns [39–40], energy choice [41], and the socio-demographic factors underlying the use patterns [38-39]. Thus, from a review of recent and existing literature, a significant void remains in studies examining psychological factors that influence household energy-saving behavior. Given the importance of residential energy saving, which has already been discussed, this study aimed to address this gap. The study's objectives were to determine whether

i) environmental values affect moral norms for energy-saving behavior,
ii) moral norms influence the energy-saving behavior in households both as an independent variable and as a mediator, and
iii) perceived behavioral control moderates the relationship between moral norms and energy-saving behavior.

This study holds valuable significance for relevant stakeholders. Since the government aims to establish a voluntary and proactive cycle of energy conservation among the people of Bangladesh, understanding the factors that motivate or hinder energy conservation in the residential sector is vital.

Additionally, this study will help policymakers develop and implement new policies related to residential consumption and refine existing ones. Moreover, the study's insights would help create awareness among people and enable stakeholders to design and implement behavioral intervention programs relevant to energy-saving policies and programs. Hence, a study investigating individual energy-saving behavior and its predictors is well-timed and crucial.

The paper will have the following outline. First, a brief discussion of the nature of energy-saving behavior is presented, followed by an overview of the study's theoretical framework. Next, the relevant literature is critically reviewed to identify research gaps and formulate hypotheses based on these findings. The methodology section will then describe the research process. Next, a section will present the main findings of this study. The final section discusses the results, their implications for relevant stakeholders, and some directions for further research.

2. Literature Review and Hypotheses Development

Energy-Saving Behavior. Energy-saving behaviors are actions that individuals take to reduce their overall energy consumption [15]. These include a wide range of actions, from simple and easy ones, such as switching off the lights in unused rooms, to high-cost and complex ones, such as installing energy-saving retrofits [40]. However, when investigating and designing interventions, addressing each specific behavior may not be feasible or effective [41]. Thus, two main categories/dimensions of behaviors – i) curtailment behavior and ii) efficiency behavior - were spotted and investigated by many recent researchers [40–43]. Curtailment behaviors help save energy by reducing usage, whereas efficiency behaviors help save energy by purchasing more efficient appliances [44].

The above two types can be distinguished based on the degree of involvement and consumer comfort [42]. Energy efficiency behaviors require planning, monetary investment, and time to implement and thus can be labeled as high-involvement behaviors. However, these behaviors increase consumer comfort [40, 42]. Examples of such behaviors include buying energy-efficient appliances, fuel-efficient cars, and retrofitting houses. On the other hand, energy curtailment behaviors are less costly and easier to execute, but they involve a range of sacrifices on the part of consumers [41]. Examples of such behavior include using fewer appliances, traveling more by public transport, and switching off lights and fans, among other actions. Furthermore, there is a third category, named maintenance behaviors, that aims to save energy by maintaining appliances more effectively, ensuring they perform optimally and efficiently [45].

To some extent, many consumers perform both curtailment and efficiency behaviors [42]. Also, some researchers favored researching environmentally significant behaviors holistically to understand the motivators behind these [46–47]. Some recent studies [48] have done so. However, our pilot study revealed that Bangladeshi households practice energy-efficiency behaviors minimally. Instead, energy curtailment behaviors are more prevalent. Thus, for this investigation, only energy curtailment behaviors were measured.

Environmental Values. Human values can be defined as enduring beliefs that some specific modes of conduct are preferable, personally or socially, to other modes of conduct [49]. People develop values at an early stage of life that remain stable throughout their lives, even in various situations, with minimal changes [50]. In measuring the roles of values in pro-environmental or conservation behavior, researchers typically use a modified version of the Schwartz Value Survey (SVS) [51]. This modified version is Environmental-SVS or E-SVS [52–53]. E-SVS presents four values under two

dimensions: (i) self-transcendence and (ii) self-enhancement. The self-transcendence dimension (biospheric and altruistic values) makes people emphasize the interests of others and the environment. On the other hand, the self-enhancement dimension (egoistic and hedonic values) emphasizes self-interest. For this study, the authors were interested in examining the impact of the self-transcendence dimension on household energy-saving behaviors. Two values—biospheric and altruistic—were included in the self-transcendence dimension. Altruistic values (AV) refer to a concern for other people's fair treatment and welfare [53–54]. Biospheric values (BV) refer to a concern for the welfare of other species and the environment, even if it is not linked to humans [7, 53]. Furthermore, the influence of hedonic values from the self-enhancement dimension has also been investigated in this study. Hedonic values (HV) primarily focus on enhancing a person's positive feelings, attaining pleasure, and reducing effort [53].

Moral Norms. Moral norms (MN) are self-expectations based on internalized values and feelings of moral obligations to perform a specific behavior [55]. According to the Norm Activation Theory [55], personal moral norms are activated when individuals become aware of the consequences of their behavior on others (humans and non-humans) and ascribe some responsibility to themselves. Again, moral norms can be regarded as an individual's values attached to a particular behavior, which are socially validated and determined [56]. Norms are considered moral when they involve moral evaluations of right or wrong. Situations can be morally relevant when individuals' self-interests and other people's interests conflict. In this study moral norms refer to an energy user's internalized moral obligations to perform energy-saving behavior.

Perceived Behavioral Control. PBC was conceptualized as the perception of an individual's degree of control over their behavior [57]. Individuals consider the availability of resources such as skills, information, and opportunities required to perform the behavior, as well as any possible barriers or impediments they may need to overcome [58–59]. In this study, PBC refers to an energy user's perceived degree of control over energy-saving behavior.

Relationship between Values and Moral Norms. Since values are relatively stable [7], it is worthwhile to examine how values influence behaviors. It has been argued that moral norms were rooted in human internalized values [60]. Also, VBN theory [7, 13] postulated that values affected personal/moral norms. Individuals with different value orientations attended to relevant, value-congruent information that influenced their moral norms related to environmental behavior [61]. However, the impact varies according to the types of values [7, 62]. When considering pro-environmental behaviors or actions, self-transcendence values (altruistic and biospheric) were significantly and positively associated with moral norms [12, 52, 53, 63]. Thus, the following hypotheses are developed:

Hypothesis 1: Altruistic values positively affect moral norms for energy-saving behavior.

Hypothesis 2: Biospheric values positively affect moral norms for energy-saving behavior.

Unlike self-transcendence values, self-enhancement (both egoistic and hedonic) values were negatively associated with moral norms in cases of similar behaviors. Researchers [10, 64] explicitly investigating the influence of hedonic values on various pro-environmental behaviors have reported that people with stronger hedonic values were less likely to feel morally obliged to perform pro-environmental actions. Notably, hedonic values negatively affect the performance of environmental behaviors that require increased effort and sacrifices of personal pleasures (for example, energy-saving behaviors) compared to behaviors that contribute to personal pleasure without being pro-

environmental (for example, riding personal vehicles) [52]. However, further investigations of hedonic values in multicultural contexts were warranted to reach conclusions regarding this relationship [10]. From the above discussion, the following hypothesis is proposed:

Hypothesis 3: Hedonic values negatively affect moral norms for energy-saving behavior.

Relationship between Moral Norms and Energy-Saving Behavior. Moral norms directly influence non-activist, personal sphere behavior aimed at protecting the environment [13]. This relationship is tested in various contexts and behaviors [11, 19, 65]. Workplace energy use has been positively and significantly affected by moral norms, as suggested by a study [65]. Similar findings were reported [12] regarding energy-saving behavior both at home and in the workplace. The more intense an individual's moral norms, the more inclined they become to engage in general energy-saving behavior [19]. Nevertheless, some investigations [9, 66] reported no significant relationship between these two variables. Thus, this investigation forms the following hypothesis:

Hypothesis 4: Moral norms positively affect energy-saving behavior.

Perceived behavioral control as a moderator between Moral Norms and Energy-Saving Behavior. Researchers [67] proposed that moral norms influenced behaviors, which did not require overcoming complex barriers or incurring huge costs. The VBN theory was built on this concept of moral norms [13]. Therefore, it can be assumed that PBC has a reason to moderate the relationship between moral norms and behavior in VBN theory. Researchers [27, 68] investigated whether PBC moderated moral norms' impact on willingness to perform a behavior. They reported that PBC significantly moderated the influence of moral norms on the willingness to perform a specific behavior. Respondents with higher levels of PBC were more willing to perform the behavior despite scoring low in moral norms. That means PBC was a weaker driver of willingness to engage in behavior among the participants with firm personal norms.

Furthermore, empirical studies [60, 69] confirmed PBC's moderating impact on the relationship between moral norms and behavioral intention. These studies reported a negative moderating effect of PBC on the relationship between moral norms and behavioral intention, indicating that with low levels of PBC, moral norms have a strong influence on behavioral intentions. However, the findings of these studies contradicted the reasoning of earlier researchers [67]. More to the point, studies examining PBC's moderating impact on the relationship between moral norms and energy-saving behavior are scarce. Thus, the following hypothesis was formed:

Hypothesis 5: PBC moderates the relationship between MN and ESB.

Moral Norms as a Mediator between Values and Energy-Saving Behavior. Researchers argued that values have an indirect relationship with behaviors, and mediating factors are more likely to exist between values and behaviors [7, 13]. Later, investigators have suggested the same [65]. Studies [11, 65–66, 70] have tested the indirect effect of values on energy-saving behaviors. However, a few researchers have investigated the mediating impact of moral norms on the relationships between values and energy-saving behavior and have reported a partial mediating effect of MN between AV and ESB [12]. Another study on children [20] reported that personal (moral) norms only mediated relationships between biospheric values and some energy-saving behaviors, but not all. Therefore, this study focuses on testing the following hypotheses:

Hypothesis 6: Moral norms mediate the relationship between AV and ESB.

Hypothesis 7: Moral norms mediate the relationship between BV and ESB.

Hypothesis 8: Moral norms mediate the relationship between HV and ESB.

All the above hypothetical relationships were combined to create the study's conceptual framework (Figure 1). The theoretical framework, namely VBN theory, is also placed above the conceptual framework in the exact figure for better understanding. Such a parsimonious conceptual model, which bypasses beliefs (NEP, AC, and AR) and directly investigates the effects of values on moral norms and ultimately energy-saving behavior, aligns with the fundamental propositions of VBN theory. The theory postulated that although each variable in the chain directly affects the next, each may also directly impact variables farther down the chain [7, 13]. Since 'Beliefs' were bypassed for the current study, it is shown inside a dotted box in Figure 1.

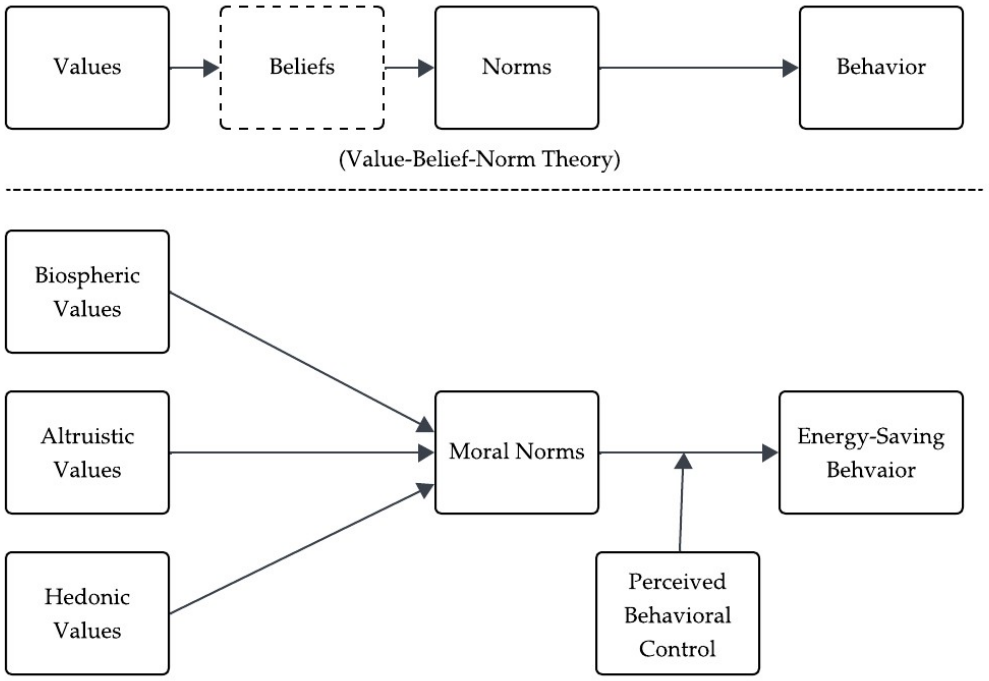

Figure 1. The theoretical and conceptual framework for energy-saving behavior.

3. Materials and Methods

3.1. Sample

The study's data were collected from participants using the non-probability judgment sampling method. The reason for using judgment sampling to select respondents is to identify eligible energy users. Also, it is difficult for social science researchers to implement random (probability) sampling without a sampling frame [71]. Since the sampling frame was unavailable, and it was almost impossible to prepare one, a nonprobability sampling technique was used in the current study. Consumers from two large cities, Dhaka and Chattogram, participated in the survey. These cities have high energy consumption. There is a significant difference among the divisions of Bangladesh in terms of electricity consumption, where the capital, Dhaka, and the port city, Chattogram, consume 40–45% and 20% of the total electricity, respectively [72]. Compared to that, other divisions consume less energy per capita. The minimum criterion set by the researcher was that the sample must pay their electricity bill and have a minimum level of education. These criteria were fixed to determine whether the participants were aware of efficient energy consumption in their daily usage. Researchers distributed 765 questionnaires to participants who met the requirements and expressed interest in participating in the study from July

2024 to October 2024. Out of 765 questionnaires, 467 were received in usable forms for analysis, yielding a 61.05% response rate.

Based on the demographic analysis of the 467 respondents, the percentage of male respondents was slightly higher than that of females (58.7% vs. 41.3%). The majority of respondents were unmarried (78.2%), and almost 85% were within the age range of 35. A considerable number of respondents were students (68.3%). Regarding educational qualifications, 60% of the participants held bachelor's degrees, and 21.8% were from postgraduate programs. Regarding the monthly family income of the respondents, the categories were almost evenly distributed, except for the last two higher-income groups. Finally, the data were collected from participants in the two large cities of Bangladesh: Dhaka (76.4 %) and Chattogram (23.6%).

3.2. Questionnaire Design and Pilot Testing

The study adopted a multi-item reflective indicator to operationalize its six constructs. All the constructs (except the one measuring energy-saving behavior) were measured using a seven-point Likert scale (1 = 'Strongly disagree,' 4 = 'Neutral, ' and 7 = 'Strongly agree'). E-SVS [52–53] was partially adopted to measure environmental values. The measurement scale of MN has been adapted from earlier research [11, 73], and the scale for PBC was taken from [74], who measured similar behaviors. Moreover, energy-saving behavior was measured through a six-point frequency scale where 1 = 'Never' and 6 = 'Always.' The measurement scale was adapted from similar studies [41, 48] that measured households' energy-saving behaviors. A total of 25 items in the questionnaire were used to measure six variables, as shown in Appendix A. Besides, there were seven demographic questions.

A pilot study was conducted with 15 respondents, resulting in minor changes in the initial draft of the questionnaire before the final survey administration. The respondents were asked to evaluate different aspects, including wording, sentence structure, clarity of each item, and the relation of each item to the corresponding construct. Although the questionnaire was written in English, it was later translated into Bangla, which an expert in the Bangla language verified.

The Common Method Bias (CMB) has been assessed using both procedural design and a multicollinearity check through variance inflation factors (VIF), as recommended by previous research [75]. For procedural design, the researchers consulted with faculty members with relevant knowledge and administered a pilot test as described earlier. Also, the anonymity of respondents was ensured. Furthermore, the inner VIF value of the model, which is <2, also confirms that there is no multicollinearity [75].

3.3. Data Analysis Methods and Tools

The study utilized IBM SPSS (version 26) to analyze the demographic variables and SmartPLS 4 to conduct partial least squares structural equation modeling (PLS-SEM), examining the proposed model. The PLS-SEM analysis was done in two steps, where the authors first assessed the measurement or outer model and then the structural or inner model. The outer model was evaluated to confirm the reliability and validity of the data before testing the hypotheses. The model comprised five reflective constructs: Altruistic Values, Biospheric Values, Hedonic Values, Moral Norms, Perceived Behavioral Control, and Energy-Saving Behavior. The construct reliability and convergent validity for each construct were assessed through outer loading, Cronbach's alpha (CA), composite reliability (CR), and the average variance extracted (AVE). For CA and CR, the cutoff value is .70, and for AVE, 0.50

[75–76]. Items were kept or deducted in the model based on these cutoff values. However, in some cases, the researchers kept some low-loading items in the model, as removing them did not improve the respective construct's CR and AVE [75–76].

Furthermore, authors applied two methods to ensure discriminant validity – the Heterotrait-Monotrait (HTMT) ratio and the Fornell-Larcker criterion. HTMT values exceeding 0.85 may indicate problems with discriminant validity [75]. Also, the Fornell-Larcker criterion compares the square root of each construct's Average Variance Extracted (diagonal positions) and the correlations of the construct with every other construct (off-diagonal positions). The square root of each construct's AVE should be larger than all correlations between the respective construct and other constructs.

In the structural model, the model's explanatory power was assessed through f-square (f^2), Q^2predict, and R-square (R^2) values for key relationships. The f^2 values indicate the effect size of exogenous constructs on the endogenous constructs, while the other indicators, such as R^2 and Q^2predict, present predictive relevance and accuracy [75]. Moreover, the path analysis results of eight hypotheses of the structural model included means, standard deviations, path coefficients, t-statistics, and p-values. Hypotheses were accepted or rejected based on these values.

4. Results

4.1. The Assessment of Measurement Model (Outer Model)

Table 1 presents the output of construct reliability (outer loadings, CA, and CR) and convergent validity (AVE). In the case of outer loading shown in Table 1, all the items crossed the cutoff value of 0.70 except for four items: ALT3 (0.655), ESB3 (0.631), HED1 (0.688), and MN3 (0.660). Since removing those items did not improve the AVE of the respective construct, the researchers kept those. However, two items in energy-saving behavior, ESB4 and ESB5, were discarded due to poor loadings and their subsequent unfavorable impacts on AVE. The results in Table 1 show that all CR values were above 0.7, which ensured good reliability and internal consistency of the constructs in the present study. Furthermore, all the calculated values of AVE in Table 1 range from 0.518 to 0.715, ensuring convergent validity.

Table 1. Outer model evaluation.

Construct	Items	Loading	CA	CR	AVE
Altruistic Values	ALT1	0.709	0.751	0.843	0.575
	ALT2	0.855			
	ALT3	0.655			
	ALT4	0.799			
Biospheric Values	BIO1	0.811	0.867	0.909	0.715
	BIO2	0.843			
	BIO3	0.872			
	BIO4	0.856			
Energy-Saving Behavior	ESB1	0.737	0.687	0.810	0.518
	ESB2	0.783			
	ESB3	0.631			
	ESB6	0.719			

Hedonic Values	HED1	0.688	0.781	0.867	0.688
	HED2	0.880			
	HED3	0.904			
Moral Norms	MN1	0.847	0.777	0.854	0.596
	MN2	0.822			
	MN3	0.660			
	MN4	0.745			
Perceived Behavioral Control	PBC1	0.791	0.756	0.842	0.572
	PBC2	0.800			
	PBC3	0.710			
	PBC4	0.718			

The result of the first test of discriminant validity, the HTMT matrix, is presented in Table 2. All the HTMT values associated with AV, BV, ESB, HV, MN, and PBC were below the suggested threshold (0.85), indicating no significant concerns regarding the discriminant validity of the constructs.

Table 2. Heterotrait-Monotrait ratio matrix.

	1	2	3	4	5	6
1. Altruistic Values						
2. Biospheric Values	0.821					
3. Energy-Saving Behavior	0.529	0.559				
4. Hedonic Values	0.582	0.536	0.347			
5. Moral Norms	0.664	0.659	0.513	0.462		
6. Perceived Behavioral Control	0.640	0.569	0.455	0.518	0.814	

Furthermore, Table 3 presents the second test of discriminant validity, the Fornell-Larcker criterion. The square root of AVE for all six variables - AV (0.759), BV (0.846), ESB (0.720), HV (0.830), MN (0.772), and PBC (0.756) exceeded the correlations of the respective constructs with other constructs (see the off-diagonal values). Thus, the above-mentioned methods presented in Tables 2 and 3 confirmed that the constructs were distinct from each other in the measurement model, ensuring discriminant validity.

Table 3. The Fornell-Larcker criterion.

	1	2	3	4	5	6
1. Altruistic Value	0.759					
2. Biospheric Value	0.671	0.846				
3. Energy-Saving Behavior	0.383	0.429	0.720			
4. Hedonic Value	0.480	0.470	0.261	0.830		
5. Moral Norms	0.529	0.562	0.382	0.401	0.772	
6. Perceived Behavioral Control	0.497	0.488	0.345	0.425	0.636	0.756

4.2. The Structural Model (Inner Model)

The results in Table 4 present that the biospheric values had the highest f^2 value (0.098) among the three values, indicating their effect on moral norms. For energy-saving behavior, the f^2 value for Moral Norms was 0.060. The interaction between perceived behavioral control and moral norms had an f^2 value of 0.007.

Table 4. Explanatory power of the model.

Relationships	f-square	Q^2predict	R-Square
Altruistic Values --> Moral Norms	0.046		
Biospheric Values --> Moral Norms	0.098		
Hedonic Values --> Moral Norms	0.018		
Moral Norms --> Energy-Saving Behavior	0.060		
PBC x Moral Norms --> Energy-Saving Behavior	0.007		
Energy-Saving Behavior		0.149	0.169
Moral Norms		0.350	0.369

The R^2 values in Table 4 indicate that the model explained 36.9% of the variance in moral norms and 16.9% of the variance in energy-saving behavior. Since Q^2predict values for MN and ESB were larger than zero, it can be concluded that the path model's predictive relevance for the dependent constructs [76] was satisfactory.

Table 5. Test of hypotheses.

Hypothesis	Sample Mean (M)	SD	Path Coefficient	t-statistics	p-values	Decision
H1: AV[1] → MN[2]	0.243	0.059	0.238	4.060	0.000	Accepted
H2: BV[3] → MN	0.339	0.065	0.344	5.282	0.000	Accepted
H3: HV[4] → MN	0.128	0.056	0.125	2.223	0.013	Rejected
H4: MN → ESB[5]	0.291	0.070	0.299	4.271	0.000	Accepted
H5: PBC[6] × MN → ESB	0.026	0.052	0.042	0.819	0.206	Rejected

[1] Altruistic Values, [2] Moral Norms, [3] Biospheric Values, [4] Hedonic Values, [5] Energy-Saving Behavior, [6] Perceived Behavioral Control.

Table 5 and Figure 2 present the path analysis results of four direct relationships and the moderating relationship, including path coefficients, standard deviations, t-statistics, and p-values. The analysis revealed that altruistic values and biospheric values had significant and positive influences on moral norms. Thus, H1 and H2 were accepted. However, hedonic values do not negatively affect moral norms. Therefore, H3 was rejected.

Furthermore, moral norms had a significant and positive impact on energy-saving behavior (See Table 5). Thus, H4 was accepted. However, the interaction between PBC and moral norms failed to significantly influence energy-saving behavior. Consequently, H5 was rejected.

The analysis in Table 6 reveals that the indirect effects of both altruistic values and biospheric values on energy-saving behavior through moral norms were significant. In contrast, the direct effects were insignificant. Therefore, the influences of AV and BV on ESB occurred entirely through moral norms, demonstrating full mediation. Furthermore, the mediations were complementary, as

evidenced by the positive indirect effect and the confidence intervals that did not include zero. Thus, H6 and H7 were accepted.

In contrast, the relationship between hedonic values and energy-saving behavior was weaker but still partially mediated through moral norms, as evident from Table 6. The indirect effect is marginally significant (p-value = 0.050), as well as the direct effect (p-value = 0.039), pointing to partial mediation. Despite the weaker effect, the mediation remains complementary, as indicated by the positive indirect effect and the confidence interval (0.000 to 0.074), which includes zero at the lower bound but is significant at the upper bound. Thus, H8 was accepted.

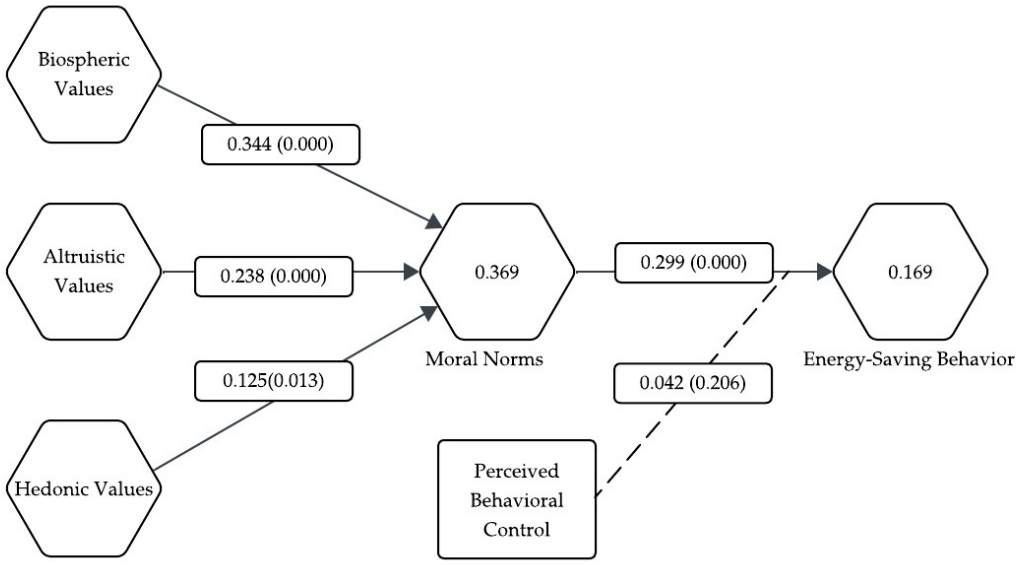

Figure 2. The structural model.

Table 6. Results of the mediation analysis.

	Total Effect			Direct Effect			Hypothesis	Indirect Effect					
	Beta	t	P	Beta	t	p		Beta	T	P	SE	Lower	Upper
AV--> ESB	0.113	2.791	0.005	0.042	1.71	0.087	H6: AV--> MN--> ESB	0.071	2.891	0.004	0.0246	0.022	0.120
BV--> ESB	0.145	3.459	0.001	0.042	1.17	0.243	H7: BV--> MN--> ESB	0.103	2.864	0.004	0.036	0.032	0.174
HV--> ESB	0.076	1.920	0.055	0.039	2.07	0.039	H8: HV--> MN--> ESB	0.037	1.964	0.050	0.0188	0.000	0.074

AV = Altruistic Values, ESB = Energy-Saving Behavior, BV = Biospheric Values, HV = Hedonic Values.

5. Discussion

The results in Table 4 suggest that among the three values, BV exerted the highest influence (f-square = 0.98) on MN, followed by AV (0.046) and HV (0.018). The three values combined explained 36.9% variance in moral norms. Also, with an effect size of 0.060, moral norms explained 16.9% of the variance (R-Square) in energy-saving behavior.

The first objective of the study was to test whether environmental values affect moral norms for energy-saving behavior. The study results (in Table 5) showed that both altruistic values (Beta Coefficient = 0.238, t-value = 4.060, and p-value = 0.000) and biospheric values (Beta Coefficient = 0.344, t-value = 5.282, p-value = 0.000) had significant, positive relationships with moral norms for energy-saving behavior. The results regarding the positive effects of altruistic and biospheric values on moral norms confirmed the most dominant approach of promoting environmental behaviors by stimulating self-transcendence values. Earlier, it was believed that people with self-transcendence values would be more engaged in pro-environmental behaviors than people with self-enhancement values [52, 77]. Some recent researchers have confirmed these findings [74, 78]. Unexpectedly, hedonic values did not negatively affect moral norms; rather, they had a significant positive impact (Beta Coefficient = 0.125, t-value = 2.223, p-value = 0.013) on moral norms, as shown in Table 5. This finding contradicts the evidence mentioned above. Now, the question is why.

Hedonism could be referred to as a way of life where pleasure plays a significant role [79]. It manifests itself in values, and hedonic values are related to happiness. Concerning sustainable consumption, it was traditionally believed that sustainable customers were unhappy due to the increased effort and sacrifice required by this behavior. Therefore, hedonism and sustainable behavior cannot go hand-in-hand [80]. However, an analysis of 152 nations (including Bangladesh) revealed that countries high in hedonic values also adhered to higher sustainability practices [81]. In such cases, higher happiness levels were linked to stronger concerns for sustainability. Furthermore, happier nations were more likely to be energy-efficient [82]. Based on all this evidence and the findings of this study, it can be concluded that hedonic values had logical reasons to affect moral norms for energy-saving behavior positively.

The second objective was to assess the direct and indirect influences of moral norms on energy-saving behavior. It is evident from the results (Table 5) that moral norms had a direct and significantly positive impact on energy-saving behavior, as indicated by a path coefficient of 0.299, a t-statistic of 4.271, and a p-value of 0.000. Thus, it can be concluded that the more intense one's moral norms are, the more inclined one becomes to perform energy-saving behavior. This finding confirmed the earlier findings of a group of researchers [11–12] while negating others [26, 66]. Moreover, moral norms played critical roles in leveraging self-transcendence values (altruistic and biospheric) to foster energy-saving behavior, as evidenced by the full mediation of moral norms between self-transcendence values and energy-saving behaviors in Table 6. The robust mediation effect of MN highlights the heightened importance of biospheric values, which are inherently tied to environmental concerns, in fostering energy-saving actions by establishing moral norms [20]. These findings significantly add to the existing literature on energy-saving behavior by confirming the long-standing notion that values only indirectly impact pro-environmental behaviors [66, 70, 83]. Interestingly, moral norms partially and complementarily mediated the relationship between hedonic values and energy-saving behaviors, albeit in a weaker manner. However, the significant direct effect of HV on ESB contradicts the earlier notion of values' indirect-only effect on such behaviors [70, 83], yet is more congruent with recent findings [81, 82].

Finally, the third objective of the study was to determine whether PBC moderates the influence of moral norms on energy-saving behavior. As shown in Table 5, PBC failed to moderate the stated relationship significantly. However, upon careful observation, it was noticed that the effect was positive, even though insignificant. That means the higher the perceived behavioral control, the

stronger the positive impact of moral norms on energy-saving behavior. Although this finding supports the proposition of Schwartz [67], it is inconsistent with the later empirical findings [60, 69]. A probable reason for this non-significant effect could be the non-probability sampling technique, which only included educated, city dwellers. The self-report data could be another reason. Additionally, the differential outcome could be partly attributed to prevailing cultural issues, such as collectivism and group influence in decision-making [84]. Individuals' perception of behavioral control may be influenced by multiple cultural and social factors that the current framework couldn't capture.

The current study has some limitations that should be overcome in future studies. First, the sampling method was the non-probability method. This type of sampling might have generated some selection bias. Had the survey been conducted using probability sampling, the results might have been different. As most respondents were educated, the study may have been affected by social desirability bias, where respondents wanted to appear positively regarding their energy-saving efforts. Additionally, the study's results cannot be generalized due to the non-probability sampling method used. Next, only energy-curtailment behavior was assessed, and the full E-SVS scale was not implemented. Therefore, a holistic picture of household energy-saving behavior could not be drawn. The study is also limited in its geographical scope. A study conducted on a group of similar emerging nations would have demonstrated more in-depth and innovative findings. Finally, in-depth qualitative research, followed by quantitative research with a more robust dataset collected through probability sampling, could validate these findings. Thus, future studies should address and overcome these issues.

6. Implications

The above-stated findings offer some important practical implications for Bangladesh and similar emerging economies. This paper reaffirms the role of self-transcendence values in influencing energy-saving behavior for emerging nations. It is also one of the few that have demonstrated how hedonic values can positively influence sustainable consumption behavior, such as energy-saving behavior. Therefore, values from both dimensions (self-enhancement and self-transcendence) should be incorporated in designing energy-saving interventions and educational programs. Such programs should instill these values in citizens and demonstrate how to engage in responsible energy-saving behaviors. For example, the sellers of electronic home appliances can design and promote their products in a way that promises both feel-good factors and energy savings. Consumer segments will be identified by value orientations (self-transcendence vs hedonic), and creatives will be tailored accordingly. Since moral norms also evidently play a critical role, communication programs should activate consumers' moral obligations to engage in energy-saving behaviors or evoke feelings of guilt if they fail to do so.

Also, the government can encourage consumers to adopt energy-saving behaviors through awards and monetary incentives. Awards such as 'Energy-Saving Hero' and cashback offers through mobile banking apps will align with their hedonic value. The Sustainable and Renewable Energy Development Authority (SREDA) of the government can organize year-round school-level competition programs and science fairs, where students develop energy-saving ideas and household models. Universities can regularly arrange seminars and talks to enhance students' awareness of energy-saving practices and promote their understanding of the importance of sustainability.

Furthermore, banks can offer green mortgages and loans to retrofit households and promote those tied to consumers' moral standards. Religious gurus in the local communities can tie their weekly sermons on morality to energy-saving behavior. This way, a larger audience can be targeted and motivated to perform energy-saving behaviors.

Next, our study offers some important theoretical implications. The study contributes to the existing literature on household energy-saving behavior, providing a robust theoretical foundation and offering fresh insights from an emerging economy. Such an attempt has broadened the scope of energy literature concerning economic conditions and culture. Then, it is one of the few studies that offer some new insights regarding hedonic values in two ways: i) filling the void of research insights regarding hedonic values' impact on sustainable household behavior, explicitly energy-saving behavior, and ii) the unexpected nature of the impact hedonic values have on such behaviors. More to the point, the inclusion of perceived behavioral control as a moderator has opened a new line of investigation in energy behavior research of emerging economies. Individuals' perception of control in these economies may differ from that of their Western counterparts due to economic and cultural factors. Thus, such an extension of VBN theory is both novel and required.

7. Conclusions

This research aimed to investigate household energy-saving behavior using the Value-Belief-Norm theory. The results of the study establish a causal chain between values (altruistic, biospheric, and hedonic), moral norms, and energy-saving behavior of the energy-users from Dhaka and Chattogram, two major cities of Bangladesh. Therefore, the results of this study reaffirm the applicability of the Value-Belief-Norm theory in an emerging country context. The results showed that biospheric values have the highest positive impact on moral norms, followed by altruistic and hedonic values. Moral norms also affect ESB significantly and positively. Although PBC fails to moderate the relationship between moral norms and ESB significantly, the study is one of the few to investigate this relationship. In conclusion, the study reveals intriguing findings regarding values and norms with valuable theoretical and practical implications for Bangladesh and similar emerging nations. Ultimately, these findings can contribute to reducing energy consumption, lowering greenhouse gas emissions, and improving climate conditions in Bangladesh, supporting the global efforts to combat climate change hazards.

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Appendix A: Measurement Scales

Environmental-Schwartz Value Survey (E-SVS) [52-53]

Biospheric Values

Bio1: It is important to me to prevent environmental pollution.

Bio2: It is important to me to protect/preserve the environment.

Bio3: It is important to me to respect nature.

Bio4: It is important to me to be in unity with nature.

Altruistic Values

Alt1: It is important to me that every person has equal opportunities.

Alt2: It is important to me to take care of those who are relatively weaker in the society.

Alt3: It is important to me that there is no war or conflict.

Alt4: It is important to me to be helpful to others.

Hedonic Values

Hed1: It is important to me to have fun.

Hed2: It is important to me to enjoy the life's pleasures, for example, food, sports, wealth, and leisure.

Hed3: It is important to me to do things I enjoy.

Moral Norms [11, 73]

MN1: I feel personally obliged to save as much energy as possible.

MN2: I feel morally obliged to save energy, regardless of what others do.

MN3: I feel guilty when I waste energy.

MN4: I would be a better person if I saved energy.

Perceived Behavioral Control [74]

PBC1: I am confident that I can perform energy-saving behavior if I want to.

PBC2: I think I have the resources, time, and willingness to perform energy-saving behavior.

PBC3: Showing energy-saving behavior is under my control.

PBC4: Performing energy-saving behavior is completely up to me.

Energy-Saving Behavior [41, 48]

ESB1: When I don't use things like TVs, air conditioners, computers, water filters, microwaves, phone chargers, or other household stuff for a long time, I will turn them off to save standby power.

ESB2: I shower or bathe in room temperature water.

ESB3: When I leave a room, I turn off the lights and fans.

ESB4: I switch the lights off when there is sufficient daylight.

ESB5: I avoid using air conditioning at night.

ESB6: I keep the window open and let fresh air enter the house.

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