Empowering Sustainable Choices: The Impact of Self-Efficacy and Response Efficacy on Energy Conservation Attitudes and Behaviours

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ABSTRACT

The negative consequences of unsustainable energy consumption have intensified the urgency to promote conservation behaviour at the individual level. While technological advances and policy interventions have been useful in shaping energy conservation behaviours, individual-level behaviours have emerged as a critical avenue for energy conservation. Drawing on the Values–Attitudes–Behaviour (VAB) framework, this study develops and tests a model explaining the role of self-efficacy and response efficacy in shaping energy conservation behaviour, with value for energy conservation and attitudes towards energy conservation serving as mediators. Data were collected from a sample of 504 energy users in South Africa and analysed using structural equation modelling. The findings revealed that response efficacy has a significant, positive influence on both the value of energy conservation and the attitude towards energy conservation. Self-efficacy, while predicting value for energy conservation, had no effect on attitude. The study also confirmed that values and attitudes influence energy conservation behaviour and that both have a positive mediating effect. The study contributes to the energy conservation literature by establishing the role of efficacy beliefs in influencing the value of energy conservation and highlighting the central role of values and attitudes in energy conservation. The study also provides policymakers with insights on how to promote energy conservation by leveraging efficacy beliefs.

Keywords: self-efficacy, response efficacy, values, attitudes, energy conservation

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1. INTRODUCTION

In recent times, governments worldwide have intensified efforts to stimulate sustainable development and curb unsustainable consumption (Li et al. 2025; Naseer, Hunjra, Palma & Bagh 2025; Yong, Ahmed, Wang, Rjoub & Bilan 2024). The irrational and unrestrained use of the world's resources has led to overconsumption, which in turn has contributed to the depletion of some of the world's most critical resources (Chen & Usman 2025; Gajdzik, Wolniak, Nagaj, Žuromskaitė-Nagaj & Grebski 2024). To advance sustainable development, the UN's Sustainable Development Goals (SDGs) were established, with various international efforts underway to achieve these goals. SDG-7 specifically calls for "affordable, reliable, sustainable, and modern energy for all" (United Nations 2024). However, despite access to reliable electricity being enshrined in SDG7, many households in developing nations still struggle with energy poverty (Donou-Adonsou, Basnet & Mathey 2025; Djeunankan, Njangang & Oumbé 2024; Drago & Gatto 2023). In these countries, nearly a billion people have little or sporadic access to electricity (Wiese & van der Westhuizen 2024). Despite this, energy demand, particularly in households, continues to rise (Chen & Usman 2025; Naseer et al. 2025).

At the same time, scholars have argued that, with household energy usage contributing significantly to total energy consumption (Le-Anh, Nguyen, Nguyen & Duong 2023), one of the best and most cost-effective ways of reducing energy consumption is to encourage individual energy-saving behaviour (Ceylan & Özbakır 2022; Słupik, Kos-Łabędowicz & Trzęsiok 2021). While technological advancements and policy interventions are crucial for curbing energy consumption (Akhtaruzzaman, Banerjee & Boubaker 2025; Han, Peng, Guo, Aslam & Xu 2025), behavioural dimensions of energy conservation remain equally vital, with the everyday actions of individuals being as important to the achievement of SGD7 as technological advances and policy interventions (Le-Anh et al. 2023; Shi, Wang & Wang 2019). However, policymakers in developing countries tend to overlook the behavioural aspects of the negative impacts of environmental degradation (Naeem Nawaz, Alvi, Rehman & Riaz 2022). Consequently, understanding what motivates individuals and households to engage in energy conservation is essential for developing effective intervention strategies that promote sustainable energy use.

In light of this need, this study examines the psychological drivers of energy conservation. Rooted in the Value Attitude Behaviour Framework (VAB), the study's objective is to understand how self-efficacy and response efficacy influence consumer values and attitudes towards energy conservation, and to determine how these values and attitudes subsequently drive energy conservation behaviour. Self-efficacy is an individual's belief in their ability to successfully perform a behaviour, while response efficacy reflects the perception that such behaviour will produce meaningful outcomes (Kothe et al. 2019). Within the VAB framework, such beliefs can strengthen the link between values and attitudes by fostering confidence in one's capacity to act in accordance with those values. The hierarchical VAB framework posits that deeply held personal values influence specific attitudes, which in turn shape behavioural intentions and actual behaviours (Sheikh et al. 2025). In the context of pro-environmental behaviour, the VAB framework suggests that individuals' fundamental values regarding environmental protection and sustainability serve as the foundation for developing specific attitudes toward energy conservation, ultimately manifesting in various conservation behaviours (Sheikh et al. 2025; Kim & Hall 2021).

Building upon this theoretical foundation, the findings of this study are important for two main reasons. Firstly, the study extends the VAB framework to include self-efficacy and response efficacy as precursors to the values and attitudes that motivate energy conservation. Despite their established relevance in risk-prevention and pro-environmental behaviours (Baah, Saleem, Greenland, Tenakwah & Chakrabarty 2024; Hedayati, Damghanian, Farhadinejad & Rastgar 2023), their combined effect on energy conservation attitudes and behaviours remains

underexplored (Zhang, Nketiah, Shi & Cheng 2024; Chen & Yeh 2017). Secondly, current energy conservation interventions often focus on technological solutions, financial incentives and policy considerations but overlook the psychological and behavioural drivers (Hnin, Javed, Karnjana, Jeenanunta & Kohda 2025; Jan & Asif 2025). By demonstrating the role of self-efficacy and response efficacy, this study provides evidence-based insights that can guide the design of more effective policies, awareness campaigns, and educational interventions aimed at strengthening individuals' confidence and belief in the impact of their energy conservation actions. Ultimately, by exploring these factors, the study seeks to identify the pathways to enhancing individual energy conservation behaviour, especially during times of energy strain. Insights from this research will help design strategies that will inculcate a culture of energy consciousness and empower consumers to contribute meaningfully to energy security.

2. LITERATURE REVIEW

2.1 ENERGY CHALLENGES IN SOUTH AFRICA

South Africa, despite being the largest economy in Africa, and its position as the biggest producer of electricity in the region (International Energy Agency 2024) has grappled with the challenge of energy poverty for almost two decades. In the late months of 2007, the country began implementing "load shedding" (Inglesi-Lotz 2023), a challenge that persisted until recently (Wiese & van der Westhuizen 2024). Load shedding is a term that refers to moving parts of the national grid offline in order to lessen the load on the power supply (Mabunda, Mukonza & Mudzanani 2023). This action, which causes rolling blackouts, is due to insufficient electricity generation as a result of the poor state of the generation facilities, as well as the limited capacity of production and distribution (Wiese & van der Westhuizen 2024). These power outages posed a significant threat to the country's everyday economic life and caused a major setback to the long-term growth prospects of the country (Marope & Phiri 2024).

Over the years, various reasons have been advanced for the persistence of load shedding, including the breakdown of power stations, electricity theft, increased manufacturing technologies, and the exponential growth in the number of electricity consumers after the government's accelerated efforts to provide energy to the previously disadvantaged (Marope & Phiri 2024; Mabunda et al. 2023; Ritchie, Engelbrecht & Booysen 2023). Regardless of the specific reason, one thing has remained certain: load shedding has been one of the country's most critical challenges. Negative effects include disrupted production, economic loss, income inequality, disrupted financial services, increased food insecurity, unemployment and negative mental health outcomes (Dlamini, Rampedi & Kwenda 2025; Wiese & van der Westhuizen 2024; Inglesi-Lotz 2023). Therefore, given South Africa's position as the leading producer of electricity in Africa and the negative impacts of load shedding on the country's economic and social life, strengthening energy conservation efforts is essential for long-term stability.

2.2 ENERGY CONSERVATION BEHAVIOUR

Energy conservation behaviour, a subset of pro-environmental behaviour, refers to all the actions that reduce overall energy usage, including electricity (Piao & Managi 2023). Energy-saving behaviours encompass all the daily and habitual practices where individuals use energy, but with a specific focus on usage reduction (Naeem Nawaz et al. 2022). Consumers typically engage in energy-saving behaviour by either engaging in energy curtailment or adopting energy-efficient systems (Nguyen, Le, Lim, Dang-Van & Nguyen 2025). For the purposes of this study, energy conservation was conceptualised as comprising habitual, interpersonal and restricted energy conservation (Li et al. 2024). Habitual behaviours involve all activities intended to reduce excess energy consumption (e.g. using energy-efficient light bulbs). Constrained behaviours are those aimed at making lifestyle adjustments to achieve the desired

energy conservation (e.g. not using air conditioning daily). Interpersonal energy-saving behaviours promote energy conservation in others by leading by example (e.g., an employee who consistently switches off lights and electronic devices when they are not in use may inspire colleagues to do the same). Understanding the different energy-conservation behaviours provides a framework for understanding the psychological factors that drive them. To explore these drivers, the study adopts the Value Attitude-Behaviour (VAB) framework to link individual values and attitudes to energy conservation behaviour.

2.3 THE VALUE ATTITUDE-BEHAVIOUR (VAB) FRAMEWORK

The VAB framework argues that an individual's decision-making processes are governed by a sequential effect that originates from values that lead to specific behaviours (Sheikh et al. 2025). Developed by Homer and Kahle (1988), the framework is premised on the idea that values serve as motivators for attitudes and behaviours and suggests a course of action in the following order: value → attitude → behaviour (Nazirova & Borbala 2024). The hierarchical model suggests that deeply held personal values influence specific attitudes, which in turn shape behavioural intentions and actual behaviours. The VAB model has been used extensively in consumer behaviour literature, including green purchase behaviour, sustainable food consumption, and environmentally friendly technology products (Sheikh et al. 2025; Park & Namkung 2024; Govaerts & Ottar Olsen 2023). Based on these previous works, the current study proposes that the VAB framework provides a robust theoretical foundation for understanding the psychological mechanisms underlying energy conservation behaviours. The study extends the VAB framework to include self-efficacy and response efficacy as possible antecedents of attitude and value for energy conservation. Building on this theoretical foundation, the next section focuses on how efficacy beliefs influence consumers' energy conservation behaviours.

2.4 EFFICACY BELIEFS

Social-cognitive theories of human behaviour have emphasised the role of perceived efficacy in shaping behaviour (Herbert et al. 2025). In this context, perceived control, which is one's belief that their ability to exert change in their environment will lead to a positive outcome, is critical for decision making (Yang & Delgado 2025). Efficacy - which manifests as self-efficacy and response efficacy, is seen as one of the most powerful antecedents of personal action (Herbert et al. 2025). Efficacy has also been found to be a powerful predictor of pro-environmental behaviour (Zhang et al. 2024; Rainear & Christensen 2022). This is also true for energy conservation behaviours. For instance, Choi and Hart (2021) found both self-efficacy and response efficacy (conceptualised as personal outcome expectancy) to have positive associations with behavioural intention and policy support regarding energy conservation. Collectively, these findings highlight the centrality of efficacy beliefs in motivating behaviour, which provides a strong rationale for integrating efficacy constructs into the VAB framework in the present study.

3. HYPOTHESIS DEVELOPMENT

3.1 CONCEPTUAL MODEL

The study proposes a conceptual model which posits that self-efficacy and response efficacy are central to fostering positive attitudes towards energy conservation and intrinsic value for energy conservation, which in turn lead to energy conservation behaviour. The hypotheses are depicted in figure 1 below.

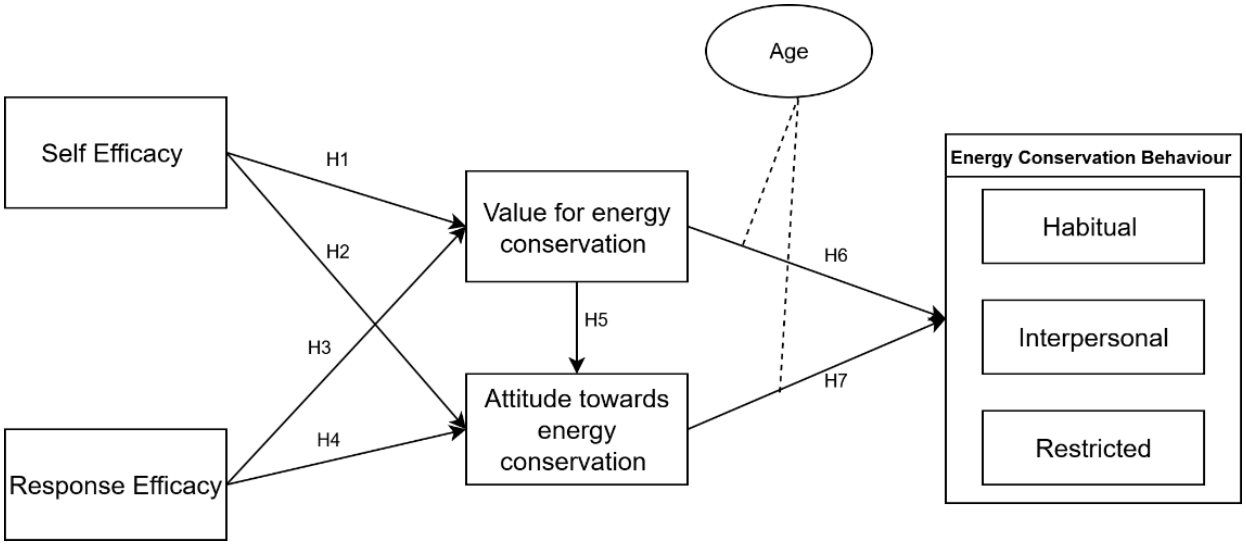

FIGURE 1: RESEARCH FRAMEWORK AND PROPOSED HYPOTHESES.

3.2 SELF-EFFICACY AND ENERGY CONSERVATION

When faced with a potential threat, people tend to engage in protective behaviours that they believe can eliminate the threat (Kothe et al. 2019). The likelihood of engaging in said behaviour depends on people's perceived ability to perform the protective behaviour (Chen & Yeh 2017). In this study, self-efficacy refers to the individual consumer's belief that they can engage in the necessary conservation actions to reduce their energy usage. Previous research has confirmed the role of self-efficacy in predicting various protective behaviours, including energy conservation (Baah et al. 2024; Choi & Hart 2021). For instance, Zhang et al. (-2024) confirmed the role of self-efficacy in predicting energy-saving behaviour in the context of the social cognitive theory. Similarly, Kuang, Hu and Chen (2025) extended the protection motivation theory to study household energy service-related resilience behaviours, finding that self-efficacy was a significant predictor. Despite these findings, limited research has examined the influence of self-efficacy on attitudes and values in the context of energy conservation is lacking. Given the central role of attitude in driving consumer behaviour, the study seeks to establish whether efficacy beliefs positively influence attitudes. The study proposes that individuals who believe they are capable of conserving energy are more likely to have a positive attitude toward energy conservation, which in turn increases their value of energy conservation. Hence, the study proposes the following hypotheses:

H1: Self-efficacy will have a significant, positive relationship with value for energy conservation.

H2: There is a positive relationship between self-efficacy and attitude towards energy conservation.

3.3 RESPONSE EFFICACY AND ENERGY CONSERVATION

Response efficacy describes a person's belief that engaging in a protective behaviour will be effective in reducing the threat to the individual (Rainear & Christensen 2022). When the perceived response efficacy is high, then the probability of engaging in a behaviour will be high (Baah et al. 2024). In this study, response efficacy refers to an individual's belief that engaging in energy conservation behaviours will help decrease energy consumption in a meaningful way, thereby reducing the threat of load shedding. Response efficacy has been shown to be an antecedent of intention to engage in conservation behaviour (Rainear & Christensen 2022; Choi & Hart 2021). However, a recent study in the energy conservation context, found it to be insignificant (Kuang et al. 2025). While these findings are valuable, the influence of response efficacy on value for energy conservation has not been investigated. The study,

therefore, argues that consumer perceptions that engaging in energy conservation behaviours decreases energy consumption and removes the threat of load shedding will positively influence their attitudes towards energy conservation and their perceived value for energy conservation. Therefore, the following hypotheses are proposed:

H3: There is a positive relationship between response efficacy and value for energy conservation.

H4: There is a positive relationship between response efficacy and attitude towards energy conservation.

3.4 VALUE FOR ENERGY CONSERVATION

Values are enduring beliefs that guide behaviour, and in the context of sustainability, they shape the way individuals prioritise resource use and environmental protection (Kumar et al. 2022). Prior research has shown that pro-environmental values are central drivers of sustainable attitudes, as they create a sense of obligation and meaning that extends beyond immediate personal benefits (Govaerts & Ottar Olsen 2023; Shi et al. 2019). When individuals hold strong values for energy conservation, they are more likely to view conservation not merely as an economic necessity or a mandatory obligation but as a moral and ecological responsibility. In this study, the value for energy conservation is seen as the importance placed on energy conservation (Li et al. 2024). The study argues that this value orientation influences the development of favourable attitudes towards energy conservation, which subsequently increases the likelihood of engaging in energy conservation. Value for energy conservation functions as a foundational element in the VAB framework, serving as an anchor that channels efficacy perceptions into positive attitudes towards energy conservation. In this regard, the study thus proposes the following hypothesis:

H5: There is a positive relationship between value for energy conservation and attitude towards energy conservation.

H6: Value for energy conservation has a positive relationship with energy conservation behaviour.

3.5 ATTITUDE TOWARDS ENERGY CONSERVATION

Attitudes reflect the extent to which engaging in behaviour is evaluated positively or negatively (Boomsma, Jones, Pahl & Fuertes 2019). Attitudes are shaped by a variety of factors, including environmental awareness, individual values, cultural norms, and socioeconomic status (Daud et al. 2025). Positive attitudes towards the environment have been shown to be a predictor of energy conservation behaviour (Naeem Nawaz et al. 2022; Pop, Dabija, Pelău & Dinu 2022). For instance, Daud et al. (2025) used attitude as an antecedent of ethical practice, finding it to be a highly significant predictor of energy efficiency. Similarly, Le-Anh et al. (2023) found attitude to be a significant predictor of energy conservation intention and behaviour under behavioural reasoning perspectives. In the VAB framework, attitudes translate values into actionable behaviours. Similarly, attitude has been adopted as a mediator in pro-environmental behaviour studies (Zhang & Cao 2025; Rainear & Christensen 2022). This study then proposes that by translating value for energy conservation into habitual, interpersonal and restricted energy curtailment behaviours, attitudes towards energy conservation play a critical role in determining whether individuals progress from holding pro-environmental values to engaging in energy conservation behaviours. Consequently, the following hypothesis is proposed.

H7: There is a positive relationship between attitude towards energy conservation and energy conservation behaviour.

3.6 AGE AS A MODERATING VARIABLE.

In addition to the direct relationships tested, the study also adopted age as a moderator to test its impact as a socio-demographic variable. Prior research has revealed age-related differences in pro-environmental behaviour (Ágoston, Balázs, Mónus & Varga 2024) including energy-saving behaviour (Li et al. 2024). A meta-analysis of the psychological predictors of energy-saving behaviour revealed that age is a relevant moderator in the relationship between pro-environmental values and emotions with energy-saving behaviours (Carrus et al. 2021). Consequently, this study adopted age as a moderator in the relationship between values and energy conservation behaviour, as well as attitude and energy conservation behaviour.

4. METHODOLOGY

4.1 STUDY CONTEXT

Data for the study were collected from a population of adult South Africans (18 and above) who are household consumers of electricity and have also experienced load shedding. South Africa is a significant market in the energy sector in Africa as it is the largest producer of electricity in the region, producing more than 40% of the region's electricity (International Energy Agency 2024). Given that the country has grappled with the challenge of load shedding for two decades, it is likely that the entire target population has experienced load shedding at some point in time. To ensure representativeness, respondents from each of the country's 9 provinces were included. Ethical approval for this study was obtained from the College of Economic and Management Sciences_ERC Marketing and Retail Management Committee under approval number 2423. Informed consent was requested from the respondents, with the researcher informing them of their right to privacy and right to withdraw from the study at any time.

4.2 MEASUREMENT INSTRUMENT

This study employed a quantitative, cross-sectional research design, using a survey method, to investigate the role of response efficacy and self-efficacy in shaping energy conservation behaviour, with value for energy conservation and attitudes towards conservation serving as mediators. To measure the constructs, the study extensively reviewed literature and adapted/adopted items to include in the questionnaire. All constructs were modelled as reflective measures, consistent with previous studies employing the VAB framework. Self-efficacy and response efficacy were both measured with 3 items each, adapted from Zhao, Cavusgil and Zhao (2016). The value for energy conservation was measured with 5 items adopted from Li et al. (2024). Attitude was measured with 5 items adapted from Ajzen (1991). Energy conservation behaviour was measured with the 9 items (3 items each) for habitual, constrained and interpersonal energy saving behaviour, adapted from Li et al. (2024). The measurement items were measured on a 7-point Likert scale, where 1 = "strongly disagree" and 7 = "strongly agree". Cronbach's Alpha values for the reliability analysis ranged from 0.84 to 0.89, confirming the reliability of the measures. The measures employed in the study are shown in Table 1 below.

TABLE 1: MEASURES

Construct	Indicators
Self-Efficacy	I know how to take precautions against the negative effects of load-shedding or blackouts.
	I can efficiently deal with load-shedding or blackouts in my daily life.
	I can manage even unexpected bouts of load-shedding or blackouts
Response Efficacy	I am sure that my energy-conserving behaviour will lead to a reduction in load-shedding.
	I am confident that I can positively influence energy conservation.
	I can do something to control the energy crisis, evidenced by the continued load-shedding or blackouts.
Value for energy conservation	Energy conservation can effectively protect the ecological environment.
	Good energy performance in my life makes me feel self-satisfied.
	Electricity conservation saves me lots of money on electricity charges.
	Electricity conservation can ease the country's shortage of electricity resources.
	Energy conservation has a direct bearing on the improvement of the natural environment.
Attitude	It is beneficial for me to reduce my electricity usage for the good of society to avoid load-shedding or blackouts.
	There is a desirability that comes with my reducing my electricity usage for the good of society to avoid load-shedding or blackouts.
	Reducing my electricity usage for any reason, whether it be for society or the purpose of avoiding future load-shedding or blackouts, is unpleasant. (R)
	I think it is wise to reduce my electricity usage for the good of society to avoid load-shedding or blackouts.
	For me, reducing my electricity usage for the good society in the form of avoiding load-shedding or blackouts is unfavourable. (R)
Energy Conservation Behaviour	Turn off the lights when leaving the house.
	I turn off personal electrical gadgets such as computers, phone, and AirPods while sleeping.
	I close the door and window when using the air conditioning.
	I reduce appropriately the brightness of the screen when using personal gadgets such as the phone and computer
	Reduce appropriately the brightness of the screen when using the computer.
	Set the air conditioner timer at night.

Construct	Indicators
	Participate actively in the publicity work of energy conservation.
	Take the initiative to advise my relatives, colleagues, and friends to save energy.
	Point out others' behaviours of wasting electricity.

4.3 SAMPLE AND DATA COLLECTION

Data were collected through an online survey by a data collection agency. Gender, age, racial group and education were included as demographic variables and treated as controls. Stratified random sampling was employed to identify respondents, utilising type of dwelling, area of residence, and household energy setup to identify suitable respondents from diverse socio-demographic backgrounds. This method is effective for fair representation and the reduction of sample errors (Appiah, Sam, Twum & Godslove 2023). The draft questionnaire was piloted using 50 respondents to assess the clarity of measures. The feedback from the pilot study indicated that respondents understood the questions and were able to complete the questionnaire without incident. The inverse square root approach was used to determine the optimal sample size required to generate reliable estimates (Kock & Hadaya 2018). The minimum sample size was calculated for a statistical power of 0.95, a significance level of 0.05, and a minimum detectable path coefficient of 0.30. The resulting sample size requirement was approximately 145 respondents, ensuring sufficient power for hypothesis testing. After the survey was terminated, 532 responses were received, and 28 were removed due to incomplete answers, resulting in a final sample of 504 respondents.

The sample consisted of 22.2% males and 77.8% females. The skewness in favour of females was likely influenced by the fact that female respondents identified themselves as being more responsible for energy consumption choices in the home. In terms of age, 33.5% were 18-25, 32.3% were 26-30, 19.0% were 31-35, 10.1% were 36-40, while 5.0% were over 40 years old. Concerning the type of dwelling, 60.9% lived in free-standing houses, 12.3% lived in apartments, 14.7% lived in townhouses, while 12.1% lived in low-cost housing. In terms of residential area, 46.8% lived in urban areas, 28% in semi-urban areas, 18.1% in rural areas and 7.1% in semi-rural areas. Lastly, in terms of residential energy set-up, 52.6% use electricity only, 34.7% use electricity and gas, while 12.7% use electricity, gas and solar.

TABLE 2: DEMOGRAPHIC CHARACTERISTICS

Variable	Number (n)	Percentage (%)
Gender		
Male	112	22.2
Female	392	77.8
Age		
18-25	169	33.5
26-30	163	32.4
31-35	96	19.0
36-40	51	10.1
Over 40 years old	25	5.0

Variable	Number (n)	Percentage (%)
Racial Group		
Black	449	89.1
Coloured	29	5.7
Indian	11	2.2
White	15	3.0
Education		
Below matric	25	5.0
Matric	190	37.7
Undergraduate	194	38.5
Postgraduate	95	18.8
Type of Dwelling		
Free standing	307	60.9
Apartment	62	12.3
Townhouse	74	14.7
Low-cost housing	61	12.1
Residential Area		
Urban	236	46.8
Semi-Urban	141	28.0
Rural	91	18.1
Semi-Rural	36	7.1
Household Energy Setup		
Electricity Only	265	52.6
Electricity and Gas	175	34.7
Electricity, Gas and Solar	64	12.7

5. RESULTS

5.1 Data Analysis

Data for the study were analysed using SPSS version 30 for demographic statistics and SmartPLS Version 4 for Structural Equation Modelling to test the hypotheses. PLS-SEM was chosen because it is suitable for predictive and theory development studies, particularly when the model includes multiple constructs and indicators (Hair, Hult, Ringle & Sarstedt 2022). Before conducting the main analyses, all statistical assumptions were thoroughly examined to ensure the accuracy and robustness of the results. Normality was assessed using skewness and kurtosis (within ±2), and multicollinearity was checked using Variance Inflation Factors (VIFs). The analysis followed a two-step approach involving the assessment of (1) the measurement model and (2) the structural model. To ensure the reliability and validity of the model, steps were taken to eliminate common method bias using some of the procedures by Podsakoff et al. (2003). The presence of common method bias in a study biases parameter estimates (Kock, Berbekova & Assaf 2021). Firstly, the anonymity of the respondents was protected by using an anonymous survey. Secondly, to avoid social desirability, respondents were advised that there were no right or wrong answers. Lastly, tested and validated scales were used to eliminate semantic ambiguity. Moreover, an analysis of Harman's one-factor test revealed that one factor explained 26% of the variance, which is less than the 50% threshold, indicating that common method bias was not a significant issue in the study.

5.2 Measurement model assessment

Given that all constructs were modelled reflectively, indicator loadings, composite reliability, Cronbach's alpha, and AVE were used to assess reliability and validity. The reliability of the measures was assessed using Cronbach's Alpha (CA). The results in Table 3 reveal that Alpha values ranged from 0.702 for self-efficacy to 0.870 for attitude. These values were all above the 0.7 threshold for internal consistency (Hair et al. 2022), confirming the reliability of the measures. Convergent validity was then assessed using standardised factor loadings, composite reliability (CR), and average variance extracted (AVE). CR values must be above 0.7 and AVE values above 0.4 for convergent validity to be supported (Hair, Risher, Sarstedt & Ringle 2019). CR values ranged from 0.838 for 'value for energy conservation' to 0.876 for 'attitude', while AVE values ranged from 0.583 (self-efficacy) to 0.794 (attitude). All these results, taken together, provide support for the reliability and convergent validity of the measurement model.

TABLE 3 – CONSTRUCT RELIABILITY

Construct	Outer loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Attitude		0.870	0.920	0.794
Attitude1	0.918			
Attitude2	0.853			
Attitude4	0.901			
Energy Conservation Behaviour		0.833	0.875	0.503
HECB1	0.567			
HECB4	0.693			
IECB1	0.745			
IECB2	0.793			
IECB3	0.716			
RECB1	0.722			
RECB3	0.707			
Response Efficacy		0.851	0.910	0.770
RespoEff1	0.864			
RespoEff2	0.910			
RespoEff3	0.858			
Self-Efficacy		0.702	0.806	0.583
Seff1	0.865			
Seff2	0.767			
Seff3	0.643			
Value for energy conservation		0.833	0.885	0.606
VEC1	0.759			
VEC2	0.747			
VEC3	0.782			
VEC4	0.803			
VEC5	0.800			

In addition to assessing convergent validity, discriminant validity, which computes the distinctness of the constructs, was assessed using the Heterotrait-Monotrait Ratio (HTMT). According to Henseler, Ringle and Sarstedt (2015), all correlated values should be below 0.9. The figures in Table 4 below indicate that the highest value was 0.740, which indicates that discriminant validity was satisfactory.

TABLE 4: DISCRIMINANT VALIDITY HTMT

	Attitude	Energy Conservation	Response Efficacy	Self-efficacy	Value for energy con
Attitude					
Energy Conservation	0.518				
Response Efficacy	0.804	0.624			
Self-efficacy	0.448	0.443	0.539		
Value for Energy Conservation	0.619	0.612	0.740	0.587	

The Fornell-Lacker Criterion was used as an additional measure of discriminant validity. This criterion holds that a latent construct's AVE, when taken as a square root, should be greater than the correlation with any other construct in the model (Fornell & Larcker 1981). The results in Table 5 indicate that all the values for the square root of AVE were greater than the correlation between the construct and any other constructs. This suggests that discriminant validity was established.

TABLE 5: FORNELL-LACKER CRITERION

	Attitude	Energy Conservation	Response Efficacy	Self-efficacy	Value for energy con
Attitude	0.891				
Energy Conservation	0.440	0.709			
Response Efficacy	0.698	0.524	0.878		
Self-efficacy	0.442	0.397	0.519	0.764	
Value for Energy Con	0.533	0.515	0.626	0.511	0.779

In PLS-SEM, the variance inflation factor (VIF) can be used to assess for collinearity. To ensure that there is no risk of multicollinearity in the model, all VIF values should be less than 3 (Hair et al. 2022). Table 6 reveals that all the VIF values were satisfactory, and thus, multicollinearity was not a challenge in the data.

TABLE 6: VIF VALUES

Indicators	VIF
Attitude1	2.800
Attitude2	1.984
Attitude4	2.488
HECB1	1.305
HECB4	2.201
IECB1	2.060
IECB2	2.737
IECB3	1.987
RECB1	2.357
RECB3	1.611
RespoEff1	1.927
RespoEff2	2.539
RespoEff3	2.074
Seff1	1.173
Seff2	2.089
Seff3	1.899
VEC1	1.623
VEC2	1.553
VEC3	2.029
VEC4	2.212
VEC5	1.840

5.3 STRUCTURAL MODEL ASSESSMENT

Once the validity of the measurement model was confirmed, a structural model was generated to test the hypotheses. PLS-SEM bootstrapping with 10,000 resampling moments was used to obtain the β values and *t*-statistic scores. The model fit was assessed using standard indices provided by SmartPLS. The results indicated acceptable fit values (SRMR = 0.083; d_ULS = 1.761; d_G = 0.517; χ^2 = 1649.591; NFI = 0.726). Although the SRMR slightly exceeded the recommended threshold of 0.08, the discrepancy measures (d_ULS and d_G) and Chi-square values were close to those of the saturated model, suggesting that the estimated model adequately reproduces the observed data.

Based on the results in Table 7, all but one of the proposed relationships were significant. The hypothesis tests revealed positive significant effects of self-efficacy on value for energy conservation (β = 0.248, *t* = 5.579, *p* = 0.000), response efficacy on value for energy conservation (β = 0.494, *t* = 11.463, *p* = 0.000), response efficacy on attitude (β = 0.573, *t* = 8.967, *p* = 0.000), value for energy conservation on attitude (β = 0.136, t = 2.033, *p* = 0.021) and value for energy conservation on energy conservation behaviour (β = 0.430, *t* = 7.780, *p* = 0.000). The results therefore provide support for H1, H3, H4, H5 and H6. The only relationship that was insignificant was self-efficacy on attitude towards energy conservation (β = 0.075, t = 1.501, *p* = 0.067), thus H2 is rejected. The results also indicated that age has a moderating effect on the relationship between value for energy conservation and energy conservation behaviour.

TABLE 7: PATH CO-EFFICIENT, T-STATISTICS

	Path	Path Coefficient	T statistics	P values	Confidence Intervals (5%, 95%		Decision
H1	Self-efficacy → Value for energy conservation	0.248***	5.579	0.000	0.175,	0.321	**Accept**
H2	Self-efficacy → Attitude	0.075	1.501	0.067	-0.006,	0.159	**Reject**
H3	Response Efficacy → Attitude	0.573***	8.967	0.000	0.465,	0.674	**Accept**
H4	Response Efficacy → Value for energy conservation	0.494***	11.463	0.000	0.421,	0.563	**Accept**
H5	Value for energy conservation → Attitude	0.136	2.033	0.021	0.032,	0.250	**Accept**
H6	Value for energy con → Energy Conservation	0.430***	7.780	0.000	0.338,	0.521	**Accept**
H7	Attitude → Energy Conservation	0.231***	3.611	0.000	0.130,	0.341	**Accept**
Moderation							
Age x Value for Energy Conservation → Energy Conservation		0.104	1.901	0.029	0.012,	0.193	**Accept**
Age x Attitude → Energy Conservation		-0.002	0.028	0.489	-0.107,	0.110	**Reject**

Note: **P < 0.01; ***P < 0.001

5.3.1 Moderation Analysis

In addition to the hypothesis tests, the study also examined the moderating effects of age on the relationship between the value for energy conservation and energy conservation behaviour. The significance tests revealed that age moderates the direct effect of value for energy conservation and energy conservation behaviour (β = 0.104, p = 0.029). The interaction effects were assessed using the f-squared value, which indicates the extent to which the moderation contributes to the explanation of the endogenous construct (Hair et al. 2022). The f-square effect size was 0.010, which is a medium effect size in moderation analysis (Hair et al. 2021). This indicates that with increasing age, the relationship between the value for energy conservation and energy conservation behaviour becomes stronger. The moderating effect of age on the relationship between attitude and energy conservation was insignificant (β = -0.002, p = 0.489). The moderation analysis, supported by the simple slope in figure 2, shows that while the value for energy conservation positively predicts energy-saving behaviour across all age groups, the effect is stronger for younger individuals. This suggests that younger people are more likely to translate their conservation values into actual behaviours, whereas older individuals may require additional motivational or structural supports to act on their values. This finding reveals that age strengthens the value for energy conservation.

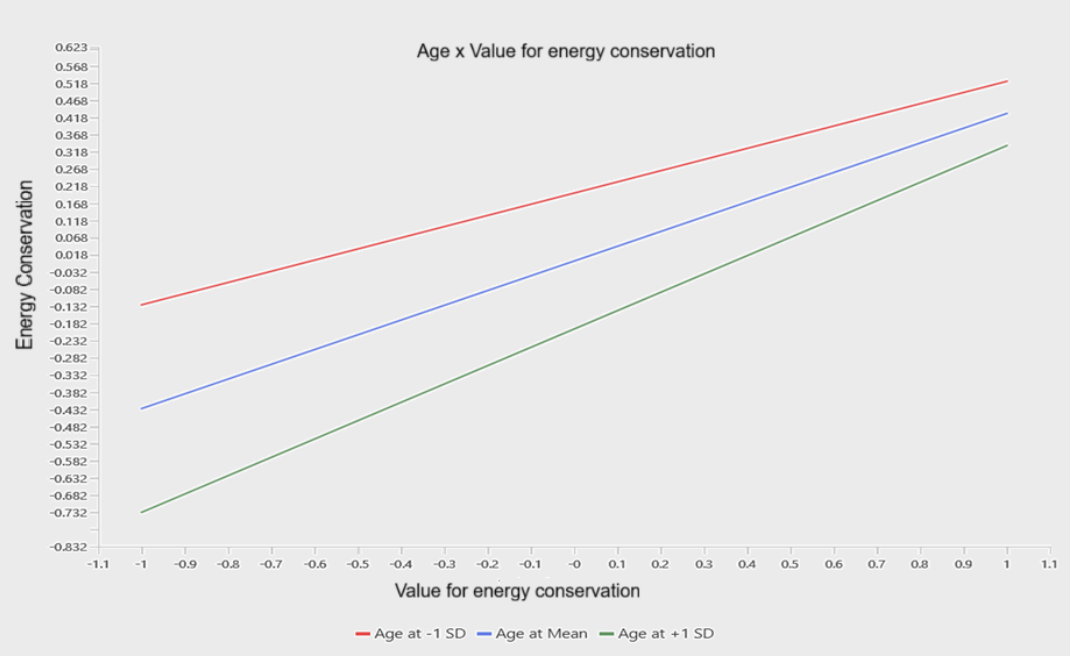

FIGURE 2: MODERATION SLOPE

To evaluate the quality of the model, the R^2 values of the model were examined. Self-efficacy and response efficacy accounted for 44.7% of the variance in value for energy conservation and 50.6% of the variance in attitudes towards energy conservation. This means that attitudes are better predicted by self-efficacy and response efficacy than by the value for energy conservation. Finally, the proposed model accounted for 34.7% of the variance in energy conservation behaviour. This figure suggests that additional predictors are necessary to enhance the model's predictive ability. The path coefficient and R2 values are depicted in Figure 3 below.

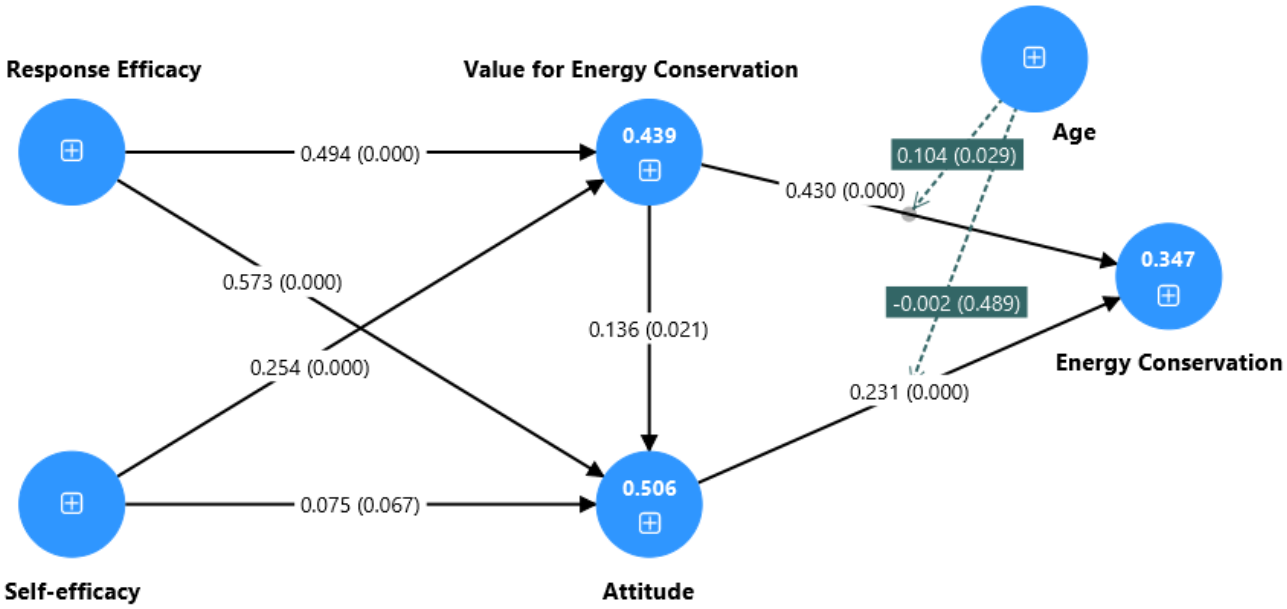

FIGURE 3: STRUCTURAL MODEL

5.4 MEDIATION ANALYSIS

Table 8 presents the results of the mediation analysis. The VAB Framework posits attitude to be a mediator in the relationship between values and behaviour. The results revealed a significant indirect effect of value for energy conservation on energy conservation behaviour through attitude towards energy conservation (β = 0.031, p = 0.039). Additionally, attitude played a significant mediating role between response efficacy and energy conservation behaviour (β = 0.132, p = 0.000). However, it did not mediate the relationship between self-efficacy and energy conservation. The study also considered value for energy conservation as a mediator in the relationship between the psychological traits and energy conservation behaviour. The results revealed that the value for energy conservation played a significant mediating effect in both the relationships between self-efficacy (β = 0.107, p = 0.000) and response efficacy (β = 0.212, p = 0.000) with energy conservation behaviour.

TABLE 8: MEDIATION

Relationship	Indirect effect	T-statistic	P value	Result
Self-efficacy → Value for energy conservation → Energy Conservation	0.107***	4.271	0.000	Sig
Self-efficacy → Attitude → Energy Conservation	0.017	1.241	0.107	Insig
Response Efficacy → Attitude → Energy Conservation	0.132***	3.298	0.000	Sig
Response Efficacy → Value for energy conservation → Energy Conservation	0.212***	1.696	0.045	Sig
Value for energy conservation → Attitude → Energy Conservation	0.031	1.758	0..39	Sig

Note: ***P* < 0.01; ****P* < 0.001, sig = significant, insig = insignificant

6. DISCUSSION

The negative effects of untenable energy consumption are well-documented. Consequently, enhancing the well-being of humanity through sustainable energy consumption is crucial (Piao & Managi 2023). This study developed a model to explain the relationship between self-efficacy, response efficacy and energy conservation behaviour, with value for energy conservation and attitude towards energy conservation serving as mediators. The study established that self-efficacy has a significant, positive impact on value for energy conservation. While this relationship has never been tested in the literature, it is consistent with findings on the positive role of self-efficacy in energy conservation behaviour (Zhang et al. 2024; Choi & Hart 2021). This suggests that individuals who believe in their ability to engage in energy-saving practices are more likely to value conservation as personally important. However, unlike studies such as Zhang et al. (2024), who reported a direct effect of self-efficacy on behaviour, the current results indicate that this influence operates primarily through internalised values. Contextual differences may explain this contrast, as individuals in developing regions often face more structural barriers, making psychological factors like values even more central to motivating behaviour.

The findings also confirmed that the value for energy conservation mediates the relationship between self-efficacy and energy conservation behaviour. These findings reveal that individuals with a strong belief in their own ability to execute energy conservation behaviours, coupled with finding energy conservation valuable, are more likely to engage in energy saving. The study therefore provides novel insights into the role of self-efficacy in stimulating energy conservation behaviour through value. This finding confirms the centrality of values in shaping behaviour, a key tenet of the VAB framework. In addition to the mediator, the findings also confirmed the moderating effect of age on the

relationship between value for energy conservation and actual conservation behaviour. The finding suggests that younger individuals, who are likely more exposed to sustainability discourse, may demonstrate stronger value-behaviour alignment compared to older consumers. From a theoretical perspective, this finding supports the notion that age functions as a contextual moderator and also underscores generational differences in energy conservation (Marchi & Gaspari 2023).

The results also revealed that response efficacy had a significant positive effect on value for energy conservation. This finding is consistent with studies on the role of response efficacy on pro-environmental behaviour in other contexts (Jankowski, Mlynski & Job 2024; Rainear & Christensen 2022). In the energy conservation context, this finding is consistent with Choi and Hart (2021), who found that personal outcome expectancy (response efficacy) has a positive association with energy conservation intentions. The findings also confirmed the role of response efficacy in predicting attitude towards energy conservation, the strongest of all the relationships in the model. Additionally, the study confirmed the role of attitude as a mediator between response efficacy and energy conservation behaviour, which is consistent with studies confirming the role of attitude as a mediator in pro-environment behaviour (Zhang & Cao 2025; Zheng, Siddik, Masukujjaman, Alam & Akter 2021). This pattern suggests that when people believe their actions will yield meaningful results, they develop more positive attitudes toward conservation and are consequently more likely to act on them. In developing countries, where institutional support and access to efficient technologies are often limited, efficacy beliefs may play a greater compensatory role in driving behavioural outcomes. Ultimately, these findings confirm that people who believe that engaging in energy conservation will have the desired effect of reducing energy consumption, and simultaneously value energy conservation and have a positive attitude towards it, are the most likely to engage in energy conservation behaviours.

The findings also confirmed that the value for energy conservation had a positive effect on both attitude towards energy conservation and energy conservation behaviour. These findings are consistent with the notion that values serve as a motivator for attitudes and behaviours (Sheikh et al. 2025; Nazirova & Borbala 2024; Govaerts & Ottar Olsen 2023) and confirm the study's assumption that personal values enhance energy-saving behaviour. The findings agree with past studies that have affirmed the role of values in sustainable energy behaviours. For instance, Bănică, Patrício and Miguéis (2024) affirmed that perceived value has a positive influence on citizen engagement with sustainable energy solutions. Similarly, Kumar et al. (2022) reported that pro-environmental values were important in reported energy curtailment behaviours. However, while most prior studies examined values as a direct predictor of behaviour, the present study demonstrates that values also function indirectly by shaping attitudes. This supports the hierarchical nature of the Value–Attitude–Behaviour framework and highlights value as a foundational driver that influences both cognitive and behavioural responses. Ultimately, these results highlight the central role of value for energy conservation as a foundational driver that shapes individuals' attitudes and translates into tangible energy-saving behaviours.

The findings also revealed that attitude towards energy conservation has a significant, positive influence on energy conservation behaviour. This finding is consistent with other studies that have confirmed the role of attitude in predicting energy conservation behaviour (Naeem Nawaz et al. 2022; Pop et al. 2022; Zhang, Bai, Mills & Pezzey 2021). This affirms the notion that people with a positive pro-environmental attitude are more likely to engage in pro-environmental behaviour. This study's focus on energy conservation provides theoretical support for the VAB from the energy context. The positive, causal relationship between attitude and pro-environmental behaviour is well established in the literature and is consistent with the VAB framework (Sheikh et al. 2025; Nazirova & Borbala 2024; Park & Namkung 2024).

7. THEORETICAL IMPLICATIONS

The findings of this study make several important contributions to the theoretical understanding of energy conservation behaviour. First, by integrating self-efficacy, response efficacy, attitude, and value for energy conservation within the VAB (Values-Attitudes-Behaviour) framework, the study provides a comprehensive model that explains not only whether individuals conserve energy but also why they do so. This extends the application of the VAB framework to the energy conservation context, demonstrating its robustness across behavioural domains. Second, the study confirms that self-efficacy and response efficacy indirectly influence energy conservation behaviour through value for energy conservation, highlighting the pivotal role of cognitive appraisals in shaping pro-environmental behaviour. The novel insight that efficacy beliefs also shape the value system underlying energy-related decisions advances theory by demonstrating that behavioural prediction is not only a direct process but occurs through an interplay of psychological constructs. Third, the mediating roles of both value and attitude reinforce the foundational place of these constructs within behavioural theories, suggesting that interventions targeting pro-environmental behaviour should consider both cognitive (beliefs) and affective (attitudes/values) dimensions. Collectively, these findings enrich behavioural theories by illustrating the dynamic interactions among efficacy beliefs, values, and attitudes, providing a more nuanced understanding of the psychological mechanisms driving energy conservation.

8. MANAGERIAL IMPLICATIONS

This research offers valuable insights for a range of stakeholders, including marketing professionals in energy companies, government agencies and sustainable energy advocates. From a practical standpoint, the insights gleaned from the study may have significant implications for the design of effective energy conservation interventions. For energy companies, the results highlight opportunities for integrating behavioural insights into customer engagement. For instance, firms could leverage technology to enhance self-efficacy (belief in one's ability to conserve energy) and response efficacy (belief that energy conservation efforts will be effective). Encouraging consumers to adopt smart home technologies such as home energy management systems, real-time feedback apps, and smart meters can increase awareness of energy use and demonstrate the effectiveness of conservation efforts. By providing immediate feedback (e.g., "you saved 10% energy this week"), these tools can strengthen perceived response efficacy, while tutorials that give instructions on how to save energy can enhance self-efficacy. Energy companies may also collaborate with technology companies to promote smart home solutions that facilitate energy monitoring while also automating energy conservation.

For sustainability advocates, energy conservation campaigns must go beyond raising awareness about the negative impacts of energy poverty and power outages but focus on enhancing both self-efficacy and response efficacy. Campaigns should focus on empowering individuals with the belief that their energy conservation efforts matter. For instance, campaigns should highlight simple, actionable steps (e.g., unplugging unused appliances, switching to energy-efficient lighting, reducing peak-time usage) while showcasing the measurable impact of these actions on energy savings. Additionally, given the central role of value for energy conservation, campaigns can frame energy conservation as a value-driven lifestyle rather than a cost-saving measure. This value can be linked to broader consumer values such as environmental protection and concern for the community.

For government agencies, regulators and policy makers, embedding behavioural principles into energy strategies and policy frameworks could help encourage energy conservation at the national level. Implementing incentive-based policies, such as credits for households that adopt energy-conserving technologies. Regulators must mandate

feedback mechanisms, such as apps and smart meters, in residential and commercial properties to demonstrate the impact of individual actions. In addition, government agencies could develop public educations campaigns that emphasise individual responsibility in the fight for energy conservation. By framing conservation efforts as part of individuals' personal responsibility towards the environment, these campaigns can exploit consumers' self and response efficacy.

9. RESEARCH LIMITATIONS AND FUTURE RESEARCH

This study, while providing insights into the psychological factors influencing energy conservation, is not without limitations. Firstly, the study relied on self-reported data. Given that self-reported data can be subject to social desirability and biased responses, respondents may have overstated their energy conservation behaviours to align with socially desirable conservation behaviour. Future research could incorporate objective measures such as actual energy consumption data to validate self-reported responses. Secondly, the study employed a cross-sectional research design, which limits the ability to draw inferences about the relationships between efficacy beliefs, values, attitudes, and behaviour. Although the proposed model was grounded in the VAB framework, which provides a solid theoretical foundation, causality cannot be fully established. Future research could adopt longitudinal designs to track changes in efficacy beliefs, values, attitudes, and conservation behaviours after energy conservation interventions, to establish any changes that may strengthen causal claims.

The study was conducted in one emerging market, which has been grappling with energy instability for some time. Being conducted within a specific socio-cultural and geographical context limits the generalisability of the findings to other populations. Cultural factors, such as collective values and attitudes towards energy conservation, may have influenced the participants' responses. Other context-specific constraints, such as load shedding and limited access to energy-efficient appliances, may have influenced consumer perception about their ability to engage in energy conservation. Future research should replicate the model in diverse cultural contexts and potentially incorporate additional cultural values to further enhance the model's predictive ability.

The study may also be limited in terms of the scope of the psychological constructs. While the study incorporated self-efficacy, response efficacy, value, and attitude, it did not account for other potentially influential psychological constructs such as personal norms, environmental concern, habit strength, or perceived behavioural control. Future research could extend the model by including these additional constructs to develop a more holistic explanation of energy conservation behaviour. For instance, combining the VAB with the Norm Activation Model (NAM) or Theory of Planned Behaviour (TPB) may yield richer insights. In addition, the study only considered individual psychological and value-driven factors, without fully considering other environmental factors. Future studies could adopt a multi-level approach that integrates individual, technological, and institutional factors to better capture the complexity of energy conservation behaviour.

10. CONCLUSION

This paper explored the relationship between consumers' efficacy beliefs and their attitude towards energy conservation and value for energy conservation in influencing consumers' energy conservation behaviour. The findings of the study offer valuable insights into the psychological drivers of energy conservation behaviour, specifically emphasising the importance of response efficacy and value for energy conservation. Response efficacy emerged as a predictor of both the value that individuals place on energy conservation and the development of positive attitudes

towards energy conservation. While self-efficacy positively influenced the value for energy conservation, it did not have a direct impact on attitude. Value for energy conservation emerged as an influence on both attitudes and actual conservation behaviours, highlighting its central role in the proposed model. The moderating effect of age suggested that younger consumers' value for energy conservation played a greater role in influencing their energy conservation behaviour. The results provide theoretical enrichment to the VAB framework while offering practical insights for policymakers and practitioners aiming to design interventions that promote sustainable energy use. Ultimately, strengthening efficacy beliefs, instilling conservation values, and shaping positive attitudes are key strategies to advancing energy conservation.

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