Factors Influencing Energy Saving Intentions: An Approach Based On Expanded TPB

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Abstract: *Based on the expanded TPB model, this study aims to examine the factors that influence young people's energy-saving intentions in Hai Phong City, Vietnam, regarding sustainable energy use. Analysis of data from 530 young people in Hai Phong city shows that attitude, subjective norms, perceived behavioral control, and knowledge related to energy saving contribute to the development of energy-saving intentions in young people. Based on these findings, solutions have been proposed to promote energy-saving behaviors among young people in Hai Phong city, Vietnam.*
Keywords: *energy saving, youth, expanded TPB model, Hai Phong City*

1.INTRODUCTION

The global energy demand continues to rise with a growing population and higher living standards. According to the Statistical Review of World Energy (2025), fossil fuels still dominate the global energy industry, making up 86 percent of the world's energy consumption in 2024. Oil remains the leading source at 32 percent, followed by coal (26 percent), natural gas (25 percent), hydropower (7 percent), renewable energy (8.2 percent), and nuclear power (4 percent). However, the energy sector, covering stages of energy production, transformation, transmission, distribution, and consumption, is a major contributor to climate change, responsible for about two-thirds of greenhouse gas emissions and approximately 90 percent of global CO_2 emissions (Ministry of Industry and Trade, 2024).

Facing these pressures, countries worldwide must speed up the restructuring of the energy sector toward cleaner and more sustainable sources. According to the climate research agency Ember, the UK projects that in 2024, renewable energy and bioenergy will make up 50% of the total electricity generation across the 27 European Union countries, a 10 percent increase from 2020. In Asia, South Korea recently stated its vision of becoming carbon-neutral by 2050 and affirmed its goal of making renewable energy a primary energy source in the country. Additionally, Japan announced a plan to reach its 2050 greenhouse gas reduction target, which involves increasing the share of renewable energy in electricity generation to at least 50 percent (Ministry of Natural Resources and Environment, 2020).

In Vietnam, on March 13, 2019, the Prime Minister's Decision No. 280/QD-TTg issued the National Program on Economical and Efficient Use of Energy for the 2019-2030 period. The primary goal of this program is to save 810 percent of the energy needed for the country's development under the normal growth scenario. The second goal is to change the energy consumption behaviors of agencies, organizations, communities, and individuals toward saving, efficiency, and responsibility. This demonstrates the government's commitment to reducing energy consumption, lowering emissions, and working with the global community to address climate change through many significant decisions.

The young generation, which makes up about 20 percent of Hai Phong city's total population, is a group capable of thinking critically and quickly understanding global progress and issues. They are a powerful force, capable of mobilizing families, schools, and communities to participate in efforts to address climate change, reduce emissions, and increase awareness of energy conservation. Youth are the future of the country, and understanding the factors that influence their energy-saving intentions will help develop strategies to encourage individual energy-saving behaviors, thereby contributing to lower energy consumption.

2. Analytical framework and research hypothesis
2.1. Analytical framework

The theory of planned behavior (TPB) is used in many studies to examine consumer attitudes and behaviors toward energy efficiency and cost savings, such as the study by Wang et al. (2014) on the energy-saving intentions of Beijing residents. Furthermore, Arya and Chaturvedi (2020) examine students'

energy-saving behavior at universities in India. Regarding young people's energy-saving behavior in Hai Phong city, TPB suggests that attitude, subjective norm, and perceived behavioral control influence their intention to save energy.

However, the TPB model only considers the relationship between attitude and behavioral intentions but ignores external factors that influence an individual's attitudes and behavioral intentions. In energy saving, if a person knows about fossil energy sources, renewable energy, or climate change, it becomes very important to form an energy-saving intention. Knowledge about energy can also influence residents' attitudes toward the environment and increase their intention to save energy (Wang et al., 2011). However, no studies have explored the link between knowledge and energy-saving intentions among young people. Based on the above analysis, the theoretical model is shown in Figure 1 below.
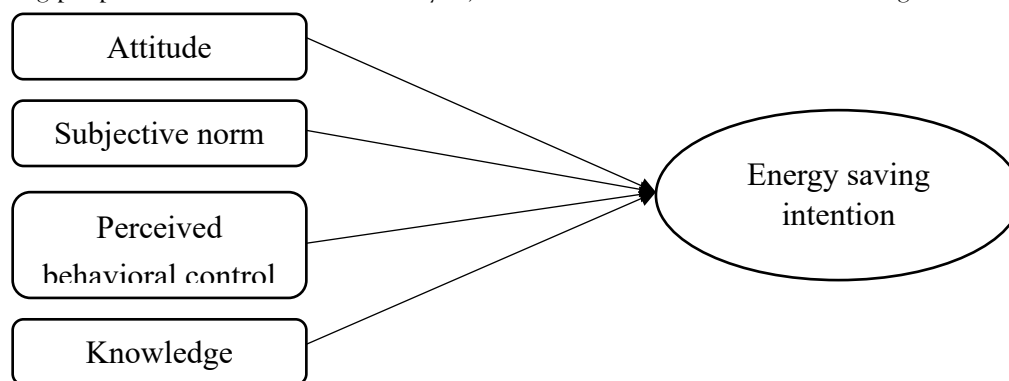
Figure 1. Research Model
Source: Recommended by the author

2.2. Research hypothesis

According to TPB, attitude is how people view certain events (Ajzen, 1991). Attitudes toward actions strongly and positively influence the intention to act, as shown in the study by Vermeir and Verbeke (2004). The more positive a person feels about a behavior or object, the stronger their intention to engage in that behavior (Jalilvand & Samiei, 2012). Zhao et al. (2019) concluded that attitude is the most influential factor in the intention to buy energy-efficient equipment when addressing the issue of smog pollution. Similar conclusions have been reached in studies on environmental behaviors, such as the intention to purchase energy-efficient devices and the behavioral intention to reduce PM2.5 (Shi et al., 2017). Based on the above discussion, attitude significantly influences behavioral intentions, and a positive attitude encourages energy-saving behaviors. Based on the above argument, the research hypothesis is proposed as follows:

H1: Attitude positively influence young people's energy saving intentions in Hai Phong City.

For young people, social pressure is a significant factor that strongly influences behavioral intentions, especially pressure from friends. Costanzo et al. (1986) study of energy use behavior found that social influence, familiarity, and reference groups such as friends, family, and other social networks play an important role in encouraging and sustaining energy efficiency. The study by Hassan et al. (2009), conducted among students living in on-campus dormitories, shows that subjective norm and peer influence can be effective methods to encourage students to conserve energy. Based on the above argument, the research hypothesis is proposed as follows:

H2: Subjective norm positively influence young people's energy saving intentions in Hai Phong City.

Perceived behavioral control (PBC) involves an individual's perception of their ability to perform a specific behavior (Ajzen, 1991). In the context of energy saving, perceived behavioral control describes how consumers perceive the availability of necessary resources, barriers, and the ease of implementing energy-saving measures. Wang (2014) suggests that perceived behavioral control is a major factor influencing behavioral intent. Ru (2018) finds that perceived behavioral control is the most decisive factor in an individual's intention to save energy. Based on the above arguments, the research hypothesis is proposed as follows:

H3: Perceived behavioral control positively influence young people's energy saving intentions in Hai Phong City.

According to DeWaters and Powers (2011), energy literacy is a key predictor of adolescents' attitudes and behaviors related to saving energy. Suppose young people possess sufficient knowledge about the environmental impact of energy use. In that case, they tend to adopt more positive attitudes toward conservation practices, such as turning off unused devices, using energy-efficient appliances, or choosing renewable energy sources. Chen and Tung (2020) conducted a study with university students in China. They found that students with higher levels of energy knowledge demonstrated a stronger intention to conserve energy than those with less knowledge. Based on the above arguments, the proposed research hypothesis is as follows:

H4: Knowledge positively influence young people's energy saving intentions in Hai Phong City.

3. METHODOLOGY

3.1. Data Collection

The survey subjects are young people living in Hai Phong City. Data was collected using convenience sampling through an online survey conducted in April 2025. Participants voluntarily responded to a Google Forms questionnaire distributed via Facebook and Zalo. The study uses a 5-point Likert scale and collected 530 valid responses that met our research criteria for analysis.

 Out of the 530 samples collected, 67.55 percent were males and 32.45 percent were females. Regarding education, 3.77 percent had a high school education, 92.26 percent attended college or university, and 3.97 percent were employed. Concerning income, since the subjects are young people, especially students, their income levels are generally low, with 96.03 percent earning less than 5 million VND or having no income. For residence, 71.32 percent of respondents said they live in towns and cities, while 28.68 percent live in rural areas.

3.2. Data analysis

The study uses SPSS 26 statistical analysis software to conduct reliability analysis, followed by exploratory factor analysis (EFA) to identify factors influencing energy-saving intentions among young people, and then analyzes the multivariate regression model.

4. Research results

4.1. Reliability testing and EFA

Table 1 shows that the Cronbach's Alpha coefficients range from 0.822 to 0.863, which are all above 0.7, confirming the reliability of the scales. The Corrected Item - Total Correlation coefficients range from 0.574 to 0.712, indicating a correlation above 0.3 between variables. Therefore, the variables are suitable for exploratory factor analysis (EFA) (Hair et al., 2010).

The results of EFA show that KMO coefficient of 0.864 (independent variables) and 0.833 (the dependent variable), which exceeds 0.5, indicating that the EFA analysis is appropriate. Bartlett's Test has a significance level of 0.000. Based on the matrix analysis results, the observed variables have factor loadings greater than 0.5 and are arranged accordingly, suggesting that the model does not contain any problematic variables (Hair et al., 2010).

Table 1: Cronbach's Alpha and EFA

Sign	Items	Cronbach's Alpha	Factor 1	2	3	4	5
	Attitude						
Att1	I'm interested in saving energy.		0.893				
Att2	I care about climate change and protecting the environment.	0.854	0.888				
Att3	The environment is just as important as economic development.		0.871				
Att4	Energy consumption drives climate change		0.868				
	Subjective norm						
SN1	People around me are serious about climate change.			0.876			
SN2	Everyone around sees climate change as linked to the responsibility of young people.	0.863		0.860			
SN3	Everyone around sees saving energy as reducing the impact of climate change.			0.855			
SN4	People around consider saving electrical energy to help preserve the natural environment.			0.844			
	Perceived behavioral control						
PBC1	Using many energy-efficient appliances can lower your monthly costs and help protect the environment.				0.809		
PBC2	Reducing fuel use will lower monthly costs and help the environment.	0.855			0.793		
PBC3	I have no trouble with the intention of saving energy.				0.786		
	Knowledge						
K1	Fossil energy is energy derived from oil, gas, and coal.					0.898	
K2	Electricity generated from factories using solar, wind, and wave energy is considered green energy.	0.822				0.883	
K3	Green/renewable energy is a type of energy that, when produced, causes less harm to the environment than fossil fuels.					0.878	
K4	Promoting the energy transition from fossil fuels to renewable energy is necessary.					0.866	
	Energy saving intention						
Int1	I plan to continue expanding my knowledge of energy efficiency.						0.845
Int2	I aim to raise awareness to promote energy security and sustainable energy.	0.834					0.837
Int3	I plan to modify my daily routine to save energy and use green energy.						0.830
Int4	I plan to alter the way I travel to be more eco-friendly.						0.828

Source: Survey data analysis results from SPSS26

4.2. Correlation analysis

Table 2 shows that the correlation coefficient between independent and dependent variables ranges from 0.146 to 0.512, indicating a strong relationship. All independent variables have Sig. values < 0.05, supporting the hypothesis. The overall correlation coefficient is 0, indicating no variation in the model. Additionally, the VIF coefficients for independent variables are all < 2, signifying no multicollinearity issues (Table 3) (Hair et al., 2010).

Table 2: Correlation analysis between independent and dependent variables

	Att	SN	PBC	K	Int
Att	1				
SN	0.252**	1			
PBC	0.360***	0.146*	1		
K	0.346***	0.205**	0.256**	1	
Int	0.512***	0.321***	0.307**	0.401***	1
Note: *significant at $p < 0.05$, **significant at $p < 0.01$, ***significant at $p < 0.001$					

Source: Survey data analysis results from SPSS26

4.3. Multiples regression analysis

Table 3 shows that the adjusted R^2 value of 0.749, or 74.9 percent, indicates the direct influence of factors such as attitude, subjective norm, perceived behavioral control and knowledge of the intention to save energy of young people in Hai Phong City. The F test reveals a very low significance value (Sig. = 0.000), suggesting the research model fits the survey sample well. All independent variables are statistically significant with Sig. < 0.05. The variance inflation factor (VIF) ranges from 1.253 to 1.743, indicating no multicollinearity issues among the independent variables (Hair et al., 2010).

Table 3: Results of regression analysis

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	Constant	0.314	0.026		2.143	0.001		
	Att	0.410	0.025	0.485	2.475	0.001	0.558	1.583
	SN	0.356	0.023	0.371	2.368	0.014	0.628	1.739
	PBC	0.312	0.020	0.334	2.783	0.002	0.579	1.893
	K	0.378	0.024	0.400	2.341	0.003	0.563	1.672
Adjusted R^2 = 0.749 Durbin-Watson = 1.856 Statistics F(ANOVA) = 103.362 Sig. of ANOVA = 0.000								

Source: Survey data analysis results from SPSS26

5. CONCLUSION AND IMPLICATIONS

The study's results indicate that attitude, subjective norm, perceived behavioral control, and knowledge influence the energy-saving intentions of young people in Hai Phong city. Therefore, it can be concluded that hypotheses H1 to H4 are accepted with 95 percent confidence. Notably, attitude is the most significant factor. This finding aligns with previous research by Armitage and Conner (2010), Zhao et al. (2019), who discovered that, compared to other dimensions in the TPB model, attitude is a strong predictor of an individual's behavioral intent.

This is followed by knowledge that directly affects young people's energy-saving intentions in Hai Phong city. The findings support the conclusion of Chen and Tung (2020) that knowledge is an external factor influencing behavioral intention.

Subjective norm was also found to have a significant positive influence on young people's energy-saving intentions in Hai Phong city. It shows that young people there are heavily influenced by people around them, such as family, friends, and environmental groups. This result aligns with similar studies conducted in other countries (Webb et al., 2013).

Perceived behavioral control positively influences young people's intention in Hai Phong city to save energy. This finding aligns with Ru (2018) and supports planned behavior theory (Ajzen, 1991), which states that PBC directly determines behavioral intent. Young people, especially in a developed city like Hai Phong, frequently access technology, media, and social media, which helps them develop clear awareness of actions to save energy, such as turning off unused electrical devices, using energy-efficient bulbs, and installing applications to monitor electricity consumption.

Based on the research results, there are some proposed policy implications as follows:

Firstly, improve energy and environmental knowledge among young people to encourage positive attitudes and behavioral intentions toward energy saving. An educational system focused on energy efficiency and related information should be established to strengthen social standards for energy efficiency and promote sustainable energy.

Secondly, it is necessary to increase knowledge and raise awareness through the media, websites, and images of positive impacts from celebrities. Therefore, launching campaigns, action months, and special days like the Earth Hour program, calling on individuals and households to turn off electric lights and appliances that do not significantly affect daily life for an hour, can help make energy saving more relatable to everyone.

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