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INTENTION AND BEHAVIOR OF USING E5 BIOGASOLINE: A CASE STUDY OF VIETNAMESE CONSUMERS

INTENÇÃO E COMPORTAMENTO NO USO DA BIOGASOLINA E5: UM ESTUDO DE CASO COM CONSUMIDORES VIETNAMITAS

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Nam Danh Nguyen*
*Thanh Dong University, Hai Phong City, Vietnam
Orcid: https://orcid.org/0000-0002-0744-4793
namnd@thanhdong.edu.vn

Lan Ngoc Thi Uong*
*Thanh Dong University, Hai Phong City, Vietnam
Orcid: https://orcid.org/0000-0001-8314-4074
lanutn@thanhdong.edu.vn

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Abstract
The purpose of this study is to examine the influence of endogenous and exogenous factors on Vietnamese consumers' intention and behavior to use E5 biogasoline. Data were collected from 1,263 consumers, and the PLS-SEM method was employed to test the conceptual model. The analysis results indicate that the intention to use E5 biogasoline is explained by both endogenous and exogenous factors based on the theory of planned behavior, value theory, and diffusion of innovations theory. Endogenous factors such as attitudes, subjective norms, perceived behavioral control, environmental concern, environmental knowledge, and willingness to pay, along with exogenous factors like online social media and green consumption policies, positively affect the intention to use E5 biogasoline. Conversely, environmental apathy negatively impacts it. Additionally, the intention to use E5 biogasoline was found to significantly and positively influence the behavior of Vietnamese consumers in adopting E5 biogasoline. Based on these findings, several recommendations are provided to promote both the intention and behavior of consumers toward using E5 biogasoline in the future.

Keywords: E5 Biogasoline. Green Consumption. Consumer Behavior. Vietnam.

Resumo
O objetivo deste estudo é examinar a influência de fatores endógenos e exógenos na intenção e no comportamento dos consumidores vietnamitas em relação ao uso da biogásolina E5. Os dados foram coletados junto a 1.263 consumidores, e o método PLS-SEM foi empregado para testar o modelo conceitual. Os resultados da análise indicam que a intenção de usar a biogásolina E5 é explicada por fatores endógenos e exógenos com base na teoria do comportamento planejado, na teoria do valor e na teoria da difusão de inovações. Fatores endógenos, como atitudes, normas subjetivas, controle comportamental percebido, preocupação ambiental, conhecimento ambiental e disposição a pagar, juntamente com fatores exógenos, como mídias sociais online e políticas de consumo verde, afetam positivamente a intenção de usar a biogásolina E5. Por outro lado, a apatia ambiental tem um impacto negativo. Além disso, verificou-se que a intenção de usar biogásolina E5 influencia de forma significativa e positiva o comportamento dos consumidores vietnamitas na adoção da biogásolina E5. Com base nestas conclusões, são apresentadas várias recomendações para promover tanto a intenção como o comportamento dos consumidores em relação ao uso da biogásolina E5 no futuro.

Palavras-chave: *E5 Biogasolina. Consumo Ecológico. Comportamento do Consumidor. Vietnã.*

1 INTRODUCTION

The global economy is currently confronting complex issues related to environmental pollution. Growing concern about the environment has increased alongside recent challenges, especially in emerging economies like Vietnam (Hoang et al., 2019). These issues include the exhaustion of natural resources and global warming, which both directly and indirectly affect consumer choices and decisions. In response to these risks, many efforts have been made to protect the environment and promote sustainability through green microconsumption (Ogiemwonyi et al., 2023).

Green consumption behavior is safer for individuals and society (Alam et al., 2023). Green consumption provides solutions for humanity and helps reduce environmental problems caused by unsustainable consumption patterns. Previous research has shown that environmental issues resulting from unsustainable consumption and unplanned behaviors, such as water and air pollution (Ganglmair-Wooliscroft & Wooliscroft, 2025; Bala et al., 2023). In this context, using green products is essential for improving environmental conditions.

Many countries around the world have launched and implemented research programs to discover new energy sources, especially renewable and environmentally friendly options like solar, wind, and biomass energy (biofuels). Among these, biofuels are particularly popular and are chosen by most countries for development because they can be produced at an industrial scale, and the raw materials are plentiful, especially in countries with strong agricultural sectors, such as Vietnam.

Vietnam is a developing country in Southeast Asia, ranking 36th out of 118 countries for air pollution levels. The country faces significant carbon emissions from its transportation system, which has been the leading cause of serious pollution in recent years. On November 20, 2007, the Prime Minister signed Decision No. 177/2007/QD-TTg, approving the "Project on development of biofuels until 2015, with a vision to 2025," emphasizing the overall goal of "Developing biofuels, a new and renewable energy source to replace part of traditional fossil fuels, helping ensure energy security and protect the environment." On November 22, 2012, the Prime Minister signed Decision No. 53/2012/QD-TTg to establish a roadmap for applying blending ratios of biofuels with traditional fuels. According to this decision, starting December 1, 2015, all gasoline produced, blended, and traded for use in road vehicles nationwide must be E5

biogasoline. However, consumers have shown much less preference for E5 biogasoline compared to RON 92 gasoline. Study results reveal that only 50.3% are willing to accept E5 biogasoline, and the market share between RON 95 and RON 92 gasoline is evenly split at 50:50. Therefore, it is essential to research what factors influence Vietnamese consumers' intentions and behaviors toward using E5 biogasoline.

The study by Bach et al. (2018) relied on rational action theory, environmental stimulus, and price perception theory to examine the impact of green skepticism, subjective environmental knowledge, environmental concern, price consciousness, and environmental apathy on customers' willingness to buy green products, specifically E5 biofuel, in Ho Chi Minh City. Recently, Mamadzhanov et al. (2019) found that driving patterns, knowledge about renewable energy, acceptance of relevant government policies, and demographic characteristics positively influence the willingness to pay for second-generation lignocellulosic bioethanol in Korea. Lately, Do (2024) has based his research on the theory of cultural values to explore the impact of individualism and collectivism on consumers' intentions to purchase green products in Vietnam, and to clarify the regulatory role of belief in the relationship between intention and behavior regarding the use of biogasoline. Although Vietnamese consumers' behavior of using E5 biogasoline has been considered, previous studies have focused heavily on individual factors such as attitudes, perceptions, knowledge, beliefs, or individual policy contexts. Therefore, this study aims to fill the gap in prior research by examining the intention and behavior of Vietnamese consumers in using E5 biogasoline in relation to both endogenous and exogenous factors, supported by multi-theoretical integration.

The article is divided into six parts. Part 1 introduces the research problem. Part 2 covers the theoretical basis, models, and research hypotheses. Part 3 describes the research methodology. Part 4 presents the study's results. Part 5 discusses the implications of the findings. Finally, Part 6 provides the conclusion and addresses the study's limitations.

2 LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Related concepts

Green products are ecological or environmentally friendly items that conserve natural resources, are non-polluting, and recyclable. They especially include products made from biodegradable materials or packaged with eco-friendly materials (Chen & Thai, 2010). The Vietnam Biofuel Association defines biofuel as a green product used in machinery and vehicle operation; it is a type of alcohol produced by biotechnology called Gasohol (Methanol, Ethanol, Buthanol...) and biodiesel, which can be made from oils such as vegetable oil, animal fat, or waste vegetable oil.

Gupta et al. (2025) define E5 biogasoline as a mixture of 5% ethanol bioalcohol by volume and 95% traditional gasoline (A92) volume. The 5% ethanol is industrial alcohol produced through an extraction process that yields 99.5% ethanol from crop products such as corn, potatoes, and cassava. Vehicles using E5 biogasoline emit 20-30% less carbon monoxide (CO) emissions than traditional gasoline vehicles (Vu, 2025).

The study of consumer behavior explains the process of deciding whether to buy or not buy a good or service. According to Schiffman and Kanuk (2007), consumer intent measures a consumer's ability to purchase a product or service; the higher the consumption intent, the more likely the person is to buy the product. Green consumption involves using products and services to meet basic needs and improve quality of life while also limiting the use of natural resources, toxic materials, and waste and pollutants throughout the product or service lifecycle. This approach aims to avoid compromising the interests and needs of future generations (Liu et al., 2017). Therefore, using E5 biogasoline means choosing a blend of RON 92 gasoline and 5% bioethanol to meet transportation and vehicle operation needs, while also helping to reduce fossil fuel consumption, lower greenhouse gas emissions, and decrease environmental pollutants throughout the product's life cycle. It supports protecting public health and safeguarding the interests of future generations.

2.2 Underlying theory and analytical framework

This study combines multiple theories, including theory of planned behavior (TPB), value theory, and diffusion of innovations theory, to thoroughly explain the factors influencing the intention and behavior of E5 biofuel use among Vietnamese consumers.

The theory of planned behavior (TPB) was developed by Ajzen (1991) to identify factors that constitute the group of endogenous factors. According to TPB, a person's intention is the basis for actually performing an act. At the same time, that intention is influenced by three factors: attitude, which is the positive or negative feeling of the individual resulting from evaluating the outcomes of performing those acts; subjective norm, which is the extent to which societal influences shape an individual's perception of whether or not to perform that behavior; and perceived behavioral control, which is the individual's perception of how difficult or easy it is to perform a specific behavior. However, research by Donald and Cooper (2001) and Donald et al. (2014) indicated that the subjective standard in the TPB model does not provide a complete overview of the content, significance, and level of evaluation of social influence on an individual's intentions. Therefore, this study measures subjective norms in two aspects: personal norms (Bamberg et al., 2007) and descriptive norms (Eriksson & Forward, 2011) to better explain the extent of social influence on consumer behavior.

However, in the context of Industry 4.0, adding new elements to expand the TPB theoretical model is essential, as consumption trends among individuals and groups can change rapidly (Phan & Nguyen, 2025; Wang et al., 2018). Therefore, this study has identified several factors to expand the model in line with the emerging economic environment, including environmental concern, environmental apathy, and environmental knowledge.

Complementing TPB in this study is Rokeach's (1973) value theory, which explains why consumers choose or reject a product or service. According to this theory, a consumer's willingness to pay reflects the ultimate goal they aim to achieve. Values influence how consumers form attitudes and intentions to use. Additionally, if the value and benefits of the product align, the likelihood of purchase and usage increases.

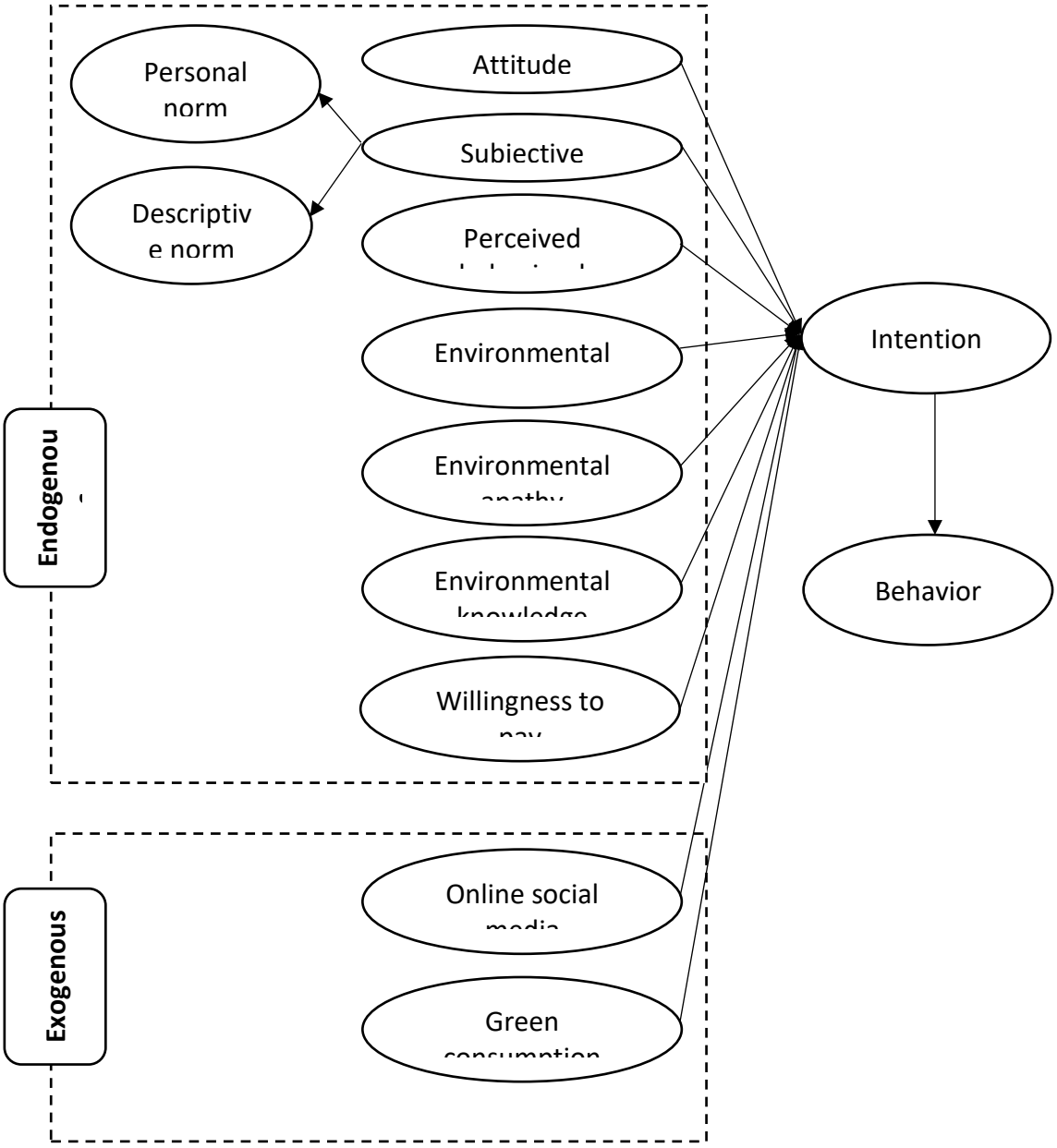
Additionally, in the context of Industry 4.0, the inclusion of new elements from an external perspective is necessary to expand the research model, as individual consumption trends can change easily. Therefore, the study used Rogers's (1962)

diffusion of innovations theory to add two more factors: online social media and green consumption policy.

The recommended analysis framework is as shown in Figure 1 as follows:

Figure 1

Analytical framework



Source: Proposed by the authors

2.3 Hypothesis development

According to TPB by Ajzen (1991), it has been shown that three factors, attitude, subjective norms, and perceived behavioral control, are considered the source of intention. At the same time, intention is the key to performing a specific behavior. The TPB model has explored the relationship between these factors in many different fields of consumer behavioral intent, especially in the area of environmentally friendly product consumption (Hoang et al., 2018; Wang et al., 2018; Do et al., 2023; Nguyen & Nguyen, 2024; Nguyen & Duong, 2025). Based on the above arguments, the research hypotheses are proposed as follows:

H1: Attitude positively influences the intention to use E5 biogasoline.

H2: Subjective norm positively influences the intention to use E5 biogasoline.

H3: Perceived behavioral control positively influences the intention to use E5 biogasoline.

Environmental concern refers to an individual's attitude toward ongoing environmental issues informed by various sources (Paço & Raposo, 2009) or, more broadly, their willingness to make sacrifices to protect the environment (Matthes & Wonneberger, 2009, 2014). Studies by Wei et al. (2018) and Hao et al. (2019) found that environmental concern directly influences green consumption intentions. Research by Yue et al. (2020) indicates that people who are more concerned about the environment are more likely to take actions to reduce waste and decrease environmental pollution. The greater the environmental concern, the more probable individuals are to have positive intentions and behaviors toward choosing products, goods, or services that benefit the environment (Chu, 2022; Ngo et al., 2024; Nguyen & Duong, 2024). Based on the above arguments, the research hypothesis is proposed as follows:

H4: Environmental concern positively influences the intention to use E5 biogasoline.

According to Thompson and Barton (1994), environmental apathy describes the attitude of some individuals who believe that environmental problems are being overexaggerated and that the natural environment is always capable of a certain self-balancing capacity, so there is no need to worry too much about problems related to environmental pollution. The sacrifice and inconvenience of having to abandon a habit or minimize the use of traditional products in favor of green products is the main cause of a

lack of concern for the environment, and apathy toward environmental health (Xu et al., 2015). The greater the environmental apathy individuals have, the less likely they are to intend to consume green products (Bach et al., 2022; Nguyen & Drink, 2024). Based on the above arguments, the research hypothesis is proposed as follows:

H5: Environmental apathy negatively influences the intention to use E5 biogasoline.

Environmental knowledge is a collection of facts and information gained through learning or practical experience across different aspects of the environment. An individual accumulates this knowledge when addressing environmental problems (Kaiser et al., 1999). Zsóka et al. (2013) found a strong link between environmental knowledge and positive environmental behaviors. The more environmental knowledge a person has, the easier it is to change attitudes and encourage behaviors like using eco-friendly products. Conversely, with less knowledge, attitudes and behaviors toward environmentally friendly products tend to be lower (Chan et al., 2014; Moslehpour et al., 2023; Nguyen & Duong, 2024). Based on the above arguments, the research hypothesis is proposed as follows:

H6: Environmental knowledge positively influences the intention to use E5 biogasoline.

Willingness to pay is an individual's willingness to spend more than the initial amount of money intended to purchase an environmentally friendly product or service compared to traditional options if they perceive it as valuable (Cronin et al., 2011; Chaudhary & Bisai, 2018). The greater the willingness to pay for eco-friendly products or services, the stronger the motivation and decision to buy them (Khoiriyah & Toro, 2018). Research by Ansari et al. (2025) has shown that appropriately priced green products or services motivate people to be willing to pay for items that are beneficial to health, zero waste, pollution reduction, and environmental protection. However, Do et al. (2023) did not find any link between willingness to pay and the intention to purchase environmentally friendly products or services. Based on the above arguments, the research hypothesis is proposed as follows:

H7: Willing to pay positively influences the intention to use E5 biogasoline.

Online social media refers to communication through online platforms, which can include social networking sites for exchanging and sharing personal information (such as Facebook, Twitter, TikTok, etc.) or social networks that share specific resources (like

YouTube). This type of communication enables users to comment and exchange ideas, allowing news to be shared and spread quickly among social media communities (Nguyen & Vu, 2019). Research by Sun and Xing (2022) has shown that using social media tools motivates individuals to be more intentional in choosing green products, goods, or services to follow sustainable consumption trends and green lifestyles. Thanks to widespread green media campaigns on social media platforms, individuals are more willing to shift their consumption intentions from traditional products and services to green ones (Sharma et al., 2023; Du & Phan, 2023). Based on the above arguments, the research hypothesis is proposed as follows:

H8: Online social media positively influences the intention to use E5 biogasoline.

Green consumption policy involves specific economic strategies that directly affect the interests and consumption behaviors of society's members, such as organizations, enterprises, and individuals. Its goal is to promote the use of eco-friendly products and services, reduce environmental emissions, encourage the efficient use of natural resources, and foster sustainable consumption habits. This aims to shift the economy from a brown to a green model toward sustainable development (Dang & Hoang, 2019). Wang et al. (2022) argue that policies focused on minimizing emissions that contribute to environmental pollution are a crucial foundation for developing green consumption policies, helping to shape individuals' perceptions of the intent to purchase products and services with green qualities, thereby ensuring a sustainable environment for future generations. According to Yu et al. (2021), the green tax policy is one of the green consumption policies that has a positive relationship with individuals' behavioral intentions when they consume green products and services. Green products and services will benefit from tax incentives, lowering costs and making green consumption more advantageous, which encourages individuals to be more willing to buy such products (Guo et al., 2025; Liu et al., 2022; Nguyen & Pham, 2022). Additionally, government regulations that promote green product and service consumption help create societal momentum and directly influence individuals' intentions during the consumption process (Ansari et al., 2025). Based on the above arguments, the research hypothesis is proposed as follows:

H9: Green consumption policy positively influences the intention to use E5 biogasoline.

In consumer behavior research, a consumer's purchase intent is a key variable that helps predict their actual purchasing ability. The concept of "purchase intent" refers to the resources and effort consumers are willing to invest in buying a specific product (Armitage & Conner, 2001; Joshi & Rahman, 2015), making it often a predictor of actual purchasing behavior (Montano & Kasprzyk, 2015). According to Ajzen (1991), the stronger a person's intention to perform an action, the more likely they are to succeed in doing it. Studies by Do (2024), Nguyen and Uong (2024) also show the positive influence of green product consumption intentions on consumer biogasoline consumption behavior, especially when trust has a moderate impact. Based on the above arguments, the research hypotheses are proposed as follows:

H10: The intention positively influences the behavior of using E5 biogasoline.

3 METHODOLOGY

3.1 Measurement scales

The preliminary scale was developed from previous studies (Sun & Xing, 2022; Nguyen & Duong, 2024; Nguyen & Drink, 2025; Ansari et al., 2025). The authors conducted a group discussion combined with in-depth interviews with several business managers, owners of petroleum wholesale and retail agents (selling E5 biogasoline), and consumers who have used or are using E5 biogasoline to gather feedback on the scales in the research model and their observational variables. These activities took place from March to May 2025. The results of the discussion showed that the participants agreed that the content of the scales and the relationships between them in the proposed research model were appropriate. Furthermore, the preliminary scale was added, and some observational variables were removed so that the content of the official scale is phrased in a concise, easy-to-understand, and non-duplicate manner to avoid misunderstanding by respondents and to ensure it is appropriate for the context of the study. The online survey form, designed using Google Forms, has two main parts: general information about the respondents and measurement items. The study used a 5-point Likert scale from Level 1 (Strongly disagree) to Level 5 (Strongly agree).

3.2 Data collection and analysis

The authors created a QR code containing the survey form's contents, which was posted at Petrolimex petrol stations in Hanoi and Ho Chi Minh City. Respondents are consumers who visit these locations to buy gasoline. Before starting the survey, participants were informed of the study's aims and their right to refuse participation or withdraw at any time. The authors confirm that this study follows relevant ethical guidelines for human subjects and that participants' anonymity and confidentiality were protected throughout the study. The study uses SmartPLS 4.3 software to test research hypotheses because the PLS-SEM technique suits studies with small sample sizes of 100 to 200 participants (Hoyle, 1995). Additionally, Hair et al. (2016) suggest that with an impact level of 80% and a reliability of 95%, the minimum sample size is 150. A convenient non-probabilistic sampling method was employed to easily reach survey participants and quickly attain the desired sample size. The result after distributing 2,350 questionnaires and removing invalid responses was 1,263 valid questionnaires, with a response rate of 75.1%. Among these 263 samples, males accounted for 72 percent, which is higher than females' 28 percent, indicating that males' interest in and understanding of E5 biogasoline are greater than those of females. Additionally, only 10% of respondents have used E5 biogasoline more than twice, while 75.3% have used it at least once, and 14.7% have only used traditional gasoline. This result suggests that the features of E5 biogasoline have not yet attracted Vietnamese consumers. Furthermore, respondents mostly aged 16-25 years made up 58.5%, those aged 26-35 accounted for 34.5%, while age groups 36 and over only represented 7% of the total sample. This indicates that the survey sample was heavily skewed toward young people. Additionally, students and learners comprised 67.5%, whereas employed individuals made up only 32.5%. Most respondents have either no stable income or an average income (5-7 million VND per month). This demographic data shows that the survey mainly involved young men with relatively good cognitive abilities but limited purchasing power. Their consumption habits are also not strongly linked to E5 biogasoline.

4 RESULTS

4.1 First-order measurement model

The study used Cronbach's Alpha coefficient and composite reliability to assess the reliability of the scales in the first-order measurement model. The results shown in Table 1 indicate that all factors are highly reliable, with values exceeding the threshold of 0.7 as recommended by Sarstedt et al. (2021). Additionally, the outer loadings of the scales are significant because their values are all 0.7 or higher (Hair et al., 2019). Moreover, the AVE values are all higher than 0.5 (Hair et al., 2019), demonstrating that the structures all achieved good convergent validity.

Table 1

Convergent validity and reliability of first-order measurement model

Scales	Sign	No.	Reliability		Convergent	Outer loadings
			Cronbach's Alpha	CR	AVE	
Attitude	Att	4	0.844	0.848	0.733	0.753
Personal norm	PN	3	0.862	0.867	0.719	0.784
Descriptive norm	DN	3	0.858	0.864	0.726	0.779
Peceived behavioral control	PBC	4	0.851	0.856	0.737	0.766
Environmental concern	EC	5	0.835	0.840	0.685	0.741
Environmental apathy	EA	5	0.842	0.849	0.691	0.759
Environmental knowledge	EK	5	0.839	0.846	0.702	0.764
Willingness to pay	WP	4	0.842	0.851	0.763	0.749
Online social media	OSM	5	0.854	0.861	0.698	0.756
Green consumer policy	GCP	5	0.857	0.865	0.709	0.745
Intention	Int	4	0.863	0.872	0.712	0.782
Behavior	Beh	3	0.869	0.877	0.722	0.791

Source: Data analysis results from SmartPLS 4.3 (2025)

The study used the Fornell-Larcker and HTMT criteria to assess the distinctiveness of the scale in the first-order measurement model. The results in Table 2 show that the square root of the AVE on the main diagonal is higher than the correlation coefficients between the variables, indicating that the model achieves discriminant validity. Additionally, an HTMT index below 0.85 suggests that the latent variables are sufficiently discriminant.

Table 2: Discriminant validity of the first-order measurement model

Fornell and Larcker												
Scale	**Att**	**PN**	**DN**	**PBC**	**EC**	**EA**	**EK**	**WP**	**OSM**	**GCP**	**Int**	**Beh**
Att	**0.856**											
PN	0.623	**0.848**										
DN	0.492	0.527	**0.852**									
PBC	0.786	0.602	0.448	**0.858**								
EC	0.493	0.385	0.603	0.473	**0.827**							
EA	0.551	0.576	0.482	0.531	0.382	**0.831**						
EK	0.713	0.743	0.734	0.354	0.526	0.536	**0.838**					
WP	0.582	0.781	0.583	0.673	0.481	0.691	0.703	**0.873**				
OSM	0.644	0.469	0.386	0.299	0.792	0.358	0.548	0.627	**0.835**			
GCP	0.725	0.568	0.401	0.407	0.747	0.283	0.472	0.513	0.426	**0.842**		
Int	0.804	0.795	0.542	0.613	0.507	0.646	0.656	0.408	0.651	0.750	**0.844**	
Beh	0.826	0.754	0.589	0.577	0.464	0.401	0.697	0.366	0.475	0.834	0.695	**0.850**
HTMT												
Att												
PN	0.620											
DN	0.496	0.547										
PBC	0.785	0.501	0.326									
EC	0.728	0.727	0.412	0.504								
EA	0.598	0.433	0.541	0.683	0.315							
EK	0.532	0.669	0.276	0.368	0.438	0.807						
WP	0.765	0.571	0.372	0.406	0.694	0.752	0.783					
OSM	0.543	0.612	0.731	0.480	0.605	0.376	0.777	0.286				
GCP	0.465	0.395	0.635	0.289	0.563	0.495	0.817	0.472	0.329			
Int	0.836	0.625	0.744	0.692	0.775	0.645	0.740	0.591	0.708	0.528		
Beh	0.823	0.631	0.768	0.704	0.797	0.662	0.772	0.611	0.717	0.534	0.824	
Note: significant < 0.05												

Source: Data analysis results from SmartPLS 4.3 (2025)

4.2 Second-order measurement model

The study used Cronbach's Alpha, composite reliability, and AVEs to assess the scale's overall reliability and convergent validity. Table 3 shows that the Cronbach's Alpha coefficients are above 0.7, indicating that all constructs have good reliability. Additionally, the composite reliability values for all indicators exceeded 0.7 (Henseler & Sarstedt, 2015), demonstrating the scales' reliability. Furthermore, the AVE values in this study ranged from 0.721 to 0.809 and exceeded 0.5 (Hair et al., 2019), confirming that all constructs demonstrated strong convergent validity.

Table 3

Convergent validity and reliability of second-order measurement model

Scale	Sign	No	Reliability		Convergent	Outer loadings
			Cronbach's Alpha	CR	AVE	
Attitude	Att	4	0.891	0.924	0.803	0.761
Subjective norm	SN	2	0.879	0.902	0.809	0.806
Peceived behavioral control	PBC	4	0.883	0.911	0.799	0.742
Environmental concern	EC	5	0.841	0.868	0.758	0.739
Environmental apathy	EA	5	0.854	0.876	0.738	0.751
Environmental knowledge	EK	5	0.845	0.871	0.721	0.757
Willingness to pay	WP	4	0.866	0.882	0.788	0.780
Internet social media	ISM	5	0.872	0.892	0.735	0.748
Green consumer policy	GCP	5	0.874	0.898	0.746	0.736
Intention	Int	4	0.887	0.915	0.825	0.793
Behavior	Beh	3	0.893	0.928	0.837	0.813

Source: Data analysis results from SmartPLS 4.3 (2025)

Next, the study used the Fornell–Larcker and HTMT criteria to assess the discriminant validity of the scale. The results showed that the square root of AVE was greater than the correlation coefficient in the corresponding row and column, indicating that the scales achieved discriminant validity. Additionally, constructs had a lower HTMT index of 0.85. Therefore, the scales in the research model are reliable and valuable (see Table 4).

Table 4. Discriminant validity of the second-order measurement model

Fornell – Larcker											
Scale	**Att**	**SN**	**PBC**	**EC**	**EA**	**EK**	**WP**	**OSM**	**GCP**	**Int**	**Beh**
Att	**0.896**										
SN	0.506	**0.899**									
PBC	0.732	0.473	**0.894**								
EC	0.317	0.454	0.674	**0.871**							
EA	0.443	0.617	0.491	0.452	**0.859**						
EK	0.628	0.309	0.287	0.369	0.776	**0.849**					
WP	0.427	0.549	0.718	0.529	0.689	0.535	**0.887**				
OSM	0.394	0.659	0.569	0.641	0.431	0.348	0.581	**0.857**			
GCP	0.588	0.371	0.538	0.485	0.318	0.629	0.346	0.652	**0.864**		
Int	0.843	0.705	0.755	0.609	0.811	0.773	0.684	0.783	0.812	**0.908**	
Beh	0.833	0.724	0.796	0.654	0.823	0.798	0.701	0.794	0.832	0.762	**0.915**
HTMT											
Att											
SN	0.620										
PBC	0.496	0.547									
EC	0.785	0.501	0.364								
EA	0.728	0.727	0.293	0.471							
EK	0.598	0.433	0.483	0.544	0.374						
WP	0.532	0.669	0.578	0.258	0.682	0.510					
OSM	0.765	0.571	0.522	0.334	0.456	0.307	0.428				
GCP	0.543	0.612	0.606	0.634	0.573	0.429	0.519	0.439			
Int	0.465	0.395	0.624	0.546	0.295	0.649	0.604	0.502	0.445		
Beh	0.622	0.594	0.715	0.761	0.699	0.584	0.614	0.756	0.711	0.639	
Att	0.636	0.601	0.729	0.774	0.686	0.593	0.637	0.767	0.723	0.643	0.706
Note: significant < 0.05 and 0.01											

Source: Data analysis results from SmartPLS 4.3 (2025)

4.3 Structural model

The study employs a Variance Inflation Factor (VIF) to analyze multicollinearity. According to Hair et al. (2019), the presence of multicollinearity can increase the standard error in bootstrapping, so the VIF should stay below the threshold of 5. In this study, the highest VIF coefficient for the latent variables was 2.445, indicating no multicollinearity. Additionally, f^2 is employed to assess effect size. According to Chin (1998), f^2 values of 0.35, 0.15, and 0.02 are considered large, medium, and small effect sizes. The results showed that the f^2 values of the structures exceeded the threshold of 0.35.

Table 5

VIF and f^2

Hypothesis	**VIF**	**f^2**
H1	1.863	0.415
H2	1.598	0.398
H3	1.706	0.407
H4	1.524	0.362
H5	2.192	0.241
H6	2.445	0.184
H7	1.927	0.365
H8	1.826	0.378
H9	1.383	0.383
H10	1.204	0.321

Source: Data analysis results from SmartPLS 4.3 (2025)

The analysis results in Table 6 indicate that the model effectively explains the dependent variable, as evidenced by the high adjusted R^2 and R^2 values. Since this study focused on consumer behavior, a statistically significant R^2 value of 0.2 or higher was considered strong evidence of explanatory power (Rasoolimanesh et al., 2021). Additionally, the structures have Q2 values above the threshold of 0 (Hair et al., 2019). The results also show a good fit with an SRMR of less than 0.08 (Hair et al., 2019) and demonstrate the model's strong predictive ability.

Table 6

R^2 and Q^2

	R^2	**Adjusted R^2**	**Q^2**	**SRMR**
Intention	0.732	0.714	0.487	0.064
Behavior	0.858	0.823	0.561	

Source: Data analysis results from SmartPLS 4.3 (2025)

The study used the Bootstrapping method with 5,000 iterations to test research hypotheses. Detailed information on path coefficients and p-values is presented in Table 7.

Table 7

Testing of hypotheses

Hypothesis		**β**	**Sample mean**	**STDEV**	**t**	**p**	**Conclusion**
H1	Att → Int	0.347	0.351	0.053	3.567	0.000	Accepted
H2	SN → Int	0.321	0.318	0.059	2.994	0.000	Accepted
H3	PBC → Int	0.336	0.332	0.055	3.258	0.000	Accepted
H4	EC → Int	0.158	0.161	0.054	2.649	0.005	Accepted
H5	EA → Int	-0.275	0.279	0.057	4.115	0.007	Accepted
H6	EK → Int	0.199	0.198	0.056	5.836	0.001	Accepted
H7	WP → Int	0.143	0.146	0.055	4.882	0.002	Accepted
H8	OSM → Int	0.124	0.120	0.054	4.394	0.002	Accepted
H9	GCP → Int	0.218	0.221	0.055	5.257	0.000	Accepted
H10	Int → Beh	0.407	0.411	0.058	3.893	0.000	Accepted

Source: Data analysis results from SmartPLS 4.3 (2025)

The results in Table 7 indicate that hypotheses from H1 to H10 positively influence Vietnamese consumers' intention and behavior to use E5 biogasoline ($p < 0.05$). Therefore, these hypotheses are accepted. Additionally, the results of the mediation analysis are also presented in Table 8.

Table 8

Decompositions of path coefficient

Hypothesis	**β**	**Sample mean**	**STDEV**	**t**	**p**
Att → Int → Beh	0.247	0.251	0.038	2.572	0.001
SN → Int → Beh	0.223	0.219	0.031	2.105	0.005
PBC → Int → Beh	0.236	0.232	0.032	2.254	0.002
EC → Int → Beh	0.158	0.163	0.033	3.971	0.017
EA → Int → Beh	0.106	0.111	0.035	4.649	0.023
EK → Int → Beh	0.173	0.178	0.034	4.353	0.011
WP → Int → Beh	0.185	0.189	0.030	5.625	0.032
OSM → Int → Beh	0.192	0.193	0.031	5.218	0.036
GCP → Int → Beh	0.255	0.257	0.032	3.026	0.008

Source: Data analysis results from SmartPLS 4.3 (2025)

5 DISCUSSION AND IMPLICATIONS

5.1 Discussion

Based on the results from the current study, endogenous factors (attitude, subjective norm, perceived behavioral control, environmental concern, environmental apathy, environmental knowledge, willingness to pay) and exogenous factors (online social media, green consumer policy) have a positive and negative influence on the intention and behavior of Vietnamese consumers to use E5 biogasoline. The results also show an important mediate role of intention for the use of E5 biogasoline. These findings are also supported by previous studies by Sun and Xing (2022), Nguyen and Uong (2024), Do (2024), Nguyen and Uong (2025), and Ansari et al. (2025).

However, the novelty of this study compared to previous research is that it successfully demonstrates the relationship between online social media and consumers' intentions and behaviors to use E5 biogasoline. This has not been empirically tested in prior studies on E5 biogasoline in Vietnam (Bach et al., 2022; Do, 2024). Additionally, this study is novel in measuring subjective norm as a higher-order construct by assessing two aspects: personal norm and descriptive norm. This approach provides a more comprehensive view of how social pressure and perceptions of common community behaviors influence the intention to use E5 biogasoline. Unlike previous studies that only considered unidimensional subjective standards, the higher-order measurement method better captures the multidimensional nature of the concept and enhances reliability in the context of green consumption in Vietnam.

5.2 Implications

Theoretically, this study combines endogenous and exogenous factors to assess intention and behavior regarding the use of E5 biogasoline in Vietnamese conditions, where characteristics of oriental culture, such as a strong emphasis on tradition, a resistance to change, and the heavy influence of family opinions on consumption behavior, are present. According to the authors' best knowledge, this is the first study to clarify this influence mechanism in the context of Vietnam. Therefore, this research can serve as a theoretical foundation and reference for future studies to build upon.

Practically, this study offers valuable insights for stakeholders seeking to enhance Vietnamese consumers' willingness and actions to adopt E5 biogasoline in the future, thereby supporting sustainable development. Given the key contributions of this research and its analysis results, several policy recommendations are proposed to encourage Vietnamese consumers to use E5 biogasoline more actively as follows:

First, attitudes have the strongest positive direct influence on intentions and also a significant indirect effect on the behavior of Vietnamese consumers using E5 biogasoline. Therefore, the government should develop national communication campaigns centered on the message "E5 biogasoline – a friendly and sustainable choice" to foster pride and environmental responsibility among the people. Additionally, petroleum companies involved in production and distribution need to run promotional programs, offer free samples, and provide transparent information about the production process, quality, and benefits of E5 at sales points to build trust and positive attitudes. Furthermore, social organizations and environmental groups should participate in community mobilization efforts, incorporating information about E5 biogasoline into environmental education activities, thereby spreading positive attitudes through social networks.

Next, to enhance perceived behavioral control, the study recommends that local governments take measures to ensure the convenience and accessibility of E5 biogasoline. Additionally, petroleum producers and distributors should expand the network of E5 biogasoline stations in densely populated areas, key traffic routes, and rural regions, and set reasonable and competitive prices compared to traditional gasoline. Moreover, enterprises and local authorities need to increase the dissemination of information on how to use E5 safely and effectively through local media channels, helping consumers feel more confident and proactive when choosing this fuel.

Finally, to improve consumers' subjective norms and reduce environmental apathy, thereby promoting the intention and behavior of using E5 biogasoline, local governments should strengthen awareness campaigns. They should educate the public about the environmental and economic benefits of E5 biogasoline through mass media, social networks, and community events; organize direct communication campaigns at petrol stations to create positive social pressure and showcase consumers leading the way in using E5; collaborate with social organizations and mass organizations (such as the Youth Union, Women's Union, Farmers' Association) to mobilize members and role

models to use E5 and share positive experiences; and simultaneously implement policies that encourage or prioritize the sale of E5 at local petrol stations to increase its appeal and establish social norms supporting biofuels.

6 CONCLUSION

Promoting a green economy plays a vital role in Vietnam's sustainable development. The study identified two groups of factors—endogenous and exogenous—that influence the intentions and behaviors of Vietnamese consumers towards consuming E5 biogasoline. While the study presents some interesting findings, it also has limitations. First, the sample was gathered from consumers at Petrolimex stations in Hanoi and Ho Chi Minh City. As a result, the findings cannot be generalized to other regions nationwide. Second, because the study relies on cross-sectional data, it may introduce some bias in the sampling process. Therefore, future research should broaden the survey to include a more diverse group of participants and utilize different survey distribution channels.

6.1 Ethical approval and informed consent

Ethical approval for this study was obtained from the thanh Dong University campus ethics committee, under ref erence number 113/QD-DHTD. Verbal consent was acquired from all participants involved in the study before con ducting structured interviews and a survey. Participants were informed verbally about the study's purpose, the nature of their participation, and their right to withdraw at any time without penalty. Verbal consent was considered appropriate due to the study population's literacy levels and cultural context. the enumerators meticulously docu mented the consent process through detailed notes taken during the interviews. Verbal consent transcripts were created based on these notes from the participants' interviews. this approach ensured that participants were ade quately informed and had provided consent for their participation.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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