

ANALYZING THE ADOPTION OF GREEN TAXI SERVICES: A MULTI-STAKEHOLDER PERSPECTIVE

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ABSTRACT

Vehicle emissions are a major contributor to urban air pollution, which poses significant health risks and contributes to environmental degradation. Research indicated that electric vehicles (EVs), such as green taxis, produce fewer pollutants than gasoline- and diesel-powered vehicles, offering the potential for cleaner urban environments. However, the widespread adoption of electric taxis is hindered by a disconnect between key stakeholders—researchers, managers, and customers—regarding their roles and expectations. To address this, a hybrid approach, combining Partial Least Squares Structural Equation Modelling (PLS-SEM) and multi-criteria decision-making techniques, specifically the Best-Worst Method (BWM), was employed to identify the key factors driving green taxi adoption in Vietnam. This approach was divided into two phases. Phase 1 utilized the Triple Bottom Line theory to examine the Environmental Behavior Intention of customers. Data in Phase 1 were collected through purposive sampling, involving over 200 participants, and analysed using PLS-SEM method. Phase 2 employed the Best-Worst Method (BWM) model, which considered three main criteria—Environmental, Social, and Economics dimension—to analyse the data. In Phase 2, ten experts, including managers and researchers, were interviewed to gather insights. The findings from Phase 1 revealed that customers' Environmental Behavioral Intentions were primarily influenced by Environmental Attitudes, Media Influence, Perceived Comfort, and Time Travel Period. In Phase 2, the results indicate that managers prioritized economics factors, while researchers emphasized environmental concerns.

Keywords: *Green taxi, Best-Worst Method, PLS-SEM, Environmental Behavioral Intention, Multiple stakeholders*

1. INTRODUCTION

Sustainability has become an increasingly urgent concern, particularly in the context of transportation, due to rising public health and environmental issues. Vehicle emissions remain one of the largest contributors to urban air pollution, leading to severe health risks and environmental degradation (Ecer, 2021). As the demand for cleaner transportation options grows, green taxis—powered by electric motors or alternative fuels—emerge as a viable solution to reduce emissions and improve air quality. Research shows that electric vehicles emit fewer pollutants compared to gasoline and diesel-powered vehicles, leading to cleaner urban environments (Duarte et al.,

2016; Z. Li et al., 2019; N. Wang et al., 2023). In recent years, the prevalence of keywords such as “green taxis” has grown significantly in academic literature, reflecting the increasing attention on sustainable transportation (Haghani et al., 2023). Green taxis operated by electric motors or alternative fuels rather than gasoline or diesel (Faria et al., 2013). The automotive industry is a major contributor to these emissions, especially in Ho Chi Minh City (Dominutti et al., 2023). Vietnam, facing growing environmental challenges, has seen a notable rise in the adoption of greener alternatives to gasoline-powered vehicles (Huu & Ngoc, 2021). Vietnam consistently experiences poor air quality. Particulate matter (PM_{2.5}), one of the main components of vehicle exhaust, could be considered the most consequential air pollutant regarding health impact. Vietnam recorded 43.7 µg/m³ for PM_{2.5} in Ho Chi Minh city in 2023. The pollution is 8 times much higher than WHO air quality recommendations (IQAir, 2023). Recent research indicates that PM_{2.5} exposure contributes to not only cerebrovascular diseases, heart disease, weaker respiratory infection, lung cancers but also many severe health effects such as chronic kidney disease (Camilleri et al., 2023; Guo et al., 2022; Sisani et al., 2022). According to a statistic, by the end of 2023, there were nearly 75 million motorbikes in operation nationwide, including nearly 73 million gasoline-powered motorbikes and over 2 million electric motorbikes. In 2013, there were only 37 million registered motorbikes across the country, meaning the number has doubled over the past 10 years (Stockbiz, 2024). This highlights the need for Vietnam not only to expand its public transportation system but also to prioritize the adoption of electric vehicles, and green transportation like green taxis can solve this problem. The UN Economic Commission for Europe (2021) has encouraged the development of ‘green transportation’ initiatives, including the adoption of green taxis. These initiatives are part of a broader movement toward sustainable urban mobility, aimed at reducing the carbon footprint of city transportation services. Vietnam has committed to achieving net-zero emissions by 2050 (WHO, 2024). The green transition within the transportation sector can plunge to 21% of Vietnam’s greenhouse gas emissions (Nghia et al., 2024). Hence, if all traditional taxis are replaced by electric taxis, the taxi industry in a metropolitan city can reduce its CO₂ emissions into the environment by 74,6% (Nghia et al., 2024). This transition will significantly improve air pollution in the city’s urban area (Nghia et al., 2024). Moreover, not only EVs can reduce the air pollution, they can also reduce the noise pollution (Cai et al., 2017). Unlike gasoline and diesel engines, the latest generation of electric vehicle models are equipped with electric motors that operate at significantly lower noise levels, and they often feature enhanced noise insulation, making them quieter during operation (Cesbron et al., 2021; Krishnasarma et al., 2021; Yavuz et al., 2024). As a result, new-generation electric vehicles contribute to a substantial reduction in noise pollution. Not only that, small and low-range electric vehicles are more affordable than gasoline-powered cars (Woody et al., 2024), and most green taxi services use these kinds of vehicles. Therefore, by switching to green taxis, taxi services can significantly reduce costs through lower energy expenses, reduced maintenance requirements, and increased vehicle efficiency.

While electric taxis offer significant environmental benefits, only 30% taxis working in Vietnam is Electric Vehicles (Nguyễn, 2024). Their adoption could be hindered by a disconnection among key stakeholders—researchers, managers, and customers—regarding their roles and expectations. For example, managers can use suggestions from researchers to promote marketing campaigns, which can effectively raise awareness and attitude of consumers toward green taxis. Thus, highlighting the importance of all stakeholders in this process. However, multi-criteria evaluations that encompass economic, social, and environmental factors from stakeholders’ perspectives remain underexplored. Hence, this study aims to address this gap by proposing a two-phase research method to compare the perspectives of consumers with those of managers and researchers to see whether there is an inconsistency in their perspectives. The results showed that there is indeed an inconsistency between the stakeholders.

2. LITERATURE REVIEW

2. 1. CONCEPTS RELATED TO GREEN TAXIS

2. 1. 1. ENVIRONMENTAL BEHAVIOR INTENTION (EBI)

Environmental Behavior Intention (EBI) reflect individuals' commitment to adopting eco-friendly practices (X. Li et al., 2021), such as using sustainable transportation options. López-Mosquera et al. (2015) categorized predictors of environmental behavior into demographic, economic, and environmentally conscious groups. On the other hand, Wijekoon & Sabri (2021) emphasized external factors such as social norms, perceived costs, and convenience as critical determinants. This suggests that environmental, social, and economics factors collectively shape Environmental Behavior Intention. To address these factors, the Triple Bottom Line (TBL) theory (Elkington, 1997) was utilized to explain Environmental Behavior Intention within the sustainability context by analyzing how the environmental, social, and economic dimensions impact consumer intentions. TBL is a business framework that expands the traditional focus on profit to include social and environmental considerations (Mastilo et al., 2025). It encourages companies to evaluate their performance not only based on financial success but also by how they impact society and the environment (Elkington, 1997). In this paper, there are ten main factors related to green taxi services, including: Environmental Awareness, Environmental Attitude, Environmentally Sustainable Features, Government Incentive Policies, Media Influence, Peer Communication, Perceived Fee, Perceived Comfort, Availability, and Time Travel Period. These factors are grouped into Environmental, Social and Economics dimension.

2. 1. 2. ENVIRONMENTAL AWARENESS (EAW)

Environmental Awareness was originally referred to the general knowledge or recognition of environmental issues (Takala, 1991). This awareness is a key driver in shaping consumers' intentions to adopt environmentally friendly behaviors, such as using electric vehicles (EVs) (Rustam et al., 2020). In the case of green taxis, when a consumer has a high awareness of the negative impacts of traditional cars on the environment, it can increase their intention to switch to a more environmentally friendly form of transportation, such as green taxis. Previous research from Abbasi et al., (2021) also indicated that people who are highly aware of environmental degradation and can differentiate between EVs and conventional cars are more likely to adopt environmentally friendly vehicles. However, this factor does not involve only environmental knowledge, but educational level, financial effects and beliefs (Carrión-Bósquez et al., 2024; Rustam et al., 2020). For instance, younger consumers with higher education levels are more likely to recognize the environmental benefits of EVs, but perceive them as costlier, thus showing a lower willingness to adopt (Ansu-Mensah, 2021; Wu et al., 2024). However, this financial concern could be removed, firstly, young consumers are likely to achieve higher salaries in near future, and secondly, the price gap between green taxis and traditional taxis is minimal. Both factors would remove financial constraints and lead to a stronger behavioral intention to use green taxis. Moreover, while some studies suggest that pro-environmental behaviors can arise even without Environmental Awareness (Kollmuss & Agyeman, 2002; P. Wang et al., 2014), it is widely recognized that such awareness plays a significant role in shaping individuals' behaviors toward the environment (Ghosh & Satya Prasad, 2024). Hence, we propose the following hypothesis:

H₁: Environmental Awareness positively affects Environmental Behavior Intention to use electric taxis.

2. 1. 3. ENVIRONMENTAL ATTITUDE (EA)

Environmental Attitude was originally referred to as the public feelings of environmental problems, which can be indicated by recognition and response towards environmental issues (Weigel & Weigel, 1978). Hoang Yen & Hoang (2023) have recently defined EA as the psychological intention by evaluating towards purchasing green products. Environmental Attitude is the step before an individual's behavior purchasing intention for protecting the environment (Fontes et al., 2021). Attitude positively affects the Intention in the case of sustainable transportation (Jaiswal et al., 2021). In the case of green taxis, when a consumer has a high level of Environmental Attitude, it may increase their intention to use green taxis. Previous study also identified Environmental Attitude shifts consumer behavior toward supporting the purchase of green products and services (Adhikari & Bisi, 2020). Previous study also stated that customers are more likely to buy and pay extra for eco-friendly products when their Environmental Attitude level is high (Pagiaslis & Krontalis, 2014). Environmental Attitude can strengthen a customer's intention to engage in green purchasing behavior (Ghosh & Satya Prasad, 2024). Hence, we propose the following hypothesis:

H₂: Environmental Attitude positively affects Environmental Behavior Intention to use electric taxis.

2. 1. 4. ENVIRONMENTALLY SUSTAINABLE FEATURES (ESF)

The terms "Environmentally Sustainable Features/ Attributes" first appeared in the literature in 2001 (W. Yang & Le, 2023). However, it lacks clear definitions (W. Yang & Le, 2023). This concept goes beyond the simple free emission concept and includes best production practices, sustainability on the processing line, and use of cleaner technologies (Lago et al., 2020). The environmental attributes of EVs may reflect the positive outcomes of adopting and using products that are perceived to be sustainable or environmentally friendly (Qian & Yin, 2017), which could lead to intention. In the case of green taxis, the consumers may realize the Environmentally Sustainable Features of green taxis, which might lead to the Behavior Intention. Previous study stated that young consumers are recognized for appreciating products with Environmentally Sustainable Features (Lago et al., 2020). However, there is limited research confirming the relationship between Environmental Sustainable Features and Environmental Behavior Intention. Hence, we propose the following hypothesis:

H₃: Environmentally Sustainable Features positively affects Environmental Behavior Intention to use electric taxis.

2. 1. 5. GOVERNMENT INCENTIVE POLICY (GIP)

Government Incentive Policy is defined as the degree to which individuals recognize and believe that policies are effective in motivating behavior (Fu et al., 2020). Empirical studies in other areas further support for the impact of the government incentive policy in driving environmental behavior intention. For example, He & Chen (2021) showed the result that subsidy policy contributes to improve social welfare and play a significant role in the development of green buildings. Yang et al. (2023) stated that there is a greater increase in green consumption behavior under the subsidy policy. Langbroek et al. (2016) found that perceptions of effective economic incentive policies promote sustainable transportation behavior. Similarly, Chemama et al. (2018), Krass et al. (2013), and Alizamir et al., (2016) observed that government subsidies and tax policies play critical roles in driving the adoption of green technologies, including electric vehicles (EVs). In the context of green taxis, government incentives, such as subsidies, tax reductions, or other financial benefits, can significantly reduce service costs. This reduction en-

ables consumers to access green taxi services at lower prices, enhancing their affordability and attractiveness. By alleviating financial constraints, well-designed incentive policies can encourage broader adoption of green transportation options and foster pro-environmental behavior. However, [Yuniza et al. \(2021\)](#) stated that the incentives are not necessary to the individual who has no financial constraints. In the context of our study, these people may perceive the price gap between green taxis and traditional taxis as small, leading them to disregard it. In this context, Government Incentive Policy does not affect Behavioral Intention. To clarify this statement, our study focuses on Vietnam, where most of the population does not have high income level. Hence, we propose the following hypothesis:

H₄: Government Incentives Policy positively affects Environmental Behavior Intention of using green taxi.

2. 1. 6. MEDIA INFLUENCE (ME)

[Ajzen \(1991\)](#) initially described Media Influence as social pressure regarding what others expect one should or should not perform a particular action. Today, Media Influence extends beyond pressure and includes the opinions of individuals and others affecting decision-making ([Grover et al., 2022](#)). Previous study believed that the coverage of media link to the perception of consumers about the degree of their control in protecting the quality of the environment ([Ozaki, 2011](#)). Media can change an individual consumer's attitude about his/her environment's unfriendly excess consumption behaviour with immediate effect ([Trivedi et al., 2018](#); [Varella-Candamio et al., 2018](#)). Through targeted messaging, the media can influence and promote environmental behavior, ultimately fostering a collective commitment to sustainability ([Le-maallem & Saadi, 2025](#)). However, media is where displays the brand image may influence consumer decisions if the company does not have a strong brand image on the media. Based on this evidence, it is hypothesized that media influence has a positive effect on individuals' environmental behavior intentions, specifically in the context of adopting green taxis. Hence, we propose the following hypothesis:

H₅: Media Influence positively affects Environmental Behavior Intention of using green taxi.

2. 1. 7. PEER COMMUNICATION (PE)

Peer Communication, as it is defined in the marketing literature, refers to any type of interpersonal communication about a product and/or the provider that sells it ([Wolske et al., 2020](#)). Such communication can happen through a variety of channels, from face-to-face conversations to organized group meetings to online discussion boards and reviews. For example, in the case of green taxi, family members or circle friends of consumers might recommend them to use green taxi service which might lead to stronger Behavior Intention ([Idris & Razak, 2025](#)). Previous research also highlights the influential role of peer communication in driving the adoption of sustainable behaviors and technologies ([Kuzmak, & Kuzmak, 2023](#)). For example, [Yuriev et al. \(2018\)](#) and [de Vries \(2020\)](#) emphasized that individuals are influenced not only by seeing that peers have adopted a technology but by hearing what they have to say about it. Furthermore, ([X. Wang et al., 2012](#)) showed that Peer Communication positively influences Purchase Intention. Based on this evidence, we propose the following hypothesis:

H₆: Peer Communication positively affects Environmental Behavior Intention of using green taxis.

2. 1. 8. PERCEIVED FEE (PF)

Perceived Fee is defined as the benefits customers receive from a product (Cakici et al., 2019). This perception significantly influences consumer buying behaviours and intentions (Ali & Bhasin, 2019). Khan & Mohsin, (2017) noted that higher prices negatively affect green product consumer choice behavior. In the case of green taxis, consumers may compare the price of green taxis with the alternative transportation options when deciding whether to adopt them. Based on this comparison, they develop a perception of the fee of using green taxis. Meanwhile, previous studies have highlighted that Perceived Fee is a key factor contributing to consumers' resistance to adopting innovations (Egbue et al., 2017). Existing studies have demonstrated that Perceived Fee has a negative impact on the adoption of innovations (X. He et al., 2018; Song, 2014). It negatively affects Behavioral Intention (Habibi & Rasoolimanesh, 2021). However, a more recent study found that Perceived Fee positively influences Behavioral Intention (F. J. Wang et al., 2023). This might be attributed to the participants in this study having relatively high incomes, which may increase their willingness to pay for products. Additionally, they may associate a higher price with superior quality or view it as a status symbol, leading to stronger Behavioral Intentions. To clarify this argument, our study focuses on Vietnamese consumers, who generally have lower income levels to test this relationship. Hence, we propose the hypothesis:

H₇: Perceived Fee negatively affects Environmental Behavior Intention to use green taxi.

2. 1. 9. PERCEIVED COMFORT (PC)

Perceived Comfort (PC) refers to an individual's subjective experience of liking, comfort, and happiness while interacting with a product or service (Mathwick et al., 2001). It can be considered as a positive feeling. Positive feelings associated with a product or service led to adoption behaviour (Venkatesh et al., 2003). Unlike gasoline and diesel engines, the latest generation of electric vehicle models are equipped with electric motors that operate at significantly lower noise levels, and they often feature enhanced noise insulation, making them quieter during operation (Cesbron et al., 2021; Krishnasarma et al., 2021; Yavuz et al., 2024). As a result, new-generation electric vehicles contribute to a substantial reduction in noise pollution, which may enhance consumer Perceived Comfort when using EVs. Meanwhile, green taxi brands in Vietnam use EVs as their fleet, which could potentially improve the overall Perceived Comfort and lead to the intention. Previous research also shown that Perceived Comfort plays a crucial role in shaping users' behavioural intentions (Khalid et al., 2024). Therefore, users who find green taxi services comfortable are more likely to develop a favourable perception. This suggests that if consumers perceive green taxis as more comfortable, they are more likely to choose these services. However, there is limited research clarify the relationship between Perceived Comfort and Environmental Behavioral Intention, especially in Vietnam. Hence, we propose the following hypothesis:

H₈: Perceived Comfort positively affects Environmental Behavior Intention of using green taxi.

2. 1. 10. AVAILABILITY (A)

Even if there is a strong purchase intention among consumers, if the availability of products remains significantly limited, it will make it challenging for consumer to fulfil their desires and ultimately impacting their overall satisfaction and purchasing behavior (Gleim & Lawson, 2014). For instance, if a consumer is in a hurry and needs a taxi, seeing the green taxi service available may prompt them to choose it. Furthermore, even when consumers do not currently require a taxi service, frequently seeing it on the street can foster a sense of familiarity with the

service. Familiarity, in turn, contributes to the formation of intention (Chi et al., 2020; Tan & Wu, 2016). In cases where the sustainable product was either unavailable or perceived to be unavailable, consumers refrained from purchasing it, despite having previously expressed positive attitudes toward the product and recognizing its inherent sustainability attributes (Weissmann & Hock, 2022). They also found that consumer Behavioural Intention is positively affected by product availability. Therefore, Availability may positively affect the sustainable intention of consumers. In this study, since we are focusing on Environmental Behavior Intention, we propose the following hypothesis:

H₉: Availability positively affects Environmental Behavior Intention of using green taxis.

2. 1. 11. TIME TRAVEL PERIOD (TTP)

Traditionally, travel time was regarded as a ‘cost’ to the traveler (Wadud & Huda, 2019), implying that longer travel times may decrease intention. However, in the context of the automobile industry, the Time Travel Period pertains to prospective buyers’ beliefs that EVs will facilitate more efficient and effective road trips and journeys (Osswald et al., 2012). If the consumer perceives the travel time of green taxis to be fast, this perception could increase their intention to use green taxis, as it aligns with their need for quick and efficient transportation. In urban area like Ho Chi Minh City, where traffic jam is common, EVs have the advantage of better acceleration compared to traditional internal combustion engine vehicles (Alemayehu Atiso, 2020) making them feel quicker in stop-and-go city traffic, which might lead to stronger Behavior Intention. However, there is a limited study confirming this relationship. Hence, we propose the following hypothesis:

H₁₀: Time Travel Period positively affects Environmental Behavior Intention of using green taxis.

2. 2. MULTI-CRITERIA DECISION-MAKING (MCDM) METHODS

Various approaches to multiple-criteria decision-making (MCDM) are frequently used to address decision-making problems that involve considering multiple criteria to rank and select the most suitable alternatives (Ananda & Herath, 2009). Evaluating performance is a multifaceted decision-making process that encompasses various aspects of units. The process of implementing MCDM consists of the following four stages (Keshavarz-Ghorabae et al., 2021). Stage 1 assesses the different options by considering their overall performance in relation to the criteria that define the alternatives, and the criteria associated with the problem; stage 2 calculates the importance of each measure; stage 3 involves assessing the individual performance of each option on each measure, while stage 4 entails evaluating the alternatives based on their overall performance across all criteria.

The foundation of MCDM models is utility functions with constraints. Over the decades since MCDM was first introduced, many different MCDM models have been developed – for example, Charnes et al. (1978) introduced data envelopment analysis (DEA); Saaty (1987, 1996) proposed the analytic hierarchy process (AHP) and the analytic network process (ANP) in 1987 and 1996, respectively; Hosseinzadeh Lotfi et al. (2023) developed the measuring attractiveness by a categorical-based evaluation technique (Macbeth); Behzadian et al. (2012) introduced TOPSIS; and Rezaei (2015) proposed BWM.

Table 1 presents MCDM models applied in various fields. For example, Hamurcu & Eren, (2020) evaluated Electric Bus Selection performance by combining the AHP and TOPSIS MCDM method. C.-N. Wang & Nguyen, (2022) assessed the green performance of hotels by using the BWM model with the fuzzy TOPSIS model. In the supply chain of green residential

megaprojects, [Alamdari et al. \(2023\)](#) utilized BWM and TOPSIS in the field of Virtual Reality (VR) headset design. [Kwok & Tang, \(2023\)](#) used AHP and Fuzzy. In the transportation field, [Moktadir & Ren \(2024\)](#) used Pareto and BWM.

Table 1. Representative literature on sustainable practice by the hybrid MCDM method

Hybrid MCDM Method	Application Sectors	Reference
AHP and TOPSIS	Electric Bus Selection with Multicriteria Decision Analysis for Green Transportation	(Hamurcu & Eren, 2020)
BWM and TOPSIS	Evaluating the sustainability of hotels using multi-criteria decision-making methods	(C.-N. Wang & Nguyen, 2022)
DEMATEL and ANP	An analytic network process model to prioritize supply chain risks in green residential megaprojects	(Alamdari et al., 2023)
AHP and Fuzzy	A fuzzy MCDM approach to support customer-centric innovation in virtual reality (VR) metaverse headset design	(Kwok & Tang, 2023)
Pareto-BWM	Towards green logistics: An innovative decision support model for zero-emission transportation modes development	(Moktadir & Ren, 2024)
PLS-SEM and BWM	Analyzing the Adoption of Green Taxi Services: A Multi-Stakeholder Perspective	Our study

Source: Authors' collection

[Rezaei \(2015\)](#) introduced the Best-Worst Method (BWM) in the group of the MCDM model to improve how weights for criteria are determined. There are some reasons why the BWM is the most suitable choice for this study. First, BWM simplifies the evaluation process by focusing only on the most and least important criteria ([Rezaei, 2015](#)). Unlike the other methods that need many comparisons among criteria, BWM only requires a formula of $2n-3$ comparisons where n is the number of criteria involved. This smaller number of comparisons helps save a lot of time and minimizes the risk of inconsistency in decision-makers' judgments. This method enhances decision-making efficiency and accuracy as many stakeholders are involved in this process.

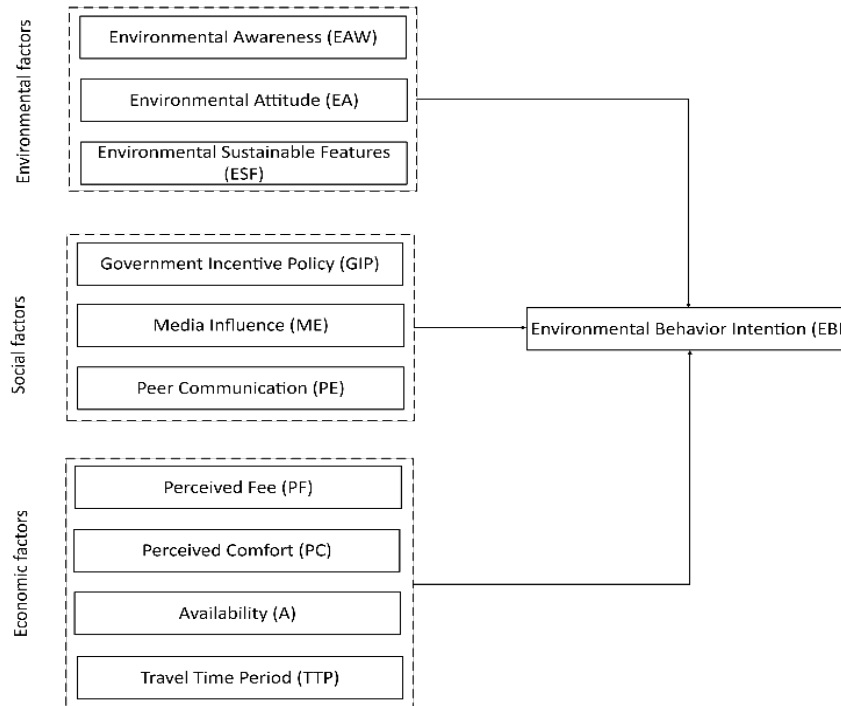
In the BWM model, decision-makers initially identify the best and worst indicators, followed by implementing pairwise comparisons on a numeric scale. These comparisons form the basis for mathematical calculations to estimate the weight of each criterion. The model has been effectively utilized across various fields. For example, in the logistics section, [Stević et al. \(2017\)](#) applied BWM to select the best wagon for internal logistics at a company. Similarly, [Mahdiraji et al. \(2018\)](#) combined BWM and COPRAS (complex proportional assessment method) to identify factors for creating sustainable architecture. However, there are only a few studies applying BWM in green taxis, which is a key purpose of this study.

3. METHODOLOGY

To address the multiple conflicting criteria influencing the Environmental Behavior Intention to use green taxis, a hybrid method combining PLS-SEM and the Best-Worst Method (BWM) is proposed. As shown in Figure 1, the proposed framework combines PLS-SEM to assess the quantitative impact of various factors, while the Best-Worst Method (BWM) is used to determine the weights of the criteria. Unlike previous studies that primarily focus on technical or environmental aspects of green taxis, this research emphasizes stakeholders' perspectives to

provide a holistic view of the adoption process. The proposed model is applied to a study in Vietnam, a country promoting sustainable transportation solutions amid rapid urbanization and environmental degradation (Thi Mai et al., 2024). By assessing and ranking stakeholder behavior intentions, this study not only identifies the key factors influencing green taxi adoption but also provides valuable insights for decision-makers looking to implement eco-friendly transportation solutions.

Figure 1. The proposed research model for Phase 1



Sources: Authors' creation

3. 1. CUSTOMERS PERSPECTIVES (PHASE 1)

3. 1. 1. MEASUREMENT ITEMS

The questionnaire items were developed from the existing literature and adjusted for the purposes of this study. In this study, the Environmental Awareness factor was utilized the 7-item scale developed by Chu et al. (2019) for their research. Following that, a 5-item scale was utilized for Environmental Attitude (Tanwir & Hamzah, 2020) and Environmental Sustainability Features (Irfan & Ahmad, 2021). A 4-item personalization scale to assess Government Incentive Policies (Jaiswal et al., 2021). Media Influence was measured using the scale from Jaiswal et al. (2021). Peer Communication was measured using the scale from Gunawan et al. (2022). Perceived Fees, Perceived Comfort, Availability and Time Travel Period were examined based on (Jain et al., 2022; Khan & Mohsin, 2017; Munim & Noor, 2020; Tanwir & Hamzah, 2020). Finally, Environmental Behavior Intention was measured using the scale from (Tanwir & Hamzah, 2020). Table 2 describes measurement items in this study. Respondents were then instructed to indicate their level of agreement with each statement using a 5-point Likert scale (5 = strongly agree, 1 = strongly disagree).

Table 2. Measurement Scale

Dimension	Criterion/ Factors	Description	Source
Environmental dimension	Environmental Awareness (EA)	Environmental issues are important to me.	Adapted from Chu et al., (2019)
		I am interested in global warming.	
		I am well aware of future disasters that environmental problems will bring.	
		I think I should use electric taxis over gasoline-fuelled taxis.	
		I am willing to pay more for purchasing environmentally friendly products.	
		I prefer products and services of companies that are environmentally conscious	
		I feel I have an obligation to reduce waste into the environment.	
	Environmental Attitude (EA)	Using electric taxis is good.	Adapted from Tanwir & Hamzah (2020)
		Using electric taxis is beneficial.	
		Using electric taxis is worthwhile.	
		Using electric taxis is satisfactory.	
	Environmental Sustainability Feature (ESF)	Using electric taxis is valuable.	Adapted from Irfan & Ahmad, (2021)
		Electric taxi services are cheaper than traditional gasoline taxis.	
		Electric taxis produce less environmental pollution compared to gasoline taxis.	
		The travel range of electric taxis is shorter than that of gasoline taxis.	
		Electric taxis use environmentally friendly technology.	
		Electric taxis help reduce the use of increasingly scarce resources like petrol and natural gas.	
Social dimension	Government Incentives Policy (GIP)	Electric taxi services are quite convenient and improve my travel experience.	Adapted from Jaiswal et al., (2021)
		I think subsidy policies will encourage the adoption of electric taxis.	
		I think relaxation in tax policies will be helpful for adopting electric taxis.	
		Subsidy and tax policies are important to me for using electric taxis.	
	Media Influence (ME)	The government should provide other incentives for using electric taxis.	Adapted from Jaiswal et al., (2021)
		The media gives me positive stimuli about using electric taxis.	
		The media could influence me to start using electric taxis.	
	Peer Communication (PE)	I would take media information into account before deciding to use an electric taxi.	Adapted from Gunawan et al., (2022)
		If my family and relatives had used electric taxis, maybe I would too.	
		Maybe I will be interested in using an electric taxi if my close friends recommend it.	
		Advertisements about electric taxis in various media can promote me to use them.	
		The tax incentives offered by the government for electric taxis made me interested in using them.	
		If the environment I work in uses electric taxis, I might as well use them.	

Dimension	Criterion/ Factors	Description	Source
Economics dimension	Perceived Fee (PF)	The fare for electric taxis is reasonably priced.	Adapted from Khan and Mohsin, (2017)
		The fare for electric taxis offers value for money.	
		The fare for electric taxis is good for the price.	
		The fare for electric taxis is economical.	
	Perceived Comfort (PC)	Using an electric taxi seems to make me more comfortable.	Adapted from Tanwir & Hamzah (2020)
		As long as an electric taxi can make me comfortable when used, maybe I will use it even though it is more expensive.	
	Availability (A)	Punctual departure and arrival schedule for electric taxis.	Adapted from Munim & Noor (2020)
		Availability of electric taxi routes within and outside the city.	
		Availability of electric taxi services between city and airport.	
		Provision of compensation scheme in cases of loss or hazard with electric taxis.	
		Attention paid when passengers are boarding on-and-off an electric taxi.	
	Time Travel Period (TTP)	I would find electric taxis useful in my daily life.	Adapted from Jain et al. (2022)
		Using electric taxis would help me travel quickly.	
		Using electric taxis would increase my productivity.	
	Environmental Behaviour Intention (EBI)	In the near future, I will consider using an electric taxi.	Adapted from Tanwir & Hamzah (2020)
		In the near future, I will consider switching to an electric taxi.	
		I prefer electric taxis over conventional taxis.	
		I prefer electric taxis even if they are more expensive as compared to conventional taxis.	

Source: Authors' creation

3. 1. 2. DATA COLLECTION

As this study targets the consumers in Vietnam, making the use of probability sampling methods unfeasible. Consequently, a large-scale survey was conducted using non-probability sampling, specifically purposive sampling. The primary aim of purposive sampling is to enhance the study's rigor while ensuring the reliability and credibility of the collected data and the resulting findings (**Campbell et al., 2020**). The questionnaire will be translated into Vietnamese to cater Vietnamese participants. To ensure that responses are exclusively from Vietnamese individuals (as there is a possibility that non-Vietnamese people may understand Vietnamese and participate in the survey), a filter question will be added: "Are you Vietnamese? Yes/No." Respondents who select "No" will be excluded from the study. The questions were set to be optional, which means the respondents were not required to answer all the questions. Because if respondents are required to fill in all the questions, they would likely either refuse to complete the survey or intentionally randomize their answers entirely (**Survey Response - an Overview | ScienceDirect Topics, n.d.**) by that negatively affect the result of the research. Therefore, if an observation skipped at least one question, that observation would not be used.

As Vietnamese people tend to use internet, especially social media platform in free time (**Nguyen, 2024**), the researcher employs questionnaires to collect data via social media platforms.

There was a total of 235 respondents. However, only 202 respondents were valid. To determine the sample size of a multiple regression model, it will take the number of independent variable times 20 (**Hair et al., 2010**). In this case, the number of independent variables is 10. Therefore, the minimal sample size for this research is $10 \times 20 = 200$ (observations). Even though the sam-

ple size is sufficient, at 202, it is still considered small. Partial Least Squares Structural Equation Modeling (PLS-SEM) is a modern multivariate data analysis method designed to examine systems of relationships among multiple sets of variables, commonly encountered in social sciences (Hair et al., 2017; Lowry & Gaskin, 2014). PLS-SEM offers several advantages over Covariance Based Structural Equation Modeling (CB-SEM) in various situations often encountered in social science research, particularly when sample sizes are small or when estimating complex models with numerous indicators and relationships (Hair et al., 2017). Therefore, the data in phase one will be analyzed using PLS-SEM. PLS-SEM will be analyzed using Smart-PLS 3, a powerful tool and has been used in many top paper journals.

3. 2. MANAGERS AND RESEARCHERS' PERSPECTIVES (PHASE 2)

Evaluation criteria are shown in table 3. The study conducted a model of a two-stage approach combining the Best-Worst Method and Group Best Worst Method (GBWM) to consider combining all DMs. In the first stage, the BWM is used to determine the local weight for each group of stakeholders, then in the second stage, the GBWM is applied to figure the most efficient strategy prioritized by all DMs from five groups. In general, the procedure of BWM and GBWM models has the following basic steps:

Table 3. Evaluation Criteria for Green Taxi Adoption

Main criteria	Sub Criteria
Environmental dimension (C1)	Environmental Awareness (C1.1)
	Environmental Attitude (C1.2)
	Environmental Sustainability Feature (C1.3)
Social dimension (C2)	Government Incentive Policies (C2.1)
	Media Influence (C2.2)
	Peer Communication (C2.3)
Economic dimension (C3)	Perceived Fee (C3.1)
	Perceived Comfort (C3.2)
	Availability (C3.3)
	Time Travel Period (C3.4)

Source: Authors' creation

Step 1: Setting goals and criteria determination

The relevant literature is reviewed and the decision criteria (i.e. Cr1, Cr2,...,Crn) are identified.

Step 2: Data collection

The authors conduct interviews with experts or decision-makers (i.e. DMs) to collect data on the set of criteria. Afterward, the DMs base on the numeric scale as Table 4 to covert linguistic terms (i.e. from 1= "Equally important" to 9 = "Extremely Important") and make pairwise comparisons between the best-worst criterion and others. The participants can be summarized in table 5:

Table 4. Numeric scale values for pairwise comparison

Scale	Linguistic term
1	Equally Important (EI)
2	Intermediate (IEM)
3	Moderately Important (MI)
4	Intermediate (IMI)
5	Important (I)
6	Intermediate (IVI)
7	Very Important (VI)
8	Intermediate (IVE)
9	Extremely Important (EI)

Source: Rezaei (2015)

Table 5. Description of the manager and expert

DMU	Degree	Expertise	Experience Years
Manager 1	Master	Transportation	18
Manager 2	Bachelor	Travelling and Transportation	20
Manager 3	Master	Logistics	15
Manager 4	PhD	Transportation	10
Researcher 1	PhD	Public Economic	5
Researcher 2	PhD	Economic	8
Researcher 3	PhD	Transportation	10
Researcher 4	PhD	Logistics	15
Researcher 5	Assoc. Prof	Transportation	15
Researcher 6	Master	Transportation	8

Source: Authors' creation

Step 3: Modelling and Estimation

The authors estimate the pairwise comparison of preferences between the best- worst criterion and all other criteria based on the guidance from (Safarzadeh et al., 2018). The Best to Others (O_B) and Others to Worst (O_W) preferences are shown in Equations (1) and (2) below:

$$O_B = (O_{B1}, O_{B2}, O_{B3}, \dots, O_{Bn}) \quad (1)$$

$$O_W = (O_{1W}, O_{2W}, O_{3W}, \dots, O_{nW}) \quad (2)$$

In which,

O_{Bj} and O_{jW} represents the pairwise preference value between best to another criteria j and j to worst criterion, $\forall j = 1, 2, 3 \dots n$. To find the optimal weights ($W_1^*, W_2^*, \dots, W_n^*$) for ranking of criteria, the following mathematical program model of GBWM is utilized as equations below.

Min ξ

Subject to

$$\xi \geq \lambda_k \xi_k, \forall k \in D \quad (3)$$

$$W_B - W_j \times O_{Bj} \leq \xi_k, \forall j \in J, k \in D \quad (4)$$

$$W_B - W_j \times O_{Bj} \geq -\xi_k, \forall j \in J, k \in D \quad (5)$$

$$W_j - W_W \times O_{jW} \leq \xi_k, \forall j \in J, k \in D \quad (6)$$

$$W_j - W_W \times O_{jW} \geq -\xi_k, \forall j \in J, k \in D \quad (7)$$

$$\sum_j W_j = 1 \quad (8)$$

$$W_j \geq 0, \forall j \in J \quad (9)$$

$$\xi_k \geq 0, \forall k \in D \quad (10)$$

In which,

W_B and W_W : the weights of the most (best) and the least (worst) important criteria, respectively.

D : the set of Decision maker; j index for criteria.

λ_k : the weight of decision-maker k

W_j : the weight of criterion j

ξ_k : the inconsistency in pairwise comparisons obtained by k^{th} decision-maker

Step 4: Consistency Ratio (CR)

A comparison is fully consistent if:

$$O_{Bj} \times O_{jW} = O_{BW}, \forall j \in J,$$

where:

O_{BW} : is the preference of best criterion over worst criterion

The optimal values of ξ_k are used to calculate the consistency ratio for each decision-maker (CR_k) and group decision making (CR^G) as below:

$$CR_k = \lambda_k \left(\frac{\xi_k^*}{CI} \right), \forall k \in D \quad (11)$$

$$CR^G = \text{Max}_k \{ CR_k \} \quad (12)$$

In which, ξ_k^* the optimal value of inconsistency for the k^{th} decision-maker

λ_k : the weight given to the k^{th} DM based on expertise level

CI: Consistency Index values are given in Table 6, corresponding to the value of O_{BW} as CR^G decreases, the consistency increases and if $CR^G = 0$, it implies that the solution is fully consistent.

Table 6. Consistency Index (CI)

	1	2	3	4	5	6	7	8	9
CI (max ξ)	0.00	0.44	1	1.63	2.30	3	3.73	4.47	5.23

Source: Rezaei (2015)

3. 2. 1. SENSITIVITY ANALYSIS

The authors conducted a sensitivity analysis to assess how variations in participant weighting impact the model's outcomes and rankings. The analysis involved three distinct scenarios:

Scenario 1: Equal Weighting. Each participant's input is assigned the same weight, with the assumption that all opinions hold equal value, regardless of experience or education.

Scenario 2: Weighting by Experience. Participants are scored based on their years of experience, with a scale from 1 (least experienced) to 4 (most experienced). This approach assumes that more experienced individuals provide more valuable insights.

Scenario 3: Weighting by Educational Level. Participants are rated from 1 (lowest educational qualification) to 4 (highest qualification). This approach assumes that higher educational qualifications correlate with more informed or accurate input. Table 7 shows scoring criteria for experience year (with "x" is the experience year) and table 8 shows scoring criteria for educational level. Based on these scores, the weight for each respondent will be calculated by dividing an individual's score to the sum of all scores in each scenario.

Table 7. Scoring criteria for experience year

Exp year (x)	Score
$x > 15$	4
$x \in [11;15]$	3
$x \in [6;10]$	2
$x \leq 5$	1

Source: Authors' calculation

Table 8. Scoring criteria for educational level

Degree	Score
Post Doc	4
PhD	3
Master	2
Bachelor	1

Source: Authors' calculation

4. DATA ANALYSIS

4. 1. RESULTS IN PHASE 1

4. 1. 1. DESCRIPTIVE STATISTICS

In this first stage, the purpose of descriptive statistics is to provide a better description of the variables and their features. This analysis includes 48 questions connected to ten key criteria. In the 5-point Likert scale measurement, data population means generally 3.23 to 4.43. The highest means are found in variables like EAW3 (4.43) and GIP1 (4.26), indicating that participants tended to give higher ratings on these items. The lowest means are ESF3 (3.23) and ESF1 (3.24), suggesting a more neutral or slightly negative response on average for these items. Most variables have a standard deviation between 0.7 and 1.2, indicating a moderate to high variability in responses. The highest variability is in ESF1 (1.18) and PF4 (1.08), suggesting that responses to these items were quite spread out, with participants likely differing more in opinion. The lowest variability is in PE4 (0.72), showing more consistency in responses, which might imply greater consensus or agreement among participants on this item. All the results are shown in table 9.

Table 9. Descriptive Statistics

Item	Min	Max	Mean	Std	Item	Min	Max	Mean	Std
EAW1	1	5	4.064356	0.870076	ME3	1	5	3.747525	0.858449
EAW2	1	5	4.287129	0.814503	PE1	1	5	4.173267	0.831398
EAW3	1	5	4.425743	0.965541	PE2	1	5	4.207921	0.878905
EAW4	1	5	3.886139	0.942056	PE3	1	5	3.90099	0.863925
EAW5	1	5	3.886139	1.065938	PE4	1	5	4.148515	0.724636
EAW6	1	5	4.054455	0.823779	PE5	1	5	4.128713	0.937482
EAW7	1	5	4.143564	1.019308	PF1	1	5	3.247525	0.879913
EA1	1	5	4.158416	1.004791	PF2	1	5	3.554455	0.908503
EA2	1	5	4.222772	0.894914	PF3	1	5	3.59901	0.865364
EA3	1	5	3.905941	0.838184	PF4	1	5	3.49505	1.084708
EA4	1	5	3.633663	1.067128	PC1	1	5	3.920792	0.92702
EA5	1	5	3.683168	0.913478	PC2	1	5	3.594059	1.080614
ESF1	1	5	3.242574	1.182614	A1	1	5	3.707921	0.996929
ESF2	1	5	3.940594	0.949698	A2	1	5	3.386139	1.101517
ESF3	1	5	3.232673	0.886786	A3	1	5	3.806931	0.850725
ESF4	1	5	4.242574	0.807656	A4	1	5	3.772277	0.839109
ESF5	1	5	3.876238	1.11504	A5	1	5	3.89604	0.80674
ESF6	1	5	3.821782	0.833336	TTP1	1	5	3.871287	0.989129
GIP1	1	5	4.257426	0.768192	TTP2	1	5	3.693069	0.948868
GIP2	1	5	4.287129	0.820589	TTP3	1	5	3.653465	1.055058
GIP3	1	5	4.128713	0.812384	EBI1	1	5	4.158416	0.794667
GIP4	1	5	4.222772	0.933019	EBI2	1	5	4.168317	0.786317
ME1	1	5	4.024752	0.938073	EBI3	1	5	4.10396	0.921865
ME2	1	5	3.752475	0.839402	EBI4	1	5	3.534653	1.060971

Source: Authors' calculation

4. 1. 2. RELIABILITY AND VALIDITY ANALYSIS

Outer loadings

Outer loadings represent the correlation or relationship between an observed indicator (manifest variable) and its associated latent construct (unobserved variable). It shows how well each indicator reflects the construct it is supposed to measure. In this study, the minimum outer loading value observed is 0.452, which exceeds the threshold of 0.4 recommended by Hair et al., (2017). According to this guideline, outer loadings above 0.4 are considered adequate, suggesting that the indicators provide a meaningful contribution to the measurement of their respective constructs. As a result, all scales were retained for further analysis. The detailed results of the outer loadings can be found in table 10.

Table 10. Outer Loadings

	A	EA	EAW	EBI	ESF	GIP	ME	PC	PE	PF	TTP
A1	0.743										
A2	0.719										
A3	0.861										
A4	0.817										
A5	0.82										
EA1		0.842									
EA2		0.843									
EA3		0.903									
EA5		0.737									
EAW1			0.452								
EAW2			0.709								
EAW3			0.646								
EAW4			0.732								
EAW5			0.687								
EAW6			0.704								
EAW7			0.693								
EBI1				0.703							
EBI2				0.883							
EBI3				0.831							
EBI4				0.745							
ESF2					0.753						
ESF3					0.66						
ESF4					0.779						
ESF5					0.49						
ESF6					0.819						
GIP1						0.852					
GIP2						0.813					
GIP3						0.869					
GIP4						0.768					
ME1							0.761				
ME2							0.784				
ME3							0.799				
PC1								0.912			
PC2								0.84			
PE1									0.795		
PE2									0.839		
PE3									0.799		
PE4									0.764		
PE5									0.778		
PF1										0.782	
PF2										0.902	
PF3										0.811	
PF4										0.785	
TTP1											0.81
TTP2											0.89
TTP3											0.86

Source: Authors' calculation

Cronbach's Alpha and Composite Reliability

This inquiry aims to determine reliability of the scales. Based on the result of Cronbach's Alpha test, questions EA4 (from Environment Attitude), ESF1 (from Environmental Sustainable Features), and EBI1 (from Environment Behavior Intention) were deleted. After the test, the minimum value Cronbach's Alpha is 0.682, which passed the threshold of 0.6 recommended by (van Griethuijsen et al., 2015). Therefore, the scales in this study are reliable. To double check reliability, composite reliability is utilized. It ranges from 0.818 to 0.9, which meets the acceptable level of 0.60 suggested (Fornell & Larcker, 1981). The results are shown in table 11.

Average variance extracted

To test Convergent Validity, the average variance extracted (AVE) test was conducted. The AVE of all variables is greater than 50%, except for the AVE of EAW and ESF (0.435 and 0.487) (table 11). According to Fornell & Larcker (1981), AVE provides a more conservative measure of the validity of the measurement model. Also, according to them, if the AVE is below 0.5 but the composite reliability exceeds 0.6, the construct's convergent validity can still be considered adequate.

Table 11. Cronbach's Alpha, Composite Reliability and AVE

Item	Cronbach's Alpha after deleting bad scales	Composite Reliability after deleting bad scales	Average Variance Extracted (AVE) after deleting bad scales
A	0.854	0.894	0.629
EBI	0.805	0.885	0.72
EA	0.851	0.9	0.694
EAW	0.795	0.839	0.435
ESF	0.761	0.818	0.487
GIP	0.847	0.894	0.68
ME	0.682	0.822	0.607
PC	0.705	0.87	0.77
PE	0.855	0.896	0.632
PF	0.840	0.892	0.674
TTP	0.813	0.89	0.729

Source: Authors' calculation

Fornell and Larcker Criterion

The criterion was considered and represented on table 12, comparing the square root of AVE for each construct to its correlations with other constructs (Fornell & Larcker, 1981). The results demonstrated that the square root of AVE for each construct exceeded its corresponding inter-construct correlations, confirming that all constructs exhibited satisfactory discriminant validity.

Table 12. Fornell-Larcker criterion

	A	EBI	EA	EAW	ESF	GIP	ME	PC	PE	PF	TTP
A	0.793										
EBI	0.462	0.849									
EA	0.507	0.613	0.833								
EAW	0.434	0.559	0.617	0.660							
ESF	0.491	0.561	0.656	0.510	0.698						
GIP	0.509	0.420	0.521	0.500	0.592	0.824					
ME	0.336	0.458	0.417	0.427	0.391	0.447	0.779				
PC	0.522	0.708	0.548	0.545	0.536	0.451	0.370	0.878			
PE	0.478	0.574	0.571	0.559	0.595	0.604	0.573	0.530	0.795		
PF	0.406	0.422	0.501	0.416	0.447	0.398	0.405	0.555	0.458	0.821	
TTP	0.626	0.684	0.581	0.458	0.607	0.477	0.394	0.675	0.549	0.427	0.854

Source: Authors' calculation

4. 1. 3. MULTICOLLINEAR ANALYSIS

The results of the multicollinearity test presented in table 13 indicate that multicollinearity is not a concern, as the Variance Inflation Factors (VIFs) for nearly all variables are below the recommended cut-off value of 5 (Henseler et al., 2009). Additionally, VIF values in PLS-SEM were examined for further analysis. The factor-level results ranged from 1.598 to 2.609 (table 14) and remains below the recommended threshold of 3.3, which indicates that the data is free from method bias (Kock, 2015).

Table 13. Outer VIF value

Item	VIF	Item	VIF	Item	VIF
A1	1.602	EAW4	1.498	ME3	1.494
A2	1.771	EAW5	1.513	PC1	1.42
A3	2.326	EAW6	1.872	PC2	1.42
A4	2.134	EAW7	1.934	PE1	1.956
A5	2.049	ESF2	1.996	PE2	2.321
EBI2	1.738	ESF3	1.319	PE3	1.784
EBI3	2.274	ESF4	1.798	PE4	1.73
EBI4	1.669	ESF5	1.711	PE5	1.777
EA1	2.332	ESF6	1.72	PF1	1.803
EA2	2.164	GIP1	2.027	PF2	2.801
EA3	2.777	GIP2	1.645	PF3	1.915
EA5	1.612	GIP3	2.509	PF4	2.023
EAW1	1.377	GIP4	1.839	TTP1	1.578
EAW2	2.243	ME1	1.241	TTP2	2.205
EAW3	2.123	ME2	1.372	TTP3	1.935

Source: Authors' calculation

Table 14. Inner VIF value

	A	EA	EAW	ESF	GIP	ME	PC	PE	PF	TTP
EBI	1.881	2.423	1.966	2.353	1.981	1.598	2.404	2.38	1.659	2.609

Source: Authors' calculation

4. 1. 4. PLS-SEM RESULTS

The value of R square is 0.648 (table 15), meaning that our model is very well constructed. A bootstrapping with 5000 samples was conducted. Among the 10 proposed hypotheses, 4 hypotheses were supported (H2, H5, H8, H10). The rest are rejected. The results are illustrated in table 16.

Table 15. R square

	R Square	R Square Adjusted
EBI	0.648	0.63

Source: Authors' calculation

Table 16. Bootstrapping result

Relationship	Beta	Sig	Results
H ₁ : Environmental Awareness and Environmental Behavioral Intention	0.104	0.103	Rejected
H ₂ : Environnemental Attitude and Environnemental Behavioral Intention	0.171	0.017	Supported
H ₃ : Environmental Sustainability Feature and Environmental Behavior Intention	0.048	0.462	Rejected
H ₄ : Government Incentives Policy and Environmental Behavioral Intention	-0.096	0.073	Rejected
H ₅ : Media Influence and Environmental Behavioral Intention	0.118	0.041	Supported
H ₆ : Peer Communication and Environmental Behavioral Intention	0.099	0.185	Rejected
H ₇ : Perceived Fee and Environmental Behavioral Intention	-0.08	0.113	Rejected
H ₈ : Perceived Comfort and Environmental Behavioral Intention	0.37	0	Supported
H ₉ : Availability and Environmental Behavioral Intention	-0.066	0.312	Rejected
H ₁₀ : Time Travel Period and Environmental Behavioral Intention	0.278	0	Supported

Source: Authors' calculation

4. 2. RESULTS IN PHASE 2

4. 2. 1. CONSISTENCY RATIO

The maximum value of Consistency ratio of all criteria in this study is 0.266666667 (table 17), which is close to 0, indicating a reliable evaluation from the experts.

Table 17. Consistency Ratio

DMU	Consistency Ratio (Main criteria)	Consistency Ratio (C1)	Consistency Ratio (C2)	Consistency Ratio (C3)
Researcher 1	0.233333333	0.1	0.133333333	0.10344828
Researcher 2	0.041666667	0.041666667	0.10714286	0.05479452
Researcher 3	0.041666667	0.041666667	0.075	0.03225806
Researcher 4	0.15	0.0625	0.125	0.08571429
Researcher 5	0.109090909	0.25	0.07692308	0.07894737
Researcher 6	0.06	0.0625	0.2109375	0.20689655
Manager 1	0.06	0.166666667	0.22	0.07142857
Manager 2	0.109090909	0.027777778	0.14	0.0483871
Manager 3	0.041666667	0.15151515	0.1	0.1
Manager 4	0.06	0.06	0.266666667	0.14814815

Source: Authors' calculation

4. 2. 2. SENSITIVITY ANALYSIS RESULTS

According to all the results, despite the different scenarios, the result stayed the same for all groups, showing the consistency of the results. However, there are differences in the way each group weighs the criteria. The results are shown in tables 18, 19, and 20 (Appendix).

For managers, they think that Economic is the most importance factor. Among the sub-criteria, factors such as Environmental Attitude, Perceived Fee, Perceived Comfort, Availability, and Time Travel Period significantly influence the Environmental Behavior Intention to use green taxis (Weight > 0.1). For researchers, prioritize environmental factors. They believe that sub-criteria like Environmental Awareness, Environmental Attitude, and Environmental Sustainability Features play a crucial role in shaping the intention to use green taxis. When combining the perspectives of both managers and researchers, the results indicate that the environmental factor is the most important overall. Additionally, sub-criteria such as Environmental Awareness, Environmental Attitude, Environmental Sustainability Features, and Availability are key determinants of the behavioral intention to use green taxis.

5. DISCUSSION

This study examines the key relationships between Environmental factors (Environmental Awareness, Environmental Attitude, Environmental Sustainable Features), Social factors (Government Incentives Policies, Media Influence, Peer Communication), and Economic factors (Perceived Fee, Perceived Comfort, Availability, and Time Travel Time) on the Environmental Behavior Intention to use green taxis. This analysis combines the PLS-SEM with Best-Worst Method (BWM) from Multi-Criteria Decision Making (MCDM).

According to the results of hypothesis testing in phase one, Environmental Awareness has a positive influence on Environmental Behavior Intentions. While it is important, if consumers only have a general understanding of environmental problems without seeing direct benefits or practical applications, they might not be compelled to change their behavior. This is consistent with the studies of Xu et al. (2020) and Fu et al. (2020). They proposed that consumer purchasing intentions are influenced by a combination of factors, rather than by awareness alone. Similarly, Environmental Sustainable Features showed a low impact to adopting electric taxis. This suggests that while certain sustainability features, such as energy efficiency, can appeal to eco-conscious consumers, others may cause concerns related to practicality, like limited charging infrastructure, or issues with operating and maintenance. This finding aligns with results of Cheung et al. (2019). They noted that even though the products have environmental features, concerns about the risks associated with innovative products can negatively influence adoption intentions. Meanwhile, Environmental Attitude shows a much stronger positive impact so individuals with a strong Environmental Attitude are likely to integrate these values into their daily lives, they are more motivated to use green taxis to reflect their commitment.

Results from the current study show that Perceived Comfort and Time Travel Period positively impact customers' behavioral intentions to use green taxis. This positive influence can be attributed to frequent traffic congestion in Vietnam, where customers are willing to use and pay for services that promise a comfortable experience and time savings. In major urban areas like Ho Chi Minh City, limited space and time constraints lead many consumers to prioritize convenience and efficiency in their travel choices. This finding aligns with the studies of Jayasingh et al. (2021), which suggest that customers often prioritize ease of use when evaluating new products. Because overcoming concerns about ease of use can significantly boost adoption, when consumers perceive electric taxis as comfortable, their behavior intention to use them increases. Similarly, Peer Communication is positively associated with Environmental Behavior Intention of using green taxis (Mohd Suki & Mohd Suki, 2019).

Regarding the second phase, in the Environmental dimension, customers, managers and researchers agree that Environmental dimensions significantly impact Environmental Behavioral Intentions, especially Environmental Attitude. In managers' view, Environmental dimensions ranked second among three dimensions, while researchers ranked it the highest. This aligns

with previous studies indicating that environmental factors significantly influence electric vehicle purchase intentions (Asadi et al., 2021; Dangelico & Pujari, 2010; Okada et al., 2019; Zhang et al., 2011). However, in managers' view, the weight of Environmental dimension is very low compared to Economics dimension, indicating the higher emphasize on economic factors. However, the main benefit of green taxis is that they are better for the environment (Duarte et al., 2016; Z. Li et al., 2019; N. Wang et al., 2023), not for profit. This shows a negative mindset from the managers, which might lead to green washing behavior (de Freitas Netto et al., 2020). In Social dimension, Sun et al. (2019) indicates that when individuals perceive Media Influence as positive, their intention to engage in specific behaviors increases. This is particularly relevant during the early stages of the green taxi market in Vietnam, where users are curious and eager to experiment and share their experiences. In our study, while managers ranked Social dimension the lowest among three dimension (Environment, Social, Economic), researchers ranked it in the middle. In this dimension, researchers ranked Government Incentive Policies the highest, showing a significant impact on the Environmental Behavioral Intention. However, managers ranked Media Influence highest in the Social dimension. This is consistent with the consumer's view where Media Influence has the positive significant correlation with Environmental Behavioral Intention. However, the overall weight of Media Influence in the manager's view is low. The main reason is because they ranked the Social dimension the lowest among the three dimensions. While the managers have special care for Media Influence, the overall care for the Social dimension is not enough. Companies today are under greater scrutiny regarding their social and environmental impact. A business that focuses only on profits or Economic dimension without considering its social responsibilities (CSR) could be perceived as irresponsible or even exploitative. CSR can provide firms with opportunities for profit (Armstrong & Green, 2013), but it seems like the managers in this research did not realize that.

In Economics dimension, although Economics dimension has been applied in previous sustainability studies (Balderjahn et al., 2013), there were certain gaps that need to be addressed. There is limited research on Perceived Fee related to green transportation compared to traditional transport (Clairand & González-Rodríguez, 2022). In our study, while managers ranked Economics the highest among three dimensions, researchers ranked it the lowest. In managers, Perceived Comfort ranked the highest, while the researchers ranked Availability the highest. While the managers are consistent with the consumers' view where Perceived Comfort has the highest path coefficient among all significant factors, the researchers are inconsistent with the customers' view where Availability has a negative impact on Environmental Behavioral Intention.

The current study presents several practical implications. Firstly, it emphasizes the importance of Environmental Attitudes in shaping consumers' Environmental Behavior Intentions to use green taxis. Therefore, managers should prioritize environmental factors when promoting green taxi initiatives, rather than focusing solely on economic aspects. They must change their mindset, that green taxis or any other green products are not just for advertising or greenwashing. Also, Media Influence is also a significant factor which affects Environmental Behavioral Intention. Combining this with Environmental Attitude, firms should actively promote green taxis through educational campaigns and motivational messages, raising the attitude of the environmental benefits associated with these transportation options. This approach allows consumers to feel that their choice of green taxis addresses ecological issues. The marketers can capture this phenomenon by making campaigns which can promote the attitude of end-users to use green taxis for a greener environment. The government should educate the public about the negative consequences of conventional vehicles, including global warming, environmental pollution, and dependence on fossil fuels. Also, having sanctions for greenwashing firms should also be applied. This can also build up brand trust, which will also affect the behavioral inten-

tion of the customers (Alan & Kabadayı, 2014), leading to a more sustainable environment. By increasing the attitude related to these issues, consumers can develop a sense of responsibility and commitment to environmental solutions. The study also highlights the positive impact of Social dimension, such as Media Influence on green taxi adoption. Managers should facilitate trial runs of green taxis to encourage satisfied users to share their experiences, thus amplifying online marketing promotion.

Perceived Comfort and Time Travel Period are significant factors influencing the intention to use green taxis. Taxi companies should prioritize high-value services to attract and retain customers. Enhancing passenger satisfaction can be achieved by offering green taxis with high comfort standards, spacious interiors, quiet rides, and smooth acceleration. Additionally, providing customer-centric services such as in-car Wi-Fi, comfortable seating, and climate control can further improve Perceived Comfort, making green taxis more appealing. Furthermore, taxi companies should integrate smart technology for route optimization and real-time traffic updates to reduce the Time Travel Period.

It appears that the managers are more well connected to the customers compared to the researchers. This could be because managers often have access to sales data and engage in frequent customer interactions, enabling them to predict customer behavior more accurately. Researchers typically lack direct access to such data and rely instead on theoretical frameworks to make predictions, which can sometimes lead to misalignment with customer preferences, like in this research.

6. CONCLUSION

Indisputably, this study has provided an in-depth perspective on the factors influencing the adoption of green taxi services in Vietnam from three main stakeholder perspectives: customers, researchers, and managers. The primary aim of this research was to compare these stakeholders' viewpoints on adopting green taxi services, addressing a gap not explored in previous studies. The findings revealed that customers and researchers prioritize environmental factors, while managers place more emphasis on economic factors. The key contributions of this research are not only providing a theoretical basis for understanding the importance of environmental, social, and economics dimension but also serve as a foundation for managers and governments to develop strategies that encourage the use of sustainable transportation, particularly in Vietnam's complex traffic environment.

Although this research has obtained some valuable findings, there are still some limitations. First, due to the cross-sectional nature of this study, it is not possible to definitively establish causal relationships among the variables investigated. Secondly, the sample used in this study could not include all customers perspective from all ages and genders, which limits the generalizability of the findings to the broader Vietnamese population. Indeed, previous research has shown that student samples can exhibit a range of behavior intentions (Caniëls et al., 2021; Lambrechts et al., 2018). Therefore, it is crucial for future research to further investigate the impact of Environmental Behavioral Intentions on the actual environmental behaviors related to taxi usage among all consumers in Vietnam.

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Declaration of interest statement

The authors report there are no competing interests to declare.

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APPENDIX:

Table 18. Scenario 1 results.

The weights based on managers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.225303031	C1.1	0.155366161	0.035004467
		C1.2	0.537159092	0.121023572
		C1.3	0.307474747	0.069274992
Social (C2)	0.14564394	C2.1	0.436666668	0.063597854
		C2.2	0.463333333	0.067481692
		C2.3	0.1	0.014564394
Economic (C3)	0.629053031	C3.1	0.193144094	0.121497877
		C3.2	0.242422982	0.152496911
		C3.3	0.370642387	0.233153717
		C3.4	0.193790536	0.121904524
The weights based on researchers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.560757576	C1.1	0.313888889	0.176015572
		C1.2	0.357638889	0.200548716
		C1.3	0.328472222	0.184193287
Social (C2)	0.24770202	C2.1	0.358912355	0.088903315
		C2.2	0.315133738	0.078059263
		C2.3	0.325953907	0.080739441
Economic (C3)	0.191540404	C3.1	0.175326287	0.033582068
		C3.2	0.16735518	0.032055279
		C3.3	0.484269892	0.092757251
		C3.4	0.173048641	0.033145807
The weights based on managers and researchers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.426575758	C1.1	0.250479798	0.10684861
		C1.2	0.42944697	0.183191667
		C1.3	0.320073232	0.136535482
Social (C2)	0.206878788	C2.1	0.39001408	0.08068564
		C2.2	0.374413576	0.077458227
		C2.3	0.235572344	0.048734921
Economic (C3)	0.366545455	C3.1	0.182453409	0.066877468
		C3.2	0.197382301	0.072349585
		C3.3	0.43881889	0.16084707
		C3.4	0.181345399	0.066471332

Source: Authors' calculation

Table 19. Scenario 2 results

The weights based on managers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.227552448	C1.1	0.168842269	0.038420472
		C1.2	0.505967367	0.115134113
		C1.3	0.325190365	0.073997864
Social (C2)	0.141433567	C2.1	0.41948718	0.059329568
		C2.2	0.48051282	0.067960642
		C2.3	0.1	0.014143357
Economics (C3)	0.631013987	C3.1	0.218627489	0.137957003
		C3.2	0.260190109	0.164183598
		C3.3	0.326545616	0.206054851
		C3.4	0.194636785	0.122818534
The weights based on researchers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.574382284	C1.1	0.319551282	0.183544595
		C1.2	0.310897436	0.178573979
		C1.3	0.369551282	0.21226371
Social (C2)	0.248228438	C2.1	0.380958545	0.094564745
		C2.2	0.292766448	0.072672958
		C2.3	0.326275007	0.080990735
Economics (C3)	0.177389277	C3.1	0.175273765	0.031091687
		C3.2	0.178103093	0.031593579
		C3.3	0.489301124	0.086796773
		C3.4	0.157322018	0.027907239
The weights based on managers and researchers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.400967366	C1.1	0.244196775	0.097914938
		C1.2	0.408432401	0.163768064
		C1.3	0.347370823	0.139284364
Social (C2)	0.194831003	C2.1	0.400222862	0.077975822
		C2.2	0.386639634	0.075329388
		C2.3	0.213137504	0.041525794
Economics (C3)	0.404201632	C3.1	0.196950627	0.072191357
		C3.2	0.219146601	0.08032719
		C3.3	0.40792337	0.149522457
		C3.4	0.175979401	0.06450445

Source: Authors' calculation

Table 20. Scenario 3 results

The weights based on managers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.223484849	C1.1	0.168842269	0.038420472
		C1.2	0.505967367	0.115134113
		C1.3	0.325190365	0.073997864
Social (C2)	0.146780304	C2.1	0.41948718	0.059329568
		C2.2	0.48051282	0.067960642
		C2.3	0.1	0.014143357
Economics (C3)	0.629734849	C3.1	0.218627489	0.137957003
		C3.2	0.260190109	0.164183598
		C3.3	0.326545616	0.206054851
		C3.4	0.194636785	0.122818534
The weights based on researchers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.560454545	C1.1	0.289583333	0.162298295
		C1.2	0.347222222	0.194602273
		C1.3	0.363194444	0.203553977
Social (C2)	0.248510101	C2.1	0.324490614	0.080639195
		C2.2	0.323113172	0.080296887
		C2.3	0.352396215	0.087574019
Economic (C3)	0.191035354	C3.1	0.171646109	0.032790475
		C3.2	0.16659898	0.031826295
		C3.3	0.489109577	0.093437221
		C3.4	0.172645334	0.032981362
The weights based on managers and researchers' perspectives				
Main criteria	Weights of main criteria	Sub criteria	Weights of sub criteria	Global weights
Environmental (C1)	0.456771562	C1.1	0.240379759	0.109798638
		C1.2	0.408613054	0.186642823
		C1.3	0.351007187	0.160330101
Social (C2)	0.217208625	C2.1	0.374647348	0.081376635
		C2.2	0.350616811	0.076156995
		C2.3	0.274735841	0.059674994
Economics (C3)	0.326019814	C3.1	0.178008139	0.05803418
		C3.2	0.175155983	0.057104321
		C3.3	0.468005988	0.152579225
		C3.4	0.178829888	0.058302087

Source: Authors' calculation