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# An investigation of consumer attitude towards anti-plastic bag consumption in Cambodia

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**ABSTRACT:** *In the present era, plastic bags have emerged as the predominant catalyst for global warming due to their protracted decomposition process. Although it has adverse environmental impacts, it is a frequently used commodity by customers. Furthermore, Phnom Penh, the capital of Cambodia, is steadily increasing the quantity of plastics consumed daily. This study aims to examine consumer attitudes towards anti-plastic bag behavior in Cambodia, considering the significant number of plastic bags used on a daily basis. The study employed seven factors, including environmental knowledge, environmental concern, attitude towards using plastic bags, subjective norms, perceived behavioral control, behavioral intention, and anti-plastic bag behavior, to examine consumer behavior about plastic consumption. Furthermore, this study employed quantitative research methodologies, specifically utilizing a cross-sectional study design to gather the data. We conducted this study with a sample size of 206 participants who responded to an online and paper survey. This study's findings suggest that environmental concern, attitude towards using plastic bags, subjective norms, and perceived behavioral control influence behavioral intention. However, it is worth noting that there is a negative association between environmental knowledge and behavioral intention. Environmental knowledge, behavioral intention, and perceived behavioral control all have a significant impact on people's behavior in avoiding plastic bags.*

***Key words****: Attitude toward anti-plastic bag behavior, Environmental concern, Environment knowledge, Subjective norms, Theory of planned behavior.*

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## 1. Introduction

In both developed and developing nations, waste management and collection are essential to public health and environmental sustainability. Population growth, socioeconomic advancement, and industrialization have all contributed to increased resource consumption and waste production in Cambodia (Agamuthu, Fauziah, Khidzir, & Aiza, 2007). In least-developed nations like Cambodia, environmental problems with energy, waste management, and water pollution are major concerns (Vitiea & Lim, 2019). In reality, managing municipal solid waste (MSW) presents one of Cambodia's largest environmental difficulties. Human health and the environment have suffered as a result of inadequate MSW management (Babalola, 2019). In 2020, 4.78 million tons of MSW, or 5,749 tons per day, were generated at a rate of 0.78 kg/capita/day (Pheakdey, Quan, Khanh, & Xuan, 2022). The lack of information to restrict plastic bag usage and trash management is a major issue that affects both climate change and life underwater, according to Sustainable Development Goals (SDGs) 13—Climate Change and SDGs 14—Life Underwater (Commission, 2019; Recuero Virto, 2018; Ryabinin et al., 2019). In Phnom

Penh City, Cambodia, the percentage of plastic bags used and the type of garbage generated increased sharply from 6% in 1999 to 15.5% in 2017 (Curea, 2017). The nation has just released a policy for the management of plastic bags, although it might be more widely enforced. Inadequate solid waste management may put these cities' surrounding areas and the public at risk for environmental health problems (Koeng, Sharp, Hul, & Kuok, 2020). According to estimations, every year rivers throughout the world release millions of metric tons of plastic debris into the oceans, making plastic pollution a "wicked environmental problem" (Lebreton et al., 2018; Wolf et al., 2020). This research reveals that the river systems of Asian countries, including Cambodia, transport a significant amount of plastic waste into the open ocean (van Emmerik, Strady, Kieu-Le, Nguyen, & Gratiot, 2019). According to Blettler, Abrial, Khan, Sivri, and Espinola (2018) these plastic-polluted rivers provide a worldwide threat to the blue economy as well as localized health and environmental issues. To lessen plastic waste materials that contaminate the ocean and enter the food chain, which can have an adverse effect on human health, which that hopes to enact a plastic ban by 2030 (McCarthy, 2018).

Environmental deterioration is a major problem in many developing country cities and towns (Thanh, Matsui, & Fujiwara, 2011). Plastic bags are frequently used to package and transport goods because they are abundant, inexpensive to create, sturdy, lightweight, and stress-free to store and transport (Aslam, Sadaf, Ali, & Danish, 2019). Plastic bags have been identified as one of the annoyances caused by businesses (Nzuki, 2020). Plastic is widely employed because of the industrial revolution not only for packing but also for serving, protecting, and disposing of all different sorts of consumer goods (Bilal, Quraishi, Khan, & Ghufran, 2016). Consumer preference for plastic bags over biodegradable, string and paper bags has led to an increase in the use of plastic bags daily (Aslam et al., 2019). On the other hand, consumers' attitudes, actions, and strategies in consumption are always evolving (Orzan, Cruceru, Bălăceanu, & Chivu, 2018) and there needs to be more information on how consumers will respond when driven to adopt anti-consumption behaviors. This is similar to how anti-consumption studies should include more than just techniques to reduce consumption. Anti-consumerism does not inherently pose a threat to the economy. Acts of anti-consumption should be viewed as chances for business professionals and academics to learn more about ourselves, our products, methods, and society (Lee, Fernandez, & Hyman, 2009).

Plastic usage has a connection with daily life in Cambodia. Approximately 10 million plastic bags are used daily in Phnom Penh alone. Small and medium-sized businesses are the driving force behind Cambodia's rising economy. Yet, the densely populated service sector supports large-scale distribution and consumption of handy and inexpensive plastic products. Most goods we consume are wrapped, packed, or supplied in plastic, from food vendors to apparel merchants (UNDP-Cambodia). In Phnom Penh, more than 3,500 tons of municipal waste are generated daily. Approximately 80% of rubbish is collected and disposed of at open dump sites. Waste is frequently burned in the open in disadvantaged urban and rural regions where waste collection services are unavailable. The leftover debris is dumped on streets or local waterways, transporting plastic to rivers. The use of plastic pollution has severe environmental and economic implications. Because plastic garbage clogs sewage and drainage systems, major cities such as Cambodia Phnom Penh and Sihanoukville have been negatively impacted by increased flooding threats. Burning plastics also emits toxic chemicals into the atmosphere, raising public health concerns (UNDP-Cambodia, 2020). Problems with the current municipal solid waste management (MSWM) has several concerns on research improvement, which are also given in this paper (Seng, Kaneko, Hirayama, & Katayama-Hirayama, 2011). According to Curea (2017) awareness of solid waste issues in Cambodia needs to be improved, and more attention should be paid to proper collection, transportation, and waste management. Thus, this study has investigated consumer attitudes toward anti-plastic bag behavior in Cambodia with a key main objective, which aims to explore the relationship between environmental knowledge, environmental concern, perceived behavioral control, subjective norm, attitude toward using plastic bags, and anti-plastic bag consumption.

## 2. Theoretical Background and Hypotheses Development

### *2.1. Theoretical Background*

#### *2.1.1. Theory of Planned Behavior (TPB)*

The theory of planned behavior (TPB) proposes three conceptually distinct drivers of customer purchasing intention (Shah Alam & Mohamed Sayuti, 2011). Also, the theory of planned behavior (TPB) has been widely applied to the prediction and change of behavior, including behavior related to technology usage (White Baker, Al-Gahtani, & Hubona, 2007) the use of technology (Ajzen, 2020) the intention to re-visit a destination (Abbasi,

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Kumaravelu, Goh, & Dara Singh, 2021). However, TPB is still a limited study in the context of consumer behavior of anti-plastic bag consumption. Thus, this applies the TPB to explain the consumer behavior of Cambodia's anti-plastic bag consumption context. According to Figure 1, the Theory of Planned Behavior (TPB) focuses on an individual's intention to perform a behavior, which is influenced by motivational factors. It proposes three independent determinants of intention: attitude, subjective norm, and perceived behavioral control. Attitude refers to the person's evaluation of the behavior, subjective norm is the perceived social pressure, and perceived behavioral control is the perceived ease or difficulty of performing the behavior (Ajzen, 1985). A more favorable attitude, subjective norm, and perceived behavioral control increase an individual's intention to perform the behavior. Intention is a crucial antecedent to behavior, with stronger intentions leading to greater success. However, success depends on nonmotivational factors like availability of opportunities and resources (Ajzen & Driver, 1992).

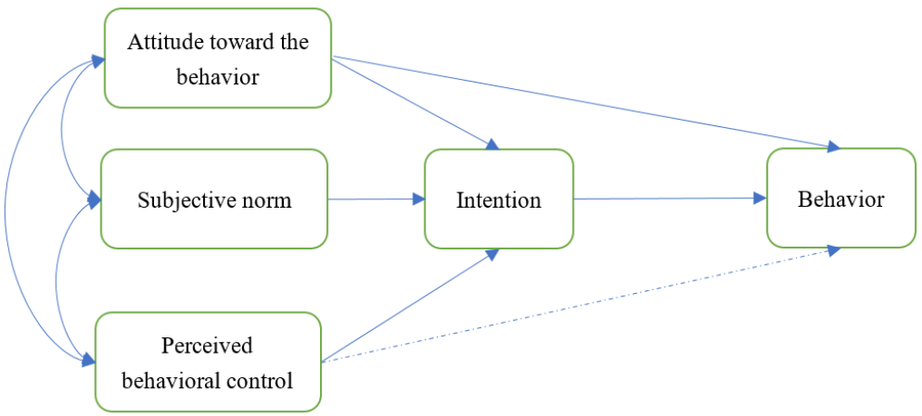


**Figure 1**. The theory of planed behavior.

**Source:** Ajzen and Driver (1992).

### *2.1.2. The S-O-R Model*

The S-O-R model, which is made up of three parts: stimulus, organism, and response, has been widely accepted and used by researchers to look at behavior in the areas of shopping in stores (Chang, Eckman, & Yan, 2011), using social media (Islam & Rahman, 2017), and making hotel reservations online (Emir et al., 2016). Researchers have examined various aspects of consumer behavior such as mobile sales (Chen & Yao, 2018), commercial connections (Kudla & Klaas-Wissing, 2012), medical treatment (Suess & Mody, 2018), intent to purchase online (Zhu, Li, Wang, He, & Tian, 2020), traveler visits (Kim, Lee, & Jung, 2020), use of online learning resources (Pandita, Mishra, & Chib, 2021), panic buying behavior (Li, Zhou, Wong, Wang, & Yuen, 2021), desire to buy organic food (Sultan, Wong, & Azam, 2021), and more. Many years ago, researchers devised the S-O-R model to aid in their understanding of consumer behavior (Turley & Milliman, 2000). Researchers have widely used the S-O-R model to analyze customer experiences and behavior (Luqman, Cao, Ali, Masood, & Yu, 2017), but they rarely use it to analyze the frequency of plastic bag usage by consumers. In light of the conceptual model shown in Figure 2, this study extends the S-O-R model to examine consumer behavior related to the usage of fewer plastic bags in Cambodia. By analyzing the connection between environmental cues, personal psychological processes, and behavioral reactions, the S-O-R model is a psychological framework that aims to explain human behavior. The S-O-R paradigm posits that external environmental stimuli, such as events, objects, or circumstances, influence an individual's internal psychological state or organism, thereby influencing their behavior.

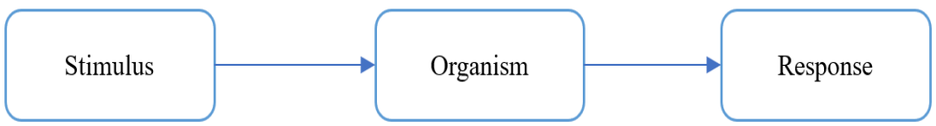


**Figure 2.** The S-O-R model.

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### 2.2. Hypotheses Development

#### 2.2.1. The Relationship between Environmental Knowledge and Behavioral Intention

According to the TBP, intentions influence many of the variables' behaviors both directly and indirectly (Ajzen, 1991). High environmental literacy among consumers may be associated with a more environmentally conscious mindset and a higher propensity for sustainable consumption practices (Fraj-Andrés & Martínez-Salinas, 2007; Marquart-Pyatt, 2015). Vicente-Molina, Fernández-Sáinz, and Izagirre-Olaizola (2013) also believed that environmental awareness can promote behavioral intentions through a study of college students. B. Z. Wang and Cheng (2017) assert that the level of environmental awareness and care significantly influences buyers' intentions to make eco-friendly purchases. According to Arı and Yılmaz (2017), the TPB observes that consumers who are socially conscious and feel pressured by others regarding their environmental knowledge are likely to have lower behavioral intentions regarding the use of plastic bags. Customers' perceptions of the value of green hotels, their behavioral desire to stay in green hotels, and their awareness of low-carbon issues all connect to their environmental value (Teng, Lu, & Huang, 2018). Knowledge of the environment influences behavioral intentions in a favorable way (Pan, Chou, Morrison, Huang, & Lin, 2018). Taiwanese ecotourism has prompted researchers to examine students' environmental knowledge, attitudes, and behavioral intentions (Teng et al., 2018). According to Kim et al. (2020) consumers in China who possess a high level of general environmental knowledge have the ability to influence environmental attitudes, behavioral intentions, and pro-environmental behaviors related to environmental behavior. Environmental knowledge raises people's views of their own behavioral intentions in the environment (Saari, Damberg, Frömbling, & Ringle, 2021). Liu, Teng, and Han (2020) have noted that environmental information plays a crucial role in influencing people's unsustainable consumption habits. Based on the aforementioned considerations, this study makes the assumption that customers' behavioral intention to use plastic bags will likely decrease as they become more knowledgeable about environmental issues. Therefore, we propose the following hypothesis:

*Hypothesis 1: Environmental knowledge has a negatively impact on behavioral intention.*

#### 2.2.2. The Relationship between Environmental Concern and Behavioral Intention

According to Minton and Rose (1997), the results of earlier studies demonstrate that one important factor that may improve sustainable purchasing behavior is the influence of environmental concern on consumer behavior. Environmental worries (Franzen & Meyer, 2010; Saari et al., 2021; Vainio & Paloniemi, 2014) describe an individual's understanding of how human progress impacts the environment and how pollution and resource overuse pose threats to it. Concerns about the environment reflect consumer attitudes toward frugal living, their perception of the ease of acting responsibly, and their declared intentions to act in a way that benefits the environment (Fujii, 2006). Additionally, consumers who were more environmentally conscious could see the efforts made by plastic consumption to support these eco-friendly behaviors, which improved their attitude and confidence (Acampora, Preziosi, Lucchetti, & Merli, 2022). When it comes to using plastic bags, it is reasonable to assume that people who are highly concerned about the environment and think that using plastic bags harms the environment will either minimize or avoid using plastic bags altogether. Environmental behavioral intentions and environmental concern have a strong correlation (Mayerl & Best, 2019). Furthermore, their worries about the environmental issues caused by the plastic crisis influence their desire to purchase reusable bags. Customers that care more about environmental issues are more likely to participate in this activity and have a more positive perception of it, according to Wang and Li (2022) and He, Duan, Wang, and Fu (2019). Therefore, we propose the following research hypothesis:

*Hypothesis 2: Environmental concern has a positive influence on behavioral intention.*

#### 2.2.3. The Relationship Between Attitude toward the Behavior and Behavioral Intention

It was discovered that attitudes regarding customer behavior could predict their behavioral intentions (Ajzen & Fishbein, 1972). Maio and Olson (1995) predicted significant predictors of attitude toward the behavior and behavioral intents. The association between behavioral intention to utilize mobile banking services and perceived usefulness has been mediated by attitude toward the practice of utilizing mobile banking (Shanmugam, Savarimuthu, & Wen, 2014). A person's intention to engage in a particular activity is influenced by their attitude towards doing so, and this in turn influences their actual behavior (Arı & Yılmaz, 2017). According to the attitude-behavior gap paradigm, consumer perceptions of behavioral intention are influenced by attitudes about the (Jung, Choi, & Oh, 2020). A psychological feeling identified in customer evaluations is

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a perspective on the use of plastic bags. When people are positive and think using plastic bags is convenient and useful, they will make the decision to do so. On the other hand, when someone has a bad attitude about using plastic bags, they are less likely to use them. The theory of planned behavior states that if consumers are given a positive impression, they are more inclined to utilize plastic bags (Sun & He, 2022). The previous author also suggested that consumers' behavioral intentions to reduce plastic waste are influenced by their views toward doing so (Ngoc, Nhi, & Nguyen, 2019). Consequently, the subsequent study hypothesis is proposed.

*Hypothesis 3: Attitude toward the behavior has a positive impact on behavioral intention.*

### *2.2.4. The Relationship between Subjective Norm and Behavioral Intention*

Subjective norms are likely to significantly influence clients' intentions to engage in healthy behaviors (Finlay, Trafimow, & Moroi, 1999). The exercise of behavioral intention influences subjective norms (Finlay, Trafimow, & Villarreal, 2002). The theory of planned behavior and the subject norm approach (Park, Klein, Smith, & Martell, 2009) emphasize the significance of normative perceptions on behavioral intentions and conduct in alcohol consumption. Subjective norms are the behavioral components that influence the goal of mobile learning self-efficacy (Kumar, Bervell, Annamalai, & Osman, 2020). Subjective standards and perceived behavioral control drive the most significant influence on behavioral intention toward purchasing ecologically friendly agricultural products in China (Li, Long, Laubayeva, Cai, & Zhu, 2020). Customers are more likely to behave favorably when they have positive subjective standards about specific activities (Ngoc et al., 2019). In fact, a number of studies have found that the most significant element influencing the prediction of behavioral intention is subjective standards (Khan, Ahmed, & Najmi, 2019). According to Kaba, Eletter, Ramaiah, and El Refae (2023), the subjective norm in knowledge-sharing behavior actually has a good behavioral aim. In order to forecast behavioral intention and explore consumer views of Cambodia's anti-plastic bag behavioral context, this study combines the theory of planned behavior variables with the subjective norm model. We then propose the following research hypothesis:

*Hypothesis 4: Subjective norm has a positive impact on behavioral intention.*

### *2.2.5. The Relationship between Perceived Behavioral Control and Behavioral Intention*

Perceived behavioral control aids in understanding intents to exercise activity (Godin, Valois, & Lepage, 1993). Planned conduct uses perceived behavioral control as a key component of behavioral intention (Terry & O'Leary, 1995). According to Sheeran, Trafimow, and Armitage (2003), the measure of perceived behavioral control doesn't really help predict behavioral intention. Perceived behavioral control is one of the main characteristics that explain behavioral intention in this study (Sheeran et al., 2003). Kang, Hahn, Fortin, Hyun, and Eom (2006) looked at perceived behavioral control and behavioral customer intention. A recent study of Aitken, Watkins, Williams, and Kean (2020) found a positive correlation between behavioral intention and perceived behavioral control. Perceived behavioral control directly predicts behavioral achievement and intention, according to the theory of planned behavior (Ajzen, 1991). Observed behavioral control reveals the perceived simplicity or complexity of the specific behavior of the consumers under study (Delistavrou, Tilikidou, & Papaioannou, 2023). Empirical research indicates that consumers' perception of behavioral control significantly positively influences their behavioral intentions (Khan et al., 2019). Therefore, we propose the following research hypothesis:

*Hypothesis 5: Perceived behavioral control has a positive impact on behavioral intention.*

### *2.2.6. The Relationship between Environmental Knowledge and Anti-Plastic Bag Behavior*

The anti-plastic consumption movement has made significant strides, spurred on by growing environmental concerns, excessive consumerism, and heavy advertising (Craig-Lees & Hill, 2002). Regarding consumer behavior, banning plastic bags can be categorized as anti-consumption behavior, described as resistance to the culture of consumption and the marketing of mass-produced goods (Irina Safitri Zen, Ahamad, & Omar, 2013). Some anti-consumers choose a simpler existence in exchange for a downshift or major reduction in their total level of material consumption (Sharp, Høj, & Wheeler, 2010). According to Scott and Vigar-Ellis (2014), When it's related to environmental issues, knowledge about the environment influences opinions, and individual purchasing behavior is also influenced by environmental knowledge. According to Irina Safitri Zen et al. (2013), The results of their study conclude that environmental knowledge influences the banning of plastic bags. The consumers' knowledge about the environmental impact of plastic bags resulted in reducing or considering

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stopping the use of plastic bags (Irina Safitri Zen et al., 2013). In environmental awareness or knowledge regarding the use of plastic bags, social pressure, positive attitude toward the banning of plastic bags, and a reduction in the use of plastic bags (Arı & Yılmaz, 2017). This study argues that environmental awareness and knowledge play an important role in reusing plastic bags, which suggests a ban on plastic bags (O'Brien & Thondhlana, 2019). Environmental knowledge and attitude significantly and positively impact consumer green behavioral intention toward anti-plastic bag consumption (Khan, Saengon, Alganad, Chongcharoen, & Farrukh, 2020). Thus, the following research hypothesis is proposed:

*Hypothesis 6: Environmental knowledge has positive impact on anti-plastic bag consumption.*

### *2.2.7. The Relationship between Behavioral Intention and Anti-Plastic Bag Consumption*

The impact of behavioral intention on anti-plastic bag behavior has been investigated by Ohtomo (2014). Environment for anti-plastic bag consumption intends to familiarize behavioral changes towards single-use plastic bags (Zen, 2020). Another study assumes that the behavioral intention of a desired audience is changed to reduce anti-plastic bag consumption (Septianto & Lee, 2020). In a study of Ajzen's theory of planned behavior to understand how attitudes, social norms, and behavioral intention affect consumers' anti-plastic bags and choices to reduce bottled water usage (Chatterjee & Barbhuiya, 2021). The intention to have the behavior of anti-plastic bags of consumers in Vietnam (Makarchev et al., 2022). The behavioral intention of residents' and enterprises' perceptions have a positive influence on anti-plastic bag behavior in China (Xu, Zhong, He, Shi, & Song, 2022). Therefore, the following hypothesis is proposed:

*Hypothesis 7: Behavioral intention has a positive impact on anti-plastic bag consumption.*

### *2.2.8 The Relationship Between Perceived Behavioral Control and Anti-Plastic Bag Consumption*

Anti-plastic consumption involves engaging consumer feelings, such as displeasure toward the consumption ban (Zen et al., 2013). Anti-plastic consumption is the voluntary and intentional avoidance of consumption that occurs either in a general or selective fashion and is a rapidly growing field of research that studies the processes and reasons against consumption. Anti-consumers reject, reduce, or reclaim certain goods, services, or brands for various reasons, including negative experiences with a product or brand, symbolic incongruence, etc (Lee & Ahn, 2016). This study assumes that perceived behavioral control is regarded as a positive predictor of consumers' intentions to purchase single-use plastic and anti-plastic bag consumption in households (Sun & He, 2022). Perceived behavioral control of anti-plastic consumption was the strongest predictor (Heidbreder, Tröger, & Schmitt, 2023). Thus, the following research hypothesis proposed:

*Hypothesis 8: Anti-plastic bag consumption has a positive impact on anti-plastic bag consumption.*

### *2.3. Conceptual Model*

This study integrates the TPB to predict consumers' behavioral intention and anti-plastic bag consumption behavior in supermarket contexts in Cambodia. The S-O-R model also applies to this study, as proposed in Figure 3.

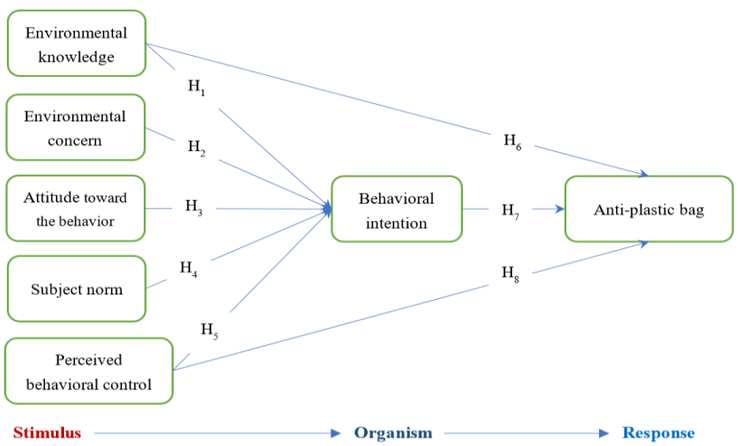


**Figure 3.** Integrated the S-O-R model and TBP for anti-plastic bag consumption.

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## 3. Methodology

This study conducts quantitative research to collect information from consumers experienced with supermarket and Mall contexts in Cambodia through cross-sectional surveys (Connelly, 2016). A convenience sampling technique (Cooper & Schindler, 2014) was adopted to invite respondents to participate in the survey in 2023. By investigating the consumer attitudes towards anti-plastic bag behavior in Cambodia, the target respondents are the group of people who are shopping at the hypermarkets or Mall in Phnom Penh City, such as AEON hypermarket (is located in Meanchey and Sensok district) and Macro hypermarket (is located in Sensok district) participate and complete the survey questionnaire in this study because the two malls are the most attractive to consumers and consumers must purchase plastic bag while shopping. The questionnaire design and measurement scale of this study are shown in the Appendix. A self-administered survey was used to distribute questionnaires to shopping consumers at those two Malls. As recommended by Bowerman, O'Connell, and Murphree (2017) formula of unknown population was adopted to determine the sample sizes for this study, refer to Chhinh, Sok, Sou, and Nguonphan (2023). Thus, 206 households were collected for the data analysis with the software package Statistical Package for the Social Sciences (SPSS) 25 and Analysis of Moment Structures (AMOS) 23 to test the developed research hypotheses proposed in Figure 3. Also, descriptive statistics, frequency distribution, factor analysis and reliability test, confirmatory factor analysis, and structural equation modeling are produced and discussed in this study.

## 4. Results

### *4.1. Frequency Distribution*

The result of frequency distribution showed that among the 206 participants, 78 respondents are males (37.86%), and 128 respondents (62.14%) are female. Moreover, the most participation was the age between 21-25 years old with 61 respondents (29.61%), 49 respondents (23.79%) between 31-35 years old, 26-30 years old with 34 respondents (16.50%), 36-40 years with with 25 respondents (12.14%), under 20 years old with 20 respondents (9,71%), 42-45 years old with 12 respondents (5.83%), and the last group is over 45 years old with only five respondents (2.43%). For the educational levels, among the 206 respondents, most participants in this study had a bachelor's degree, with 135 (65.53%), a master's degree with 33 respondents (16.02%), 18 respondents (8.74%) are high school graduates, secondary school graduates with 12 respondents (5.83%), and the highest degree holder of Ph.D. with 8 respondents (3.88%). In addition, the income levels of respondents indicated that 78 respondents, 37.86%, have an income of 301$-500$, and 501$-700$ with 57 respondents, 27.67%. After that, with a gain of under 300$, 38 respondents with 18.45%, then 17 respondents accounting for 8.25% have an income range of 701$-1,000$ and a higher revenue of over 1,000$ only has 16 respondents representing 7.77%. Thus, most participants have an income between 300$ and 500$ per month.

### *4.2. Descriptive Statistics*

Descriptive statistics were employed to produce a mean value and standard deviation of all research items, measured by a 5-point Likert scale, i.e., 1=strongly disagree to 5=strongly agree. The results of descriptive statistics indicated that 206 respondents rated all research items as having mean scores ranging from 3.76 to 4.13, with the standard deviation value ranging from 0.59 to 0.88. This research finding assumed that respondents' perception is approximately neutral to agree with the rating scale of a five-point Likert scale.

### *4.3. Factor Analysis and Reliability Test*

By treating data and reducing unimportant research items, factor analysis and reliability test is the priority that needs to be produced before implementing a correlation matrix. Then, the rule of thumbs was adopted to evaluate the results of the factor analysis and reliability test, as recommended by Hair Jr, Black, Babin, and Anderson (2019) which categorized as Factor Loading (FL) $\geq 0.60$, Kaiser-Meyer-Olkin (KMO), and Bartle's Test $\geq 0.50$, Cumulative Percentage $> 0.60$, Eigenvalue $> 1$, Item-total correlation $> 0.50$, and Coefficient Alpha ($\alpha$) $\geq 0.60$. Then, the results of Table 1 indicated that all research items of this study met the expectation of thresholds, which ranged from 0.74 to 0.90 of factor loading, and Cronbach's Alpha ranged from 0.76 to 0.86, respectively. Therefore, the results of this study are reliable and validated. Then, the rest of the formal items from this stage were adopted to proceed with Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM).

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**Table 1.** The results of factor analysis and reliability test.

| Code | Factor analysis | | | | Reliability test | |
|---|---|---|---|---|---|---|
| | **Factor loading** | **KMO** | **Eigenvalue** | **Cumulative %** | **Item-total correlation** | **Alpha** |
| | ≥ 0.60 | >0.50 | >1 | >0.60 | >0.50 | ≥0.60 |
| Environmental knowledge | | | | | | |
| EK2 | 0.79 | 0.65 | 1.74 | 58.13 | 0.69 | 0.82 |
| EK3 | 0.75 | | | | 0.68 | |
| EK1 | 0.74 | | | | 0.66 | |
| EK4 | Deleted (Factor loading <0.60) | | | | | |
| Environmental concern | | | | | | |
| EC2 | 0.83 | 0.69 | 2.02 | 67.39 | 0.6 | 0.76 |
| EC3 | 0.82 | | | | 0.58 | |
| EC1 | 0.82 | | | | 0.58 | |
| EC4 | Deleted (Factor loading <0.60) | | | | | |
| Attitude toward the behavior | | | | | | |
| Att4 | 0.87 | 0.81 | 2.82 | 70.59 | 0.76 | 0.86 |
| Att2 | 0.87 | | | | 0.71 | |
| Att3 | 0.83 | | | | 0.69 | |
| Att1 | 0.82 | | | | 0.67 | |
| Att5 | Deleted (Factor loading <0.60) | | | | | |
| Att6 | | | | | | |
| Subjective norm | | | | | | |
| SN2 | 0.9 | 0.71 | 2.19 | 73.01 | 0.69 | 0.82 |
| SN3 | 0.88 | | | | 0.69 | |
| SN1 | 0.82 | | | | 0.62 | |
| SN4 | Deleted (Factor loading <0.60) | | | | | |
| Perceived behavioral control | | | | | | |
| PBC2 | 0.90 | 0.65 | 2.11 | 70.43 | 0.74 | 0.79 |
| PBC3 | 0.84 | | | | 0.64 | |
| PBC1 | 0.77 | | | | 0.53 | |
| PBC4 | Deleted (Factor loading <0.60) | | | | | |
| PBC5 | | | | | | |
| Behavioral intention | | | | | | |
| BI4 | 0.84 | 0.77 | 2.73 | 68.25 | 0.7 | 0.85 |
| BI3 | 0.83 | | | | 0.69 | |
| BI1 | 0.82 | | | | 0.66 | |
| BI2 | 0.82 | | | | 0.67 | |
| Anti-plastic bag behavior | | | | | | |
| APB2 | 0.89 | 0.71 | 2.23 | 74.19 | 0.73 | 0.83 |
| APB1 | 0.85 | | | | 0.66 | |
| APB3 | 0.85 | | | | 0.66 | |

### *4.4. Confirmatory Factor Analysis (CFA)*

The results of Table 2 and Figure 4 indicated that research variables of Environmental Concern, Attitude toward the Behavior, Anti-Plastic Bag Consumption, Perceived Behavioral Control, Behavioral Intention, and Subjective Norm have met the thresholds of Average Variance Extracted (AVE) > 0.5 and Composite Reliability (C.R) > 0.70. Indeed, one research variable of Environmental Knowledge has AVE < 0.50 and C.R < 0.70. This study assumes that consumers have perceived low perceptions of environmental knowledge related to the impact of plastic bag use on environment. According to value of the Cronbach Alpha Table 1 of Environmental knowledge is 0.82. Thus, this study concludes that the environmental knowledge is still reliable and validated. This research finding indicated that $\chi^2$/D.F = 1.011, GFI = 0.933, AGFI = 0.898, NFI = 0.925, CFI = 0.999, and

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RMSEA = 0.007 which met the expectation of threshold values as recommended by Fornell and Larcker (1981); Hair Jr et al. (2019) and Hooper, Coughlan, and Mullen (2008). AVE and C.R was calculated by the following formula, as recommended by Fornell and Larcker (1981); Anderson and Gerbing (1988); Hair, Black, Babin, and Anderson (2014); Jöreskog, Olsson, and Wallentin (2016); Jöreskog and Sörbom (1993) and Kline (2015). Overall, the results of this manuscript concluded that these research variables have high reliability and validity, which contribute to exploring the significant coefficient among hypothesis relationships. SEM was also applied to test a research hypothesis formulated in relation conceptual model as proposed by this study. Then, a detail of the SEM process and analysis is proceeded and shown in the results of Table 3 and Figure 5.

The results of Table 2 and Figure 4 indicated that research variables of Environmental Concern, Attitude toward Behavior, Anti-Plastic Bag Consumption, Perceived Behavioral Control, Behavioral Intention, and Subjective Norm have met the thresholds of AVE > 0.5 and C.R > 0.70. Indeed, one research variable of Environmental Knowledge has AVE =0.37 which is less than the threshold of 0.50 and C.R= 0.63 < 0.70. This study makes the assumption that consumers don't think much about the effects of plastic bag use on the environment. According to the value of the Cronbach Alpha (Table 1) of Environmental knowledge is 0.82. Thus, this study concludes that environmental knowledge is still reliable and validated. This research finding indicated that $\chi^2$/D.F = 1.011, GFI = 0.933, AGFI = 0.898, NFI = 0.925, CFI = 0.999, and RMSEA = 0.007, which met the expectation of threshold values as recommended by Fornell and Larcker (1981); Hair Jr et al. (2019) and Hooper et al. (2008). AVE and C.R were calculated by the following formula, as recommended by Anderson and Gerbing (1988); Hair et al. (2014); Jöreskog et al. (2016); Jöreskog and Sörbom (1993) and Kline (2015). Overall, the results of this manuscript concluded that these research variables have high reliability and validity, which contribute to exploring the significant coefficient among hypothesis relationships. SEM was also applied to test a research hypothesis formulated in relation to the conceptual model proposed by this study. Then, a detail of the SEM process and analysis is shown in the results of Table 3 and Figure 5.

$$\text{AVE} = \frac{\sum_{i=1}^{n} \lambda_i^2}{n} \qquad (1)$$

$$\text{CR} = \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum_{i=1}^{n} \delta_i)} \qquad (2)$$

Where: λ (Lamda) represents the standardized factor loading and *i* is the number of items (1) and δ (Delta) represents error variance terms (2) while δ = 1-$\lambda_i^2$.

**Table 2.** The results of CFA.

| Indicators | | Research variables | Standardized loading (λ) | t-value | AVE | C.R |
|---|---|---|---|---|---|---|
| EK1 | ← | Environmental knowledge | 0.548*** | 5.861 | 0.37 | 0.63 |
| EK2 | ← | | 0.637*** | A | | |
| EK3 | ← | | 0.629*** | 6.496 | | |
| EC1 | ← | Environmental concern | 0.676*** | 8.174 | 0.50 | 0.75 |
| EC2 | ← | | 0.728*** | 8.472 | | |
| EC3 | ← | | 0.725*** | A | | |
| Att1 | ← | Attitude toward the behavior | 0.694*** | 10.984 | 0.62 | 0.87 |
| Att2 | ← | | 0.798*** | 12.212 | | |
| Att3 | ← | | 0.745*** | 12.127 | | |
| Att4 | ← | | 0.896*** | A | | |
| APB1 | ← | Anti-plastic bag consumption | 0.751*** | 10.814 | 0.63 | 0.83 |
| APB2 | ← | | 0.840*** | 12.047 | | |
| APB3 | ← | | 0.780*** | A | | |
| PBC1 | ← | Perceived behavioral control | 0.580*** | 6.712 | 0.58 | 0.80 |
| PBC2 | ← | | 0.779*** | 12.336 | | |
| PBC3 | ← | | 0.896*** | A | | |
| BI1 | ← | Behavioral intention | 0.783*** | 10.86 | 0.63 | 0.87 |

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| Indicators | | Research variables | Standardized loading (λ) | t-value | AVE | C.R |
|---|---|---|---|---|---|---|
| BI2 | ← | | 0.767*** | 10.585 | | |
| BI3 | ← | | 0.859*** | 11.087 | | |
| BI4 | ← | | 0.759*** | A | | |
| SN1 | ← | Subjective norm | 0.795*** | 10.868 | 0.66 | 0.85 |
| SN2 | ← | | 0.722*** | 10.576 | | |
| SN3 | ← | | 0.904*** | A | | |

**Note:** λ significant at t-value>1.96 with ***p<0.001; A is fixed at regression weight equal to 1; AVE=Average variance extracted; C.R=Composite reliability.

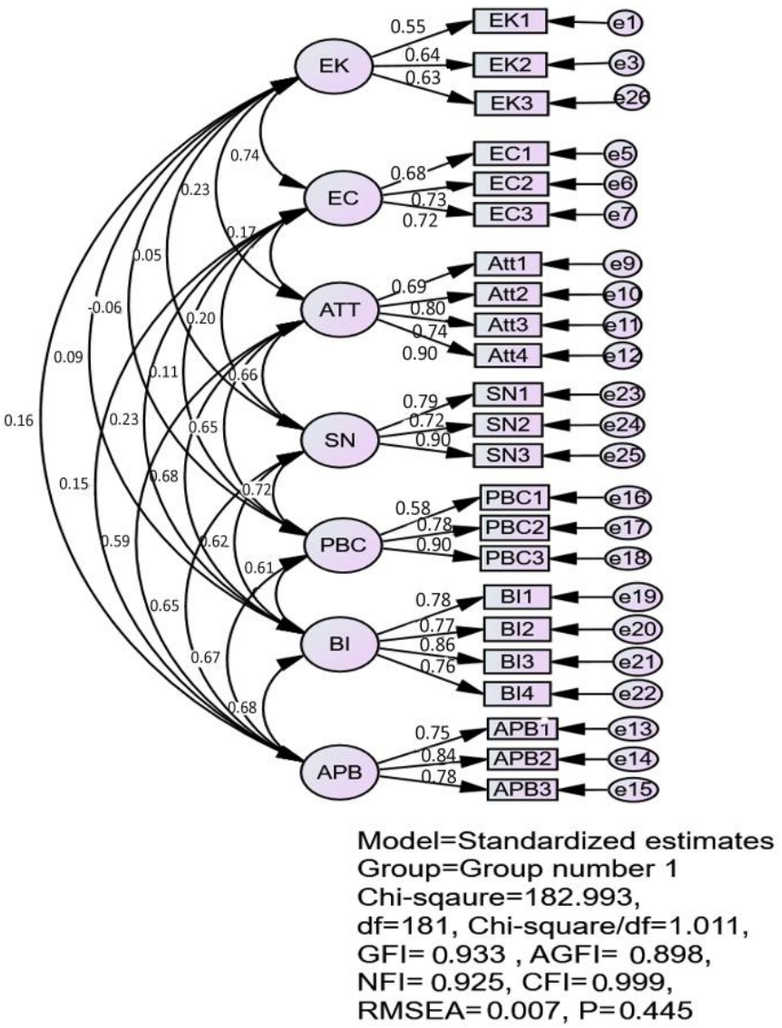


**Figure 4.** The results of CFA.

**Note:** EK= Environmental knowledge;EC = Environmental concern; ATT= Attitude toward the behavior; SN =Subjective norm; PBC = Perceived behavioral control; BI = Behavioral intention; APB = Anti-plastic bag consumption.

D.F= Degree of freedom, $\chi^2$= Chi-square; GFI= Goodness of Fit Index; AGFI= Adjusted Goodness of Fit Index; NFI = Normed Fit Index; CFI=Comparative Fit Index; RMSEA= is the root mean square error of approximation (values of 0.01, 0.05 and 0.08 indicate excellent, good and mediocre fit respectively, some go up to 0.10 for mediocre). GFI, AGFI, NFI and CFI have values near or above 0.90 indicate a good fit.


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### *4.5. Structural Equation Modeling (SEM)*

The results of Table 3 and Figure 5 showed that $\chi^2$/D.F = 1.187, GFI = 0.924, AGFI = 0.879, NFI = 0.916, CFI = 0.985, and RMSEA = 0.030 are satisfied with the threshold which indicated that results are good model fit for this study. Also, path relationships for hypothesis testing showed that this study significantly supported and confirmed all eight proposed hypotheses.

**Table 3.** The results of SEM.

| Indicators | | Research variables | Standardized loading (λ) | t-value | p-value |
|---|---|---|---|---|---|
| EK1 | ← | Environmental knowledge | 0.51*** | 4.338 | 0.000 |
| EK2 | ← | | 0.55*** | A | 0.000 |
| EK3 | ← | | 0.59*** | 4.381 | 0.000 |
| EC1 | ← | Environmental concern | 0.68*** | 7.598 | 0.000 |
| EC2 | ← | | 0.74*** | 7.83 | 0.000 |
| EC3 | ← | | 0.67*** | A | 0.000 |
| Att1 | ← | Attitude toward the behavior | 0.71*** | 11.152 | 0.000 |
| Att2 | ← | | 0.77*** | 11.419 | 0.000 |
| Att3 | ← | | 0.74*** | 11.627 | 0.000 |
| Att4 | ← | Anti-plastic bag consumption | 0.89*** | A | 0.000 |
| APB1 | ← | | 0.71*** | 9.803 | 0.000 |
| APB2 | ← | | 0.81*** | 10.949 | 0.000 |
| APB3 | ← | | 0.76*** | A | 0.000 |
| PBC1 | ← | Perceived behavioral control | 0.64*** | 3.957 | 0.000 |
| PBC2 | ← | | 0.79*** | 5.678 | 0.000 |
| PBC3 | ← | | 0.76*** | A | 0.000 |
| BI1 | ← | Behavioral intention | 0.86*** | 9.799 | 0.000 |
| BI2 | ← | | 0.70*** | 9.528 | 0.000 |
| BI3 | ← | | 0.83*** | 10.78 | 0.000 |
| BI4 | ← | | 0.78*** | A | 0.000 |
| SN1 | ← | Subjective Norm | 0.81*** | 9.366 | 0.000 |
| SN2 | ← | | 0.67*** | 6.894 | 0.000 |
| SN3 | ← | | 0.93*** | A | 0.000 |
| Path relationships | | | β-coefficient | | |
| H1: EK | → | BI (Accepted) | -2.347** | -0.17 | 0.019 |
| H2: EC | → | BI (Accepted) | 2.229** | 0.13 | 0.026 |
| H3: ATT | → | BI (Accepted) | 2.078** | 0.34 | 0.038 |
| H4: SN | → | BI (Accepted) | 2.730** | 0.22 | 0.006 |
| H5: PBC | → | BI (Accepted) | 4.286*** | 0.30 | 0.000 |
| H6: EK | → | APB (Accepted) | 2.589** | 0.23 | 0.010 |
| H7: BI | → | APB (Accepted) | 6.735*** | 0.58 | 0.000 |
| H8: PBC | → | APB (Accepted) | 4.531*** | 0.37 | 0.000 |

**Note:** λ significant at t-value>1.96 with ***p<0.001, **p<0.05; A is fixed at regression weight equal to 1; EK= Environmental knowledge; EC = Environmental concern; ATT= Attitude toward the behavior; SN =Subjective norm; PBC = Perceived behavioral control; BI = Behavioral intention; APB = Anti-plastic bag consumption.

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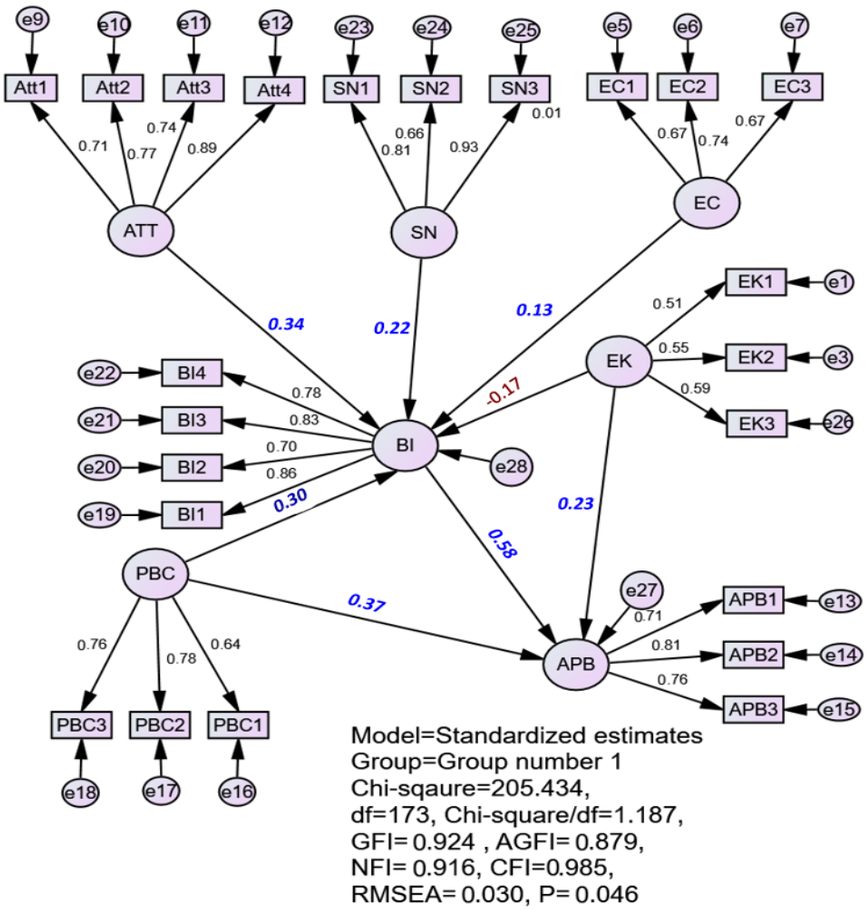


**Figure 5.** The results of SEM.

## 5. Discussion and Conclusion

### *5.1. Discussion*

The results of SEM showed that hypothesis (H1): environmental knowledge and behavioral intention have been accepted, which $\beta = -0.17^{**}$, t-value =|2.347| >1.96, and significance of p-value=0.019 < 0.05. From this result, consumers who have higher environmental knowledge will lead behavioral intention to behave low anti-plastic bags, which mean that consumer understands the harm of plastic bag to the environment but still use it in daily consumption because of their convenience to store the commodities or them has the habit of plastic consumption. Jallaludin et al. (2021) also said that even though consumers are aware of the negative effects of plastic bags, they still purchase plastic bags instead of carrying their shopping bags. So, this hypothesis is acceptable and exists with the previous (Chang & Wu, 2015).

The results of SEM showed that hypothesis (H2): Environmental concern and behavioral intention have been accepted, which $\beta = 0.13^{**}$, t-value =2.229 > 1.96, and significance of p-value =0.026 < 0.01. This result describes that environmental concern and behavioral intention have a positive relationship. According to Saari et al. (2021) and Wang and Li (2022) environmental concern strongly affects behavioral intention. Consumers' environmental concern about plastic bag consumption in their daily lives influences their behavior. Consumers are concerned about the environment, and when they use plastic bags, they will think more and more about consumer behavior that can make them reduce their plastic consumption or become anti-plastic bag consumers.

The results of hypotheses (H3): Attitude toward using plastic bag and behavioral intention has accepted which SEM showed that $\beta = 0.34^{**}$, t-value =2.078 >1.96, and significant of p-value = 0.038 < 0.05. These findings are congruent with those of the prior study (Arı & Yılmaz, 2017). It can be shown that attitude has a positive influence on behavioral intention. This study noticed that each consumer always has an attitude that

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will produce their behavioral intention. Especially if they have a positive attitude toward plastic bag consumption, their behavioral intention toward plastic bag consumption is also positive.

The results of hypotheses (H3): Attitude toward using plastic bags and behavioral intention has been accepted, which SEM showed that $\beta = 0.34^{**}$, t-value =2.078 >1.96, and significance of p-value = 0.038 < 0.05. These findings are congruent with the prior studies study (Arı & Yılmaz, 2017). It can be shown that attitude has a positive influence on behavioral intention. This study noticed that consumers always have a perspective that will produce their behavioral intention. Especially if they have a positive attitude toward plastic bag consumption, their behavioral intention toward plastic bag consumption is also positive.

The results of hypotheses (H4): Subjective norm and behavioral intention are accepted, which SEM confirmed that $\beta = 0.22^{**}$, t-value =2.730 >1.96, and significance of p-value = 0.006 <0.05. It can show that their behavioral intention influences the subjective norm of consumers (Ngoc et al., 2019; Tonglet, Phillips, & Read, 2004). When the people around them, like family, friends, or people who influence them, have an anti-plastic bag consumption behavior, their behavioral intention will also do so. Moreover, all types of these people (family, friends, or people who influence them) can encourage them to behave in the positive behavioral intention of plastic consumption.

The results of hypotheses (H5): Perceived behavioral control and behavioral intention are accepted, which SEM confirmed that $\beta = 0.30^{***}$, t-value =4.286 >1.96, and significance of p-value = 0.000 < 0.001. The results of this research are consistent with the previous studies (Madden, Ellen, & Ajzen, 1992). It can be described that perceived behavioral control has a positive relationship with behavioral intention. It can be described that All consumers have individual behavior, and they act their behavior as they control. Under their control of behavior, their behavior intention of them was influenced by it. If they define themselves as reducing or avoiding plastic bags, their behavioral intention is not to use them.

The results of SEM showed that hypotheses (H6): environmental knowledge and anti-plastic bag behavior have been accepted, which $\beta = 0.23^{**}$, t-value =2.589 >1.96, and the significance of p-value =0.010 < 0.05. This result is consistent with the previous study (Zen et al., 2013) and clarifies that environmental knowledge and anti-plastic bag behavior have a significant relationship. Environmental knowledge was an important part of making consumers behave in an anti-plastic bag way. When consumers have the knowledge and know a lot of the effects of plastic bags on the environment, they will choose to behave in an anti-plastic bag manner, even though some have less behavioral intention to reduce their plastic consumption. This relationship can be a factor that motivates them to avoid or reduce plastic consumption in their daily consumption to protect the environment and make it healthier in the future.

The results of SEM showed that hypotheses (H7): perceived behavioral control and anti-plastic bag behavior have supported which $\beta = 0.58^{***}$, t-value =6.735 >1.96, and significance of p-value = 0.000 < 0.001. These results revealed that perceived behavioral control positively correlates with anti-plastic bag behavior. And the previous study also stated that (Ohtomo, 2014). In this case, perceived behavioral control of consumers will lead the consumer to behave in anti-plastic bags behavior. Consumers can control themselves to avoid or not use the plastic bag in their consumption. They also can determine the degree of use of plastic bags that can be a factor in reducing plastic bags consumption in their daily life.

The results of hypotheses (H8): Behavioral intention and anti-plastic bag behavior are accepted, which SEM confirmed that $\beta = 0.37^{***}$, t-value =4.531 > 1.96, and significant p-value =0.000 <0.001. It can be described that behavioral intention and anti-plastic bag behavior have a positive relationship. Ohtomo (2014) also stated that behavioral intention strongly affects anti-plastic bag behavior. For this reason, the behavioral intention of consumers will cause the consumers to behave in anti-plastic bags behavior. When the consumers get a positive behavioral intention, it shows that they know the bad affection of plastic bags on the environment and the earth. It will lead consumers to think more about this problem and try to cut off their use of them. So, the behavioral intention of consumers is important to motivate them to behave in anti-plastic bags behavior.

This section will discuss the findings in light of existing literature, providing a comprehensive understanding of consumer attitudes towards anti-plastic bag consumption in Cambodia. It will explore the implications of these attitudes for policymakers, businesses, and environmental organizations, offering recommendations for effective strategies to reduce plastic bag usage.

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### *5.2. Conclusion*

According to the results of Table 3 SEM showed that objective (i.e., aims to explore the relationship between environmental knowledge, environmental concern, perceived behavioral control, subjective norm, attitude toward using plastic bags, and anti-plastic bag consumption) indicated that "Behavioral Intention" has the most important factor influencing on "Anti-plastic bag consumption" (i.e., $\beta = 0.58$, t-value =6.735 and p-value<0.001 ) and second is "Perceived Behavioral Control" ( $\beta = 0.37$, t-value =4.531, and p-value <0.001) and the less important is " Environmental Knowledge" ($\beta = 0.13$, t-value =2.229 and p-value <0.05). Therefore, all proposed research hypotheses are significantly supported by this study. Indeed, the variables of behavior intention, perceived behavior control, environmental knowledge, and attitude toward the behavior play the most important role in enhancing consumers' anti-plastic bag consumption behavior in mall experiences in Cambodia. The study will conclude by summarizing the key findings, highlighting implications for stakeholders, and suggesting future research directions. By investigating consumer attitudes towards anti-plastic bag consumption, this research contributes to the ongoing efforts to tackle plastic pollution in Cambodia and promotes sustainable practices for a greener future.

### *5.3. Recommendation and Future Research*

While some potential health, safety, and environmental issues require further analysis to explore more critical problems in further research and appear to be resolvable (Shackley et al., 2012). Environmental policymakers can better understand each actor's possibilities and capabilities to improve policy design and learning and respond to policy changes effectively (Vitiea & Lim, 2019). Related to environmental harm, the government must first reform and re-adjust policies to ensure that its concerned institutions will be held accountable for their policy implementation and regulatory enforcement (Young, Katell, & Krafft, 2019). The government needs to adjust its policies and strengthen its regulatory enforcement institutions to account for environmental issues alleged by affected communities and Non-Governmental Organizations (NGOs). Government accountability is considered an extremely important entry point to corporate environmental accountability. The service provision for MSW management efficiency only reached 72% in urban areas (Pheakdey et al., 2022). In practice, the Cambodian government should conduct an incentive policy to improve the existing systems and extend resource recovery to attain the country's circular economy. Hence, extensive novel studies should be carried out to investigate the current MSW management systems and their impacts on the environment and climate change.

Moreover, the Cambodian government should install advanced technologies such as Artificial Intelligence (AI) and the Internet of Things (IoT) to increase management efficiency and meet sustainable development goals. Recycled waste accounted for about 9.3% of all waste generated in 2003. The overall technical arrangement, including storage and discharge, collection and transport, and disposal, still needs to be in better condition, leading to environmental and health risks (Seng et al., 2011). According to the Cambodian Ministry of Environment, 3R concepts (i.e., Reduce, Reuse, and Recycle) were proposed and drafted in 2009 to establish an efficient solid waste management system through an increased waste collection service, promotion of waste separation for recycling, enhancement of organic waste composting, and improvement of disposal sites. Because the 3R concepts are quite new to Cambodian national and local officials, the policymakers of Cambodia must plan to:

1. Establish and implement the 3R policies and regulations for waste management at national and local levels, based on the existing environment legal instruments.
2. Implement pilot projects in selected urban areas, for example: under project campaign of "Clean Village-Clean City".
3. Disseminate knowledge and implicate the 3R policies and regulations in both the public and private sectors, and
4. Integrate the 3R initiatives into national policy development.
5. Raise environmental knowledge related to the 3R concepts to local communities (i.e., villages, schools, universities, and public areas).
6. Provide the 3R successful models from other countries to organize capacity-building program for government officials.

Lesson learned of the 3R concept, in a bid to reduce plastic waste, the Japanese government made it mandatory from July 2020 for all retailers to charge between 3 and 5 yen (3 to 5 cents) for each plastic bag, via

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a change to ministerial ordinances under the law for recycling containers and packages (The_Japan_News, 2023). In Taiwan, new plastic bags charge will be based on three sizes that will be made available for the dual bags, a 3-liter bag will cost NT$1, a 6-liter bag will cost NT$2, and a 14-liter bag will cost NT$5 (Matthew, 2024). In Singapore, the charge of plastic bag is S$0.20 per transaction at supermarkets and S$0.10 per transaction at convenience stores (Zhang, 2022). Then, in Cambodia, plastic management in the country is also based on the 3R principles of 'Reduce, Reuse, and Recycle.' The effort will be strengthened by Sub-decree 113 on Waste Management. It proposes to hike the levy for plastic bags charged by supermarkets from the current 400 riels (0.10$) to 600 riels (0.15$) a piece (Mathew, 2023). In addition, promoting alternatives to plastic bags should be encouraged for consumption, production, and investment. Promoting alternative materials should be carefully considered for the price, quality, and quantity. These should not be much different from the current situation of using plastic bags. Furthermore, providing awareness raising and education programs let people be aware of the negative effects of plastic bags. This encourages them to reduce plastic bag consumption as much as possible. Awareness raising programs can be any activities, such as environmental campaigns, outreach activities, workshops, meetings, pilot projects, social media, television, radio, posters, and school curricula. These proposed policies can be implemented effectively for reducing plastic bags. The policies need good strategies, efforts, and the support of all stakeholders, including governmental institutions, non-governmental organizations, private sectors, and local people with short and long-term plans and enforcement. Further research on plastic bags, especially the study of the behavior of people for plastic bag consumption is crucial and needed urgently in Phnom Penh and other cities in Cambodia (Koeng et al., 2020).

Lesson learned of the 3R concepts: in a bid to reduce plastic waste, the Japanese government made it mandatory from July 2020 for all retailers to charge between 3 and 5 yen (3 to 5 cents) for each plastic bag via a change to ministerial ordinances under the law for recycling containers and packages (The_Japan_News, 2023). In Taiwan, new plastic bag charges will be based on three sizes that will be made available for the dual bags: a 3-liter bag will cost NT$1, a 6-liter bag will cost NT$2, and a 14-liter bag will cost NT$5 (Matthew, 2024). Then, in Cambodia, plastic management is also based on the 3R principles of 'Reduce, Reuse, and Recycle.' The effort will be strengthened by Sub-decree 113 on Waste Management. It proposes to hike the levy for plastic bags charged by supermarkets from the current 400 riels (0.10$) to 600 riels (0.15$) a piece (Mathew, 2023). In addition, promoting alternatives to plastic bags should be encouraged for consumption, production, and investment. Promoting alternative materials should be carefully considered for price, quality, and quantity. These should be similar to the current plastic bag use.

Furthermore, raising awareness and education programs make people aware of the negative effects of plastic bags. This encourages them to reduce plastic bag consumption as much as possible. Awareness-raising programs can include environmental campaigns, outreach, workshops, meetings, pilot projects, social media, television, radio, posters, and school curricula. These proposed policies can be implemented effectively to reduce plastic bags. The policies need good strategies, efforts, and the support of all stakeholders, including governmental institutions, non-governmental organizations, private sectors, and local people with short and long-term plans and enforcement. Further research on plastic bags, especially the study of people's behavior for plastic bag consumption, is crucial and urgently needed in Phnom Penh and other cities in Cambodia (Koeng et al., 2020).

This study investigates consumers' attitudes toward anti-plastic bag behavior; that research framework conducted seven research variables such as environmental knowledge, environmental concern, attitude toward the behavior, subjective norms, perceived behavioral control, behavioral intention, and anti-plastic bag consumption behavior by applying the theory of planned behavior and the S-O-R model. By recommendation, future researchers should focus on more key independent research variables (i.e., Environmental awareness, eco-friendly alternatives, good governance, accountability, environmental regulation, environmental health concern, environmental awareness, community engagement, community commitment, and stakeholder engagement) to examine consumer behavior related to plastic bag consumption behavior to sustain environmental performance and reduce climate change issues. Therefore, the review highlights the limitations of the Municipal Solid Waste (MSW) management system and technologies and suggests possible actions for sector improvement. Sustainable MSW management in Cambodia requires strong public and private sector participation, development partners, government, and community engagement. Indeed, the following critical points can improve the consumer attitude towards anti-plastic bag consumption in Cambodia.

1. Awareness Campaigns

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It is essential to launch comprehensive awareness campaigns to attitudes towards ani-plastic bag consumption of consumers in Cambodia. These campaigns should focus on educating consumers about the negative impacts of plastic bags on the environment, wildlife, and human health. The environmental campaign can utilize various media channels, such as television, radio, social media platforms, and community events, to reach a wider audience.

2. Government Regulations

Implementing strict government regulations on plastic bag usage can significantly influence consumer behavior. Cambodia should consider banning or levying substantial taxes on single-use plastic bags. This action approach has proven successful in other countries, significantly reducing plastic bag consumption. Indeed, the revenue generated from these taxes can be used to fund environmental conservation initiatives.

3. Alternative Packaging Solutions

Encouraging the use of alternative packaging solutions is crucial to changing consumer behavior. Promoting reusable bags, such as cloth or jute bags, can be effective. Offering incentives, such as discounts or loyalty points, to customers who bring their bags while shopping can further motivate consumers to adopt sustainable alternatives to plastic bags.

4. Collaborations with Businesses

Engaging businesses in the efforts to reduce plastic bag consumption is vital. Encouraging retailers to provide eco-friendly packaging options and offering training programs on the harmful effects of plastic bags can help create a more sustainable shopping environment. Additionally, collaborating with local businesses to develop and promote innovative, biodegradable packaging materials can be beneficial in the long run.

5. Continuous Research

To ensure the effectiveness of these recommendations, continuous research is necessary. Future studies should focus on assessing the impact of awareness campaigns, government regulations, and alternative packaging solutions on consumer attitudes toward plastic bag consumption. Additionally, research should explore the most effective implementation methods and identify potential barriers to behavior change. Transforming consumer attitudes towards anti-plastic bag consumption in Cambodia requires a multi-faceted approach. By implementing awareness campaigns and government regulations, promoting alternative packaging solutions, collaborating with businesses, and conducting continuous research, Cambodia can work toward a sustainable future with reduced plastic bag consumption.

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## Appendix—Questionnaire design

Anti-Plastic Bag Consumption—(APB) (Iyer & Muncy, 2009; Ohtomo, 2014)

1. Given the choice, I would rather use alternative to plastic bag.
2. I try to reuse plastic bag as much as I can.
3. I make specific efforts to buy products without using plastic bag.
4. When you purchase some goods, you use your own bag instead of receiving free plastic bags.

Behavioral Intention—(BI) (Van et al., 2021)

1. I intend to find the alternatives of instead of using plastic items.
2. I am willing to persuade other individuals to reduce using plastic.
3. I intend to educate my relatives about the way of reducing plastic.
4. I am willing to switch to using plastic-free accessories and tools.

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Perceived Behavioral Control—(PBI) (Van et al., 2021)

1. Determine self-constraint over the usage of use plastic in a day.
2. I bring my own reusable shopping bag at grocery store.
3. I do not apply for plastic spoons, straws and forks while take-out any food.
4. Use eco-friendly products such as recycle bag, lunch box and so on to attain minimum usage of plastic.
5. I choose to purchase environmentally sustainable products regardless of the price in order to decrease the consumption of plastic.

Subject Norm—(SN) (Ngoc et al., 2019)

1. My family encourages me to reduce using plastics
2. My friends are conscious of plastic waste pollution and tend to reduce plastic waste in their consumption.
3. Celebrities who have influence on me are conscious of plastic waste pollution.
4. If my office / school has regulation of reducing plastic waste, I will follow it.

Attitude toward the Behavior—(ATT) (Ferdous & Das, 2014)

1. It not right to throw plastic products anywhere after use.
2. People should be conscious to use plastic products.
3. Plastic thrown by the people does damage the environment.
4. Plastic products are more user friendly than any other products.
5. Black color of plastic bags is more attractive than other color.
6. Everyone needs to aware of use of plastic products.

Environmental Concern—(EC) (Maichum, Parichatnon, & Peng, 2016; Sun & He, 2022)

1. When humans interfere with nature, it often produces disastrous consequences.
2. I am willing to reduce my consumption to help protect the environment.
3. I am very concerned about the environment.
4. Humans are severely abusing the environment.

Environmental Knowledge—(EK) (Ferdous & Das, 2014)

1. ‘Reuse’ of plastic bag is good.
2. Awareness is essential for saving our environment from the plastic hazards.
3. In the ground, plastic materials are sustained long time and decrease the soil quality.
4. To keep the environment beautiful, we need to be free of plastic products.

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