Investigating Factors Influencing Consumer Behavior in Reducing Single-Use Plastic Bag Usage: An Extended TPB Approach

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ABSTRACT

Plastic pollution remains a major environmental concern, and single-use plastic bags contribute substantially to urban waste. This study examines factors associated with consumers' intention to reduce single-use plastic bag use and their self-reported plastic-bag reduction behaviour among Retail S customers in Bandung, Indonesia. Drawing on an extended Theory of Planned Behavior (TPB) framework, the study examines the roles of attitude, subjective norms, perceived behavioral control, convenience, and policy promotion. Data were collected through an online questionnaire from 213 eligible respondents and analysed using partial least squares structural equation modelling (PLS-SEM) in SmartPLS 4. The findings show that attitude was positively associated with intention to reduce plastic-bag use, whereas subjective norms, perceived behavioral control, and convenience were not significantly associated with this intention. Intention to reduce plastic-bag use was positively associated with self-reported plastic-bag reduction behaviour. Policy promotion was likewise not significantly associated with this intention at the two-tailed 5% level. The findings are specific to regular Retail S customers in Bandung who had prior experience using alternatives to plastic bags. In this retailer-managed setting, convenience and policy promotion did not show the significant associations reported in the original extended TPB model, whereas attitude and intention did, suggesting that interventions may need to prioritise attitudinal change and help consumers convert intentions into action. They may assist retailers and policymakers in designing interventions that support reduced reliance on single-use plastic bags.

Keywords: Consumer Behavior, Environmental Sustainability, Single-use Plastic Bag, Theory Planned Behavior (TPB)

INTRODUCTION

Environmental sustainability has become a global problem that requires cooperation between various parties, including businesses, individuals, and governments (Asha et al., 2023). One of the most serious sustainability issues is plastic pollution, as it threatens ecosystems around the world (Khan, 2023). Unmanaged plastic pollution has a significant impact on the environment. Plastics take hundreds of years to biodegrade (Afreen et al., 2020) and can enter the human food chain through contaminated marine organisms, causing potential health problems (Conti et al., 2021). One of the major contributors to plastic pollution is single-use plastics. The single-use plastics (SUPs), are invented for the modern "throwaway society" are consciously to be used only once and has been produced and used globally mostly as packaging or consumables, such as SUP shopping bags (Chen et al., 2020). The contamination of single-use plastics is present in numerous environmental media, including soil, rivers, lakes, and oceans globally. It is inflicting harm not only on humans but also on all other beings. (Chen et al., 2020). In 2022, around 36% of the 430 million metric tons of plastic generated globally annually was utilized for packaging, including single-use plastic products for food and beverages (UNEP, 2022).

Recent international endeavours to mitigate single-use plastics (SUP) via prohibitions and regulations have intensified, as evidenced by actions in nations in Europe, the United States, Australia, Rwanda, and some Asian

Countries such Japan, China, Singapore, Malaysia, Indonesia, and else. Certain cities in these nations have prohibited plastic straws, discouraged single-use plastic bags, and instituted an environmental levy on all imported goods packaged in plastic or single-use plastic items (Uche, 2023; Lima et al., 2022a; Macintosh et al., 2020; Taylor & Villas-Boas, 2015). Indonesian government issued Circular Letter No. S.1230/PSLB3-PS/2016 regulating the paid plastic bag policy in 22 regions, including Bandung (Lusnita, 2019). Under this policy, consumers have to pay Rp200 per plastic bag and are encouraged to bring their own shopping bags (Pramisti, 2022). However, research shows that this regulation does not significantly change consumer behaviour (Paramita & Firmansyah, 2024). Although the paid plastic bag policy has been in place since 2016, what remains less understood is how retailer-led initiatives that go beyond the mandated policy, such as reusable-bag incentives and policy promotion, relate to consumers' intentions and reported behaviour. Legislative efforts are significant; yet their capacity to mitigate the overarching plastic pollution challenge is inherently constrained. This highlights the necessity for holistic measures encompassing consumer behaviour, enhanced recycling, and new waste management approaches (Sharma et al., 2021). This research will primarily focus on consumer behaviour.

Understanding the determinants that affect consumer behaviour is crucial for facilitating plastic reduction initiatives. The Theory of Planned conduct (TPB) encompasses the determinants that affect human social conduct and elucidates behavioural decisions (Ajzen, 1991). The Theory of Planned Behaviour elucidates human behaviour via three primary determinants: attitude, perceived behavioural control, and subjective norms (Ajzen, 1991; Yuliawati et al., 2024). Attitudes denote an individual's assessment of a behaviour, perceived behavioural control pertains to the perceived facilitation of executing a behaviour, and subjective norms signify societal impacts on decision-making (Aruta, 2021 in Yuliawati et al., 2023). Consequently, it is believed that these three factors influence individuals' intents to adopt specific actions that will reduce the utilisation of single-use plastic bags.

Research indicates that the conventional Theory of Planned Behaviour (TPB) may inadequately account for plastic reduction behaviour in contexts where policy interventions and convenience considerations are prominent (Zhou et al., 2023). The Theory of Planned Behaviour (TPB) framework was expanded by incorporating the additional variables of convenience and policy promotion in a previous study conducted by Zhou et al. (2023), which identified the primary factors influencing the decrease in plastic bag consumption among consumers in Nanjing, China. Given that Retail S actively provides reusable-bag alternatives and promotes its plastic-reduction policy, as described below, this study extends the TPB with these two factors to examine whether they are also associated with consumers' intentions in an Indonesian retail setting. The traditional Theory of Planned Behaviour, encompassing attitude, subjective norm, and perceived behavioural control, is seen as inadequate for encapsulating the intricacies of consumer decision-making, especially within dynamic social and regulatory environments (Ajzen, 1991; Zhou et al., 2023). Research findings by Zhou et al. (2023) demonstrated that the Theory of Planned Behaviour (TPB) can better accurately forecast consumer behaviours and intentions about the reduction of plastic bag consumption by incorporating the factors of Convenience and Policy Promotion. This aligns with Steg and Vlek's (2009) research, which shown that effective policies positively influence behaviour, and with Putri and Adi's (2022) study, which indicated that convenience positively affects behaviour.

Business sectors, mainly retails, have been urged to adopt measures and efforts to reduce and restrict the use of single-use plastics (SUP), as the majority of SUP consumption originates from retail activities. In 2016, the government of Indonesia through the Ministry of Environment and Forestry (KLHK) issued Circular Letter No. S.1230/PSLB3-PS/2016 which regulates the price and mechanism of implementing paid plastic bags (Lusnita, 2019). This policy trial was conducted in 22 regions in Indonesia, one of them is Bandung. Approved by the government, the Indonesian Retailers Association (APRINDO), the National Consumer Protection Agency (BPKN), and the Indonesian Consumers Foundation (YLKI), this provision requires consumers to pay Rp200 for each unit of plastic bag requested when shopping and consumers are also encouraged to bring their own shopping bags (Pramisti, 2022).

In Bandung, major retailers have adopted government policies aimed at reducing single-use plastic bags (SUPBs) by introducing paid bag schemes and alternative options like cloth bags or cardboard boxes (Komala,

2020). Retail S stands out for its consistent and aggressive efforts toward plastic reduction. Since 2006, it has implemented a series of initiatives, including a paid bag policy, participation in the national no-free plastic bag trial, and launching the *"Bijak Menggunakan Kantong Plastik"* campaign. These efforts go beyond compliance by eliminating plastic bag provision entirely and offering incentives such as cashback for reusable bag usage and eco-friendly alternatives like used cardboard or reusable shopping bags.

Retail S's innovations continued with the 365 Fresh Bag launch in 2021 and its consistent recognition at the TOP CSR Awards, most recently in 2024. These initiatives reflect a comprehensive sustainability approach that significantly influences consumer habits and highlights the retailer's leadership in promoting green behaviour. In contrast, other retailers in Bandung often provide paid plastic bags, which are insufficient to change consumer practices due to weak incentives and lack of education (Paramita & Firmansyah, 2024).

Retail S's case demonstrates how strategic policies, such as convenience, incentives, and strong promotional efforts, can drive sustainable consumer behaviour. Through those strong rationales, this study examines how extended TPB constructs, attitude, subjective norm, perceived behavioural control, convenience, and policy promotion, affect plastic reduction behaviour.

This research contributes to global environmental discussions by offering actionable insights into how retail policies can support consumer transition to more sustainable practices. Specifically, it contributes to the extended TPB literature by testing whether convenience and policy promotion, which were identified as key factors in Nanjing (Zhou et al., 2023), are also associated with plastic-reduction intention in a setting where both are actively managed by the retailer, thereby clarifying whether the extended model holds in an Indonesian retailer-managed context.

Despite growing research on the TPB and plastic reduction, less is known about how the extended TPB constructs operate within a retailer-specific context in Indonesia, where policy promotion and convenience are actively managed by the retailer.

This study therefore examines associations between attitude, subjective norms, perceived behavioral control, convenience, and policy promotion with consumers' intention to reduce single-use plastic bag use, as well as the association between intention to reduce and self-reported plastic-bag reduction behaviour. The findings should be interpreted within the specific sampling frame of regular Retail S customers in Bandung who had prior experience using plastic-bag alternatives.

LITERATURE REVIEW

Theory of Planned Behavior (TPB)

The Theory of Planned Behaviour (TPB), proposed by Ajzen (1991), enhances the Theory of Reasoned Action (TRA) by integrating Perceived Behavioural Control (PBC) with Attitude and Subjective Norm. This inclusion recognizes the influence of perceived ease or difficulty in executing an activity, hence augmenting its predictive capacity. Ajzen (1991) posits that an individual's intention to engage in a behaviour is reinforced by a favourable attitude, the perception of substantial social support, and an enhanced sense of control over the conduct. Although the Theory of Planned Behaviour is successful in several circumstances, it may not entirely encompass the intricacies of behavioural factors.

To rectify this, researchers frequently augment the model with supplementary variables to enhance precision. Zhou et al. (2023) augmented the Theory of Planned Behaviour in their investigation of consumer plastic bag usage reduction in Nanjing, China, by incorporating Convenience and Policy Promotion. These supplementary elements encompass practical and external influences on consumer choices, especially in diminishing plastic consumption. The extended TPB framework, by incorporating these variables, provides a more thorough comprehension of behavioural determinants, enhancing its applicability to specific circumstances (Zhou et al., 2023).

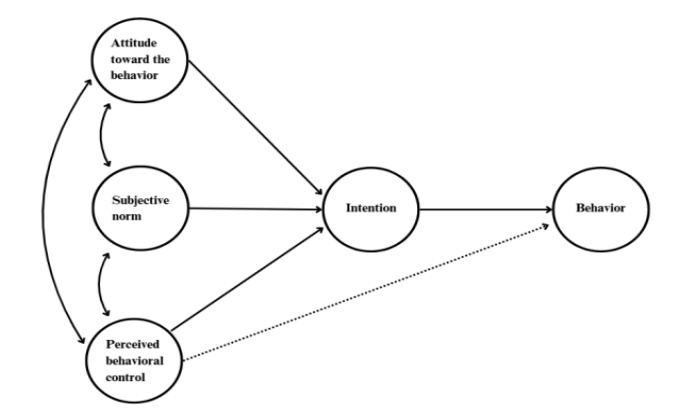


Figure 1. Theory of Planned Behaviour Model (Ajzen (1991)

Attitude, as articulated by Ajzen (1991), denotes an individual's favourable or unfavourable assessment of a behaviour, influenced by their convictions regarding its consequences. An optimistic disposition enhances the probability of engaging in a behaviour, particularly when linked to favorable outcomes. Van et al. (2021) assert that contentment and awareness of an action's influence are crucial in influencing intentions, whereas Zhou et al. (2023) underscore the interplay between attitude and pragmatic elements such as convenience. Subjective Norm reflects the impact of social pressure from peers, family, or society on the formation of behavioural intentions (Ajzen, 1991). Research conducted by Yuliawati et al. (2024) and Van et al. (2021) confirms that robust social influence can compel individuals to conform to societal standards, whereas Zhou et al. (2023) propose that policy initiatives and community-led campaigns can enhance these impacts. Perceived Behavioral Control (PBC) denotes an individual's perceived ability to execute an activity, taking into account internal and external circumstances, including resources and obstacles (Ajzen, 1991). Zhou et al. (2023) assert that perceived behavioural control (PBC) is especially pertinent to environmental behaviour, as the availability of options substantially influences decision-making, and elevated PBC enhances the probability of undertaking pro-environmental acts (Galván-Mendoza et al., 2022).

H_1: Attitude has a positive and significant influence on reduction of intention

H_2: Subjective norms have a positive and significant influence on reduction of intention

H_3: Perceived Behavioral Control has a positive and significant influence on reduction of intention

H_4: Perceived Behavioral Control has a positive and significant influence on Reduction of Behavior

Extended Theory of Planned Behavior (Extended TPB)

Although the Theory of Planned conduct (TPB) effectively elucidates conduct across diverse situations, certain studies indicate that it may not comprehensively encompass the intricate aspects influencing behaviour. Consequently, supplementary variables are frequently integrated into the TPB to enhance predictability and the model's significance. An illustration of an expanded Theory of Planned Behaviour model is presented by Zhou et al. (2023) The variables Convenience and Policy Promotion were incorporated to address the practical and external factors that affect consumer choices, particularly on the reduction of plastic usage (Zhou et al., 2023). Expanding the TPB enables researchers to get deeper insights and discover specific aspects pertinent to the research setting, yielding a more comprehensive and effective model (Zhou et al., 2023). The presence of alternatives, like reusable shopping bags, significantly affects customer readiness to diminish plastic bag usage (Ginting et al., 2020), and findings by Putri & Adi (2022) suggest that utility and convenience positively influence consumer behaviour. Finally, Policy Promotion analyses the influence of governmental rules and corporate actions on consumer intentions. Zhou et al. (2023) emphasize the role of policy measures in facilitating behavioural change, whereas Amri and Susilawati (2023) underscore the significance of well-socialized policies in enhancing ethical awareness. Effectively crafted policies have demonstrated a substantial impact on customer behaviour (Steg & Vlek, 2009).

H_5: Convenience has a positive and significant influence on reduction of intention

H_6: Policy Promotion has a positive and significant influence on reduction of intention

H_7: Reduction of Intention has a positive and significant influence on reduction behavior

Single-use Plastic Bags (SUPBs)

Single-use plastic bags (SUPBs) are composed of high-density polyethylene (PE) and possess minimal post-consumer value (Cristi et al., 2019; Muposhi et al., 2021). PE bags, frequently utilized as shopping bags or disposable cutlery, are engineered for single use and are favoured for their cost-effectiveness and ease (Chen et al., 2020). Their extensive utilization has resulted in significant waste, with the majority of single-use plastic bags (SUPBs) either discarded in landfills or incinerated, leading to pollution and the exhaustion of natural resources, while only a little fraction is recycled (Chen et al., 2020). In response to these environmental challenges, governments globally have enacted measures including levies, prohibitions, and awareness initiatives, which have been effective in diminishing SUPB usage (Life Cycle Initiative, 2023; Taghipour et al., 2023). Utilizing alternatives such as reusable polypropylene non-woven bags (PNB), cotton woven bags, and paper bags can enhance efforts to reduce the consumption of single-use plastic bags (SUPB) (Ahamed et al., 2020).

Fast-Moving Consumer Goods (FMCG): Retail

The fast-moving consumer goods (FMCG) sector is a dynamic industry that rapidly distributes a variety of products at relatively low prices, with consumers frequently acquiring them in substantial quantities (Kumari et al., 2023). FMCG products generally possess a brief shelf life owing to elevated demand or perishability, encompassing processed foods, beverages, fresh produce, frozen foods, cleaning agents, cosmetics, toiletries, and over-the-counter pharmaceuticals (Kenton, 2024). Kenton (2024) emphasizes that the FMCG sector is perpetually expanding, marked by fierce market rivalry, substantial sales volumes, and considerable marketing expenditures. FMCG companies employ several sales channels, including as traditional retail, e-commerce, direct sales, and wholesale distribution, to effectively engage consumers (Appinio Research, 2024). Retail is essential in FMCG sales, offering direct customer access via physical establishments like supermarkets, convenience stores, and hypermarkets. This industry emphasizes efficiency in inventory turnover, supply chain management, and product availability to promptly satisfy consumer demand (Appinio Research, 2024; Yuliawati et al., 2023; Shakur et al., 2024). Due of the elevated purchase frequency and minimal consumer engagement in decision-making, retailers utilize marketing and promotional tactics to cultivate brand loyalty. Technological innovations in inventory management and logistics enable merchants to adjust to market trends and changing consumer preferences. The Indonesian Retail Entrepreneurs Association (APRINDO), founded in 1994, is a pivotal group representing retailers and facilitating communication between businesses and the government in Indonesia. APRINDO, with 150 members, including prominent merchants such as Alfamart, Indomaret, Hypermart, and Retail S, offers support and solutions for the retail sector (Aprindo, 2024).

METHOD

This study employs the extended Theory of Planned Behaviour model proposed by Zhou et al. (2023), which integrates convenience and policy promotion with attitude, subjective norms, and perceived behavioural control to analyse their impact on consumer intentions and behaviours aimed at diminishing the use of single-use plastic bags. This study utilizes a confirmatory research design with quantitative methods to validate the extended Theory of Planned Behaviour (TPB) model, investigating the impact of Attitude, Subjective Norms, Perceived Behavioural Control, Convenience, and Policy Promotion on consumer intentions and behaviours regarding the reduction of single-use plastic bag usage. Throughout this study, “intention to reduce” refers to a consumer’s intention to reduce the use of single-use plastic bags. “Plastic-bag reduction behavior” refers to self-reported actions aimed at reducing such use. These terms should not be interpreted as a reduction in intention or a reduction in behavior itself. Data were collected from September 2024 to January 2025, utilizing primary data gathered through an online survey questionnaire disseminated via Google Forms on social media

platforms like WhatsApp, Line, and Instagram. The research examines Retail S consumers in Bandung, particularly individuals who have utilized alternate shopping bags such as reusable bags or cardboard boxes. A non-probability purposive sampling strategy is utilized to guarantee that respondents fulfil essential characteristics, including being regular Retail S customers and possessing past expertise with plastic alternatives. An online survey was chosen to reach regular Retail S customers in Bandung efficiently, and eligibility was verified by screening responses against the inclusion criteria, with ineligible responses excluded (see Results). Purposive sampling was considered appropriate because the target population, regular Retail S customers with experience of plastic-bag alternatives, has no publicly available sampling frame. However, recruitment through social media and non-probability sampling may introduce selection bias and limit generalisability, as discussed in the limitations. Sample adequacy was assessed against two criteria. The 10-times rule, based on the largest number of structural paths directed at a single construct (five, for reduction intention), gives a minimum of 50 respondents, and a power analysis for a medium effect size ($f^2 = 0.15$, $\alpha = 0.05$, power = 0.80, five predictors) indicates a minimum of 92 respondents (Hair et al., 2021). The final sample of 213 exceeds both thresholds. PLS-SEM was selected because the study tests an extended theoretical model with multiple constructs, has a prediction-oriented objective, and does not require normally distributed data (Hair et al., 2018; Hair et al., 2021).

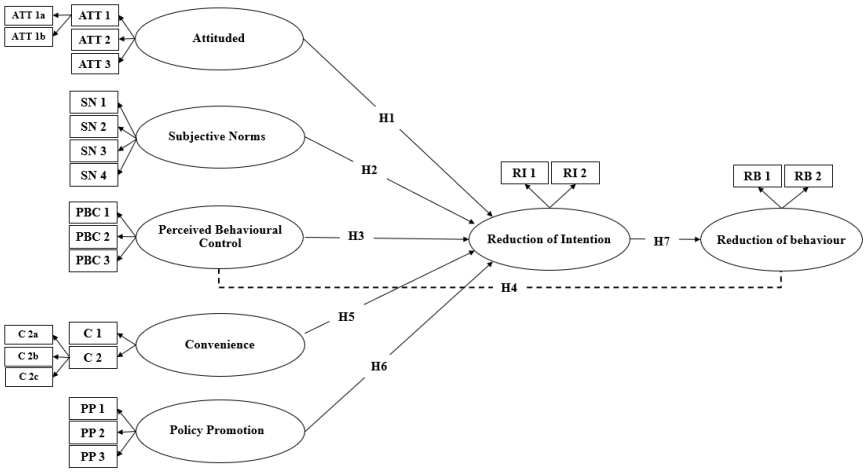


Figure 2. Conceptual Framework

RESULT

Descriptive Analysis

The data for this study was gathered by an online survey questionnaire disseminated in December 2024 via Google Forms, shared on WhatsApp, Line, and Instagram. A total of 264 responses were initially gathered; however, 51 respondents were subsequently excluded after screening due to non-compliance with the research criteria, including never having shopped at Retail S outlets in Bandung City, never utilizing alternatives to plastic shopping bags, exhibiting inadequate shopping frequency (less than once a month), or not being members of Retail S in Bandung City. An outlier test was manually performed using Excel to detect respondents who may have given uniform answers without due diligence, as the research employed Likert scale measurement, which allows for the chance of respondents not thoroughly reading the questionnaire. Of the 264 collected responses, 213 valid responses were retained after screening. The largest proportions of respondents reported shopping at Retail S Dago (36.15%) and Retail S Antapani (34.27%). Respondents aged 18–30 years represented 46.01% of the sample. Employees constituted 48.36% of respondents, followed by students at 35.68%.

Outer Model Test Result

The outer model evaluates the extent to which observed indicators effectively represent latent constructs, variables that are not directly measurable. This study identifies the hidden components as Attitude, Subjective

Norms, Perceived Behavioural Control, Convenience, Policy Promotion, Intention to Reduce, and Reduction Behaviour. The outer model is evaluated for validity and reliability by convergent and discriminant validity tests, along with reliability assessments via composite reliability and Cronbach's alpha. In evaluating convergent validity, indicator variables are considered acceptable and valid when the loading factor exceeds 0.7 and the average variance extracted (AVE) surpasses 0.5 (Sihombing et al., 2024). The results presented in the table above demonstrate that all indicator variables in this study have a loading factor greater than 0.7 and an AVE exceeding 0.5. Therefore, it can be concluded that all indicator variables in this analysis are valid concerning convergent validity. Below is the table to evaluate the validity of the model.

Table 1. Convergent Validity Test Result

Variable	Indicator	Factor Loading	AVE	CR	Cronbach's Alpha
ATT	ATT 1a	0.885	0.805	0.943	0.943
	ATT 1b	0.929			
	ATT 2	0.901			
	ATT 3	0.872			
SN	SN 1	0.854	0.697	0.901	0.902
	SN 2	0.792			
	SN 3	0.88			
	SN 4	0.811			
PBC	PBC 1	0.792	0.702	0.875	0.875
	PBC 2	0.851			
	PBC 3	0.869			
C	C 1	0.748	0.672	0.892	0.889
	C 2a	0.823			
	C 2b	0.848			
	C 2c	0.855			
PP	PP 1	0.868	0.735	0.892	0.891
	PP 2	0.885			
	PP 3	0.817			
RI	RI 1	0.722	0.577	0.731	0.772
	RI 2	0.795			
RB	RB 1	0.802	0.673	0.803	0.804
	RB 2	0.838			

Reliability

The reliability assessment of the outer model test aims to determine if the research variables demonstrate internal consistency of indicators in evaluating latent constructs and possess requisite dependability, which is crucial for data processing in research. This entails calculating Cronbach's Alpha and composite reliability (CR), both of which must exceed 0.70 for the research variables to be considered reliable (Sihombing et al., 2024). The PLS-SEM bootstrapping capability is utilized through SmartPLS 4 software during the data processing for this test. The calculation results are presented in Table 1, located in the convergent validity section. The reliability findings of this study, as indicated in the table, demonstrate that both Cronbach's alpha and the composite reliability values for all research variables surpass 0.7, indicating overall reliability. Consequently, it is apparent that each research variable employed in this study is deemed credible. The composite reliability of Reduction of Intention (0.731) is the lowest in the model, which is expected for a construct with only two indicators, because composite reliability is bounded by the number of indicators and tends to be lower when only two indicators are available (Hair et al., 2018). Nevertheless, its value exceeds the

recommended threshold of 0.70 (Hair et al., 2021), its AVE of 0.577 surpasses 0.50, and both indicators load above 0.70, indicating that the construct is reliable and exhibits convergent validity.

R-Square (R^2)

R-squared is a statistical measure that reflects the proportion of variance in the dependent variable that can be explained by the independent variables in a model. The R-squared value signifies the effectiveness of the research model in predicting the dependent variable based on the independent variable's value. An elevated R-squared value signifies enhanced explanatory capability of the model about the dependent variable.

Table 2. R-Squared

Variable	R^2
Reduction of Intention	0.763
Reduction of Behavior	0.618

Hair et al. (2018) assert that an R-squared value ranging from 0.5 to 0.75 is deemed moderate, whilst a value over 0.75 is regarded as substantial. The reduction of intention exhibits a significant R-squared value, signifying that the model effectively elucidates this variable. The Reduction of Behavior exhibits a modest R-squared value, signifying that the model sufficiently elucidates this variable, although remains amenable to enhancement.

Path Coefficient Test (Hypothesis Test)

In Path Coefficient Test, the T-statistic value is employed to assess the strength of the link between variables. If the value exceeds the crucial limit (higher than 1.96 for a significance level of 5%), the hypothesis is accepted (Hair et al., 2021). P-values are utilized to assess statistical significance. A value below 0.05 indicates a significant association at the 5% significance level (Hair et al., 2021).

Table 3. Coefficient Test Result

Hypothesis	Relationship	T statistics (|O/STDEV|)	P-Value (Two-Tailed)	Result
H1	Attitude → Reduction of Intention	2.805	0.003	Accepted
H2	Subjective Norms → Reduction of Intention	1.49	0.068	Rejected
H3	Perceived Behavioral Control → Reduction of Intention	0.308	0.379	Rejected
H4	Perceived Behavioral Control → Reduction of Behaviour	0.838	0.201	Rejected
H5	Convenience → Reduction of Intention	1.054	0.146	Rejected
H6	Policy Promotion → Reduction of Intention	1.923	0.027	Rejected
H7	Reduction of Intention → Reduction of Behaviour	2.474	0.007	Accepted

The analytical results in the table indicate two acceptable hypotheses and five rejected hypotheses. The validated hypotheses are **H1**, indicating that attitude significantly positively influences the reduction of intention; and **H7**, which asserts that the reduction of intention significantly positively impacts the reduction of behaviour. The rejected hypotheses are **H2**, which posits that subjective norms do not significantly influence the reduction of intentions; **H3**, which asserts that perceived behavioural control does not significantly affect the reduction of intentions; **H4**, which claims that perceived behavioural control does not significantly impact the reduction of behaviour; and **H5**, which contends that convenience does not significantly influence the reduction of intentions. **H6** was also rejected, as policy promotion was not significantly associated with reduction intention (t = 1.923, below the critical value of 1.96 at the two-tailed 5% level).

Indirect Effects

A bootstrapping procedure was used to assess whether reduction intention mediates the relationships between the proposed antecedents and plastic-bag reduction behaviour. The indirect effects were evaluated using a two-tailed significance threshold of 5%. The findings indicate that attitude has a positive and significant indirect effect on plastic-bag reduction behaviour through reduction intention ((\beta) = 0.260, t = 2.176, p = 0.030). This result suggests that consumers with more favourable attitudes towards reducing single-use plastic-bag use tend to report stronger reduction intentions, which are subsequently associated with greater plastic-bag reduction behaviour. In contrast, the indirect effects of subjective norms ((\beta) = 0.130, t = 1.818, p = 0.069), perceived behavioural control ((\beta) = 0.027, t = 0.178, p = 0.859), convenience ((\beta) = 0.072, t = 0.915, p = 0.360), and policy promotion ((\beta) = 0.169, t = 1.243, p = 0.214) on plastic-bag reduction behaviour through reduction intention were not statistically significant. Therefore, the results support an indirect pathway from attitude to reduction behaviour through reduction intention, but do not support indirect pathways for subjective norms, perceived behavioural control, convenience, or policy promotion.

Table 4. Indirect Effect

	Original sample (O)	**Sample mean (M)**	**Standard deviation (STDEV)**	**T statistics (|O/STDEV|)**	**P values (Two-Tailed)**	**Result**
ATT -> RI -> RB	0.26	0.245	0.119	2.176	0.03	Supported
SN -> RI -> RB	0.13	0.109	0.072	1.818	0.069	Rejected
PBC -> RI -> RB	0.027	0.04	0.151	0.178	0.859	Rejected
C -> RI -> RB	0.072	0.067	0.078	0.915	0.36	Rejected
PP -> RI -> RB	0.169	0.171	0.136	1.243	0.214	Rejected

The findings demonstrate that reduction intention is positively associated with plastic-bag reduction behaviour. This result suggests that consumers who express a stronger intention to reduce their use of single-use plastic bags are more likely to report behaviour consistent with that intention, such as bringing reusable bags, refusing plastic bags, or choosing available alternatives. The indirect-effect analysis further shows that attitude has a significant positive indirect association with plastic-bag reduction behaviour through reduction intention. Specifically, favourable attitudes towards reducing single-use plastic-bag use are associated with stronger reduction intentions, which are subsequently associated with greater self-reported reduction behaviour. This finding highlights the importance of consumers' personal evaluations of plastic-bag reduction in shaping behavioural intention and, indirectly, reported behaviour.

However, subjective norms, perceived behavioural control, convenience, and policy promotion do not demonstrate statistically significant indirect effects on reduction behaviour through reduction intention. Although subjective norms may be positively associated with reduction intention, the evidence does not support the conclusion that subjective norms indirectly influence reduction behaviour through intention at the two-tailed 5% significance level. Likewise, perceived behavioural control, convenience, and policy promotion do not show evidence of indirect relationships with reduction behaviour through reduction intention. These results suggest that interventions should prioritise the development of favourable consumer attitudes towards reducing single-use plastic-bag use and should help consumers convert their intentions into action. Retail S may support this objective through environmental communication, checkout reminders, visible reusable-bag displays, and accessible alternatives to single-use plastic bags. The results should be interpreted cautiously because the study is based on cross-sectional and self-reported data. The observed relationships indicate statistical associations and do not establish causal effects. In addition, the purposive sample was limited to regular Retail S customers in Bandung who had experience using alternatives to plastic bags; therefore, the findings may not generalise to other consumer groups, retail settings, or geographical locations.

DISCUSSION

This study examined factors associated with consumers' intention to reduce single-use plastic-bag use and their self-reported plastic-bag reduction behaviour among regular Retail S customers in Bandung, Indonesia. Using an extended Theory of Planned Behaviour (TPB) framework, the study assessed the effects of attitude, subjective norms, perceived behavioural control, convenience, and policy promotion on the intention to reduce single-use plastic-bag use. The study also examined the relationship between reduction intention and self-reported plastic-bag reduction behaviour, including the indirect effects of the proposed antecedents on behaviour through reduction intention. The findings showed that attitude positively influenced consumers' intention to reduce single-use plastic-bag use. This result indicates that respondents who regarded plastic-bag reduction as beneficial, environmentally responsible, or personally meaningful were more likely to report stronger intentions to reduce their reliance on single-use plastic bags. This finding is consistent with the TPB, which proposes that favourable evaluations of a behaviour are associated with stronger behavioural intentions. In the context of plastic-bag reduction, consumers may be more willing to bring reusable bags or refuse plastic bags when they recognise the environmental consequences of plastic waste and view plastic-bag reduction as a meaningful contribution to environmental sustainability.

The positive relationship between attitude and reduction intention suggests that retailers and policymakers should strengthen consumers' environmental awareness and favourable evaluations of plastic-bag reduction. Retail S may communicate the environmental benefits of reusable bags through in-store messages, promotional materials, social-media campaigns, and visual reminders at checkout counters. Such initiatives may help consumers link their individual shopping decisions to broader environmental outcomes. However, awareness initiatives should be communicated consistently because established habits and routine purchasing practices may influence consumer behaviour. Subjective norms were not significantly associated with consumers' intention to reduce single-use plastic-bag use. This finding suggests that perceived expectations or encouragement from family members, friends, communities, or society did not substantially influence respondents' intentions in this study. Consumers may decide whether to use plastic bags primarily on the basis of personal beliefs, preferences, and shopping habits rather than perceived social pressure. However, this interpretation is speculative because personal beliefs, preferences, and shopping habits were not measured in this study; it should be tested in future research that includes measures of habit strength, environmental concern, and personal norms. One possible explanation is that reducing plastic-bag use may not yet be perceived as a highly visible social norm among the sampled consumers. Although environmental awareness may have increased, respondents may not perceive strong approval or disapproval from people around them regarding their decision to accept or refuse plastic bags. In addition, decisions about shopping bags are often made quickly during retail transactions, which may limit the influence of external social expectations. Retailers may therefore consider making reusable-bag use more visible and socially normalised by communicating widespread consumer participation in plastic-reduction initiatives.

Perceived behavioural control was not significantly associated with the intention to reduce plastic-bag use. This result indicates that respondents' perceived ability to reduce their use of plastic bags did not significantly explain their reduction intentions. Although consumers may believe that they can bring reusable bags or select alternatives such as cardboard boxes, this perceived ability alone may not be sufficient to create a stronger intention to change their behaviour. The finding may reflect practical barriers encountered during shopping. Consumers may forget to bring reusable bags, make unplanned purchases, travel without sufficient storage space, or prefer the convenience of retailer-provided plastic bags. These conditions may reduce the influence of perceived behavioural control on reduction intention. Interventions should therefore not rely solely on consumers' confidence in their ability to reduce plastic-bag use. Retailers may provide accessible alternatives, reminders, and convenient reusable-bag options to help consumers translate their environmental awareness into routine shopping practices. Perceived behavioural control was also not significantly associated with self-reported plastic-bag reduction behaviour. This result suggests that believing one has the ability to reduce plastic-bag use does not necessarily lead directly to consistent behavioural change. Consumers may experience a gap between perceived capability and actual behaviour, particularly when established shopping routines, time constraints, or convenience considerations encourage the continued use of plastic bags.

The absence of a significant direct relationship may indicate that reduction intention is more important than perceived behavioural control in explaining plastic-bag reduction behaviour in this sample. Consumers may need to form a clear intention before consistently engaging in actions such as bringing reusable bags, declining plastic bags, or using alternative packaging. Retailers may therefore focus on interventions that strengthen consumers' intentions while also improving their ability to act on those intentions. Convenience was not significantly associated with the intention to reduce single-use plastic-bag use. This finding suggests that the perceived convenience of alternatives to plastic bags did not significantly influence respondents' intentions. Although reusable bags, cardboard boxes, and other alternatives may be available, convenience alone may not be sufficient to motivate consumers to change established shopping behaviours. Consumers may continue to use plastic bags because they are familiar, immediately available, and require no advance preparation. Bringing reusable bags requires planning, remembering to carry them, and sometimes managing additional items while travelling. Therefore, even when alternatives are available, consumers may not regard them as sufficiently convenient to influence their reduction intentions.

This finding indicates that practical alternatives should be integrated into the shopping experience in ways that reduce effort and minimise disruption to consumers' routines. Retail S may improve convenience by ensuring that reusable bags are easily available at store entrances and checkout areas, offering affordable reusable-bag options, providing bag-return or bag-reuse programmes, and using checkout reminders. Retailers may also consider incentives for consumers who bring their own bags. Such approaches may help reduce habitual reliance on plastic bags and make sustainable shopping practices easier to maintain. Policy promotion was not significantly associated with the intention to reduce single-use plastic-bag use; therefore, H6 was rejected. This result indicates that policy-related initiatives, campaigns, or promotional efforts did not significantly influence respondents' intentions to reduce plastic-bag use. Although policies and promotional activities may increase awareness of plastic pollution, awareness alone may not necessarily result in a personal commitment to reduce plastic-bag use. Consumers may be aware of plastic-reduction policies but may not perceive them as personally relevant or sufficiently influential in everyday shopping decisions. Policy messages may also have limited effects when they are not supported by clear implementation, regular communication, financial incentives, or convenient alternatives. The rejection of H6 suggests that policy promotion should be combined with practical and behavioural interventions. This finding differs from Zhou et al. (2023), who identified policy promotion as a key factor influencing consumers' willingness to reduce plastic-bag use in Nanjing, China. Several contextual explanations are possible, although none was tested in this study. First, all respondents were customers of a single retailer that actively promotes its plastic-reduction programme, so exposure to policy promotion may have varied little across respondents, restricting the variance available to detect an association. Second, customers who already use plastic-bag alternatives may be highly aware of the retailer's policies, which would reduce the marginal contribution of additional policy promotion. Third, the effectiveness of policy promotion may depend on the broader regulatory environment, including the visibility of enforcement, which may differ between Bandung and Nanjing. Retailers and policymakers may need to supplement awareness campaigns with visible reminders, reusable-bag incentives, pricing mechanisms, and easily accessible alternatives. Policy communication should also explain clearly the purpose and environmental benefits of reducing plastic-bag use. Repeated and targeted communication may be needed to translate policy awareness into sustained consumer intention.

Reduction intention was positively associated with self-reported plastic-bag reduction behaviour. This result supports H7 and indicates that consumers with stronger intentions to reduce plastic-bag use were more likely to report behaviours such as bringing reusable bags, declining plastic bags, or using alternative packaging. This finding is consistent with the central TPB proposition that behavioural intention is an important predictor of behaviour. The specific indirect-effect analysis further showed that attitude had a positive indirect effect on plastic-bag reduction behaviour through reduction intention ((\beta) = 0.260, t = 2.176). Using a two-tailed 5% significance criterion, this indirect effect was statistically significant ($p \approx 0.030$). This result indicates that consumers with more favourable attitudes towards reducing single-use plastic-bag use were more likely to form stronger reduction intentions, which were in turn associated with greater self-reported plastic-bag reduction behaviour.

The indirect effects of subjective norms, perceived behavioural control, convenience, and policy promotion on plastic-bag reduction behaviour through reduction intention were not statistically significant at the two-tailed 5% level. Subjective norms showed an indirect effect of (\beta) = 0.130 (t = 1.818, $p \approx 0.069$), while the indirect effects of perceived behavioural control ((\beta) = 0.027, t = 0.178, $p \approx 0.859$), convenience ((\beta) = 0.072, t = 0.915, $p \approx 0.360$), and policy promotion ((\beta) = 0.169, t = 1.243, $p \approx 0.214$) were also not significant. Therefore, the findings support an indirect pathway from attitude to plastic-bag reduction behaviour through reduction intention, but they do not support indirect pathways for subjective norms, perceived behavioural control, convenience, or policy promotion.

The positive relationship between reduction intention and self-reported behaviour, together with the significant indirect effect of attitude, highlights the importance of strengthening consumers' commitment to reduce plastic-bag use. Retailers can support this process by creating conditions in which consumers can easily act on their intentions. For example, reminders before payment, visible reusable-bag displays, loyalty incentives, and readily available alternatives to plastic bags may help consumers convert intention into consistent behaviour. Overall, the findings indicate that attitude and reduction intention were more important than subjective norms, perceived behavioural control, convenience, and policy promotion in explaining plastic-bag reduction behaviour among the sampled Retail S customers. Consumers' favourable evaluations of plastic-bag reduction were associated with stronger intentions, and those intentions were associated with greater self-reported efforts to reduce plastic-bag use. The significant indirect effect of attitude further indicates that attitude was associated with behaviour through reduction intention. These findings suggest that interventions should prioritise the development of positive environmental attitudes while helping consumers act on their intentions through practical and accessible alternatives.

Several limitations should be considered when interpreting these findings. First, the cross-sectional design means that the observed relationships should not be interpreted as causal effects. Reverse causality is possible; for example, consumers who already reduce their plastic-bag use may develop more favourable attitudes afterwards to justify their behaviour. Omitted variables, such as habit strength, environmental concern, or perceived effectiveness of individual action, may also confound the observed relationships. Longitudinal or experimental designs would be needed to establish temporal precedence and test causal pathways. Second, the data were based on self-reported responses and may be affected by recall bias or social-desirability bias. Respondents may have overreported their intentions and behaviour to appear environmentally responsible, which could inflate the observed associations between attitude, intention, and behaviour; because all constructs were measured with the same self-report instrument, common method bias may also be a concern. Future research could validate self-reported behaviour using observational methods, such as recording actual reusable-bag use at checkout, or indirect measures, such as loyalty-card or sales data on bag purchases. Third, the study focused on regular Retail S customers in Bandung who had prior experience using alternatives to plastic bags. Consequently, the findings may not be generalisable to all consumers in Bandung, other retail settings, or the broader Indonesian population. This sample characteristic may also have shaped the results: consumers with prior experience of alternatives may differ from the general population in their attitudes and intentions, and because all respondents shopped at the same retailer, variation in exposure to its policy promotion and convenience measures may have been limited, which may have reduced the ability to detect associations for these constructs. Future research should include consumers with no prior experience of alternatives, as well as consumers from other retailers and cities, to test whether the extended TPB model operates differently across contexts. Future studies may use longitudinal, experimental, or observational designs to examine whether changes in attitudes, policy initiatives, or retail interventions produce sustained reductions in plastic-bag use over time. Researchers may also include more diverse consumer groups, compare multiple retail settings, and examine additional factors such as environmental concern, habit, price sensitivity, availability of reusable bags, and perceived effectiveness of environmental actions. Future research should also test direct paths from the antecedent variables to plastic-bag reduction behaviour to determine whether the observed indirect effect of attitude represents indirect-only, partial, or full mediation. If direct paths from attitude or other antecedents to behaviour are significant, intention would not be the only mechanism linking them to behaviour, and automatic or habitual processes may also play a role; this would imply that changing attitudes or norms could influence behaviour even where intentions are weak, with implications for intervention design.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study examined the factors influencing consumers' intention to reduce single-use plastic-bag use and their self-reported plastic-bag reduction behavior among regular Retail S customers in Bandung. Using an extended Theory of Planned Behavior framework, the study assessed the effects of attitude, subjective norms, perceived behavioral control, convenience, and policy promotion on the intention to reduce single-use plastic-bag use. It also examined the relationship between reduction intention and plastic-bag reduction behavior, including the indirect effects of the proposed antecedents on behavior through intention. The findings indicate that attitude significantly and positively influenced consumers' intention to reduce single-use plastic-bag use. Consumers who viewed plastic-bag reduction as beneficial, responsible, and environmentally meaningful were more likely to express stronger intentions to reduce their use of single-use plastic bags. This result highlights the importance of individual environmental evaluations in encouraging sustainable shopping practices.

The indirect-effect analysis further showed that attitude had a significant positive indirect effect on plastic-bag reduction behaviour through reduction intention ((\beta = 0.260), (t = 2.176), (p \approx 0.030), two-tailed). This finding indicates that favourable attitudes towards reducing plastic-bag use were associated with stronger reduction intentions, which were subsequently associated with greater self-reported plastic-bag reduction behaviour. Thus, reduction intention appears to be an important pathway through which positive attitudes may be translated into sustainable shopping practices. In contrast, subjective norms, perceived behavioral control, convenience, and policy promotion did not significantly influence consumers' intention to reduce single-use plastic-bag use. Policy promotion, in particular, did not significantly affect reduction intention; therefore, H6 was rejected. The indirect effects of subjective norms, perceived behavioral control, convenience, and policy promotion on plastic-bag reduction behaviour through intention were also not statistically significant using a two-tailed 5% significance criterion. These findings suggest that social expectations, perceived ability, convenience, and policy-related communication alone were insufficient to explain consumers' intentions or behavioural changes in this sample. The results further demonstrate that intention to reduce single-use plastic-bag use significantly and positively influenced plastic-bag reduction behaviour. Consumers with stronger intentions were more likely to report behaviours such as bringing reusable bags, refusing plastic bags, or choosing alternative packaging. Overall, the study concludes that efforts to reduce single-use plastic-bag consumption should prioritise the development of positive consumer attitudes and strengthen consumers' intention to adopt environmentally responsible shopping practices. Although policy promotion remains relevant, it should be supported by practical measures that make sustainable alternatives accessible, convenient, and meaningful within consumers' daily shopping routines.

Recommendations

Recommendations for Retail S

Retail S should strengthen consumers' positive attitudes towards reducing single-use plastic bags through clear, consistent, and environmentally focused communication. Information displayed at store entrances, shopping aisles, checkout counters, and digital platforms can remind customers of the environmental consequences of plastic waste and the benefits of using reusable bags. Because attitude was significantly associated with reduction intention and indirectly associated with plastic-bag reduction behaviour through intention, these messages should emphasise how individual shopping decisions can contribute to meaningful environmental outcomes. The retailer should also make reusable alternatives more visible and accessible. Reusable shopping bags should be available at affordable prices near store entrances and cashier counters. Retail S may also provide cardboard boxes, reusable-bag stations, or other alternatives for customers who do not bring their own bags. Such measures can help consumers act on their intentions at the point of purchase, where plastic-bag decisions are often made quickly and habitually. Retail S may introduce incentives that encourage sustainable shopping behaviour. Customers who bring reusable bags could receive loyalty points, discounts, vouchers, or other rewards. These incentives may help consumers develop repeated habits of carrying reusable bags and reduce their dependence on single-use plastic bags. Checkout reminders may also

help customers act on their intentions. Cashiers or self-service checkout systems can ask customers whether they have brought reusable bags before plastic bags are provided.

Recommendations for Policymakers

Policymakers should not rely solely on policy promotion or awareness campaigns to reduce plastic-bag use. Since policy promotion did not significantly influence behavioural intention or demonstrate a significant indirect effect on plastic-bag reduction behaviour through intention, policy initiatives should be accompanied by stronger implementation strategies, incentives, and practical alternatives. Plastic-reduction policies should be communicated in simple, consistent, and consumer-focused language. Rather than only emphasising regulations, public campaigns should demonstrate how individual actions, such as bringing reusable bags, contribute to reducing plastic waste and protecting the environment. Policymakers may also collaborate with retailers to implement incentive-based programs, reusable-bag distribution campaigns, and educational activities. Partnerships among local government, retail businesses, schools, universities, and community organisations may help increase public participation in plastic-waste reduction. Where appropriate, policymakers may consider economic measures, such as charging for single-use plastic bags or providing incentives for reusable-bag use. However, these measures should be implemented alongside affordable and accessible alternatives to avoid placing an unnecessary burden on consumers.

Recommendations for Future Research

Future research should include consumers from different retail settings, cities, and demographic groups to improve the generalisability of the findings. Comparing consumers from supermarkets, traditional markets, convenience stores, and online-shopping platforms may provide a broader understanding of plastic-bag reduction behaviour. Future studies should also examine additional variables that may influence plastic-bag reduction behaviour, including environmental concern, habit, price sensitivity, environmental knowledge, perceived effectiveness of individual action, availability of reusable bags, and retailer incentives. Longitudinal, experimental, and observational research designs are recommended to examine whether policy interventions, financial incentives, reusable-bag programs, or retailer reminders lead to sustained reductions in single-use plastic-bag use. Further research should examine the mediating role of behavioural intention using longitudinal or experimental designs and should test direct effects of attitude and other antecedents on plastic-bag reduction behaviour. Such analyses would help determine whether reduction intention fully or partially mediates the relationship between attitude and sustainable shopping behaviour.

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