

Original Research

Plastic-Free Future: Investigating Consumer Intentions and Behavior Toward Plastic Waste in China

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Abstract

Plastic pollution can decrease the ability of ecosystems to adapt to climate change, directly affecting the livelihoods and social well-being of millions of individuals worldwide. Reducing plastic consumption is a priority in global action plans to reduce environmental pollution and combat climate change. Motivating consumers to adopt green and environmentally friendly lifestyles, which is required to decrease environmental pollution in a green economy, is challenging because it requires behavioral shifts. Therefore, this study aimed to investigate different factors, including environmental concerns, affecting Chinese millennials' plastic packaging consumption behavior to improve their environmental quality. Data collected through an online survey questionnaire from 876 Chinese consumers were analyzed using the partial least squares structural equation model. The results showed that environmental concerns ($\beta = 0.304$, $p < 0.01$), environmental attitude ($\beta = 0.466$, $p < 0.01$), and consumer awareness ($\beta = 0.221$, $p < 0.01$) had a significant direct impact on the plastic packaging purchasing intentions of the individuals. Similarly, intentions ($\beta = 0.407$, $p < 0.01$) had a strong positive effect on the plastic packaging purchasing behavior of individuals. This shows that individuals with high environmental concerns, a strong attitude toward environmental sustainability, and a high awareness of the environmental impact of single-use plastics were less likely to use products with plastic packaging to reduce plastic pollution and improve environmental quality. Therefore, policymakers should create environmental awareness about the repercussions of individual actions among the masses to control environmental pollution and reduce climate implications worldwide.

Keywords: environmental pollution, environmental degradation, plastic waste, green behavior, single use plastic

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Introduction

The world is facing a significant challenge in mitigating climate change and reducing environmental pollution for human well-being. Decreasing plastic consumption is a priority within the global action plan to reduce environmental pollution and achieve green economy objectives. Plastic usage has been increasing worldwide, leading to the production of municipal solid waste [1]. The plastic market growth increased by almost one-fourth owing to its versatile characteristics and inexpensive manufacturing. Only 10% of all manufactured plastics have been recycled, creating concerns among policymakers regarding plastic environmental pollution. Current plastic production and waste management practices suggest that approximately 12,000 million metric tons of plastic waste will be accumulated in landfills or nature by 2050 [2]. In addition, plastic production was estimated to produce 1.78 Gt of carbon emissions in the same year. These emission values will rise to 6.5 gigatons of carbon emissions equivalent in 2050 [3]. Consumer plastics are made to last long and are strong, which is advantageous in that they offer long-lasting products that are also safe to use. But this plastic material creates environmental pollution as it is difficult to dispose of and recycle. More than one-third of the annually produced plastic material is categorized as post-consumer, a lot of it single-use packaging, some of which is designed for usage times of no more than minutes after purchase [2]. Thus, plastic production and waste are hazardous to the natural environment owing to the plasticization effects and greenhouse gas emissions. Hence, appropriate management of hitherto unappreciated plastic packaging waste remains a challenge for an environmentally friendly future [4].

Public concern has recently shifted towards plastic waste, and more so from single-use plastic packaging [5]. None of the plastics currently in use in society is 100% biodegradable and thus persists in natural ecosystems and even landfills [6]. In addition, there is an enhanced understanding of the link between the extraction of fossil fuels and the use of petroleum to produce plastics in the recent past [7]. Approximately four-fifths of the total plastic packaging material ends up in landfills and/or in the environment [2]. Therefore, the consequences of plastic waste accumulation in the natural environment have become a topical issue for consumers [8]. Owing to the size of the plastic contribution to the waste stream, many countries have acted to reduce packaging waste and increase recycling to improve environmental quality. Transitioning towards a green and circular economy depends on policy interventions, applications of investments and technologies, and shifts in individual and societal behaviors [9]. Moran et al. [10] suggest that carbon emissions can be decreased by altering consumer behavior to improve environmental quality and reduce pollution. Motivating consumers to adopt green and environment-friendly lifestyles, required to decrease

environmental pollution in a green economy, is even more challenging because it requires many fundamental shifts [11].

Therefore, since human behavior related to lifestyles and consumption is among the causes of environmental pollution, it is essential to understand public perceptions, attitudes, and behavioral patterns concerning plastics [12]. To reduce plastic use, promote a green economy, and improve environmental quality [13], strategic interventions are needed. Personal behavior includes awareness, perception, attitude, concern about this environmental issue, and the influence of social factors. Previous studies have aimed to identify the factors that promote and predict general green behavior to decrease environmental impact from the consumption of household goods and services [14, 15]. Among these drivers, attitudes towards the environment and perceptions of one's behavior appear to be the most important factors [16]. Most research on the nature of the attitude-behavior link has relied on theories of reasoned action and planned behavior. All these theories were devised to help explain and forecast an individual's behavior within a particular setting. The literature suggested that individual behavior is the learned outcome of rational decisions made through internal and external factors. Therefore, there is a need to identify the fundamental factors affecting plastic packaging reduction to assist policymakers in improving the environmental quality [12, 17]. Moreover, it is also important to reduce carbon emissions and environmental problems of plastic through individuals' recognition of altering habits towards sustainable use and creation for improved environmental and economic returns. Therefore, this study aims to determine consumers' motivations and drivers for reducing the use of plastic packaging waste in daily life to reduce environmental pollution.

Theoretical Background

Environmental pollution is a multifaceted problem involving three key stakeholders: the public, firms, and the government. First, the idea of environmental protection is derived from the fact that the public has become a landmark of environmental concern (ENC) [18]. An increase in ENC can increase individuals' drive for pro-environmental behavior, including littering, conservation of energy, and purchase of environmentally friendly products [19, 20]. Furthermore, ENC is characterized by the potential for higher economic, social, and environmental returns through the demonstration effect and collective action. Due to this, an increasing number of people show a great deal of ENC, and it is inevitable to have a higher level of environmentalism in the vicinity to achieve environmental sustainability. In addition, ENC is defined as an individual's attitude toward environmental issues [21]. This line of investigation presumed ENCs to be part of an individual's intentions toward sustainable

products [22, 23]. Anggraini et al. [24] stated that ENC affects green purchase intentions of consumers.

Environmental attitude (ENA) refers to the importance of the consequences of a particular product on the environment. Consumers are concerned about the environmental implications of their consumed products, which is the given product's potential to exhaust natural resources. On the contrary, individual attitudes are the importance level of the price that consumers are willing to pay when purchasing or buying a particular product. For instance, consumers who purchase disposable diapers indicate to producers and manufacturers that what they value most is their willingness to protect the environment rather than the ease of using a given product [25]. Law et al. [26] also found a positive connection between ENA and intentions. Thus, we posed the following hypotheses regarding the relation between ENC, ENA, and plastic packaging purchasing intentions (PPPI).

H1 = ENC is expected to positively relate to consumers' PPPI.

H2 = ENC significantly affects consumers' ENA.

H3 = ENA positively affects PPPI.

Rousseau and Venter [27] describe consumer awareness (CAW) as the level or degree of consciousness that individual consumers have of their rights and responsibilities in the marketplace. Such rights also include the right to a clean environment. The recognition of these rights, which do not require real conditions, can, in turn, help consumers accept responsibility and thus make rational choices and change their consumption patterns. For example, switching to environmentally friendly products in place of conventional goods for environmental protection [28]. CAW can stimulate behavior change to reduce environmental pollution [29]. It is also important in the management of plastic packaging and the prevention of environmental problems [30]. Heidbreder et al. [13] argue that to establish efficient plastic strategies, policymakers must achieve a deep level of plastic CAW and awareness of the associated negative externalities.

Achieving sustainable behavioral change requires a comprehensive understanding of how different behaviors among consumers are linked to varying levels of CAW. A lack of knowledge about CAW may result in political or entrepreneurial actions that fail to change consumer behavior or, conversely, lead to unintended negative consequences [31].

H4 = CAW positively affects their PPPI.

Some past research has centered on how the context enhances or hinders the consumer activities involved in avoiding plastic packaging to improve environmental quality [32]. Heidbreder et al. [33] identified perceived difficulty of finding suitable alternatives to traditional plastic products as having the strongest correlation with the willingness to decrease plastic waste. The unavailability of alternative choices to plastic was the main reason consumers did not reduce their consumption of plastics [32]. Thus, this

study hypothesizes the relationship between perceived availability of alternatives (PPA) and PPPI as follows:

H5 = PAA significantly affects consumers' PPPI.

The purchase decisions are influenced greatly by intentions, since they are the leading cause of consumers' buying processes. Consumer intentions significantly affect product-buying decisions [34]. Perceived green intention has often been found to affect actual behavior towards green consumption [35]. Green behavior is a planned action for environmental conservation to meet disruptive social and individual needs. Moreover, this study also proposes that the availability of green plastic alternatives may moderate the relationship between green consumption, plastic reduction intentions, and behavior. Consumers' intentions can actually be turned into behavior based on whether they can call their intentions [36]. As with the act of consuming green products, we expect a similar situation for green consumption by replacing conventional plastic products to decrease environmental pollution. In this case, green products may be a situational feature in which their existence will provoke the recognition of behavioral intention when encountered. Green products evoke consumers' earlier intentions regarding green consumption episodes that could have occurred. In other words, the observation of green products leads to the actualization of consumers' intended behavior [36]. Research has demonstrated a correlation between actual purchase intentions and plastic packaging purchasing behavior (PPPB) of consumers [37].

Based on the above arguments and evidence, we hypothesize the following:

H6 = PPPI significantly affects PPPB.

H7 = PAA moderates the relationship between PPPI and PPPB.

Materials and Methods

Data Collection and Analysis

China is the leading producer of plastic materials and meets approximately 29.4% of the global plastic demand [38]. Therefore, this study chose China as the study area for the present research owing to its considerable contribution to the generation of plastics, pollution, and environmental degradation. The target population of this study was Chinese millennials. Connell et al. [39] stated that the new-generation people, who were born in or after 1982, show more social responsibility towards environmental sustainability. Therefore, only participants born in or after 1982 were included in this study.

Data collection lasted for 5 months, and self-completed, structured web-based questionnaires were used in this environmental study. To have a greater extent of coverage for the target demographic population, the survey was shared through different social media platforms (WeChat, Sina Weibo, TikTok,

Email, etc.). It was an anonymous, self-administered questionnaire survey to minimize social desirability effects. A team of subject specialists consisting of 2 associate professors and 1 professor validated the survey questionnaire. A preliminary study was conducted with 20 farmers before the final survey. After pre-testing, the survey questionnaire was changed to make it harmonious with the ground realities. Invalid and incomplete survey responses were deleted, and 876 complete responses were used for further analysis. More than three-fifths (63%) of the respondents in this survey resided in urban areas of China, while 37% were from rural areas, ensuring adequate geographical representation. Additionally, 55% of the respondents were male and 45% were female, reflecting a balanced gender distribution. This demonstrates that the sample for this study encompassed sufficient geographical, gender, and residential diversity to be representative of the Chinese population.

Survey links were shared through different social applications. When the link was clicked, those who wanted to participate in the study signed an informed consent form and voluntarily completed the questionnaire, which was divided into 2 parts. The first part sought to identify the socio-demographic characteristics of the Chinese millennials. The second section estimated consumer behavior related to plastic packaging reduction, including six sub-sections (ENC, ENA, CAW, PAA, PPPI, and PPPB), measured using various indicators. Overall, 27 items were used to measure the 6 constructs: 4 items for the constructs ENC and PPPI; 5 items for the constructs ENA, CAW, and PPPB; and 3 items for the construct PAA. All indicators of constructs were measured on five-point Likert scale questions were prepared by reviewing relevant literature and discussions with research area specialists. This study was designed to focus on the drivers of Chinese consumers (millennials) to reduce plastic packaging. Each statement was modified to be appropriate for this research and to meet the construct congruity of the instrument [40]. The collected data were analyzed using the partial least squares structural equation model.

Results

Constructs and Description of Indicators

Table 1 presents information on the number of items used to measure the constructs (latent variables) to test the study hypothesis. The first latent variable is ENCO, which consists of 4 different items depicting respondents' perceptions of their concern with the environment regarding plastic packaging. Modes 4 and 5 indicated that the respondents were very concerned with the environment, as most of them showed a high level of agreement. The average of ECON1, which is equal to 3.69, signifies that respondents were highly concerned about the negative impact of plastic

Table 1. Description of the indicator measuring a particular construct.

Constructs and their items	Mode	Mean	Std. Dev.
Environmental Concerns (ENCO)		4.27	1.06
ENCO1	4	3.69	1.03
ENCO2	4	3.81	1.05
ENCO3	5	4.89	1.04
ENCO4	5	4.68	1.08
Environmental Attitude (ENA)		3.53	1.16
ENA1	4	3.55	1.07
ENA2	4	3.52	1.10
ENA3	4	3.48	1.33
ENA4	4	3.62	1.15
ENA5	4	3.51	1.19
ENA6	4	3.45	1.13
Consumer Awareness (CAW)		3.62	1.13
CAW1	5	4.72	0.97
CAW2	4	3.47	1.13
CAW3	3	2.97	1.18
CAW4	4	3.48	1.10
CAW5	4	3.44	1.24
Plastic Packaging Purchasing Intentions (PPPI)		3.80	1.18
PPPI1	4	3.79	1.25
PPPI2	4	3.62	1.05
PPPI3	4	3.92	1.20
PPPI4	4	3.85	1.22
Plastic Packaging Purchasing Behavior (PPPB)		3.83	1.20
PPPB1	4	3.71	1.22
PPPB2	4	3.45	1.32
PPPB3	5	4.83	0.94
PPPB4	4	3.68	1.29
PPPB5	4	3.46	1.22
Perceived Availability of Alternatives (PAA)		3.34	1.10
PAA1	4	3.49	1.08
PAA2	4	3.66	1.19
PAA3	3	2.86	1.02

packaging on the environment. Similarly, the average of 3.81, ECON2, indicates that the respondents also believed that plastic packaging majorly caused pollution. The highest average of ECON3 (4.89) highlights that

respondents were familiar with the impact of the low use of plastic packaging on natural resources. Moreover, the respondents also indicated a high level of agreement with their personal responsibility to lower the use of plastic in order to protect their environment. Generally, an overall mean ECON of 4.27 indicates that the respondents are highly concerned about the impact of plastic packaging on their environment.

Concerning the ENA construct, the mode for all items equaling 4 shows that respondents highly agreed with the items asked regarding their eco-friendly attitude toward plastic packaging. The highest average of ENA4 (3.622) indicates that the values and lifestyles of the respondents greatly reflect sustainable packaging. ENA1, with an average of 3.556, shows that respondents highly supported the idea of using sustainable packaging materials. The respondents also indicated that they believe that the adoption of sustainable packaging by future generations is very important (ENA2). They also showed a willingness to pay high prices and accept low convenience for sustainable packaging (ENA3). Moreover, they encourage others to adopt packaging practices that contribute to sustainability (ENA5), and they feel that their choice majorly influences their environment (ENA6). The overall mean score of 3.53 of ENA with a standard deviation of 1.16 indicates that the respondents showed a considerable attitude toward the environment regarding plastic packaging, with slightly varied responses. This implies that there is still potential for improvements in the attitude of respondents toward the usage of plastic packaging and its impact on the environment.

The overall average of CAW equal to 3.62 with a standard deviation of 1.16 signifies that generally respondents have a considerable level of awareness of the impact of plastic packaging on the environment, with substantial variation in their responses. This implies that some of the respondents were still not aware of the implications of plastic packaging on the environment, and there is room for increasing awareness in the community about the side effects of plastic packaging. Considering the individual items measuring CAW, CAW1 with the highest mode 5 and average (4.72), indicates that the respondents are highly familiar with the harmful effects of plastic packaging on the ecosystem. CAW2, with an average of 3.47 and a mode of 4, highlights that they have a good level of familiarity with alternatives to plastic packaging, and a standard deviation of 1.138 showed a high variation in their responses, which implies that some of them are not familiar with the alternatives to plastic packaging. The mode of CAW3 was equal to 3, with an average of 2.97, indicating that the respondents had a moderate level of understanding of how their choice of packaging affects environmental sustainability. Similarly, the mode and average of CAW4 are equal to 4 and 3.487, respectively, demonstrating that most of the respondents regularly seek information on eco-friendly packaging. Moreover, the mode of CAW5 equal to 4 also

indicates that most respondents felt informed about the consequences of using plastic packaging (CAW5).

Overall, the respondents highly intended to reduce the use of plastic packaging in the future, as PPPI has a mode of 4 and an average of 3.80, but a standard deviation of 1.18 indicates a slightly high variation in their responses. The respondents showed a high level of agreement to lower the use of plastic packaging (PPPI1), switch to eco-friendly packaging alternatives whenever possible (PPPI2), commit to buying products with minimal or no plastic packaging (PPPI3), and encourage others to minimize their use of plastic packaging (PPPI4).

The highest average of PPPB3 (4.831) indicates that the respondents preferred reusable and recyclable packaging over single-use plastics, which shows their good purchasing behavior considering plastic packaging. PPPB1 with an average of 3.71 and a mode of 4 indicates that they also showed a high level of agreement over their behavior toward reducing their use of plastic packaging. They also indicated that, in their daily routine, they choose products that come with environmentally friendly packaging (PPPB4). The respondents also actively sought brands that used sustainable packaging (PPPB5). Considering their behavior of avoiding purchasing products with excessive plastic packaging, based on an average of 3.452 with a standard deviation of 1.321, this indicates that although they avoid such products, their responses have slightly high variation. Generally, they had a considerably high level of good PPPB toward lowering the harm to the environment due to plastic packaging, with an overall average of 3.83.

The respondents did not perceive the availability of alternatives (PAA = 3.34), and a standard deviation of 1.10 also indicates variation in their responses. This implies that few respondents may not have a good level of PAA compared to others. Respondents found it difficult to easily locate products with environmentally friendly packaging (PAA3), with an average score of 2.86. However, they showed moderate to high levels of agreement with statements, such as that finding eco-friendly packaging alternatives for most products they purchase is slightly easy (PAA1). Similarly, they believe that convenient alternatives are available in the market for plastic packaging (PAA2).

Measurement Model Assessment

Before proceeding to the structural model estimation, it is important to analyze the validity of the measurement model. The measurement model has 2 types of validity: convergent validity (CV) and discriminant validity (DV). The first element of CV is ensuring that the items or indicators that measure a particular construct are reliable. The reliability of the items or indicators was indicated by measuring the factor loadings (FL) for each item. The scores of FL for each item in a particular construct greater than 0.70 indicate that the items

are highly linked with that specific construct. However, items with FL lower than 0.70 must be removed [41] to maintain the CV. A similar approach has been used by Su et al. [42]. Table 2 indicates that each item having an FL greater than 0.70 is strongly interlinked with a particular construct, which ensures the reliability of the items.

To ensure CV of the measurement mode, a particular construct must be reliable and consistent. To confirm the reliability and consistency of the construct, three different parameters were used to assess the CV of the model. A value of Cronbach's alpha close to 1 highlights the consistency of each construct, and a value close to 0 indicates that the construct is not internally consistent [43]. The composite reliability (CR) score for each construct also provides robust evidence for internal reliability, and a value greater than 0.60 signifies that the construct is internally consistent [44]. The third parameter is the average variance extracted (AVE), which requires a value greater than 0.50 for each construct to confirm the CV of the measurement model [45]. Therefore, the outcome of all the CV parameters ensured that the measurement model was adequate for further analysis.

Uniqueness of Each Construct

Table 3 presents the Fornell-Larcker criterion (FLC) and heterotrait-monotrait ratio (HTMT) that describe the discriminant validity (DV) of the measurement model. This highlights how a construct is unique from the other constructs, which implies that all constructs are truly different from each other. FLC compares the correlation scores of constructs with the square root of the AVE of the constructs. The below findings indicate that all the correlation scores of a construct with other constructs were lower than the square root value of AVE, which confirms that a particular construct was unique and distinct from the other constructs. Similarly, the HTMT scores being lower than 0.90 also ensured the DV of each construct.

Structural Model

Goodness of Fit

The goodness of fit of the structural model was assessed, and the results are presented in Table 4. The estimated values of each parameter followed their threshold levels, which ensured the goodness of fit of the model and led to further estimation of the path analysis.

Direct Effects without Mediation

Table 5 presents the direct effects of the variables without considering mediation. R² indicates that all the paths have a good relationship, as the R² score for each path is greater than 0.50 [46], indicating that the variables have a substantial relationship and demonstrate a high

Table 2. Convergent validity.

Constructs and their items	Factor loading	Cronbach's Alpha	CR	AVE
Environmental Concerns (ENCO)				
ENCO1	0.856	0.804	0.882	0.651
ENCO2	0.839			
ENCO3	0.820			
ENCO4	0.811			
Environmental Attitude (ENA)				
ENA1	0.845	0.836	0.898	0.595
ENA2	0.839			
ENA3	0.822			
ENA4	0.814			
ENA5	0.809			
ENA6	0.800			
Consumer Awareness (CAW)				
CAW1	0.921	0.849	0.893	0.626
CAW2	0.878			
CAW3	0.856			
CAW4	0.833			
CAW5	0.829			
Plastic Packaging Purchasing Intentions (PPPI)				
PPPI1	0.845	0.804	0.851	0.589
PPPI2	0.828			
PPPI3	0.816			
PPPI4	0.804			
Plastic Packaging Purchasing Behavior (PPPB)				
PPPB1	0.857	0.834	0.887	0.611
PPPB2	0.849			
PPPB3	0.825			
PPPB4	0.813			
PPPB5	0.805			
Perceived Availability of Alternatives (PAA)				
PAA1	0.844	0.803	0.821	0.604
PAA2	0.829			
PAA3	0.816			

Composite reliability (CR), Average variance extracted (AVE).

level of predictive capacity of the structural model. The predictive relevance of each path is assessed by Q², which highlights that a Q² greater than 0 indicates the predictive relevance of a path in the structural model for a particular dependent variable. How strongly a specific dependent variable is affected by the structural

Table 3. Discriminant validity of each construct.

Fornell-Larcker criterion						
Constructs	ENCO	ENA	CAW	PPPI	PPPB	PAA
ENCO	0.807	-	-	-	-	-
ENA	0.345	0.771	-	-	-	-
CAW	0.135	0.373	0.791	-	-	-
PPPI	0.373	0.264	0.498	0.768	-	-
PPPB	0.236	0.274	0.537	0.574	0.781	-
PAA	0.185	0.462	0.356	0.363	0.375	0.777
Heterotrait-Monotrait ratio						
Constructs	ENCO	ENA	CAW	PPPI	PPPB	PAA
ENCO	-	-	-	-	-	-
ENA	0.244	-	-	-	-	-
CAW	0.454	0.294	-	-	-	-
PPPI	0.383	0.105	0.175	-	-	-
PPPB	0.285	0.226	0.265	0.563	-	-
PAA	0.205	0.332	0.383	0.205	0.464	-

Environmental concerns (ENCO), Environmental attitude (ENA), Consumer awareness (CAW), Plastic packaging purchasing intentions (PPPI), Plastic packaging purchasing behavior (PPPB), Perceived availability of alternatives (PAA).

Table 4. Goodness of fit results.

Fitness tests	χ^2/df	GFI	CFI	AGFI	NFI	RMSEA
Estimated values	2.36	0.941	0.917	0.928	0.944	0.053
Threshold level	<3.0	>0.90				<0.08

Goodness of fit index (GFI), Adjusted goodness of fit index (AGFI), Comparative fit index (CFI), Normed Fit Index (NFI), Root means square error of approximation (RMSEA).

Table 5. Direct effect.

Paths	Beta-value	Std. Err.	t-value	f2	Q2	R2	Decision
ENCO -> PPPI	0.304	0.045	6.711	0.448	0.454	0.685	Accepted
ENA -> PPPI	0.466	0.056	8.262	0.685	0.375	0.676	Accepted
CAW -> PPPI	0.221	0.077	2.889	0.522	0.275	0.575	Accepted
PPPI -> PPPB	0.407	0.109	3.734	1.154	0.337	0.746	Accepted

Note: $p < 0.01$ when the t-value is greater than 2.32.

Environmental concerns (ENCO), Environmental attitude (ENA), Consumer awareness (CAW), Plastic packaging purchasing intentions (PPPI), Plastic packaging purchasing behavior (PPPB), Perceived availability of alternatives (PAA)

mode is indicated by the scores of f^2 , which shows that f^2 greater than 0.35 (for all hypotheses) signifies a very large effect size.

The impact of the variables on the dependent variables was measured using the non-parametric bootstrapping method of Wetzels et al. [47]. ENCO ($\beta = 0.304$, $p < 0.01$), ENA ($\beta = 0.466$, $p < 0.01$), and CAW ($\beta = 0.221$, $p < 0.01$) had a significant direct impact

on the PPPI of the individuals. This indicates that individuals with high environmental concerns, a strong attitude toward environmental sustainability, and a high awareness of the environmental impact of plastic packaging are more likely to have high PPPI. Similarly, PPPI ($\beta = 0.407$, $p < 0.01$) had a strong positive effect on PPPB. Therefore, PPPI is important for developing environmentally oriented PPPB in individuals.

Mediating Effect

The indirect effect of ENCO on PPPI through ENA is presented in Table 6, which shows the mediation effect of ENA between ENCO and PPPI. The direct impacts of ENA on PPPI and ENCO on PPPI were statistically significant, implying that the inclusion of ENA as a mediator is meaningful.

The indirect effect of ENCO on PPPI through ENA as a mediator necessitates an assessment of the significance of this indirect path. For this purpose, we extracted the bootstrapping sample data and imported it into MS Excel to measure the standard deviation and obtain the t-value for the indirect paths. The outcomes indicate that the t-value is equal to 3.758, which signifies that ENA indeed mediates the relationship between ENCO and PPPI. The variance accounted for (VAF) method proposed by Hair et al. [48] provides information on the significance of the strength of mediation. Therefore, the value of VAF ($= (0.169/0.343) \times 100$) in Table 7 indicates that the effect of ENA accounts for 49.284% of the effect of ENCO on PPPI. As the VAF value surpasses 20 and is lower than 80%, ENA partially mediates the relationship between ENCO and PPI.

Moderation Effect

Table 8 provides information on the moderating effect of PAA on the relationship between PPPI and PPPB. The PAA ($\beta = 0.352$, $p < 0.01$) significantly affects the PPPB, and PPPI ($\beta = 0.453$, $p < 0.01$) also strongly affects PPPB. Moreover, their interaction term (PAA \times PPPI) also significantly affected PPPB. This significant and positive impact on PPPB indicates that respondents' PPPI with high PAA can act as a strong moderator for the effect of PPPI on PPPB.

Discussion

Plastics are widely used packaging materials around the world, and growing concern about the environmental impact of the use of this material as packaging is necessary. To reduce the use of plastic packaging, the final consumers of products with plastic packaging can play an important role in the development of their pro-environmental behavior. For this, they must lower their consumption of plastic packaging. Therefore, the current study aimed to analyze the direct and indirect impacts of ENCO, ENA, and CAW on PPPI,

Table 6. Mediation effect.

Paths	Beta-value	Std. Err.	t-value	Decision
ENA -> PPPI	0.395	0.047	8.475	Accepted
ENCO -> PPPI	0.174	0.035	4.915	Accepted
ENCO -> ENA	0.428	0.089	4.792	Accepted

Note: $p < 0.01$ when the t-value is greater than 2.32.

Environmental concerns (ENCO), Environmental attitude (ENA), Plastic packaging purchasing intentions (PPPI).

Table 7. Indirect effect and VAF.

Path	Coefficient	Indirect effect	sta. Dev.	Total effect	VAF (%)	t-value
ENA -> PPPI	0.395	0.169	0.045	0.343	49.284	3.758
ENCO -> PPPI	0.174					
ENCO -> ENA	0.428					

Note: $p < 0.01$ when the t-value is greater than 2.32.

Environmental concerns (ENCO), Environmental attitude (ENA), Plastic packaging purchasing intentions (PPPI).

Table 8. Moderation effect of PAA on the relationship between PPPI and PPPB.

Variables	Beta-value	Std. Err.	t-value	R	R2	F-value
PAA	0.352	0.045	7.779	0.71	0.49	41.045
PPPI	0.453	0.072	6.274			
PAA \times PPPI	0.546	0.094	5.779			

Note: $p < 0.01$ when the t-value is greater than 2.32.

Plastic packaging purchasing intentions (PPPI), Plastic packaging purchasing behavior (PPPB), Perceived availability of alternatives (PAA).

which further has a strong impact on PPPB. Moreover, the moderating impact of PAA on the relationship between PPPI and PPPB was analyzed.

The study findings revealed that ENCO significantly affected PPPI. The positive coefficient indicates that respondents who are highly concerned about the environment are more likely to have strong PPPI toward plastic packaging. Highly concerned people make more conscious and sustainable choices and are more likely to feel environmentally responsible [49, 50]. Perceiving the positive impact of reducing the consumption of plastic packaging on the environment, individuals with high ENCO may have enhanced PPPI. Therefore, personal values and product attributes strongly lead to purchase intentions for environmentally friendly plastic packaging. When consumers recognize the importance of sustainability in their purchasing decisions, ENCO is considered the basic element of green purchase intentions [51, 52]. Additionally, consumers who are more concerned about the environment are more likely to scrutinize the packaging choices linked with the products they purchase [53]. Therefore, high ENCO has a stronger impact on the purchasing intentions of individuals [54], and Macht et al. [55] also highlight that ENCO strongly determines the purchasing intentions of consumers for eco-friendly food packaging alternatives. Shimul and Cheah [56] also confirmed the significant impact of ENCO on the intention to adopt eco-friendly packaging.

The positive and significant impact of ENA on PPPI highlights that the strong positive environmental attitude of a person contributes significantly to the intention of purchasing plastic packaging. Attitude indicates the degree to which a person has a favorable or unfavorable appraisal of a specific behavior. When an individual is aware of the negative consequences of a phenomenon, he/she tries to avoid that specific activity. Because an individual's attitude is more environmentally oriented, his or her intentions will be more environmentally friendly. Wan et al. [57] described that the attitude strongly affects the intentions to perform a specific behavior. Similarly, Prakash and Pathak [58] endorsed the strong positive impact of pro-environmental attitudes on purchasing intentions for eco-friendly packaged products. Popovic et al. [59] also determined that attitude is a strong driver of their purchasing intentions for eco-friendly packaging. Santoso et al. [50] also highlighted the strong impact of ENA on purchasing intentions regarding eco-friendly plastic packaging alongside perceived behavior control, eco-responsibility, and eco-friendliness of companies. Similarly, Siddiqui et al. [60] analyzed consumer intentions to reduce plastic packaging for various groups of fast-moving consumer goods. They also found a significant impact of ENA on consumers' intentions regarding plastic packaging for fast-moving consumer goods.

The outcomes indicate that CAW has a significant positive impact on PPPI, which emphasizes how an aware person can make sustainable choices. High CAW

empowers consumers to make more informed and sustainable choices. Consumers are highly aware of the environmental implications that lead them to reconsider their purchasing habits, and they often seek eco-friendly packaging alternatives. Therefore, CAW is an important determinant of PPPI, as throwaway behavior prompts stakeholders worldwide to raise awareness among consumers to reduce plastic use through single-use packaging [61]. Moreover, the lack of awareness among consumers is also considered the main barrier to achieving a sustainable packaging economy [62, 63]. Therefore, high concern about the environment and high awareness, along with a strong positive environmental attitude regarding plastic packaging, significantly influence consumers' purchasing intentions for plastic packaging, which in turn affects their purchasing behavior. This encourages firms to use sustainable packaging materials, steering the market toward greener solutions.

The study outcomes reveal that ENA significantly mediates the relationship between ENCO and PPPI, which explains the strong development of PPPI through positive ENA. ENCO indicates an individual's awareness level and how much he or she is worried about environmental problems; it does not direct the intention to engage in environmentally friendly actions. At this point, ENA plays a crucial role as a bridge, transforming ENCO into a favorable outcome toward sustainable behavior. Therefore, individuals with high ENCO develop a positive ENA toward sustainable plastic packaging. Considering green purchase intentions, ENA mediates the impact of ENCO on green purchase intention, which implies that promoting ENA can enhance the effect of ENCO on a person's intentions to adopt sustainable actions [64, 65]. Our findings are in line with those of Ibrahim et al. [66], as they also highlight the partial mediation role of ENA in the relationship between ENCO and anti-littering intentions. Therefore, ENCO is not a direct determinant of specific behavior, and it has an impact on situation-specific beliefs and attitudes. Onurlubaş [67] highlighted the partial mediation role of attitude in the relationship between ENCO and intentions toward green products.

The significant moderating impact of PAA on the relationship between PPPI and PPPB indicates that an individual's PPPI is highly affected by their perception of alternative availability, such as environmentally friendly packaging options. Therefore, when consumers perceive that the alternatives to plastic packaging are easily available and affordable, they are more likely not to follow through with their original PPPI and will try to buy the products packed with sustainable packaging material. Therefore, PAA transforms the PPPI into an actual PPPB, as consumers prefer an environmentally friendly alternative to their initial intentions toward purchasing plastic packaging. Painuly and Pachaury [68] also demonstrate that the availability of alternatives makes consumers act based on their intentions. They highlight that the availability of organic food

enhances consumers' purchasing intentions and actual buying behavior. Therefore, the availability of a sustainable option improves intentions and behavioral relationships.

Conclusions

The use of plastic packaging is a major threat to environmental sustainability, and its low use is a way to achieve a green market and sustainable consumption behavior. This study aimed to analyze the dynamic relationship between ENCO, ENA, CAW, PPPI, and PPPB, which is expected to provide information for lowering the use of plastic packaging through the development of personal psychological aspects. Moreover, the study provides important insights into the mediating role of ENA in the relationship between ENCO and PPPI. Additionally, the moderating impact of PAA on the relationship between PPPI and PPPB was analyzed.

PLS-SEM revealed that ENCO, ENA, and CAW had a significant positive relationship with PPPI. This implies that people with high concerns about the environment, strong positive attitudes toward it, and high awareness of the environmental implications of plastic packaging substantially determine their sustainable intentions toward purchasing plastic packaging. The significant mediating impact of ENA on the relationship between ENCO and PPPI indicates that the effect of ENCO on PPPI is enhanced by ENA, which implies that ENA shapes ENCO toward favorable intentions for plastic packaging. The significant moderating role of PAA implies that the availability of an alternative enables a person to act on his or her intentions toward performing a certain behavior.

The study concludes that ENCO, ENA, and CAW are important psychological aspects of a person toward developing PPPI, leading to PPPB. Therefore, public education through awareness programs, TV shows, and social media (popular among young people) campaigns is needed to raise awareness and knowledge about the impact of plastic packaging on the environment. Moreover, school and university campaigns are needed to raise awareness of the importance of adopting sustainable and recyclable products and materials in order to develop sustainable behavior among the younger generation. Moreover, marketing professionals of companies using extensive plastic packaging may develop effective strategies to educate young consumers about the advantages of eco-friendly packaging to strengthen their green intentions, leading to sustainable behavior.

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Conflict of Interest

The authors declare no conflict of interest.

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