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RESEARCH ARTICLE

Navigating the green shift: An analytical study of consumer behaviour towards eco-friendly packaging in Coimbatore city

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Abstract

This study investigates the Indian market's consumer preferences and awareness regarding eco-friendly packaging materials. The primary objective of eco-friendly packaging is to minimize pollution even after its useful life has ended. On the other hand, sustainable packaging has a broad scope, considering the entire life cycle to ensure socioeconomic socioeconomic and environmental sustainability. Although eco-friendly packaging is becoming increasingly important, research has been conducted on Indian consumers' preferences and awareness, particularly regarding the barriers to adoption and the variables that influence it. This article focuses on consumers' constraints and factors influencing purchase decisions and interests across different product categories through convenience sampling of 200 respondents. Four major factors that influenced preferences were identified by factor analysis: consumer awareness and social influence, consumer well-being and accessibility, consumer purchase driver factors and corporate reputation and ethical factors. The major hindrance to adoption was found to be price, followed by issues with durability and limited usefulness. The results inferred that, particularly for food and beverage consumers are becoming more conscious and inclined towards eco-friendly packaging materials. Businesses, lawmakers and marketers can use these insightful findings to establish strategies that effectively encourage the adoption of eco-friendly packaging.

Keywords: environmental awareness; ethical considerations; green consumerism; recyclable materials; sustainability

Introduction

Environmental concerns over plastic's persistence are driving a shift to sustainable, recyclable and biodegradable packaging materials. Guidelines for using recycled PET (rPET) in food packaging have been introduced in line with global standards. Industries are developing eco-friendly, lightweight and recyclable solutions. Policies now emphasize circular economy practices like plastic waste recovery and Extended Producer Responsibility (EPR) to mitigate environmental harm (1).

Eco-friendly packaging is designed to minimize pollution throughout its lifecycle, from production and shipping to disposal. Materials such as polylactic acid (PLA), derived from starch and cellulose-based films are commonly used due to their compostable and biodegradable nature, offering viable alternatives to conventional plastics (2). The urgency of adopting sustainable packaging practices is increasingly recognized in various industries, especially in fast-moving consumer goods (FMCG). The sustainable packaging is not only an environmental necessity but also a competitive advantage, with start-ups driving innovation in this domain (3). Technological advancements also play a pivotal role. The innovations in sustainable food packaging that align functionality with environmental goals (4). The Polyvinyl alcohol (PVA) films that were enhanced with glass flakes, which offer moisture resistance and transparency qualities essential for maintaining product integrity while being eco-friendly (5). Plant-based packaging materials provide eco-friendly alternatives to conventional plastics while preserving food quality and safety. Cellulose forms paper, bioplastics and edible coatings with enhanced antimicrobial properties, while natural gums create stable films that can indicate freshness. Starch-based materials offer excellent barrier properties and can be enhanced with the addition of antioxidants and advanced processing techniques, such as electrospinning. Plant proteins deliver biodegradable packaging with superior gas barriers and mechanical strength, serving as both protective and edible solutions. These materials combine natural abundance, biodegradability and functionality to provide sustainable packaging solutions (6).

Consumer awareness and regulatory influence are critical drivers of sustainable packaging adoption. A growing emphasis on cleaner consumption practices and the impact of environmental regulations and the triple bottom line (economic, social and environmental considerations) on packaging decisions (7). Nowadays consumer awareness of eco -friendly materials is increasing but noted that high costs and limited availability still hinder widespread adoption (8).

In the context of e-commerce, it was revealed that consumers demand sustainable packaging options that are also cost-effective, urging companies to integrate environmentally responsible practices without compromising affordability (9). Though the consumers value sustainability, adoption is influenced by incentives, education and perceived benefits (10). The consumer education and the role of pricing in adoption behaviour is important. Consumers generally favour eco-friendly packaging but remain sensitive to price and accessibility, with information availability and affordability emerging as key factors influencing their choices (11, 1 2).

Given this background, the present study aims to explore consumer preferences and awareness regarding eco-friendly packaging materials. This paper provides a localized understanding of consumer preferences towards eco-friendly packaging in Coimbatore, an area not much covered in previous studies. Unlike International determinant studies, which concentrate on the broader context of influence and trends this research highlights region specific patterns from an emerging market. It also identifies the practical realities of usage that consumers face which are largely ignored in both theoretical and practical sustainable adoption among communities. The objectives of the research were to assess customer preferences towards eco-friendly packaging materials, analyse the factors influencing customer preferences towards eco-friendly packaging materials and identify the constraints faced by consumers regarding eco-friendly packaging materials.

Materials and Methods

Sampling design and size of sample

Quantitative research was conducted to determine the familiarity of consumers regarding eco-friendly packaging materials in the formation of sustainable behavior. For study 200 respondents selected through convenience sampling during the period December 2024. Primary data which was directly gathered from the respondents who frequently purchase Fast moving consumer goods (FMCG) and are used for the study.

Study area

Coimbatore being the third largest city in Tamil Nadu provided a wide range of consumers because of its active retail and diversified population. Primary data was collected through well-structured personal questionnaire. The survey was focused on their exposure to eco-friendly packaging materials, Purchasing behavior and demographic factors.

Analytical tools

Percentage analysis

To evaluate the level of consumer preferences and awareness towards eco-friendly packaging materials percentage analysis was employed (13).

Percentage analysis = (Number of respondents/Total sample size) * 100

Factor analysis

Factor analysis breaks down the large set of variables into smaller and more manageable factors or components which reflects shared variance among original variables (14). This helps to unveil the hidden correlation among variables. Factor analysis mathematically explains the relationship between a set of variable $[X_1, X_2, \ldots . X_k]$ by explaining them in terms of fewer components.

The factors identified in this analysis include Brand reputation, CSR initiatives, Ethical consumerism trends, Government initiatives and policies, environmental awareness, convenience and functionality, Transparency and labelling, Loyalty programs and Incentives, Cost and affordability, Packaging aesthetics and design, consumer awareness and campaigns, social influence, Health and safety concerns, Availability and accessibility. These variables are analyzed for the preferences towards eco-friendly packaging materials.

Garrett Ranking

Garrett ranking technique was used for prioritizing the factors that had been perceived by the respondent's preferences (15). It is used to rank the key constraints that were hindering the preferences and usage of eco-friendly packaging materials. It converts the order of problems into numerical scores. The advantage of this technique is that the problems are arranged based on their severity from the point of view of respondents.

Garrett's formula for converting ranks into percent is as follows:

$$\text{Percent position} = 100 * (R_{ij} - 0.5)/N_j$$

Where, R_{ij} = rank given for ith constraint by j_{th} individual;

N_j = number of constraints ranked by j_{th} individual.

The constraints that have been listed for analysis are price, limited availability, limited functionality, durability, habit & convenience.

Results and Discussion

Source of information on eco-friendly packaging

The study used percentage analysis to identify the source of information about eco-friendly Packaging. The survey revealed that social media was the primary source of information shown in Table 1 about eco-friendly packaging for 42.5 % of respondents. Educational institutions ranked second, with 30.5 % of respondents gaining information through this channel. News outlets (11 %), personal networks (10 %) and advertisements (5 %) were other significant sources of information. Notably, only 1 % of respondents reported being unaware of eco-friendly packaging. This suggests that while a sizable segment of the population is still ignorant, the majority of those surveyed are aware of eco-friendly packaging to some extent. It coincides with previous studies showing how social media may influence sustainable behaviour and environmental awareness, particularly among young consumers (16). Even better than direct advertising, social media channels actively influence consumers views and opinions of eco-friendly packaging in addition to increasing awareness of it (17).

Table 1. Source of information in eco-friendly packaging

Source	No of respondents	%
Social media	85	42.5
News	22	11
Institutions	61	30.5
Personal network	20	10
Advertisements	10	5
Not aware	2	1
Total	200	100

Category-wise preferences for eco-friendly packaging:

The survey indicated varying preferences for eco-friendly packaging across product categories in Fig. 1. Food and beverages emerged as the category with the highest preference (169 respondents), followed by groceries (97 respondents) and personal care products (73 respondents). Cleaning products (58 respondents), apparel (42 respondents) and lifestyle products (41 respondents) showed comparatively lower preferences for eco-friendly packaging. These finding also supported by the previous research, which shows that consumers are more sensitive to eco-friendly packaging in food related items as it has direct impact on freshness, safety and health (18, 19).

Preferred packaging materials for food and beverages

From the study we could infer that food and beverage consumers prefer eco-friendly packaging materials (Table 2). For food and beverage products specifically, metal packaging was selected by 25 % of respondents, closely followed by paper packaging (24 %). Edible packages were favoured by 21 % of respondents, while plant-based materials and glass were preferred by 18 % and 12 % of respondents, respectively. Consumers prefer metal, paper, glass for food packaging due to their recyclability, safety and product production. Paper is seen as environment friendly while metal and glass offer freshness and durability (20).

Factors influencing customer preferences

Factor analysis was performed to identify the underlying dimensions influencing customer preferences towards eco-friendly packaging materials. The respondents were asked to use a 5-point Likert scale to rate 14 key variables related to their preferences towards eco-friendly packaging materials. The variables included brand reputation, CSR initiatives, ethical consumerism trends, government initiatives and policies, environmental awareness, convenience and functionality,

Table 2. Preferred packaging materials for food and beverages

Materials	No of respondents	%
Metal	42	25
Paper	41	24
Edible packages	35	21
Plant based	31	18
Glass	20	12
Total	169	100

transparency and labelling, loyalty programs and incentives, cost and affordability, packaging aesthetics and design, Consumer awareness and campaigns, social influence, Health and safety concerns, availability and accessibility. Following the collection of these responses, factor analysis was used to identify the main drivers of consumer adoption.

The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test were used to ensure the sampling adequacy and the suitability of the data for factor analysis. According to Table 3, Kaiser-Meyer-Olkin (KMO) index of sampling adequacy is 0.779, indicating that the data is moderately suitable for factor analysis. Furthermore, the results of Bartlett's Test of Sphericity, which have an estimated Chi-Square value of 890.280 and a significance level of $p < 0.001$, prove to the suitability of the variable correlations for factor analysis.

The Principal Component Analysis (PCA) (Table 4) shows that the contribution of each component to the overall variance and describes the total variance explained by the PCA. Together, the eigenvalues of the first four components, which exceed one-account for 62.981 % of the variance. The first component, Corporate Reputation and Ethical factors accounts for 29.75 % of the variation, showing a considerable impact on the dataset. The second component, " Consumer Purchase Driver factors," provides 13.83 % of the variation, while the third component, " Consumer Awareness and Social Influence," contributes 10.30 % of the variation, improving the overall explanation of the variance and the fourth component, "Consumer Well-being and Accessibility," accounts for 9.08 %. Together, these four components explain a total variance of 62.981 %.

Table 3. KMO and Barlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.779
Bartlett's Test of Sphericity	Approx. Chi-Square	890.280
	Df	91
	Sig.	.000

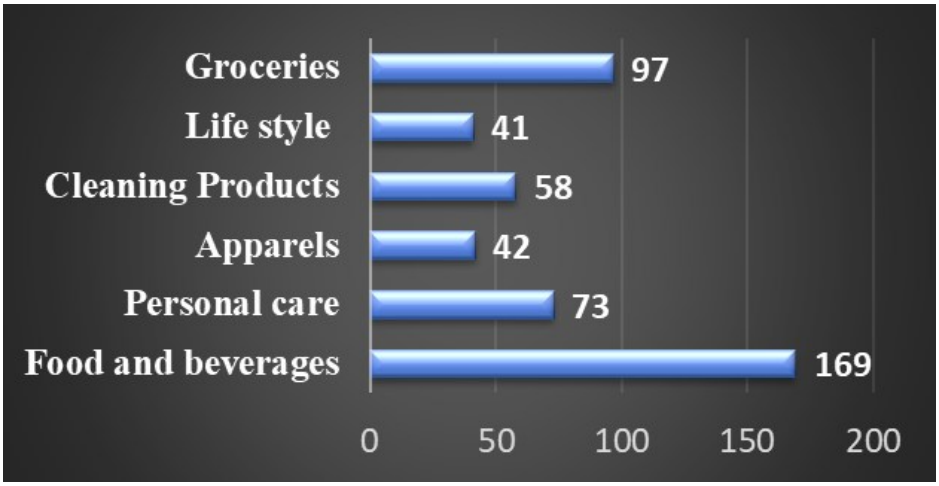

Fig. 1. Category wise preferences for eco-friendly packaging.

Table 4. Total Variance explained (PCA)

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	%of variance	Cumulative %
1	4.165	29.753	29.753	4.165	29.753	29.753
2	1.937	13.836	43.589	1.937	13.836	43.589
3	1.443	10.308	53.897	1.443	10.308	53.897
4	1.272	9.084	62.981	1.272	9.084	62.981
5	.835	5.962	68.943			
6	.750	5.357	74.300			
7	.611	4.365	78.665			
8	.584	4.174	82.839			
9	.529	3.782	86.621			
10	.474	3.383	90.003			
11	.452	3.229	93.232			
12	.436	3.112	96.344			
13	.320	2.283	98.627			
14	.192	1.373	100.000			

The primary factors that influence consumer preferences towards eco-friendly packaging materials, as well as the variance explained by each element and their factor loadings, are summarized in Table 5. "Corporate Reputation and Ethical factors "which include Brand reputation, CSR initiatives, ethical consumerism trends, Government policies explain the most variance at 29.75 %, indicating they have the strongest influence on consumer decisions regarding eco-friendly packaging materials. Consumer purchase drivers encompass convenience, transparency, incentives, design with a variance of 13.83 %. Consumer awareness and social influence encompassing awareness campaigns and social influence, account for 10.30 % of the variance. Consumer well-being and accessibility covering health and accessibility, account for 9.08 %. Each of these components contributes to consumer preferences in different ways. This research shows that product performance, particularly aspects like corporate reputation and ethical factors, significantly influences consumer buying behaviour for eco-friendly packaging materials.

A scree plot (Fig. 2) in factor analysis displays eigenvalues which helps to determine the optimal number of factors. The scree plots the eigenvalues for each principal component, with the greatest drop occurring after the first component. The "elbow" point at the fourth component indicates that the first four components have the greatest influence, accounting for the majority of the variation in the data. Components beyond the fourth have eigenvalues near to zero, indicating a weak contribution to the model and lowered significance.

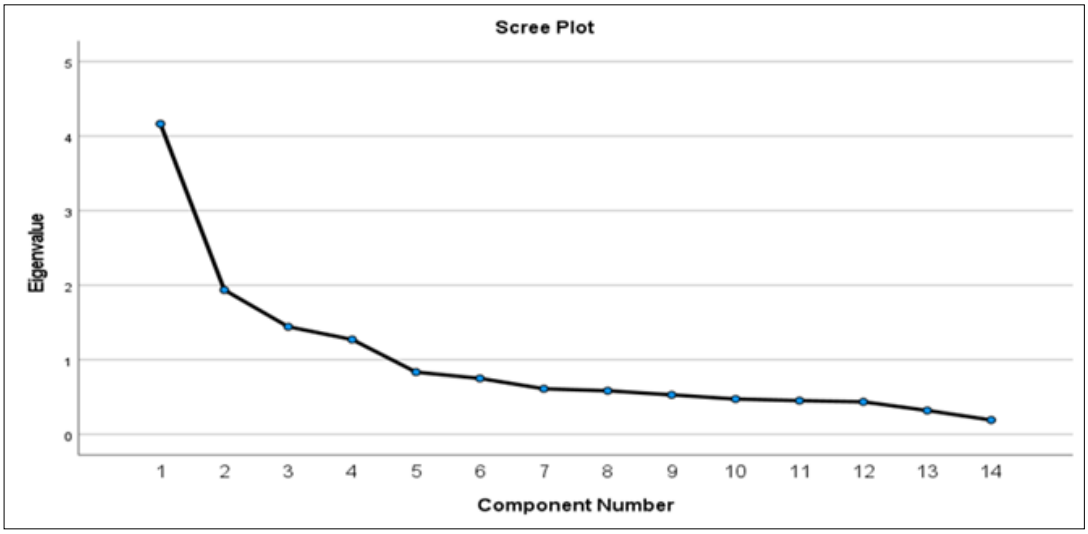

Fig. 2. Scree plot graph.

Table 5. Rotated Component matrix (PCA)

Components	% of variance	Factors	Factor loadings
Corporate Reputation and Ethical factors	29.75	Brand Reputation	.771
		Corporate Social Responsibility (CSR) Initiatives	.712
		Ethical Consumerism Trends	.707
		Government Regulations and Policies	.678
Consumer Purchase Driver factors	13.83	Convenience and Functionality	.745
		Transparency and Labelling	.728
		Loyalty Programs and Incentives	.649
		Cost and Affordability	.599
		Packaging Aesthetics and Design	.563
Consumer Awareness and Social Influence	10.30	Consumer Education and Awareness Campaigns	.930
		Social Influence	.917
Consumer Well-being and Accessibility	9.08	Health and Safety Concerns	.852
		Availability and Accessibility	.790

Constraints faced by the consumers adopting eco-friendly packaging materials

Garrett ranking is a method for ranking factors based on consumers priorities, often assessed using a Likert scale. In this study, customers ranked various constraints in adopting eco-friendly packaging materials. The scores were analysed using Garrett ranking to determine the most significant constraints, highlighting the key obstacles customers face when considering eco-friendly packaging. The constraints are ranked based on Garrett scores (Table 6), with higher scores indicating more significant barriers. "Higher price is the top constraint, scoring 54.71 and ranked first, followed by "Limited functionality" (53.77). "Lack of durability" (53.44) and "Limited availability"(51.99) rank third and fourth, respectively, while Habit and convenience (45.88) rank lower.

Table 6. Garrett Ranking Table

SNO	Constraints	Garrett mean score	Rank
1	Price	54.71859	I
2	Limited functionality	53.77889	II
3	Durability	53.44221	III
4	Limited availability	51.99497	IV
5	Habit & Convenience	45.88945	V

Conclusion

This study shows that for Coimbatore consumers, Social media is the primary source of information to know about eco-friendly packaging, with a strong preference for its use in food and beverage products. Compostable materials, paper and metal are the most recognized sustainable options for usage. Four key factors which influence consumer choices are ethical reputation, purchase drivers, social influence and health/accessibility concerns. However, price remains the biggest constraint, followed by issues of functionality, durability and availability. To boost adoption, businesses must offer affordable and practical eco-friendly solutions. The study offers valuable insights for promoting eco-friendly packaging in the Indian context.

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Authors' contributions

KS carried out the data collection, conducted the consumer study and drafted the manuscript. KU coordinated the research process and provided critical revisions. ND assisted with the data analysis and interpretation. SS contributed to the literature review and factor analysis. RR provided guidance on methodology and assisted in statistical analysis. All authors read and approved the final manuscript for the study. All authors read and approved the final paper.

Compliance with ethical standards

Conflict of interest: The authors declare no Conflicts of interest.

Ethical issues: None

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