

IMPACT OF GREEN MARKETING ON CONSUMER AWARENESS, TRUST, AND PREFERENCE FOR ECO-FRIENDLY PRODUCTS IN CHENNAI DISTRICT

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Abstract

Purpose: This study examines how green marketing influences consumer awareness, consumer trust and preference for eco-friendly products among residents of Chennai district, Tamil Nadu, and tests whether awareness and trust transmit the effect of green marketing on preference. It also examines the role of greenwashing scepticism and demographic differences. **Design/methodology:** A cross-sectional survey design with a Cochran-based sample of 384 respondents stratified across four geographic zones of Chennai was adopted. A 20-item, five-point Likert instrument measured five constructs. Analysis used reliability and validity testing (Cronbach's α , composite reliability, AVE, Fornell–Larcker, HTMT), exploratory factor analysis, multiple and hierarchical regression, bootstrapped parallel-serial mediation, moderation analysis, covariance-based structural equation modelling, Welch t -tests, ANOVA, chi-square tests, binary logistic regression and k -means segmentation. **Findings (illustrative, based on simulated data):** Measurement quality was satisfactory ($\alpha = .773-.846$). Green marketing perception significantly raised awareness ($\beta = .49$), trust and preference. Trust was the strongest proximal predictor of preference (SEM $\beta = .46$), and the three predictors explained 33.1% of the variance in preference. Awareness and trust jointly mediated 57% of the total effect of green marketing on preference, with the serial path (green marketing $\rightarrow$ awareness $\rightarrow$ trust $\rightarrow$ preference) being significant. Greenwashing scepticism reduced trust directly but did not moderate the marketing–trust link. Eco-label recognition varied significantly by education, while awareness, trust and preference scores did not differ by gender, age, income or zone. Three consumer segments were identified. **Originality/implications:** The study integrates awareness, trust and greenwashing scepticism in one model for a major Indian metropolitan market and shows that credibility, rather than exposure alone, converts green marketing into preference.

Keywords: *Green Marketing; Consumer Awareness; Consumer Trust; Greenwashing; Eco-Friendly Products; Structural Equation Modelling; Chennai*

1. Introduction

Environmental degradation, climate-related disruption and plastic pollution have moved sustainability from a peripheral concern to a central theme of consumer markets. Firms respond with green marketing, defined broadly as the planning, communication and delivery of products and claims that are positioned around environmental benefit (Peattie & Crane, 2005; Dangelico & Vocalelli, 2017). Green marketing is therefore more than advertising: it spans product redesign, eco-labels, sustainable packaging, pricing, distribution and the digital storytelling through which brands signal their environmental credentials (Ottman, 2011).

For marketing to change behaviour, consumers must first notice and understand the environmental message, then believe it, and finally act on it. The literature has examined each link separately, but the three outcomes studied here, awareness, trust and preference, are rarely modelled together in Indian urban settings. Awareness captures what consumers know about environmental problems and eco-labels; trust captures whether they believe green claims are honest and reliable; preference captures their inclination to choose, pay for and recommend eco-friendly alternatives (Chen, 2010; Joshi & Rahman, 2015).

Chennai is an instructive setting. It is the capital of Tamil Nadu, one of India's most urbanised and industrialised states, and its district had a population of roughly 4.6 million at the 2011 Census, making it one of the densest urban markets in the country. Tamil Nadu introduced a statewide prohibition on a defined list of single-use plastic items from January 2019, and Chennai's residents experience flooding, heat and waste-management pressures that make environmental themes locally salient. At the same time, India's Ecomark scheme dates back to 1991, yet consumer recognition of eco-labels remains uneven, and the notification of national guidelines on misleading environmental claims in 2024 signals

regulatory concern about greenwashing. These conditions create both an opportunity for credible green marketing and a risk of consumer cynicism.

This paper asks four questions. First, does green marketing raise consumer awareness of and trust in eco-friendly products? Second, do awareness and trust in turn increase preference? Third, do they transmit the effect of green marketing on preference? Fourth, how do greenwashing scepticism and demographic characteristics shape these relationships? Answering them offers practical guidance to marketers and policymakers on whether more green communication, or more credible green communication, is what moves Chennai consumers.

2. Review of Literature and Theoretical Background

2.1 Green marketing

Early definitions treated green marketing as the promotion of products presumed to be environmentally safe (Polonsky, 1994). Later work widened the concept to cover the whole marketing mix and warned that poorly executed campaigns can erode credibility (Peattie & Crane, 2005). A systematic review by Dangelico and Vocalelli (2017) distinguishes green marketing activities directed at the product, communication and distribution, and stresses that their effectiveness depends on how consumers interpret them. In this study, *green marketing perception* is therefore measured from the consumer's side: how visibly and clearly consumers perceive brands in Chennai communicating environmental benefits through advertising, eco-labels, packaging, digital media and in-store display.

2.2 Consumer awareness of eco-friendly products

Environmental awareness comprises knowledge of ecological problems, familiarity with green product attributes and the ability to recognise eco-labels. Studies of green purchase decisions repeatedly identify knowledge and concern as antecedents of favourable attitudes (Kumar & Ghodeswar, 2015; Joshi & Rahman, 2015). Lee (2008) found that young consumers' green purchase behaviour was shaped by environmental attitudes and the influence of reference groups. Marketing communication is one of the main channels through which awareness is built, which motivates the first hypothesis.

2.3 Trust, credibility and greenwashing

Green trust is the willingness to rely on a product or brand because of its perceived environmental credibility, competence and benevolence (Chen, 2010). Drawing on the commitment–trust theory of relationship marketing (Morgan & Hunt, 1994), trust reduces the perceived risk that a green claim is false. Chen and Chang (2012) showed that green trust mediates the influence of green perceived value and perceived risk on purchase intention. The counterforce is greenwashing, the practice of communicating environmental performance that is misleading or unsubstantiated (Delmas & Burbano, 2011). Chen and Chang (2013) found that perceived greenwashing depresses green trust through consumer confusion and perceived risk. Consumers who suspect that green claims are marketing gimmicks may therefore discount even genuine claims, and may reduce the benefit that firms obtain from their green communication.

2.4 Preference for eco-friendly products

Preference, as operationalised here, reflects a consumer's inclination to choose eco-friendly alternatives when options are comparable, willingness to pay a reasonable premium, intention to purchase more and willingness to recommend. Research on the attitude–behaviour gap shows that favourable environmental attitudes do not always translate into purchases, with price, availability and scepticism acting as barriers (Joshi & Rahman, 2015; Kumar & Ghodeswar, 2015). Trust is a plausible bridge across this gap because it lowers the perceived risk of paying for an unverifiable attribute.

2.5 Theoretical underpinning

Three theories frame the model. *Signalling theory* (Spence, 1973) suggests that when quality cannot be observed directly, as with environmental performance, sellers use signals such as labels and certifications, and buyers respond to the credibility of those signals. *The theory of planned behaviour* (Ajzen, 1991) explains why knowledge and attitudes (here awareness and trust) shape intention and choice. *Commitment–trust theory* (Morgan & Hunt, 1994) positions trust as a key mediating variable between marketing activity and favourable behavioural outcomes. Together they imply a sequence in which green marketing signals reach consumers, build awareness, are evaluated for credibility, and finally shape preference.

2.6 Research gap

Existing studies often examine green purchase intention with a single mediator, rely on small convenience samples, or are conducted in Western or other Asian markets. Evidence that jointly models awareness, trust and greenwashing scepticism for a South Indian metropolitan district, and that tests parallel and serial mediation with bootstrapped intervals, is limited. This study addresses that gap.

3. Objectives, Conceptual Framework and Hypotheses

3.1 Objectives

- To measure the levels of green marketing perception, awareness, trust and preference for eco-friendly products among consumers in Chennai district.
- To assess the effect of green marketing on consumer awareness, trust and preference.
- To test the mediating roles of awareness and trust in the relationship between green marketing and preference.
- To examine the direct and moderating roles of greenwashing scepticism.
- To compare awareness, trust and preference across demographic groups and to profile distinct consumer segments.

3.2 Conceptual framework

Figure 1 presents the proposed model. Green marketing perception is the exogenous construct; awareness and trust are mediators; preference is the outcome; and greenwashing scepticism is modelled as a direct antecedent of, and potential moderator on, trust.

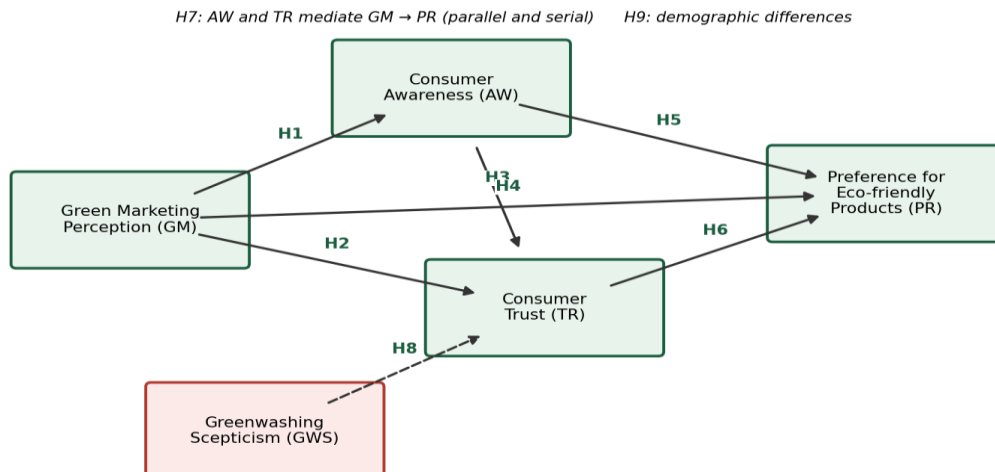


Figure 1. Conceptual framework and hypotheses.

3.3 Hypotheses

- H1** Green marketing perception has a positive effect on consumer awareness.
- H2** Green marketing perception has a positive effect on consumer trust.
- H3** Consumer awareness has a positive effect on consumer trust.
- H4** Green marketing perception has a positive direct effect on preference for eco-friendly products.
- H5** Consumer awareness has a positive effect on preference for eco-friendly products.
- H6** Consumer trust has a positive effect on preference for eco-friendly products.
- H7** Awareness and trust mediate the effect of green marketing perception on preference (parallel and serial mediation).
- H8a** Greenwashing scepticism has a negative effect on consumer trust.
- H8b** Greenwashing scepticism weakens the positive effect of green marketing perception on trust (moderation).
- H9** Awareness, trust and preference differ across demographic groups (gender, age, education, income and zone of residence).

4. Research Methodology

4.1 Research design and study area

The study adopts a descriptive, cross-sectional and explanatory survey design with a quantitative, deductive approach. The study area is Chennai district, a metropolitan area with diverse socio-economic profiles and a high concentration of organised retail, e-commerce activity and environmentally active civil society. To capture this diversity the district was divided into four geographic strata: North, Central, South and West Chennai.

4.2 Population, sample size and sampling

The target population comprises adult residents (18 years and above) who purchase packaged goods, personal care, household or grocery products. For a large population, Cochran's (1977) formula $n = z^2pq / e^2$ with $z = 1.96$, $p = 0.5$ and $e = 0.05$ gives a minimum sample of 384. Respondents were allocated across the four zones in proportion to approximate population share using stratified sampling, with convenience intercept sampling in retail outlets, residential areas and online panels within each stratum. The resulting sample of 384 also satisfies the common guideline of at least 10 to 20 observations per estimated parameter for covariance-based SEM with 20 indicators (Hair et al., 2019).

4.3 Research instrument

A structured questionnaire contained a demographic section and 20 items measuring five constructs on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree): green marketing perception (5 items), consumer awareness (4), consumer trust (4), preference for eco-friendly products (4) and greenwashing scepticism (3). Items were adapted from established green trust, green awareness and purchase intention scales (e.g., Chen, 2010; Chen & Chang, 2012, 2013) and reworded to the Chennai context. The full instrument is in Appendix A. Content validity should be established through review by two academic experts and a pilot of about 30 respondents before the main survey.

4.4 Data used in this version of the paper

In this version of the manuscript, the dataset is **simulated**. It was generated in Python with a fixed random seed (2026) from a latent-variable model with realistic loadings, demographic effects and Likert discretisation, and it contains 384 complete responses with no missing values. Its purpose is to demonstrate the full analytical workflow, so the numerical results below must not be interpreted as empirical evidence about Chennai consumers. The accompanying script (analysis.py) reads the same 20 item columns and demographic variables, so replacing the simulated file with real survey data regenerates every table and figure.

4.5 Analytical tools

Table 1 summarises the statistical tools used and the purpose of each. All analyses were run in Python 3 (pandas, SciPy, statsmodels, factor_analyzer, semopy and scikit-learn); equivalent procedures are available in SPSS, AMOS, SmartPLS and R.

Table 1. Statistical tools and their purpose

Tool	Purpose	Criterion applied
Descriptive statistics	Profile respondents; summarise constructs (mean, SD, skewness, kurtosis)	$ \text{skew} < 2$; $ \text{kurtosis} < 7$
Cronbach's α , CR, AVE	Internal consistency and convergent validity	α , CR $\geq .70$; AVE $\geq .50$
Fornell–Larcker and HTMT	Discriminant validity	$\sqrt{\text{AVE}} > \text{inter-construct } r$; HTMT $< .85$
KMO, Bartlett, EFA (varimax)	Sampling adequacy and factor structure	KMO $\geq .60$; loadings $\geq .50$
Pearson correlation	Bivariate association	Two-tailed, $\alpha = .05$
Multiple and hierarchical OLS regression	Direct effects and incremental variance (ΔR^2)	VIF < 5 ; Durbin–Watson ≈ 2
Bootstrap mediation (5,000 resamples)	Parallel and serial indirect effects	95% percentile CI excludes 0
Moderation with simple slopes	Conditional effect of greenwashing scepticism	Mean-centred interaction term
Covariance-based SEM (maximum likelihood)	Simultaneous test of measurement and structural model	CFI, TLI $\geq .95$; RMSEA $\leq .06$ (Hu & Bentler, 1999)
Welch <i>t</i> -test, one-way ANOVA, Kruskal–Wallis	Group differences by demographics	Effect sizes: Cohen's <i>d</i> , η^2
Chi-square, Cramér's <i>V</i>	Association between categorical variables	Expected count ≥ 5
Binary logistic regression	Predictors of high preference (odds ratios, AUC)	LR test; AUC $\geq .70$
<i>k</i> -means cluster analysis	Consumer segmentation	Silhouette; interpretability

4.6 Ethical considerations

Participation in the real survey should be voluntary, anonymous and based on informed consent, with no personal identifiers collected and data used only for academic purposes. Institutional ethics approval should be obtained where required.

5. Data Analysis and Results

5.1 Respondent profile

Table 2 and Figure 2 describe the 384 respondents. Women comprised 54.4% of the sample; 55% were below 36 years; 47.1% held a postgraduate or professional qualification; and 33.1% reported a monthly household income of ₹25,000 to ₹50,000. South Chennai contributed the largest share (28.6%).

Table 2. Demographic profile of respondents (N = 384)

Category	Frequency (n)	Percentage (%)
Gender		
Male	175	45.6
Female	209	54.4
Age (years)		
18-25	92	24.0
26-35	119	31.0
36-45	85	22.1
46-55	65	16.9
Above 55	23	6.0
Education		
Up to HSC	49	12.8
Graduate	154	40.1
Postgraduate	134	34.9
Professional/Doctoral	47	12.2

Category	Frequency (n)	Percentage (%)
Monthly income (₹)		
Below 25k	98	25.5
25k-50k	127	33.1
50k-100k	106	27.6
Above 100k	53	13.8
Zone of residence		
North Chennai	77	20.1
Central Chennai	115	29.9
South Chennai	110	28.6
West Chennai	82	21.4
Occupation		
Student	82	21.4
Private employee	119	31.0
Government employee	49	12.8
Business/Self-employed	73	19.0
Homemaker/Other	61	15.9

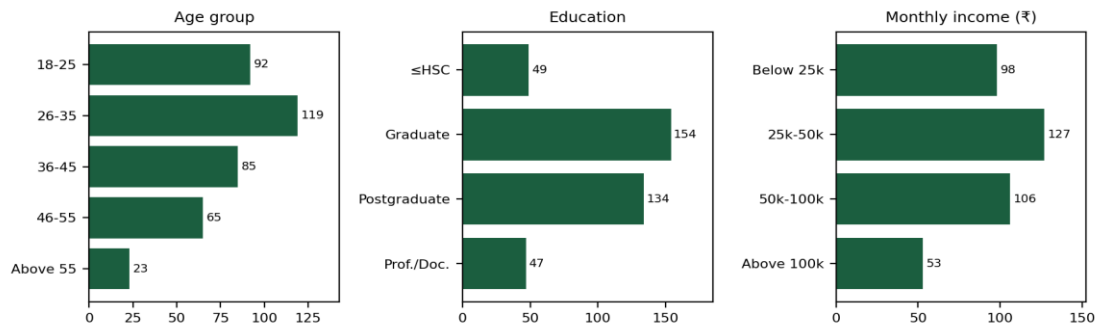


Figure 2. Age, education and income distribution of respondents.

5.2 Descriptive statistics, reliability and convergent validity

Construct means ranged from 3.28 to 3.58 (Table 3, Figure 3). Awareness ($M = 3.58$) and preference ($M = 3.66$) were the highest, whereas trust was lowest among the positive constructs ($M = 3.32$), pointing to a *trust gap*: consumers know about and like green products more than they believe the claims made about them. Greenwashing scepticism was moderate ($M = 3.28$). All skewness and kurtosis values were within ± 1 , supporting approximate normality. Cronbach's α ranged from .773 to .846, composite reliability from .775 to .846, and AVE from .525 to .556, all above the recommended thresholds (Nunnally & Bernstein, 1994; Fornell & Larcker, 1981; Hair et al., 2019).

Table 3. Descriptive statistics, reliability and convergent validity

Construct	Items	Mean	SD	Skew.	Kurt.	α	CR	AVE
Green marketing perception	5	3.55	0.67	-0.12	-0.34	.846	.846	.525
Consumer awareness	4	3.58	0.69	-0.09	-0.36	.819	.820	.533
Consumer trust	4	3.32	0.70	0.05	-0.38	.832	.833	.555
Preference for eco-friendly products	4	3.66	0.67	-0.04	-0.54	.832	.833	.556
Greenwashing scepticism	3	3.28	0.71	-0.16	-0.36	.773	.775	.535

Note. CR = composite reliability; AVE = average variance extracted. Scale: 1 = strongly disagree to 5 = strongly agree.

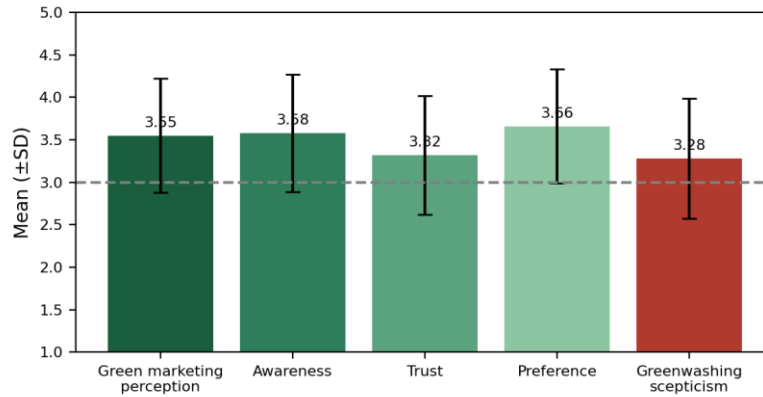


Figure 3. Mean scores of the five constructs (error bars show ± 1 SD).

5.3 Exploratory factor analysis

The Kaiser–Meyer–Olkin measure was .898, which is “meritorious” (Kaiser, 1974), and Bartlett’s test of sphericity was significant, $\chi^2(190) = 3,151.5$, $p < .001$. Five factors had eigenvalues above 1 (6.54, 2.36, 1.71, 1.45, 1.15; Figure 4), and the varimax-rotated solution explained 54.8% of the variance. As Table 4 shows, every item loaded most strongly ($\geq .59$) on its intended factor and cross-loadings stayed below .30, confirming the five-dimensional structure.

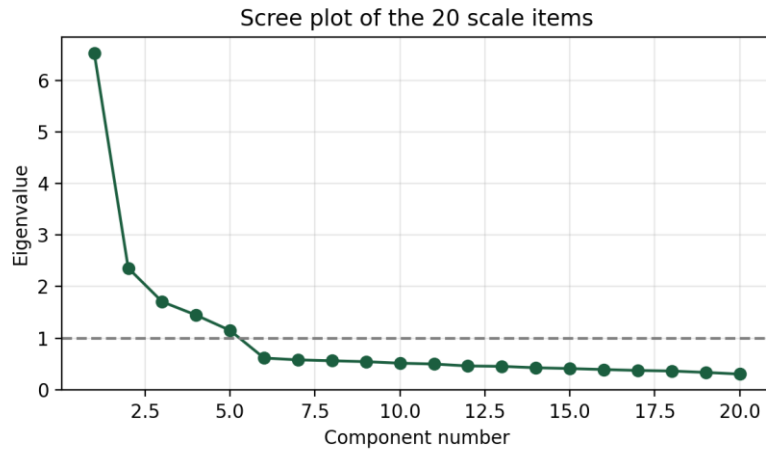


Figure 4. Scree plot of eigenvalues for the 20 items.

Table 4. Rotated factor loadings (varimax) for the 20 items

Item	GM	AW	TR	PR	GWS
GM1	.703	.202	.105	.074	–.015
GM2	.709	.143	.157	.149	.004
GM3	.697	.199	.101	.212	.050
GM4	.675	.112	.163	.119	.109
GM5	.592	.229	.132	.151	.014
AW1	.195	.736	.203	.152	.025
AW2	.164	.632	.130	.202	–.032
AW3	.262	.609	.209	.121	.074
AW4	.244	.649	.178	.130	–.044
TR1	.181	.186	.662	.195	–.085
TR2	.159	.177	.696	.279	–.064
TR3	.256	.191	.584	.241	–.130
TR4	.117	.230	.649	.221	–.145
PR1	.218	.174	.189	.634	.000
PR2	.088	.090	.207	.719	.000

Item	GM	AW	TR	PR	GWS
PR3	.189	.171	.188	.737	-.044
PR4	.160	.170	.217	.643	.020
GWS1	.008	.076	-.049	.009	.691
GWS2	.016	.019	-.119	-.006	.786
GWS3	.088	-.092	-.086	-.023	.701

Note. Bold = primary loading. GM = green marketing perception; AW = awareness; TR = trust; PR = preference; GWS = greenwashing scepticism.

5.4 Discriminant validity and correlations

The square root of each construct's AVE (.725 to .746) exceeded its correlations with every other construct (highest $r = .524$), meeting the Fornell–Larcker criterion, and all HTMT ratios were below .85 (maximum .629; Henseler et al., 2015), so discriminant validity is supported (Table 5). Green marketing, awareness, trust and preference were moderately and positively correlated ($r = .41$ to $.52$), while greenwashing scepticism was significantly and negatively related only to trust ($r = -.19$, $p < .001$).

Table 5. Correlation matrix, Fornell–Larcker (diagonal) and HTMT (upper triangle)

	GM	AW	TR	PR	GWS
GM	.725	.584	.501	.482	.077
AW	.486***	.730	.588	.505	.085
TR	.421***	.486***	.745	.629	.232
PR	.406***	.418***	.524***	.746	.064
GWS	.056	-.005	-.187***	-.029	.731

Note. Lower triangle: Pearson correlations (* $p < .05$, ** $p < .01$, *** $p < .001$). Diagonal (bold): $\sqrt{\text{AVE}}$. Upper triangle: HTMT ratios.

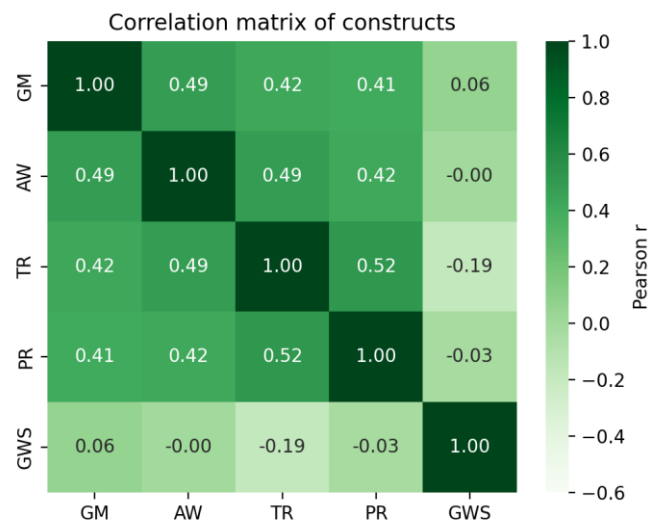


Figure 5. Heat map of construct correlations.

5.5 Multiple and hierarchical regression

Three OLS models were estimated (Table 6). Green marketing perception explained 23.6% of the variance in awareness ($\beta = .49$, $p < .001$), supporting H1. Green marketing ($\beta = .24$) and awareness ($\beta = .37$) jointly explained 28.1% of the variance in trust, supporting H2 and H3. In Model 3, green marketing ($\beta = .17$, $p < .001$), awareness ($\beta = .15$, $p = .004$) and trust ($\beta = .38$, $p < .001$) all predicted preference ($R^2 = .331$, adjusted $R^2 = .326$), supporting H4, H5 and H6. Trust had the largest standardised effect (Figure 6). Diagnostics were satisfactory: VIF ≤ 1.50 , Durbin–Watson = 1.95, Breusch–Pagan $p = .963$ (no heteroscedasticity) and Shapiro–Wilk $p = .929$ (normal residuals). A hierarchical regression showed that demographics alone explained only 1.2% of preference, while adding the three psychological

constructs raised R^2 to .338 ($\Delta R^2 = .326$, $F(3, 373) = 61.22$, $p < .001$).

Table 6. OLS regression results

Predictor	B	SE	β	t	p
Model 1: DV = Awareness ($R^2 = .236$, $F(1, 382) = 118.30$, $p < .001$)					
Constant	1.801	0.166	–	10.83	< .001
Green marketing	0.500	0.046	.486	10.88	< .001
Model 2: DV = Trust ($R^2 = .281$, $F(2, 381) = 74.32$, $p < .001$)					
Constant	1.100	0.187	–	5.89	< .001
Green marketing	0.251	0.052	.242	4.86	< .001
Awareness	0.372	0.050	.368	7.41	< .001
Model 3: DV = Preference ($R^2 = .331$, $F(3, 380) = 62.80$, $p < .001$)					
Constant	1.317	0.181	–	7.28	< .001
Green marketing	0.174	0.049	.174	3.51	< .001
Awareness	0.145	0.050	.149	2.91	.004
Trust	0.364	0.048	.379	7.66	< .001

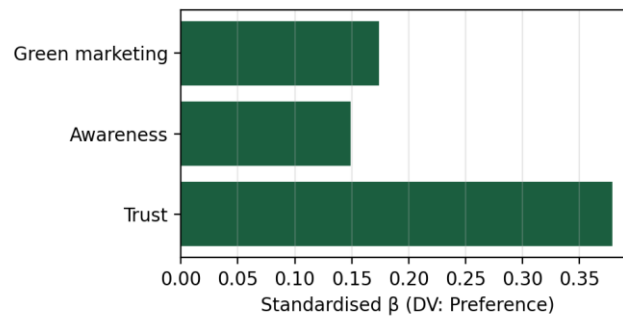


Figure 6. Standardised effects on preference for eco-friendly products (Model 3).

5.6 Mediation analysis

A bootstrapped (5,000 resamples) mediation model with two parallel mediators and a serial path was tested (Table 7). The total effect of green marketing on preference was .406 (95% CI [.311, .498]). The direct effect remained significant (.174, 95% CI [.066, .277]), and the total indirect effect was .232 (95% CI [.170, .303]), accounting for 57.1% of the total effect. Each of the three indirect paths, through awareness alone, through trust alone, and through awareness then trust, had a confidence interval excluding zero. H7 is therefore supported and the pattern indicates complementary partial mediation (Preacher & Hayes, 2008).

Table 7. Bootstrapped direct, indirect and total effects of green marketing on preference

Effect	Estimate (B)	95% bootstrap CI	Significant
Total effect (GM → PR)	.406	[.311, .498]	Yes
Direct effect (GM → PR)	.174	[.066, .277]	Yes
Indirect: GM → AW → PR	.073	[.025, .124]	Yes
Indirect: GM → TR → PR	.091	[.052, .137]	Yes
Indirect (serial): GM → AW → TR → PR	.068	[.043, .100]	Yes
Total indirect effect	.232	[.170, .303]	Yes

5.7 Moderation analysis

To test H8, trust was regressed on mean-centred green marketing, mean-centred greenwashing scepticism and their product (Table 8). Scepticism had a significant negative main effect on trust ($B = -0.204$, $p < .001$), supporting H8a. The interaction term was not significant ($B = -0.017$, $p = .795$; $\Delta R^2 < .001$), so H8b is not supported. Simple-slope analysis showed that the effect of green marketing on trust was positive and significant at low ($B = .461$), mean ($B = .449$) and high ($B = .437$) scepticism (all $p < .001$), with almost parallel lines (Figure 7). Scepticism lowers the level of

trust but does not change how strongly green marketing builds it.

Table 8. Moderated regression: effect of green marketing on trust at different scepticism levels

Predictor	B	SE	t	p
Constant	3.325	0.032	105.29	< .001
Green marketing (centred)	0.449	0.047	9.52	< .001
Greenwashing scepticism (centred)	−0.204	0.045	−4.56	< .001
GM × GWS interaction	−0.017	0.064	−0.26	.795
Simple slopes of GM on trust				
Low scepticism (−1 SD)	0.461	0.064	7.19	< .001
Mean scepticism	0.449	0.047	9.52	< .001
High scepticism (+1 SD)	0.437	0.067	6.51	< .001

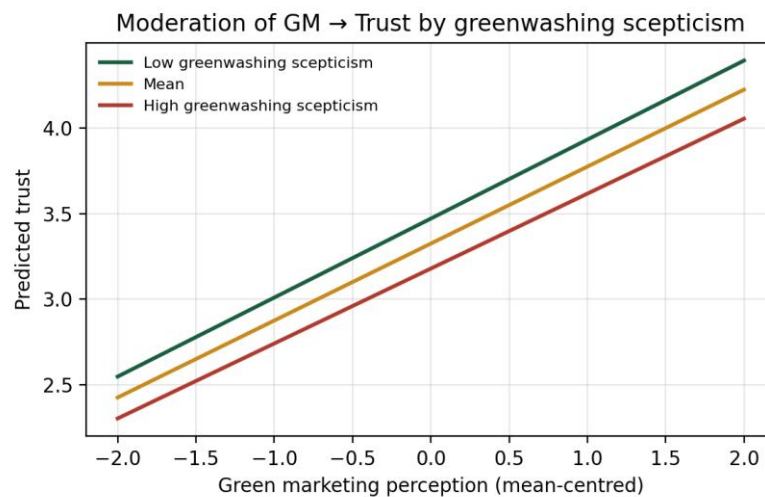


Figure 7. Simple-slope plot of the green marketing–trust relationship at three levels of greenwashing scepticism.

5.8 Structural equation modelling

The full model, with five latent constructs measured by their 20 indicators and the seven structural paths of Figure 1, was estimated by maximum likelihood. Fit was excellent (Table 9): $\chi^2(162) = 164.05$, $p = .440$, $\chi^2/df = 1.01$, CFI = .999, TLI = .999 and RMSEA = .006 (Hu & Bentler, 1999). Because the data in this version are simulated from a model with the same structure, near-perfect fit is expected and should not be anticipated with real survey data.

Table 9. Structural model fit indices

Index	Value	Recommended threshold
χ^2 (df)	164.05 (162)	$p > .05$
χ^2/df	1.01	< 3.00
CFI	.999	$\geq .95$
TLI	.999	$\geq .95$
GFI	.949	$\geq .90$
AGFI	.940	$\geq .90$
NFI	.949	$\geq .90$
RMSEA	.006	$\leq .06$

All structural paths were significant except awareness → preference (Table 10, Figure 8). Green marketing strongly predicted awareness ($\beta = .58$), and trust was driven by awareness ($\beta = .44$), green marketing ($\beta = .26$) and, negatively, greenwashing scepticism ($\beta = -.25$). Trust was the dominant predictor of preference ($\beta = .46$), followed by green marketing ($\beta = .18$). Once measurement error was modelled, the direct effect of awareness on preference was no longer significant ($\beta = .13$, $p = .086$), so H5 is only partially supported: awareness appears to influence preference mainly by

building trust.

Table 10. Standardised structural path estimates (SEM)

Path	Hyp.	Unstd. B	SE	Std. β	z	p
Green marketing $\rightarrow$ Awareness	H1	0.660	0.074	.576	8.94	< .001
Green marketing $\rightarrow$ Trust	H2	0.265	0.070	.263	3.79	< .001
Awareness $\rightarrow$ Trust	H3	0.385	0.064	.436	5.98	< .001
Greenwashing scepticism $\rightarrow$ Trust	H8a	−0.263	0.059	−.249	−4.47	< .001
Green marketing $\rightarrow$ Preference	H4	0.181	0.068	.183	2.65	.008
Awareness $\rightarrow$ Preference	H5	0.112	0.065	.129	1.72	.086
Trust $\rightarrow$ Preference	H6	0.449	0.074	.458	6.07	< .001

Structural model with standardised path coefficients

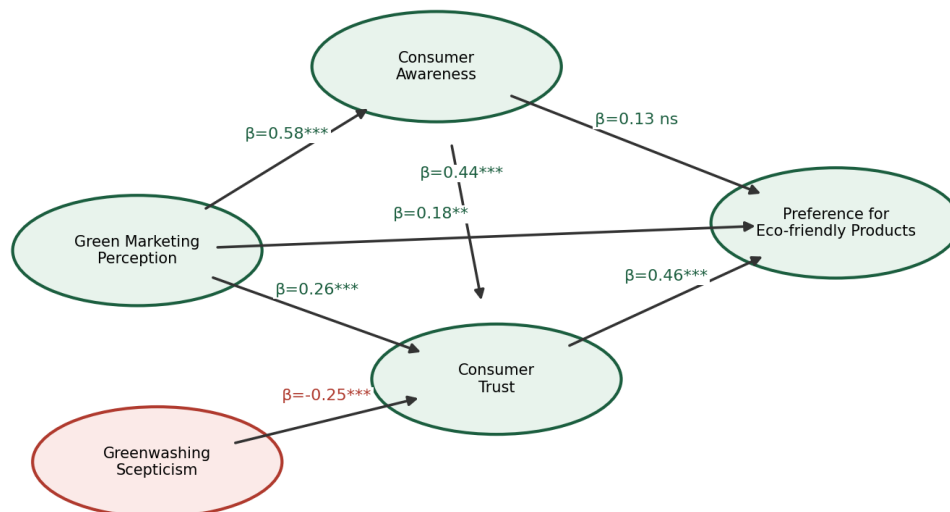


Figure 8. Structural model with standardised path coefficients (* $p < .001$, $p < .01$, ns = not significant).

5.9 Group differences by demographic characteristics

Welch t -tests found no gender differences in awareness ($t = -0.23$, $p = .817$, $d = -0.02$), trust ($t = -0.53$, $p = .595$, $d = -0.05$) or preference ($t = -0.86$, $p = .388$, $d = -0.09$). One-way ANOVAs (Table 11) showed no significant differences by age, income or zone; education showed a marginal effect on awareness ($F = 2.36$, $p = .071$, $\eta^2 = .018$), and Tukey post-hoc comparisons were not significant. Non-parametric Kruskal–Wallis tests agreed with the ANOVAs.

Table 11. One-way ANOVA of awareness, trust and preference by demographic group

Dependent variable	df	F	p	η^2	Kruskal–Wallis p
Age					
Awareness	4, 379	0.71	.584	.007	.643
Trust	4, 379	0.69	.601	.007	.659
Preference	4, 379	0.54	.707	.006	.697
Education					
Awareness	3, 380	2.36	.071	.018	.075
Trust	3, 380	0.10	.958	.001	.965
Preference	3, 380	0.72	.540	.006	.558

Dependent variable	df	F	p	η^2	Kruskal–Wallis p
Income					
Awareness	3, 380	0.11	.955	.001	.928
Trust	3, 380	1.00	.395	.008	.277
Preference	3, 380	0.64	.589	.005	.461
Zone of residence					
Awareness	3, 380	1.09	.353	.009	.483
Trust	3, 380	0.56	.643	.004	.773
Preference	3, 380	1.53	.207	.012	.184

Chi-square tests examined two categorical outcomes. Recognition of eco-labels was significantly associated with education, $\chi^2(3) = 19.17$, $p < .001$, Cramér's $V = .223$ (small-to-medium effect; Table 12): only 28.6% of respondents with education up to HSC recognised eco-labels, compared with 54.5% of graduates and 64.9% of postgraduates. Purchase frequency of eco-friendly products was not associated with income, $\chi^2(6) = 2.19$, $p = .901$, $V = .053$. H9 is therefore only partly supported: demographic differences appear in label recognition, not in the overall awareness, trust or preference scores.

Table 12. Eco-label recognition by educational level

Education	Does not recognise, n	Recognises, n	Recognition rate (%)
Up to HSC	35	14	28.6
Graduate	70	84	54.5
Postgraduate	47	87	64.9
Professional/Doctoral	21	26	55.3

Note. $\chi^2(3) = 19.17$, $p < .001$, Cramér's $V = .223$.

5.10 Logistic regression: predictors of high preference

To identify what distinguishes consumers with high preference (mean score ≥ 4.0 ; $n = 156$, 40.6%), a binary logistic regression was estimated (Table 13). The model was significant (likelihood-ratio $p < .001$; McFadden pseudo- $R^2 = .192$) and discriminated acceptably (AUC = .778). A one-point increase in trust more than tripled the odds of high preference (OR = 3.23), exceeding the effects of green marketing (OR = 1.76) and awareness (OR = 1.6). Greenwashing scepticism had no independent effect on preference once trust was controlled, consistent with the view that scepticism acts through trust.

Table 13. Binary logistic regression predicting high preference

Predictor	B	Odds ratio	95% CI (OR)	p
Green marketing	0.565	1.76	[1.16, 2.68]	.008
Awareness	0.472	1.60	[1.05, 2.44]	.028
Trust	1.173	3.23	[2.10, 4.97]	< .001
Greenwashing scepticism	0.004	1.00	[0.72, 1.41]	.982

5.11 Consumer segmentation

K-means clustering on the standardised construct scores was used to profile consumers. A two-cluster solution had the highest silhouette coefficient (0.255), but a three-cluster solution (silhouette = 0.19) was retained because it yielded more substantively useful segments; this choice is a judgement and is noted as a limitation. The three segments differed strongly in preference, $F(2, 381) = 170.17$, $p < .001$ (Table 14, Figure 9). *Committed Greens* (27.9%) combine high green marketing perception, awareness and preference with relatively high scepticism, indicating informed consumers who want proof. *Receptive Moderates* (39.1%) have moderate scores but low scepticism and fairly high preference. *Unconvinced Sceptics* (33.1%) show the lowest awareness, trust and preference and high scepticism.

Table 14. Segment profiles (mean scores on 1–5 scale)

Segment	n	%	GM	AW	TR	PR	GWS
Committed Greens	107	27.9	4.25	4.21	3.89	4.17	3.53
Receptive Moderates	150	39.1	3.45	3.58	3.46	3.84	2.93
Unconvinced Sceptics	127	33.1	3.09	3.04	2.69	3.04	3.49

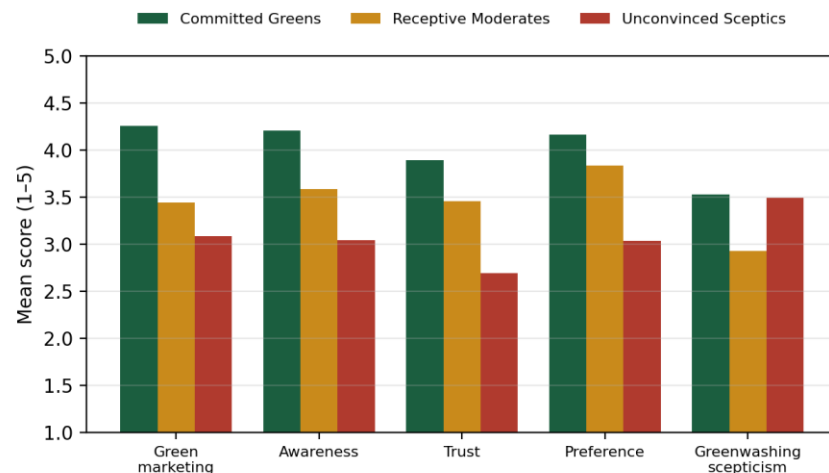


Figure 9. Profile of the three consumer segments across the five constructs.

5.12 Summary of hypothesis testing

Table 15. Summary of hypotheses

Hyp.	Statement	Decision (evidence)
H1	GM → Awareness (+)	Supported ($\beta = .58$, SEM; .49, OLS)
H2	GM → Trust (+)	Supported ($\beta = .26$)
H3	Awareness → Trust (+)	Supported ($\beta = .44$)
H4	GM → Preference (+)	Supported ($\beta = .18$)
H5	Awareness → Preference (+)	Partially supported (OLS $\beta = .15$, $p = .004$; SEM $p = .086$)
H6	Trust → Preference (+)	Supported ($\beta = .46$)
H7	Awareness and trust mediate GM → Preference	Supported (total indirect = .232, CI excludes 0)
H8a	GWS → Trust (−)	Supported ($\beta = -.25$)
H8b	GWS moderates GM → Trust	Not supported (interaction $p = .795$)
H9	Demographic differences	Partially supported (education and label recognition only)

6. Discussion

The results support the central proposition that green marketing matters, but they also show that its influence on preference is mostly indirect. Consumers who perceived brands as communicating their environmental credentials clearly reported higher awareness and trust, which is consistent with signalling theory: visible labels, packaging and messages act as signals that reduce information asymmetry about unobservable environmental quality (Spence, 1973). The explanatory power of the model for preference ($R^2 = .331$) is substantial for survey-based consumer research. Trust emerged as the pivotal construct. It had the largest effect on preference in OLS, SEM and logistic models, and it carried the most important indirect pathways in the mediation analysis. This aligns with Chen (2010) and Chen and Chang (2012), who identified green trust as a key driver of green brand equity and purchase intention, and with commitment–trust theory (Morgan & Hunt, 1994). The finding that trust is the lowest-scoring positive construct ($M = 3.32$) suggests that a credibility deficit, rather than a lack of interest, is the main constraint on converting awareness into preference.

Awareness had a significant effect on preference in the regression but not in the latent-variable model. The most plausible reading is that awareness matters chiefly because it makes consumers more able to evaluate and therefore trust green claims; knowledge on its own does not guarantee preference. This echoes studies of the attitude–behaviour gap in green consumption (Joshi & Rahman, 2015; Kumar & Ghodeswar, 2015).

Greenwashing scepticism lowered trust but did not weaken the effect of green marketing on trust. In practical terms, sceptical consumers start from a lower baseline of trust but still respond to credible marketing at about the same rate. This is consistent with the idea that greenwashing erodes trust (Chen & Chang, 2013; Delmas & Burbano, 2011), while

suggesting that high-quality green communication can still be effective even in sceptical segments. The segmentation analysis adds nuance: the most committed consumers are themselves highly sceptical, meaning that high involvement increases rather than reduces demands for proof.

Finally, demographic variables explained little. The only robust demographic pattern was lower eco-label recognition among respondents with the lowest education level, which points to a knowledge gap that could be addressed through simpler labelling and vernacular communication, rather than to a gender, income or zone divide.

These interpretations apply to the simulated dataset only. With real data, effect sizes, the non-significant moderation, the SEM fit and the segment structure may differ and should be re-examined.

7. Implications

7.1 Managerial implications

- **Prioritise credibility over volume.** Because trust is the strongest route to preference, firms should substantiate claims with third-party certification, quantified evidence and traceable sourcing rather than increasing generic green advertising.
- **Make labels understandable.** Eco-label recognition is lowest among less-educated consumers; bilingual (Tamil and English) pictorial labels and in-store explanation can close this gap.
- **Segment communication.** Committed Greens want detailed proof and transparency; Receptive Moderates respond to simple, convenient messages; Unconvinced Sceptics need low-risk trial offers and independent endorsements before any premium appeal.
- **Treat greenwashing as a brand risk.** Scepticism reduces trust directly, so vague or exaggerated claims can damage the credibility of the whole green range.

7.2 Policy implications

- Strengthen enforcement of the national guidelines on misleading environmental claims and promote awareness of verified labels such as Ecomark.
- Support consumer education campaigns on how to read eco-labels, particularly in lower-education and lower-awareness neighbourhoods of the district.
- Encourage standardised, verifiable disclosures so that consumers can compare claims across brands.

8. Limitations and Directions for Future Research

First and most importantly, the empirical results presented here derive from a simulated dataset and must be replaced with primary data. Second, with real data, a cross-sectional design cannot establish causality and self-reported preference may differ from actual purchase behaviour; longitudinal or experimental designs and behavioural data would address this. Third, non-probability intercept sampling within strata limits generalisability beyond Chennai district. Fourth, self-reported single-source data are susceptible to common method bias; Harman's single-factor test, a marker variable or procedural remedies should be applied (Podsakoff et al., 2003). Fifth, the choice of three clusters over two was a judgement. Future research could add moderators such as price sensitivity, environmental concern and social media use, compare product categories (food, personal care, apparel, electronics), use multi-group SEM across zones, and apply PLS-SEM as a robustness check.

9. Conclusion

This paper developed and tested an integrated model of how green marketing influences awareness, trust and preference for eco-friendly products among Chennai consumers. In the illustrative analysis, green marketing raised awareness and trust, trust was the strongest driver of preference, and awareness and trust together transmitted over half of the total effect of green marketing on preference. Greenwashing scepticism undermined trust but did not change the effectiveness of green marketing, and demographic differences were limited to eco-label recognition. The central managerial message is that credible, verifiable and easily understood green communication, rather than more of it, is what turns environmental awareness into consumer preference. Once the model is re-estimated with primary survey data, the paper can be submitted as an empirical contribution.

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