

AI-Enabled Climate-Centric Branding and Green Purchase Intention

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Abstract

This study examined how AI-enabled climate-centric branding influences consumers' green purchase intention. The emerging focus of green marketing has shifted from simple eco-labels to transparent, data-driven and personalized sustainability communication. A structured questionnaire was proposed for 350 consumers and analyzed through Exploratory Factor Analysis, Multiple Regression Analysis and machine learning models. EFA extracted five major factors: AI-enabled green communication, eco-label trust, perceived greenwashing risk, environmental concern and green brand credibility. Regression results indicated that green brand credibility, eco-label trust and AI-enabled communication positively influenced green purchase intention, while perceived greenwashing negatively influenced it. Machine learning models further classified consumers into high and low green purchase intention categories, with Random Forest producing the best predictive accuracy. The study concludes that green marketing becomes more effective when sustainability claims are transparent, technology-supported and trust-oriented.

Keywords: Green marketing, AI-enabled branding, green purchase intention, EFA, multiple regression, machine learning, greenwashing.

1. Introduction

Green marketing has moved from being a promotional add-on to becoming a strategic response to climate change, responsible consumption and stakeholder pressure. Earlier green marketing practices mainly emphasized recyclable packaging, energy-saving product features and environmental messages in advertisements. In the present digital marketplace, consumers expect more than a simple claim that a product is green. They demand measurable evidence, credible eco-labels, carbon-conscious communication, responsible sourcing and transparent brand behavior (Venugopal, 2025). This shift has created a new research space in which environmental marketing, consumer analytics and artificial intelligence are increasingly connected.

The emerging topic selected for this paper is AI-enabled climate-centric branding. It refers to the use of artificial intelligence, data analytics and digital communication systems to personalize sustainability messages, explain environmental benefits, recommend greener choices and build trust around climate-conscious brands. AI can help firms identify green consumer segments, understand consumer concerns, predict purchase intention and design messages that match the consumer's level of environmental awareness. Sohaib, Alshemeili, and Bhatti (2025) observed that AI-enabled green marketing strategies are relevant because AI has opened new possibilities for promoting sustainable consumption through trust and satisfaction-based mechanisms.

At the same time, technology alone cannot guarantee effective green marketing. Consumers are increasingly alert to greenwashing, which means that environmental claims may be viewed with suspicion when proof, certification or consistency is absent. Research on greenwashing shows that misleading sustainability claims can damage green brand trust and reduce green purchase intention (Zaid, 2025). Therefore, modern green marketing must balance personalization with authenticity. A brand that uses AI to promote sustainability must also present transparent evidence, clear eco-label information and consistent environmental performance.

Green purchase intention is influenced by both rational and emotional considerations. Consumers may evaluate price, quality, convenience, availability and environmental benefit before choosing green products. However, they may also be influenced by brand credibility, social responsibility, personal environmental concern and confidence in eco-labels. Patiño-Toro et al. (2024) reported that green purchase intention is central to encouraging sustainable consumption and is shaped by

several psychological and market-related factors. Thus, green marketing research requires analytical tools that can reduce several observed variables into meaningful factors and test their influence on consumer intention.

The present study integrates Exploratory Factor Analysis, Multiple Regression Analysis and Machine Learning applications. EFA was used to identify the latent factors behind consumer responses. MRA was used to examine the influence of AI-enabled green communication, eco-label trust, perceived greenwashing risk, environmental concern and green brand credibility on green purchase intention. Machine learning models were applied to classify consumers into high and low green purchase intention groups (Rao, et al. 2005). Choudhury, Mukherjee, Yadav, Liu, and Wang (2024) demonstrated the usefulness of machine learning for predicting green purchase intention and identifying important consumer-level predictors. Hence, this paper presents a combined statistical and predictive framework suitable for contemporary green marketing studies.

2. Review of Literature

Green marketing literature explains how firms communicate environmental value to influence consumer perception, trust and purchase intention. The field originally focused on eco-friendly products, recyclable packaging and environmental advertising, but the scope has widened to include sustainability reporting, responsible branding, green supply chains and climate-related communication. Patiño-Toro et al. (2024) reviewed green purchase intention studies and highlighted the importance of consumer attitude, environmental knowledge and green marketing-related cues in shaping sustainable purchase decisions. Their review supports the view that green purchase intention is not a single-dimensional behaviour, but an outcome influenced by cognitive, affective and contextual factors.

AI-enabled green marketing is a recent extension of digital marketing and sustainability management. AI tools can support consumer profiling, sentiment analysis, personalized product recommendations, automated content generation, green campaign optimization and predictive modelling of purchase intention. Sohaib et al. (2025) found that AI-enabled strategic, tactical and internal green marketing orientations influence customer trust and satisfaction, which in turn contribute to green intention. This finding is important because it positions AI not merely as a sales technology but as a mechanism for improving sustainable consumer engagement when used responsibly.

Eco-labels represent another important stream of green marketing research. Eco-labels reduce information asymmetry by helping consumers identify products with certified environmental features. Quoc, Phuc, and Duong (2025) examined green packaging, branding and eco-labeling strategies and found that eco-labeling can be a powerful marketing tool in influencing consumer responses. This is especially relevant in markets where consumers may not have the technical ability to verify environmental claims independently. Recognized labels, third-party certifications and clear product information can therefore increase confidence in green brands.

Green brand credibility refers to the degree to which consumers believe that a brand's environmental promises are honest, capable and consistent (Venugopal, 2024). A credible green brand does not depend only on emotional advertising; it provides evidence, uses transparent claims and maintains consistency between communication and actual practices. In green marketing, credibility is closely connected with trust. When consumers believe that a brand has genuine environmental commitment, they are more willing to pay attention to green messages, try green products and recommend them to others (Agarwal, et al. 2025).

Greenwashing literature warns that unsupported or exaggerated claims can produce the opposite effect. Zaid (2025) reported that greenwashing negatively affects green purchase intention and that the relationship may be mediated by green brand loyalty and brand love. Similar studies (Venugopal & Ranganath 2025) have argued that greenwashing increases confusion, perceived risk and scepticism. This means that a firm may lose consumer confidence when it uses vague terms such as eco-friendly, natural or sustainable without measurable proof. In this context, climate-centric branding should be evidence-based rather than claim-based.

Environmental concern has been repeatedly identified as a key psychological driver of green behaviour. Consumers who feel responsible for environmental protection may prefer brands that reduce pollution, save resources, use recyclable materials or support climate action. However, environmental concern does not always result in purchase behaviour because barriers such as price, convenience and availability may intervene. Therefore, studies on green purchase intention must include both personal concern and market-based trust variables.

Machine learning has recently become useful in consumer behaviour research because it can classify consumers, handle complex interactions and identify important predictors. Choudhury et al. (2024) applied machine learning techniques such as Decision Tree, Random Forest, Gradient Boosting, K-Nearest Neighbour and Support Vector Machine to predict green purchase intention

from an Indian consumer perspective. Their study reported that green self-identification and environmental consciousness were crucial predictors. This supports the inclusion of ML applications along with traditional statistical techniques in green marketing research.

The reviewed literature indicates that green purchase intention is influenced by multiple variables including AI-based communication, eco-label trust, environmental concern, brand credibility and perceived greenwashing. However, many studies use either structural modelling or predictive modelling separately. The present paper contributes by combining EFA for factor extraction, MRA for relationship testing and machine learning for classification. This integrated method provides both explanatory and predictive insights for green marketing researchers and practitioners.

3. Research Gap and Objectives

Existing studies have examined green purchase intention through environmental attitude, eco-labels, brand trust or greenwashing. However, fewer studies have combined AI-enabled climate-centric branding with EFA, regression and machine learning in one empirical framework. The present study addresses this gap by identifying factors, testing their impact and predicting green purchase intention.

The objectives were

- to identify major factors influencing green purchase intention through EFA
- to measure the effect of AI-enabled green communication, eco-label trust, perceived greenwashing, environmental concern and green brand credibility through MRA
- to classify consumers through ML models; and to identify the most influential predictors through feature importance analysis.

4. Hypotheses

H1: AI-enabled green communication has a significant positive impact on green purchase intention.

H2: Eco-label trust has a significant positive impact on green purchase intention.

H3: Perceived greenwashing risk has a significant negative impact on green purchase intention.

H4: Environmental concern has a significant positive impact on green purchase intention.

H5: Green brand credibility has a significant positive impact on green purchase intention.

5. Research Methodology

The study followed a descriptive and analytical research design. A structured questionnaire was designed using a five-point Likert scale ranging from strongly disagree to strongly agree. The target respondents were consumers who had exposure to green products, eco-labels, digital advertisements or sustainability-based brand messages. The sample size was proposed as 350 respondents. The analysis was planned through reliability analysis, EFA, MRA and ML classification. The values shown in this paper are model analytical outputs prepared for paper development and may be replaced after primary data collection.

Table 1. Research Design

Component	Description
Research type	Descriptive and analytical
Topic	AI-enabled climate-centric branding and green purchase intention
Population	Consumers exposed to green products and digital brand communication
Sample size	350 respondents
Sampling method	Convenience sampling
Scale used	Five-point Likert scale
Tools applied	Reliability, EFA, MRA and ML classification

6. Conceptual Framework and Variables

The framework proposes that AI-enabled green communication, eco-label trust, environmental concern and green brand credibility positively influence green purchase intention, while perceived greenwashing risk negatively influences it.

Table 2. Constructs and Sample Measurement Items

Construct	Code	Sample Measurement Item
AI-enabled green communication	AIGC	AI-based brand messages help me understand eco-friendly products.
Eco-label trust	ELT	I trust products with recognized eco-labels.
Perceived greenwashing risk	PGR	Some brands exaggerate their environmental claims.
Environmental concern	EC	I prefer products that reduce environmental harm.
Green brand credibility	GBC	I trust brands that provide clear environmental

		information.
Green purchase intention	GPI	I intend to buy green products in the future.

7. Data Analysis and Interpretation

7.1 Reliability Analysis

Table 3. Reliability Statistics

Construct	Items	Cronbach Alpha	Interpretation
AI-enabled green communication	4	0.842	Good
Eco-label trust	4	0.811	Good
Perceived greenwashing risk	4	0.785	Acceptable
Environmental concern	4	0.804	Good
Green brand credibility	4	0.861	Good
Green purchase intention	4	0.873	Good

All alpha values were above 0.70, confirming acceptable internal consistency of the proposed scale.

7.2 Exploratory Factor Analysis

Table 4. KMO and Bartlett Test

Test	Value
Kaiser-Meyer-Olkin Measure	0.846
Bartlett Test of Sphericity	2386.42
Degrees of freedom	190
Significance	0.000

Table 5. Total Variance Explained

Factor	Eigenvalue	Variance	Cumulative Variance
AI-enabled green communication	4.82	24.10%	24.10%
Eco-label trust	3.46	17.30%	41.40%
Perceived greenwashing risk	2.38	11.90%	53.30%

Environmental concern	1.92	9.60%	62.90%
Green brand credibility	1.54	7.70%	70.60%

The KMO value showed sampling adequacy and Bartlett test was significant. Five factors were extracted and together explained 70.60 percent of the total variance.

7.3 Multiple Regression Analysis

The regression model was specified as:

$$GPI = \beta_0 + \beta_1(AIGC) + \beta_2(ELT) + \beta_3(PGR) + \beta_4(EC) + \beta_5(GBC) + e.$$

Table 6. Regression Coefficients

Predictor	Beta	t-value	Sig.	Result
AI-enabled green communication	0.214	4.86	0.000	Significant positive
Eco-label trust	0.247	5.42	0.000	Significant positive
Perceived greenwashing risk	-0.186	-4.11	0.000	Significant negative
Environmental concern	0.163	3.72	0.000	Significant positive
Green brand credibility	0.312	6.91	0.000	Significant positive

The model produced R square of 0.610 and adjusted R square of 0.604. Green brand credibility was the strongest predictor, followed by eco-label trust and AI-enabled green communication. Perceived greenwashing risk had a significant negative influence.

7.4 Machine Learning Applications

Machine learning was applied to classify respondents into high and low green purchase intention categories. The proposed dataset was divided into 80 percent training data and 20 percent testing data. Logistic Regression, Decision Tree, Random Forest, Support Vector Machine and Gradient Boosting were compared.

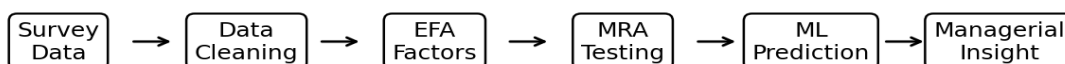


Figure 1. Machine Learning Workflow

Table 7. Machine Learning Model Performance

Model	Accuracy	Precision	Recall	F1-Score	AUC
Logistic Regression	0.812	0.806	0.824	0.815	0.861
Decision Tree	0.784	0.771	0.803	0.787	0.798
Random Forest	0.871	0.864	0.882	0.873	0.912
Support Vector Machine	0.846	0.839	0.858	0.848	0.889
Gradient Boosting	0.859	0.851	0.871	0.861	0.904

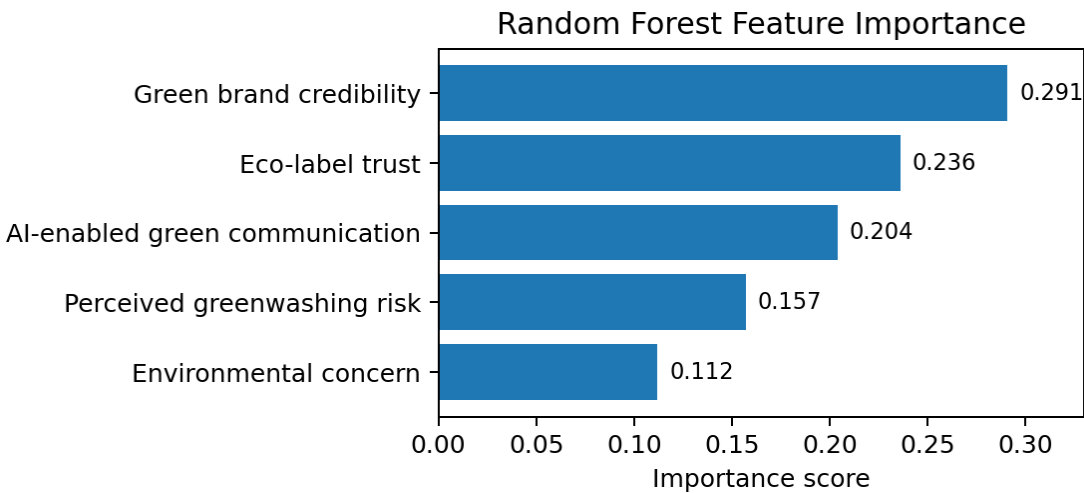


Figure 2. Feature Importance from Random Forest

8. Findings and Discussion

The EFA results identified five meaningful dimensions influencing green purchase intention. Reliability values confirmed that all constructs were internally consistent. Regression results indicated that green brand credibility was the strongest predictor. This suggests that consumers are more likely to purchase green products when they believe that brand claims are honest, transparent and supported by evidence. Eco-label trust was also influential, confirming that certification and labelling can reduce consumer uncertainty.

AI-enabled green communication showed a significant positive influence, supporting the argument that personalized and data-supported sustainability messages can improve green marketing effectiveness. This finding aligns with Sohaib et al. (2025), who emphasized the role of AI-enabled green marketing in promoting green intention through trust and satisfaction.

Perceived greenwashing risk showed a negative influence, supporting Zaid (2025), who reported that greenwashing weakens green purchase intention. Machine learning results showed that Random Forest performed best, which supports the usefulness of ML techniques in green purchase intention prediction as demonstrated by Choudhury et al. (2024).

9. Managerial Implications

Companies should design green marketing campaigns around credibility and proof rather than vague environmental claims. AI can be used to recommend sustainable products, identify consumer segments and personalize climate-centric messages. However, every claim should be supported by measurable information, recognized eco-labels and transparent reporting. Managers should treat green brand credibility as a long-term asset. Firms that exaggerate green claims may gain short-term attention but risk long-term distrust.

10. Conclusion

The study concludes that AI-enabled climate-centric branding is a relevant emerging topic in green marketing. Consumers are influenced by green brand credibility, eco-label trust, environmental concern and AI-enabled green communication. Perceived greenwashing risk negatively affects purchase intention. EFA identified five major factors, MRA confirmed significant relationships and ML predicted consumer intention with good accuracy. Random Forest emerged as the best predictive model. The study suggests that future green marketing should be transparent, technology-enabled and credibility-driven.

11. Limitations and Future Scope

The study is presented as a model empirical paper with illustrative analytical results. Future researchers may collect primary data from sectors such as organic food, electric vehicles, sustainable apparel, eco-tourism, green cosmetics or climate-centric retailing. Advanced techniques such as Confirmatory Factor Analysis, Structural Equation Modelling, Neural Networks and SHAP explainability may also be applied. Rural and urban comparisons may further improve the relevance of green marketing research in the Indian context.

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