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UNDERSTANDING GREEN CONSUMERISM: BUYING BEHAVIOUR AND SUSTAINABLE MARKET TRENDS IN INDIA WITH FUZZY MODEL

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ABSTRACT
Consumer interest in environmental sustainability, health, and ethical production has grown significantly in India. This study investigates green consumerism by examining consumer buying behaviour and emerging sustainable market trends. Building on the Theory of Planned Behaviour (TPB) and complementary behavioural frameworks, the research identifies key determinants of green purchasing, including environmental concern, perceived consumer effectiveness, ethical obligation, and awareness of greenwashing. Findings indicate that while environmental awareness among Indian consumers is rising, challenges such as high product costs, limited availability, and trust issues continue to hinder sustainable consumption. Notably, markets for eco-friendly electronics, organic products, and green packaging are expanding, signalling a gradual shift in consumer preferences toward sustainability. The study emphasizes that urbanization, education, government policies, and global sustainability awareness are key drivers of this transition. Green purchasing decisions, however, are inherently complex and often influenced by uncertainty, vagueness, and subjective perceptions. Traditional behavioural models like TPB explain intentions but may not fully capture hesitation and imprecise attitudes. To address this limitation, the study proposes a fuzzy logic-based approach, particularly using intuitionistic fuzzy sets, to model and quantify ambiguity in eco-conscious consumer behaviour. This framework provides a nuanced understanding of decision-making processes and can guide policymakers and businesses in designing strategies that enhance transparency, affordability, and trust. By integrating behavioural theory with fuzzy modelling, this research offers a comprehensive perspective on India's evolving green consumer landscape, highlighting the interplay between consumer intentions, market trends, and sustainable consumption practices.

Keywords: *Green consumerism, fuzzy model, sustainable market, consumer behaviour, TPB, decision-making, India.*

1. INTRODUCTION
Environmental degradation, climate change, and unsustainable consumption patterns represent some of the most critical global challenges of the 21st century. In India, these challenges are compounded by a rapidly expanding middle class and rising consumerism, which place significant pressure on balancing economic growth with environmental sustainability (Chaudhary, 2018). As environmental consciousness grows, a new trend—"green consumerism"—has emerged, characterized by consumers who prefer environmentally responsible products and ethically driven business practices (Rukhsar, Sharma, & Kumar, 2024). Although this transformation is still in its early stages in India, it is gradually gaining momentum. Consumers are increasingly showing interest in green products, including organic foods, energy-efficient appliances, and eco-friendly packaging (Namdev & Gawas, 2020). Despite this growing awareness, a notable gap exists between consumers' environmental knowledge and their actual purchasing behaviour. This gap is influenced by factors such as perceived product quality, affordability, and consumer trust in green offerings (Jog & Singhal, 2020). Rapid economic growth, urbanization, and rising living standards have intensified consumption patterns, placing environmental sustainability at the forefront of both public discourse and corporate strategy. As concerns about climate change, resource depletion, and pollution escalate, consumers are becoming more attentive to the environmental and social impacts of their purchasing decisions (Joshi & Rahman, 2017). Consequently, green consumerism is emerging as a mode of consumption in which buyers actively seek products and services that minimize environmental harm, conserve natural resources, and promote social responsibility. Understanding this evolving phenomenon is essential for policymakers, businesses, and researchers aiming to align market practices with sustainable development objectives (Chaudhary, 2018).

This study addresses existing gaps in understanding green consumerism in India by integrating theoretical perspectives and empirical findings to propose a comprehensive framework. The research specifically aims to: (a) identify key psychological and situational determinants of green buying behaviour, (b) map current sustainable market trends and sectoral dynamics, and (c) highlight policy and managerial interventions that can

ISSN 2322 - 0899

enhance consumer trust, reduce market frictions, and encourage wider adoption of sustainable consumption practices. By combining insights from behavioral theory with market analysis, this study provides guidance for firms and policymakers on translating increasing environmental concern into measurable and scalable market outcomes.

The study reviews literature on Indian consumers' green purchasing behaviour through frameworks such as the Theory of Planned Behaviour (TPB), environmental psychology, and consumer behaviour models, focusing on sustainable market trends. The analysis identifies common determinants, barriers, and patterns, synthesizing findings thematically to develop a conceptual understanding of green consumerism in India. Green consumerism reflects the alignment of individual purchasing behaviour with environmental and social sustainability values. As global concerns over climate change, resource depletion, and pollution intensify, consumers increasingly seek products that are environmentally friendly, ethically produced, and socially responsible (Biswas & Roy, 2015). In the Indian context, green consumerism has been gaining traction, particularly among urban, educated populations who are more aware of the environmental consequences of their consumption choices (Kumar & Ghodeswar, 2015). This heightened awareness is evident in market segments such as organic food, plant-based beverages, eco-friendly personal care products, and sustainable fashion, which are witnessing increasing adoption due to consumer preference for environmentally responsible products.

Understanding consumer behaviour in the context of sustainable consumption is inherently complex. Although many consumers report pro-environmental attitudes, these do not consistently translate into green purchasing behaviours, a phenomenon widely recognized as the "attitude-behaviour gap" (Joshi & Rahman, 2019). This discrepancy arises from multiple factors, including socio-economic constraints, cultural norms, perceived efficacy, and limited product availability. Furthermore, consumers often experience hesitation and uncertainty when evaluating eco-friendly products, influenced by ambiguous labelling, price sensitivity, and questions regarding the reliability of environmental certifications (Paul et al., 2016).

Behavioural theories, particularly the Theory of Planned Behaviour (TPB), provide a structured framework for analysing green purchasing intentions (Ajzen, 1991). According to TPB, an individual's behavioural intentions are shaped by attitudes toward the behaviour, subjective norms, and perceived behavioural control. While these frameworks are valuable, they generally assume that behavioural determinants are deterministic, thereby overlooking the inherent vagueness and uncertainty in human decision-making. To address these limitations, fuzzy logic and intuitionistic fuzzy systems offer robust mathematical tools for modelling imprecise, uncertain, or hesitant consumer judgments (Zadeh, 1965; Atanassov, 1986).

This study adopts a fuzzy modelling perspective to explore green consumerism in India, integrating behavioural theories with fuzzy and intuitionistic fuzzy systems to capture the ambiguity in attitudes, intentions, and perceptions. The research aims to (i) identify the key determinants influencing green purchasing, (ii) examine emerging trends in sustainable markets, and (iii) develop a framework for analysing consumer uncertainty using fuzzy-based methodologies. By combining behavioural theory with fuzzy logic, the study provides a nuanced understanding of green consumer behaviour, offering insights for policymakers, marketers, and sustainability advocates.

2. LITERATURE REVIEW

The academic literature highlights several psychological and contextual factors influencing green purchasing behaviour. The Theory of Planned Behaviour (TPB), which posits that behavioural intentions are shaped by attitudes, subjective norms, and perceived behavioural control, has been widely employed to study sustainable consumption (Ajzen, 1991). In the Indian context, empirical studies extending TPB have incorporated additional constructs such as environmental concern, perceived consumer effectiveness, ethical obligation, and trust in eco-claims (Rukhsar, Yameen, & Khanam, 2024; Yadav & Pathak, 2017). Although many Indian consumers report pro-environmental attitudes, translating these attitudes into actual purchase behaviour is often hindered by factors such as price sensitivity, perceived product performance, and limited product availability (Chaudhary, 2018; Jog & Singhal, 2020).

Market-level dynamics are actively reshaping the green consumption landscape in India. Sectors such as organic food, natural personal care products, energy-efficient appliances, and eco-friendly packaging have demonstrated measurable growth, particularly among urban, educated, and higher-income consumers (Mahlawat, 2018; Namdev & Gawas, 2020). The COVID-19 pandemic further influenced consumer priorities, emphasizing health, safety, and local sourcing, which in many cases coincided with sustainable purchasing motives and accelerated demand for specific green products (Chowdhury & Paul, 2022).

Despite these positive trends, several persistent barriers continue to challenge the green market. The prevalence of greenwashing and weak regulatory enforcement regarding sustainability claims undermine consumer trust and impede the scaling of eco-conscious products (Jog & Singhal, 2020). Although a growing body of research exists, significant gaps remain. First, much of the literature predominantly focuses on urban or convenience samples, leaving rural and lower-income consumer behaviour relatively underexplored (Chaudhary, 2018). Second, while extensions of the Theory of Planned Behaviour (TPB) explain purchase intentions effectively, fewer studies investigate the longitudinal attitude–behaviour gap, including repeat purchases and brand loyalty in green markets. Third, evidence regarding the role of digital media, fintech innovations, and traceability technologies (e.g., blockchain) in addressing information asymmetries and shaping purchase decisions in India is still emerging (Rukhsar et al., 2024).

Author(s) (Year)	Purpose / Research Question	Methodology & Sample	Key Findings	Implications for Current Study
Ajzen (1991)	Present Theory of Planned Behaviour (TPB) as a framework to predict intention → behaviour.	Theoretical paper; formulation of TPB.	Attitude, subjective norms, and perceived behavioural control predict behavioural intention which predicts behaviour.	Provides the primary theoretical backbone for modelling green purchase intention (use TPB + extensions). (Ajzen, 1991)
Yadav & Pathak (2017)	Identify determinants of green purchase behaviour in a developing country context (India).	Quantitative survey; sample of Indian consumers; structural equation modeling.	Environmental concern, attitude, and PCE (perceived consumer effectiveness) strongly predict green purchase intention; knowledge alone is insufficient.	Empirical support for adding PCE and environmental concern to TPB in Indian context. (Yadav & Pathak, 2017)
Joshi & Rahman (2017)	Examine drivers of sustainable purchase behaviour across consumer segments.	Review plus empirical elements; cross-sectional consumer data.	Environmental concern and perceived behavioural control influence purchase; socio-demographics moderate effects.	Reinforces need to control for demographics (age, income, education) when analysing green buying. (Joshi & Rahman, 2017)
Chaudhary (2018)	Explore willingness to pay (WTP) a premium for green products in India.	Survey-based empirical study; urban Indian consumers.	Many consumers state willingness to pay a premium, but actual WTP is limited and conditional on perceived value and product performance.	Highlights price premium as a major barrier; suggests value-communication strategies. (Chaudhary, 2018)
Mahlawat (2018)	Assess green awareness, perception, and brand preference among Indian consumers.	Descriptive and analytical study; sample across urban centres.	Younger and educated consumers show greater green awareness and brand preference; regional differences observed.	Suggests segmentation: initial targeting should focus on urban, educated youth. (Mahlawat, 2018)
Namdev & Gawas (2020)	Investigate green buying behaviour for Ayurvedic/ herbal cosmetic products in India.	Empirical survey of cosmetics consumers; regression analysis.	Health concerns, product trust, and perceived naturalness drive purchase of Ayurvedic products; price remains a moderating factor.	Sector-specific insight: cultural fit (Ayurveda) can strengthen green uptake. (Namdev & Gawas, 2020)
Jog & Singhal	Examine greenwashing	Mixed methods; consumer survey	Awareness of greenwashing reduces	Points to credibility and transparent

ISSN 2322 - 0899

(2020)	awareness and its impact on green consumption in India.	and qualitative assessment.	trust in green claims and weakens purchase intention even among environmentally concerned consumers.	certification as critical for market growth. (Jog & Singhal, 2020)
Chowdhury & Paul (2022)	Assess how COVID-19 influenced sustainable consumption and green marketing in India.	Empirical analysis using pandemic-period consumer data; case examples.	COVID-19 increased emphasis on health, local sourcing, and sustainability in purchase decisions; firms adapted green messaging and supply-chain transparency.	Shows contextual shocks (pandemic) can accelerate green market trends; signals importance of health-framed green messaging. (Chowdhury & Paul, 2022)
Rukhsar, Yameen & Khanam (2024)	Understand purchase behaviour toward green electronic products using TPB extensions.	Quantitative study focused on electronics consumers (Delhi/NCR); SEM analysis.	Attitude, subjective norms, perceived behavioural control, and ethical obligation significantly predict intent; product performance and credibility moderate behaviour.	Confirms applicability of TPB-extensions in electronics sector; underscores role of product performance & credibility. (Rukhsar et al., 2024)

Green consumer behaviour refers to the patterns of purchasing and consumption in which individuals make choices that prioritize environmental sustainability. In India, this behaviour is increasingly prevalent among urban and semi-urban populations, reflecting a growing awareness of environmental issues. Research indicates that consumers are highly concerned about pollution, climate change, and the depletion of natural resources, which significantly influences their preference for eco-friendly products (Biswas & Roy, 2015). The adoption of sustainable consumption practices, including the purchase of organic food, plant-based beverages, energy-efficient appliances, and biodegradable packaging, exemplifies both personal environmental responsibility and broader societal consciousness toward ecological preservation (Gupta & Ogden, 2009; D'Souza, Taghian, & Lamb, 2007).

2.1 Theoretical Foundations

The Theory of Planned Behaviour (TPB) is a widely utilized framework for understanding green consumerism. Developed by Ajzen (1991), TPB posits that an individual's behavioural intentions are influenced by three key factors: attitude toward the behaviour, subjective norms, and perceived behavioural control. These intentions, in turn, predict actual behaviour. In the Indian context, research has extended TPB by incorporating additional variables such as environmental concern, perceived consumer effectiveness (PCE), and ethical obligation. For instance, Rukhsar et al. (2024) applied an extended TPB model to examine consumer purchase behaviour toward green electronic products in India. Their study highlighted the importance of environmental concern and ethical obligation in shaping green purchase intentions.

Chaudhary (2018) identified attitude toward green products as the strongest predictor of green purchase intention among Indian consumers. Her research emphasized the significance of consumer attitudes in driving sustainable purchasing decisions. Furthermore, subjective norms—such as influences from peers, family, and social groups—play a variable role in green consumer behaviour, depending on demographic and cultural factors. Recent findings also indicate that awareness of greenwashing moderates consumer trust and purchase intentions. Jog and Singhal (2020) found that consumers' understanding of greenwashing affects their responsiveness to green advertising and subsequent purchasing behaviour. Behavioural theories offer critical insights into the cognitive and motivational processes that underpin green consumerism. Among these, the Theory of Planned Behavior (TPB) is widely employed in sustainability research to elucidate the relationships between attitudes, subjective norms, perceived behavioural control, and consumers' intentions to purchase environmentally friendly products (Ajzen, 1991). Complementing this perspective, environmental psychology emphasizes the role of personal norms, ecological values, and perceived responsibility as predictors of pro-environmental behaviour (Schultz, 2000).

ISSN 2322 - 0899

Despite their explanatory power, these theoretical frameworks often struggle to address the inherent vagueness and uncertainty present in consumer decision-making. Consumers may demonstrate ambiguous preferences, partial commitment, or hesitation when considering eco-friendly purchases. For instance, while a consumer may acknowledge the importance of sustainability, they may refrain from purchasing a green product due to concerns about price or limited trust in eco-labelling and certification standards. Such subjective and uncertain factors highlight the need for analytical models that can accommodate imprecision and ambiguity in consumer behaviour (Liu et al., 2022; Wang & Lee, 2021).

2.2 Determinants of Green Buying Behaviour in India

2.2.1 Environmental Concern (EC)

Environmental concern (EC) refers to the degree to which individuals are aware of environmental issues and support efforts to mitigate them. Research indicates that EC significantly influences purchase intentions among Indian consumers. For instance, Joshi and Rahman (2017) found that heightened environmental consciousness positively impacts consumers' intention to buy green products among educated young consumers in Delhi. However, concern alone may not lead to green purchasing without the perception that individual actions can make a difference. Rukhsar et al. (2024) emphasize that EC remains a significant predictor of green purchasing intentions, suggesting that consumers with heightened awareness of environmental issues are more inclined to make eco-friendly purchases.

2.2.2 Perceived Consumer Effectiveness (PCE

Perceived Consumer Effectiveness (PCE)—the belief that individual actions can contribute to environmental outcomes—has been identified as a significant mediator between environmental concern and purchase intention. In the Indian context, Yadav and Pathak (2017) found that consumers who perceive their actions as impactful are more likely to engage in green purchasing behaviours. Similarly, ethical obligation or moral responsibility has been shown to strengthen sustainable decision-making. Namdev and Gawas (2020) highlighted that a sense of ethical duty enhances consumers' commitment to sustainable choices. In a recent study, Yameen and Rukhsar (2025) further emphasized the role of PCE in influencing green purchase behaviour. Their research indicates that consumers in India who believe their choices can make a difference are more likely to engage in environmentally friendly purchasing decisions.

2.2.3 Price Sensitivity

Price sensitivity continues to be a significant barrier to green consumption in India. Despite positive attitudes toward eco-friendly products, many consumers remain unwilling to pay a premium for them (Chaudhary & Bisai, 2018). Studies indicate that although consumers express favourable environmental intentions, actual purchasing behaviour often does not reflect these intentions, as price considerations frequently override environmental concerns (Yameen & Rukhsar, 2025). Trust and credibility are also critical factors in influencing green consumption. Misleading claims regarding environmental benefits, commonly referred to as greenwashing, can erode consumer confidence (Jog & Singhal, 2020). Research demonstrates that while environmental concerns positively impact green purchase behaviour, this relationship weakens when consumers perceive greenwashing, highlighting the necessity of transparency and authenticity in marketing green products (Jog & Singhal, 2020). Overall, price sensitivity, combined with issues of trust and credibility, remains a major deterrent to green purchasing behaviour in India. Consumers may hold positive attitudes toward sustainable products, but the higher cost and potential for misleading claims often prevent these attitudes from translating into actual purchases (Chaudhary & Bisai, 2018; Yameen & Rukhsar, 2025).

2.2.4 Subjective Norms

Subjective norms and social influence are critical determinants of green purchasing behaviour, particularly among younger consumers such as Millennials and Generation Z. These groups often associate sustainable consumption with social identity and seek digital peer approval, reflecting the importance of social validation in environmentally conscious choices (Mahlawat, 2018). In India, sustainable consumption is shaped not only by economic considerations but also by social and cultural factors. Peer pressure, family expectations, and societal norms significantly influence consumers' green purchasing decisions, as individuals tend to emulate the attitudes and behaviours of their social circles. Empirical studies confirm that subjective norms have a positive impact on green buying behaviour in the Indian context, highlighting the interplay between social influence and environmentally responsible consumption (Yameen & Rukhsar, 2025). Understanding these social drivers is essential for marketers and policymakers aiming to promote sustainable consumption among younger demographics.

ISSN 2322 - 0899

2.2.5 Demographic Factors

Demographic factors significantly influence green buying behaviour in India, with variables such as age, education, income, and urbanization playing pivotal roles in shaping consumers' inclination toward sustainable consumption. Research indicates that younger, well-educated, and higher-income individuals are more aware of environmental issues and more likely to purchase eco-friendly products. Urban consumers, in particular, demonstrate stronger preferences for sustainable goods due to greater exposure to green marketing and accessibility to eco-friendly options. Overall, demographic attributes serve as key determinants in predicting environmentally responsible purchasing behavior among Indian consumers (Yameen & Rukhsar, 2025).

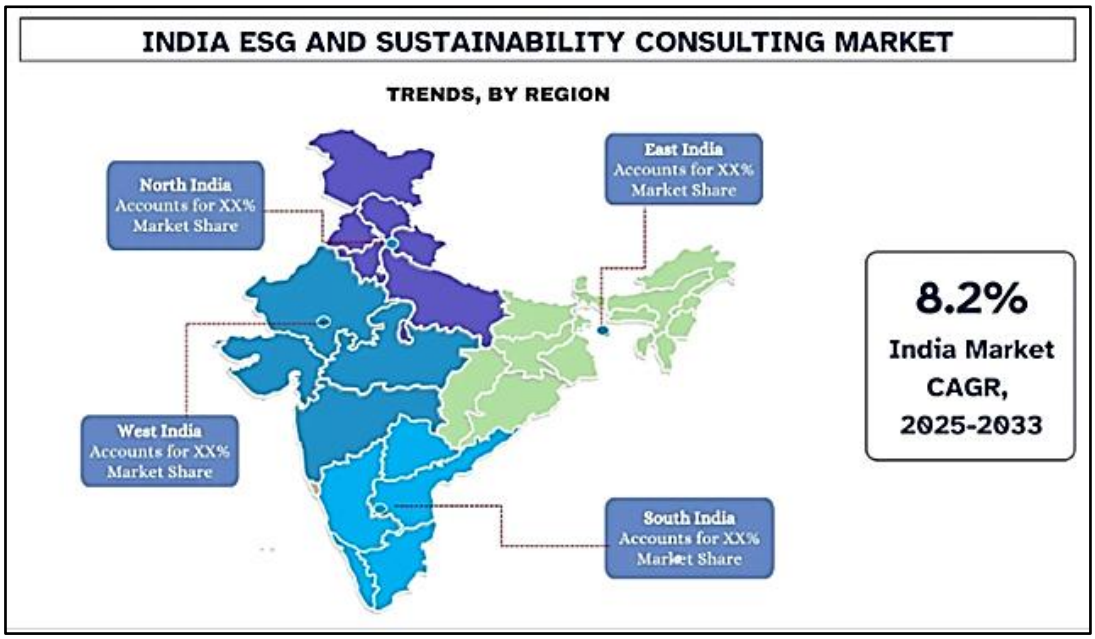
2.2.6 Trust and Credibility

Trust and credibility are critical factors influencing green consumer purchasing decisions. The reliability of product claims and eco-labels significantly impacts consumer confidence in sustainable products. However, the prevalence of greenwashing—where firms exaggerate or falsify environmental benefits—undermines this trust and weakens consumer commitment to sustainable consumption. Research indicates that Indian consumers increasingly rely on credible information and authentic sustainability certifications when making green purchases. Therefore, trust and transparency emerge as key determinants of green buying behavior in India, emphasizing the importance of verified eco-labels and ethical marketing practices in promoting sustainable consumer choices (Das & Roy, 2024; Yameen & Rukhsar, 2025).

2.3 Sustainable Market Trends in India

The sustainable market in India is undergoing rapid transformation, driven by heightened consumer awareness, supportive government policies, and evolving corporate strategies. Key growth sectors include organic foods, eco-friendly packaging, green electronics, and natural personal care products. In the electronics sector, consumers are increasingly prioritizing sustainability. Attributes such as energy efficiency and recyclability are becoming significant considerations in purchasing decisions. This trend reflects a broader shift towards environmentally responsible consumption patterns. Similarly, the cosmetics industry is experiencing a surge in demand for Ayurvedic and herbal products. This shift is driven by health-conscious and eco-aware consumers seeking natural alternatives. Studies have highlighted that consumers perceive a strong relationship between these products and their healing properties, influencing their purchasing decisions.

The COVID-19 pandemic has further accelerated the adoption of sustainable consumption practices. Consumers have become more focused on safety, locality, and environmental impact, leading to a heightened demand for products that align with these values. Government initiatives such as the Swachh Bharat Abhiyan, Plastic Waste Management Rules (2016), and Extended Producer Responsibility (EPR) have been instrumental in promoting sustainable practices. These policies encourage businesses to adopt eco-friendly measures, though challenges remain in enforcement and consumer awareness. In conclusion, India's sustainable market is evolving rapidly, influenced by growing consumer awareness, government initiatives, and corporate strategies. This dynamic landscape presents both opportunities and challenges for stakeholders aiming to contribute to a more sustainable future.



ISSN 2322 - 0899

2.3.1. Growth of Green Technology and Sustainability Market

India's green technology and sustainability market has experienced significant growth, reflecting a strategic shift towards environmentally responsible economic development. According to Grand View Research (2023), the sector's revenue increased from USD 628.2 million in 2023 to USD 4,609.0 million by 2030, representing a compound annual growth rate (CAGR) of 32.9%. This expansion is driven by a combination of policy reforms, technological innovation, and heightened public awareness of climate change and sustainability challenges. Key areas contributing to this growth include renewable energy, sustainable infrastructure, and waste management solutions, which collectively underscore India's commitment to transitioning towards a low-carbon economy. Government initiatives such as the National Solar Mission and the Smart Cities Mission have further catalysed private sector investment and international collaboration. Additionally, the increasing adoption of clean technologies across industries—from manufacturing to transportation—highlights a broader transformation towards sustainable business practices. Collectively, these developments position India as an emerging leader in the global green economy, aligning national growth with environmental stewardship and long-term sustainability objectives.

2.3.2. Rise in Sustainable Consumption

Sustainable consumption in India has emerged as a defining trend in the nation's evolving market landscape, reflecting a significant shift in consumer preferences and industrial practices. Valued at approximately USD 200 billion in 2023, the sector is projected to grow at a compound annual growth rate (CAGR) of 18–20% in the coming years (Trans4m, 2024). This growth is primarily driven by rising environmental awareness, ethical considerations, and the increasing demand for eco-friendly and responsibly produced goods. Urban consumers, particularly the younger demographic, are exhibiting a strong preference for sustainable alternatives in fashion, food, personal care, and home products. This changing mindset has encouraged industries to integrate environmentally responsible practices into production, packaging, and marketing strategies. Companies are investing in green technologies, adopting circular economy models, and enhancing transparency across supply chains to align with consumer expectations. Moreover, government policies promoting sustainability, such as eco-labelling and plastic reduction initiatives, are further stimulating the market. The convergence of consumer awareness, ethical branding, and policy support underscores a transformative shift in India's consumption patterns, positioning sustainability as both a moral and economic imperative for long-term market competitiveness (Trans4m, 2024).

2.3.3. Electric Vehicle (EV) Adoption

The adoption of electric vehicles (EVs) in India has experienced significant growth, driven by supportive government policies and a growing focus on sustainability. The Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme, launched by the Government of India, has been instrumental in promoting EV adoption through financial incentives, subsidies, and infrastructure development. In 2023, EV sales in India surged significantly, signalling a broader shift toward cleaner mobility and reduced dependence on fossil fuels (Wagh, 2024). This momentum is supported by substantial investments in charging infrastructure, advancements in battery technology, and the increasing affordability of electric models. Moreover, state-level initiatives—such as tax exemptions, road fee waivers, and dedicated EV policies—have further encouraged consumer acceptance. Major automobile manufacturers are expanding their EV portfolios, while startups contribute to technological innovation and localized manufacturing. Collectively, these efforts are fostering a sustainable transportation ecosystem aligned with India’s net-zero emission goals. The rapid transition to electric mobility not only represents an industrial transformation but also demonstrates India’s commitment to climate resilience, economic growth, and urban sustainability.

2.3.4. Sustainable Fashion and Textiles

The Indian textile and fashion industry is increasingly adopting sustainable practices, aligning with global trends and responding to growing consumer awareness about environmental impacts. Initiatives like the 'Swadeshi Campaign' have been pivotal in promoting domestic handlooms, eco-friendly production methods, and traditional craftsmanship, while fostering cultural pride. These campaigns particularly engage urban youth and Generation Z consumers, who prioritize sustainability and ethical consumption. This demographic influences market trends and corporate strategies in the textile industry. The emphasis on sustainable fashion is not merely a response to consumer demand but also a strategic economic opportunity. The domestic textile market in India is projected to reach USD 250 billion by 2030, signalling substantial growth potential for eco-friendly and ethically produced apparel (Press Information Bureau [PIB], 2025). This growth underscores the dual importance of sustainability and economic development, as companies that integrate green practices into production, supply chain management, and marketing can enhance both their brand reputation and market competitiveness. Overall, the movement toward sustainable fashion in India represents a convergence of

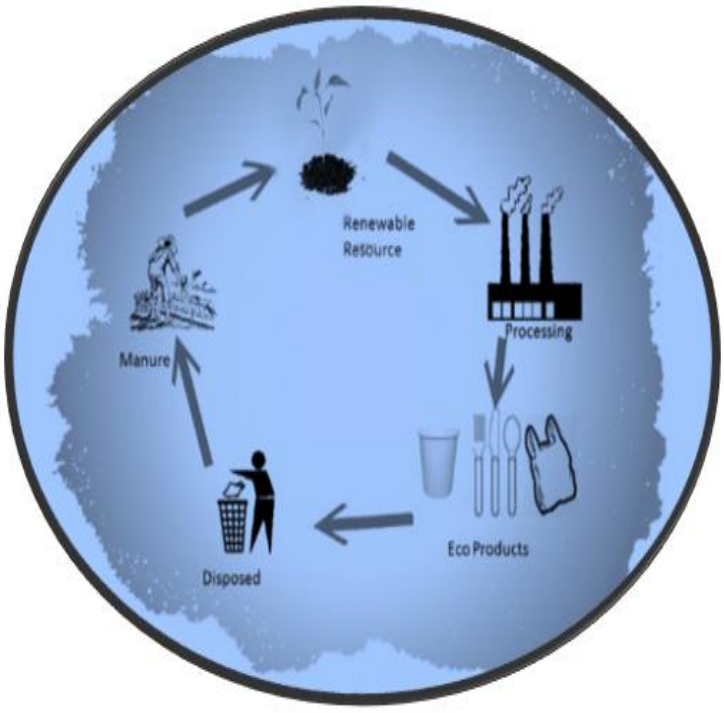
ISSN 2322 - 0899

cultural heritage, environmental responsibility, and economic opportunity, positioning the sector as a key contributor to the country's sustainable development objectives.

2.3.5. Eco-Friendly Packaging and Biopolymers

Eco-friendly packaging has emerged as a critical focus for businesses and policymakers in India, driven by increasing consumer demand for sustainable alternatives and stringent government regulations aimed at reducing plastic waste. Consumers are becoming more aware of the environmental impact of conventional packaging materials and increasingly prefer products packaged in biodegradable, recyclable, or compostable materials (Mintel, 2023). This growing awareness has prompted companies to adopt innovative packaging solutions, ranging from plant-based materials to recyclable plastics, as part of broader sustainability strategies. In parallel, government initiatives, such as bans on single-use plastics and the promotion of eco-labelling, have reinforced the adoption of sustainable packaging practices. The Plastic Waste Management (Amendment) Rules, 2025, introduced by the Ministry of Environment, Forest and Climate Change, mandate Extended Producer Responsibility (EPR), traceability, and compliance measures for plastic packaging producers (Ukhi, 2025). These regulations aim to shift India's plastics economy towards a modern, circular system, where plastics are made responsibly, tracked from start to finish, and reintegrated into the economy rather than polluting the planet (Ukhi, 2025).

One of the fastest-growing sectors in this area is the market for biopolymers. Biopolymers, derived from renewable resources, are being utilized not only in packaging but also in textiles and agriculture, offering environmentally friendly alternatives to conventional petroleum-based materials. The biopolymer packaging market in India is projected to reach a revenue of US$3,657.7 million by 2030, with a compound annual growth rate (CAGR) of 12% from 2025 to 2030 (Grand View Research, 2025). This expansion reflects both technological innovation and a societal shift towards sustainability. As companies invest in research and development of green packaging solutions, the intersection of consumer preference, regulatory support, and technological advancement is expected to accelerate the adoption of eco-friendly materials. This convergence not only reduces environmental impact but also creates new business opportunities in sustainable markets.



2.3.6. Government Initiatives and Policy Support

The Indian government has actively implemented a range of policies to foster sustainability and environmentally responsible consumption. Among these, eco-labelling systems serve as an important regulatory mechanism to inform consumers about the environmental impact of products, thereby promoting transparency and facilitating informed decision-making. By providing standardized information on energy efficiency, recyclability, and other eco-friendly attributes, eco-labelling encourages manufacturers to adopt sustainable practices and consumers to make environmentally conscious choices. In parallel, plastic waste management rules have been introduced to curb the widespread use of single-use plastics, reduce environmental pollution, and promote circular economy practices. These regulations not only mandate proper disposal and recycling

ISSN 2322 - 0899

mechanisms but also incentivize the development of alternative packaging solutions, such as bio plastics and reusable materials. Together, these initiatives aim to enhance consumer trust by ensuring the credibility of sustainability claims, addressing concerns about misleading green marketing, and reducing green washing practices. Furthermore, these measures align with global sustainability goals and provide a framework for businesses to integrate environmental considerations into production and marketing strategies. As awareness of environmental issues grows among Indian consumers, such government policies play a critical role in shaping sustainable consumption patterns, fostering responsible purchasing, and supporting the broader transition toward a greener economy (United Nations Environment Programme [UNEP], 2025).

2.3.7. Corporate Sustainability and ESG Reporting

Businesses in India are increasingly integrating sustainability into their corporate strategies, driven by evolving consumer expectations and stringent regulatory frameworks. Modern consumers prioritize environmental responsibility, ethical practices, and social accountability in their purchasing decisions, compelling companies to align their operations with sustainable principles (Garg et al., 2024). Simultaneously, regulatory bodies are instituting guidelines and reporting standards, such as mandatory ESG disclosures and eco-labelling, which incentivize corporations to adopt transparent and responsible practices (Securities and Exchange Board of India [SEBI], 2025). The increasing emphasis on Environmental, Social, and Governance (ESG) frameworks has catalysed a significant rise in ESG consulting services. Organizations are actively seeking expert guidance to develop and implement sustainable strategies, evaluate their environmental impact, and enhance governance structures. This trend reflects a growing recognition that sustainability is not merely a peripheral concern or marketing tool but a core component of long-term business resilience and competitiveness (UpGuard, 2023). Companies that integrate ESG considerations into their operations often experience improved reputation, operational efficiency, and investor confidence. These firms are better positioned in conscientious markets, as stakeholders increasingly prioritize ethical and sustainable business practices (EY, 2025). Moreover, adopting ESG-oriented practices aids in risk management, ensures compliance with evolving regulations, and fosters innovation, all while building and maintaining stakeholder trust (Climate Change, 2024).

In the context of India, the convergence of consumer demand, policy enforcement, and market dynamics is compelling businesses to deeply embed sustainability within their strategic frameworks. The Securities and Exchange Board of India (SEBI) has introduced guidelines for ESG ratings, emphasizing the importance of accurate and transparent ESG disclosures. This regulatory push underscores the critical role of sustainability in determining corporate success in contemporary India (Reuters, 2025).

3. METHODOLOGY

This research adopts a comprehensive review of existing literature encompassing studies on marketing and environmental behaviour related to green consumerism. It integrates insights from previous research to understand evolving sustainable market trends in India. Additionally, primary data may be gathered through surveys and interviews to explore consumer attitudes and perceptions toward sustainability. A fuzzy model is applied to analyse the complexities of green consumer behaviour, enabling a nuanced understanding of buying patterns and sustainable market dynamics within the Indian context, where environmental awareness and responsible consumption are gaining increasing significance in shaping modern consumer preferences and market strategies.

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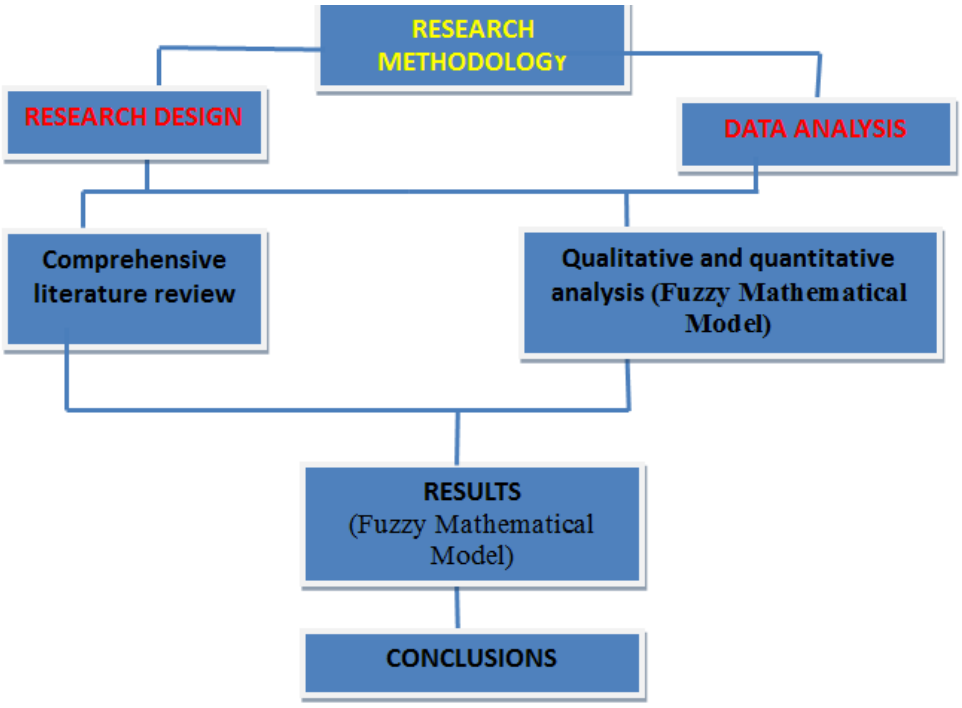

4. FINDINGS AND DISCUSSION

4.1 Drivers of Green Consumerism

The study of green consumer behaviour in India indicates that attitude, environmental concern, perceived consumer effectiveness (PCE), and ethical obligation are among the most influential factors shaping sustainable purchasing decisions (Chaudhary, 2018; Rukhsar et al., 2024). Consumers with heightened environmental concern tend to engage more actively in green buying behaviour when they believe their individual actions can significantly impact environmental protection, highlighting the mediating role of PCE between environmental awareness and actual purchasing behaviour (Yadav & Pathak, 2017). Despite the growing prevalence of environmental consciousness, many Indian consumers have limited knowledge regarding specific attributes of sustainable products (Joshi & Rahman, 2017). Often, consumers express favourable attitudes toward eco-friendly products without fully understanding aspects such as product lifecycle, resource efficiency, or certification standards. This discrepancy between awareness and informed decision-making underscores the need for structured educational and awareness initiatives that deliver accurate, accessible, and actionable information about sustainable products. Such interventions can enhance consumer confidence, reduce misinformation, and strengthen the overall impact of green consumerism in India. Therefore, fostering both ethical motivation and practical knowledge is critical for promoting consistent and meaningful sustainable consumption. Key drivers of green consumerism in India include education, awareness campaigns, environmental concern, income levels, and social influence (Kumar & Ghodeswar, 2015). Research suggests that individuals with higher education levels demonstrate greater awareness of sustainability issues and exhibit stronger purchase intentions for environmentally friendly products (Joshi & Rahman, 2019). Additionally, social norms and peer influence significantly affect consumer behaviour, as individuals are more likely to adopt sustainable consumption practices when supported by their social environment (Paul et al., 2016). However, despite these motivating factors, several barriers hinder the widespread adoption of green consumer behaviour. These include higher product prices, limited availability of eco-friendly options, and skepticism regarding the credibility of eco-labelling (Joshi & Rahman, 2019; Kumar & Ghodeswar, 2015). Addressing these challenges is critical for fostering a robust green consumer market in India.

4.2 Barriers to Green Consumption

Despite the growing positive attitudes toward environmentally sustainable products in India, significant behavioural gaps persist due to both structural and psychological barriers. One of the most frequently cited deterrents is the price premium associated with green products, which often discourages consumers from making environmentally friendly purchases despite their awareness and concern for sustainability (Chaudhary, 2018). Limited availability of such products further exacerbates the issue, particularly in smaller cities and rural areas where eco-friendly alternatives are often scarce. Additionally, consumer perceptions that green products underperform compared to conventional alternatives create a gap between environmental intentions and actual purchasing behaviour (Jog & Singhal, 2020).

ISSN 2322 - 0899

A critical challenge in fostering consumer trust is greenwashing, defined as the exaggeration or misrepresentation of a product's environmental benefits. Evidence suggests that suspicion of greenwashing significantly reduces consumers' willingness to purchase sustainable products, even among those with high environmental concern and favourable attitudes toward sustainability (Jog & Singhal, 2020). These findings underscore the importance of transparency, credible eco-labelling and regulatory oversight to bridge the attitude-behaviour gap and promote genuine adoption of green products in India.

4.3 Demographic Variations

Research indicates that demographic factors play a significant role in shaping green consumer behaviour in India. Younger consumers, especially those residing in urban areas and possessing higher levels of education and income, demonstrate a stronger propensity toward sustainable consumption (Mahlawat, 2018). This segment is more likely to evaluate the environmental impact of their purchases and actively seek eco-friendly products and brands that exhibit social responsibility. Education fosters awareness of environmental issues, while higher income levels allow consumers to afford green products, which are often associated with a premium price. Gender differences also influence sustainable consumption patterns. Studies reveal that women tend to display higher environmental concern and stronger ethical awareness, increasing their likelihood of supporting sustainable products and practices (Joshi & Rahman, 2017). These differences may be attributed to social roles and value systems that emphasize caregiving, household management, and long-term wellbeing. Conversely, rural consumers often encounter barriers such as limited access to sustainable products, lower awareness of environmental issues, and economic constraints, which restrict their engagement in green consumption (Chaudhary, 2018). Overall, these findings highlight the necessity of tailoring sustainability strategies to specific demographic segments. Policy interventions and marketing initiatives that enhance awareness, improve accessibility, and make green products more affordable could foster greater participation in sustainable consumption across diverse population groups.

4.4 Market and Policy Implications

The emergence of eco-friendly markets in India signifies a significant transformation in consumer behaviour and corporate strategies, underscoring the growing emphasis on sustainability in business practices. Prominent companies such as FabIndia, Forest Essentials, and Tata Power Solar have seamlessly integrated environmentally responsible principles into their operations, illustrating the economic viability of sustainability-driven business models (Chowdhury, 2024). These organizations not only cater to an expanding segment of environmentally conscious consumers but also establish industry benchmarks for ethical sourcing, resource efficiency, and social responsibility. The increasing preference for green products indicates that Indian consumers are placing greater value on environmental impact alongside product quality, marking a pivotal shift in the retail, energy, and lifestyle sectors.

From a policy standpoint, advancing sustainable markets necessitates comprehensive measures, including stringent regulation of eco-labelling, targeted consumer education, and fiscal incentives to promote green manufacturing. Policies that ensure transparency and credibility in sustainability claims can foster consumer trust, thereby encouraging broader adoption of eco-friendly products. Moreover, collaborative efforts among the government, private enterprises, and consumers are essential to develop a circular economy, where resource efficiency, waste reduction, and product life-cycle management are prioritized. Such an integrated approach can expedite India's transition toward sustainable development while generating long-term economic and environmental value.

5. FUZZY LOGIC AND INTUITIONISTIC FUZZY SYSTEMS

Fuzzy logic, first introduced by Zadeh (1965), allows variables to assume degrees of membership ranging from 0 to 1, representing partial truth rather than rigid binary decisions. This capability makes fuzzy logic particularly suitable for modelling consumer attitudes, which are often vague, subjective, or context-dependent. Zimmermann (1991) further extended fuzzy logic principles to optimization and decision-making scenarios, enabling more realistic representations of human preferences in complex environments. To handle uncertainty in decision-making, Dubois and Prade (1988) proposed possibility theory, which complements traditional probabilistic approaches by modeling imprecision rather than randomness. Atanassov (1986) introduced intuitionistic fuzzy sets, which incorporate three components: membership, non-membership, and hesitation. In the context of green consumerism, these frameworks facilitate nuanced modelling of attitudes, intentions, and perceptions. For instance, a consumer's willingness to adopt biodegradable packaging can simultaneously reflect partial positivity, partial negativity, and a degree of hesitation—capturing a more realistic behavioural pattern that conventional binary approaches cannot.

ISSN 2322 - 0899

Recent studies have applied fuzzy multi-criteria decision-making (FMCDM) techniques to evaluate consumer behaviour in sustainability contexts (Rashid et al., 2022). By assigning fuzzy scores to factors such as environmental concern, social influence, perceived affordability, and trust in eco-labelling, FMCDM provides a structured, comprehensive approach to understanding the determinants influencing green consumerism. This integration of fuzzy frameworks offers both theoretical richness and practical utility for analysing complex, subjective consumer decisions.

5.1 Research Design

This study employs a mixed-method approach to investigate consumer behaviour and sustainability patterns in India. Initially, a comprehensive literature review was conducted to examine Indian consumer behaviour, green purchasing trends, and sustainable market dynamics. The review focused on studies integrating theory of planned behaviour (TPB)**,** environmental psychology, and consumer behaviour frameworks to identify key determinants and barriers influencing eco-conscious purchasing (Ajzen, 1991; Kollmuss & Agyeman, 2002; Biswas & Roy, 2015). Subsequently, fuzzy modeling techniques were employed to capture the inherent uncertainty and subjectivity in consumer decision-making, providing a nuanced understanding of behavioural patterns under ambiguity (Zadeh, 1965; Atanassov, 1986).

5.2 Fuzzy Model Formulation

In the fuzzy model, behavioural factors such as environmental concern, social influence, perceived affordability, and trust are treated as fuzzy variables. Each variable is represented using linguistic terms—low, medium, and high—allowing the model to capture subjective and imprecise evaluations of consumer behaviour. Behavioural factors are treated as fuzzy variables with linguistic terms: low, medium, high. Intuitionistic fuzzy sets include membership (μ), non-membership (ν), and hesitation ($\pi = 1 - \mu - \nu$). For example: $\mu = 0.7$, $\nu = 0.2$, $\pi = 0.1$.

Let a behavioural factor X be described as a fuzzy variable with membership function $\mu_x(x)$. The degree of membership $\mu_x(x)$ indicates the extent to which a consumer exhibits the attribute (e.g., high environmental concern).

Intuitionistic fuzzy sets extend this representation by introducing a non-membership function $\nu_x(x)$ and a hesitation degree π_x defined as:

$$\pi_x(x) = 1 - \mu_x(x) - \nu_x(x)$$

where:

$\mu_x(x)$ is the membership degree,

$\nu_x(x)$ is the non-membership degree

$\pi_x(x)$ represents hesitation or uncertainty in the consumer's evaluation.

For example, consider a consumer's willingness to purchase eco-friendly products. Using an intuitionistic fuzzy representation:

$\mu = 0.7$, $\nu = 0.2$, $\pi = 0.1$

This indicates a 70% positive intention, 20% negative perception, and 10% hesitation.

Weighted Aggregation of Behavioural Factors in Fuzzy Model

This table illustrates the weighted aggregation of behavioural factors used in the fuzzy model to compute an overall green purchase score (S). Each factor (Xi) represents a behavioural determinant of green consumerism, assigned a relative weight (wi) and a membership value (μXi(x)). The final score is calculated as the weighted sum of all factors, where the total of weights equals 1.

Behavioural Factor (Xi)	Description	Weight (wi)	Membership Value (μXi(x))	Weighted Score (wi × μXi(x))
X_1	Attitude toward green products	0.25	0.7	0.175
X_2	Environmental concern	0.20	0.8	0.160
X_3	Perceived consumer effectiveness	0.15	0.6	0.090
X_4	Price sensitivity	0.15	0.5	0.075

ISSN 2322 - 0899

X_5	Availability awareness	0.10	0.7	0.070
X_6	Trust in eco-labels	0.15	0.8	0.120
	Total	1.00		S = 0.69

Fuzzy Score Equation:

$S = \Sigma (wi \times \mu Xi(x))$, with $\Sigma wi = 1$

The computation yields an overall fuzzy green purchase score (S = 0.69), indicating a moderately high level of sustainable consumer intention after aggregating behavioural factors.

This approach allows the fuzzy model to quantify uncertainty in consumer behaviour, incorporate multiple factors, and provide a structured framework for decision-making analysis. The intuitionistic fuzzy formulation ensures that both positive and negative tendencies, along with hesitation, are explicitly represented, enabling more nuanced insights into green consumer intentions.

5.3 Aggregation and Decision Rule

A fuzzy multi-criteria aggregation approach is employed to evaluate consumer green purchasing behaviour by integrating multiple behavioural factors. Weighted averages are used to calculate an overall green purchase score, taking into account environmental concern, social norms, affordability, and trust (Shen & Wang, 2013; Gegovska & Gajdzik, 2020). This methodology enables policymakers and marketers to identify priority consumer segments and design targeted interventions, thereby enhancing the effectiveness of sustainability strategies (Shen & Wang, 2013). By considering both subjective perceptions and objective criteria, fuzzy multi-criteria models offer a comprehensive framework for promoting environmentally responsible consumption (Gegovska & Gajdzik, 2020).

5.4. Determinants of Green Consumerism

Existing literature identifies several key determinants influencing green purchasing behaviour in India, including environmental concern, perceived consumer efficacy, product quality, price sensitivity, and social influence (Joshi & Rahman, 2019; Paul et al., 2016). These factors collectively shape consumer intentions and actions toward environmentally sustainable products. To quantify these influences, fuzzy modelling techniques are employed, allowing for the representation of these determinants along a continuum. This approach captures the varying degrees of impact each factor has on individual purchasing decisions, providing a nuanced understanding of consumer behaviour in the context of green purchasing.

5.5 Market Trends

Sustainable markets in India are experiencing significant growth, driven by increasing consumer adoption of eco-friendly products such as organic food, plant-based beverages, electric vehicles (EVs), and eco-conscious personal care items. Research indicates that Indian consumers are increasingly inclined towards products that are environmentally friendly, influenced by factors such as green product experience, environmental friendliness of companies, and social appeal (Kumar & Ghodeswar, 2015). Government initiatives like the Swachh Bharat Mission and Mission LiFE have played a pivotal role in promoting environmental awareness and encouraging sustainable practices. The Swachh Bharat Mission, launched in 2014, focuses on sanitation and cleanliness, leading to improved public health outcomes (Majid, 2020). Mission LiFE, introduced by NITI Aayog, aims to nudge individuals and communities towards adopting lifestyles that are in harmony with nature, thereby fostering a culture of sustainability (NITI Aayog, 2023). However, despite these positive developments, several challenges hinder the widespread adoption of sustainable products. Issues such as limited supply, higher prices, and inconsistent labelling practices continue to pose barriers. These factors affect consumer trust and willingness to pay a premium for eco-friendly products, suggesting the need for more robust infrastructure and regulatory frameworks to support the growth of sustainable markets in India.

5.6 Application of Fuzzy Modelling

Fuzzy logic and intuitionistic fuzzy systems are instrumental in capturing the uncertainty and ambiguity inherent in consumer behaviour, particularly in the context of green consumerism. These approaches facilitate nuanced market segmentation and inform policy development by quantifying hesitation and imprecision in consumer decision-making processes. For example, consumers' reluctance to purchase biodegradable products can be analysed through fuzzy models, allowing for targeted interventions such as price incentives, enhanced certification transparency, and social campaigns to address these hesitations effectively. Integrating fuzzy logic with the Theory of Planned Behaviour (TPB) and environmental psychology offers a robust framework for modelling imprecise consumer behaviour. TPB posits that attitudes, subjective norms, and perceived

behavioural control collectively influence behavioural intentions and actual behaviours (Ajzen, 1991). By incorporating fuzzy logic, researchers can better capture the complexities and uncertainties in these psychological constructs, leading to more accurate predictions of consumer behaviour.

In India, green consumerism is influenced by a multitude of behavioural, social, and economic factors, many of which are characterized by uncertainty and ambiguity. Fuzzy logic and intuitionistic fuzzy models provide powerful tools to quantify this uncertainty, enhancing the understanding of consumer behaviour and sustainable market trends. These models enable the identification of key drivers and barriers to green consumption, facilitating the development of strategies to promote sustainable purchasing behaviours. Future research should focus on empirical validation through surveys and the application of fuzzy inference systems across diverse product categories. Such studies would provide deeper insights into the factors influencing green consumerism and the effectiveness of various interventions. For businesses, implementing fuzzy modelling techniques can highlight priority consumer segments and inform eco-marketing strategies. By understanding the nuanced preferences and behaviours of different consumer groups, companies can tailor their marketing efforts to resonate more effectively with their target audiences. Policymakers can leverage insights derived from fuzzy models to design programs that reduce uncertainty, promote trust in eco-certifications, and increase product availability. These measures can enhance green market penetration, contributing to the broader goal of sustainable development.

6. CONCLUSION

Green consumerism in India presents both significant opportunities and notable challenges. Although awareness and intention toward sustainable consumption are rising, persistent behavioural and structural barriers continue to impede widespread adoption. Empirical evidence highlights that attitudes, environmental concern, and perceived consumer effectiveness are the strongest predictors of green purchasing behaviour. Yet, factors such as price premiums, limited availability, and the prevalence of greenwashing constrain market growth. Sustainable consumption trends are particularly prominent among younger, urban populations, indicating a generational shift in environmental values. To foster meaningful adoption, businesses must focus on transparent communication, credible eco-labelling, and affordable green product lines, while policymakers need to implement regulations that discourage misleading claims and incentivize eco-friendly practices. From a research perspective, green consumer behaviour in India is influenced by complex, uncertain behavioural, social, and economic variables. Fuzzy and intuitionistic fuzzy models offer a robust framework to capture and quantify this uncertainty, providing insights into consumer decision-making under ambiguity. Future studies should aim for empirical validation through surveys and fuzzy inference systems, enabling more accurate prediction and strategic intervention. Ultimately, promoting sustainable consumption is not merely an ethical responsibility—it is a strategic imperative for achieving long-term economic growth, environmental resilience, and progress toward India's sustainable development goals.

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