International Journal of Social Ecology and Sustainable Development
Volume 15 • Issue 1

Advancing Sustainability:
Green Product Satisfaction, Circularity, and Sustainable Development

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ABSTRACT

This research focuses on sustainable consumption and production (SCP) to balance economic growth with ecological preservation. It assesses Greek consumers' attitudes, satisfaction, and knowledge about green products through questionnaires, analyzing the interplay of these factors in consumer satisfaction and highlighting the role of awareness in the green market. The study also compares these findings with Romanian consumer behavior to understand cultural and socioeconomic influences. Results show that positive attitudes towards green products and access to information significantly enhance consumer satisfaction, a trend consistent across different cultures. However, a lack of sustainability knowledge among youth presents an educational opportunity. The study advocates for strategic educational efforts to support SCP, emphasizing the need for well-informed product design, fair pricing, and clear communication to promote sustainable consumer habits, contributing to the broader SCP discourse and guiding future sustainable economy policies.

KEYWORDS

Circular Economy, Consumer Satisfaction, Environmental Attitudes, Green Products, Sustainable Consumption and Production, Sustainable Development

1. INTRODUCTION

In the contemporary global landscape, the interplay between consumer behavior and the proliferation of green products stands at the forefront of a paradigm shift towards sustainability (Kostis & Kafka, 2023). This paper seeks to explore and analyze this dynamic relationship, delving into how modern market trends are redefining the concept of green products and the corresponding consumer behavior. The study is set against the backdrop of the circular economy, a model emphasizing the reuse, recycling, and circulation of products and materials to minimize waste and environmental impact, thereby fostering a sustainable future (Petrakis & Kostis, 2020).

The urgency of addressing environmental concerns has never been more pronounced. As the world grapples with climate change, resource depletion, and environmental degradation, the role of green products and consumer choices in mitigating these challenges becomes increasingly critical.

DOI: 10.4018/IJSESD.335037 *Corresponding Author

This paper aims to dissect the complexities of this relationship, examining how consumer preferences and behaviors are evolving in response to the growing awareness of environmental issues and the availability of green alternatives.

We delve into the challenges businesses face in transitioning to sustainable practices, exploring the internal and external factors that hinder or facilitate this shift. The study also highlights sustainability opportunities for businesses, from energy savings and waste reduction to tapping into the growing consumer demand for environmentally friendly products.

Our methodology revolves around a comprehensive survey conducted in Greece, primarily targeting residents of the Attica region. The survey, distributed via Google Forms, aimed to gauge the environmental consciousness of respondents, their knowledge and attitudes towards green products, and their satisfaction levels with these products. This approach allows us to draw insights from a specific demographic, providing a nuanced understanding of consumer behavior in the context of green products.

This manuscript contributes to the burgeoning discourse on sustainable consumerism and the circular economy. By examining the interconnections between consumer behavior, business challenges, and opportunities in sustainability, we aim to provide valuable insights for businesses, policymakers, and consumers alike. The findings and discussions presented herein are intended to inform strategies that align business practices with sustainable development goals, ultimately contributing to a more sustainable and environmentally responsible future.

This work is structured to methodically explore the intricate relationship between consumer behavior and green products within the framework of a circular economy. A detailed Literature Review, is presented which (i) examines the emergence and characteristics of green products and their influence on consumer behavior, (ii) focuses on the barriers businesses face in adopting sustainable practices, and (iii) highlights the potential benefits and opportunities for businesses in the realm of sustainability. The next section, Data and Methodology, describes the research methodology, including the questionnaire's design and distribution and the survey's demographic focus. The Discussion section analyzes the survey results, contextualizes them, and explores their implications for businesses, policymakers, and consumers. Finally, the paper concludes with the Conclusions section, summarizing the key findings, offering recommendations for various stakeholders, and suggesting future research directions in sustainable consumer behavior and circular economy practices.

2. LITERATURE REVIEW

2.1 Redefining Green Products and Consumer Behavior in the Modern Market

In an era where consumerism significantly impacts socio-economic and environmental landscapes, the emergence of green products is a crucial solution (Walia et al. 2021). These products, designed to minimize environmental impact throughout their lifecycle, aim to reduce waste and maximize resource efficiency. They are characterized by using non-toxic ingredients, eco-friendly processes, and certifications from organizations like Energy Star and the Forest Stewardship Council (Das, 2021).

Consumer behavior towards green products is increasingly influenced by environmental consciousness. The market now offers a wide range of environmentally safe products, with consumer choices often guided by their ecological beliefs and awareness. Choosing green products benefits the individual and contributes to long-term environmental health. Developed countries have shown a greater inclination towards green lifestyles, with many companies adopting green marketing strategies for sustainable product development (Das, 2021) and adopting green IT solutions (Hernandez and Ona 2016).

A survey conducted by Simon-Kucher & Partners (2021) involving approximately 10,000 consumers across 17 countries revealed that 60% consider sustainability an essential purchasing criterion. However, only 34% are willing to pay extra for green products, with a higher willingness

observed among younger generations. This generational gap underscores a growing trend towards sustainability, particularly among younger consumers.

Purnama, et al. (2020) highlights eco-labels' influence on green product purchase intentions. This research emphasizes the benefits of environmentally friendly products for companies and society, suggesting the importance of understanding green consumer behavior for effective green marketing strategies and policy formulation.

The concept of a circular economy is integral to sustainable development, aiming to maximize product value through resource reuse at the end of their lifecycle (Cheng and Du 2010). The Circular Economy Package proposes policies to close the product life cycle loop, emphasizing recycling and reintroducing materials as secondary raw materials (Geissdoerfer et al., 2016).

Consumer expectations of green products have evolved, with a 2021 study by Kerry Group surveying 14,000 consumers across 18 countries finding that 49% seriously consider product sustainability. This shift is more pronounced in mature markets and among younger consumers. However, Tseng and Hung (2013) noted that the market shares of green products have not risen in line with environmental awareness, primarily due to a gap between customer expectations and perceptions of green products, highlighting the need for better alignment with consumer expectations (Baziana and Tzimitra-Kalogianni 2016).

2.2 Challenges for Businesses in Embracing Green Products

Traditional businesses in Europe are encountering significant challenges in transitioning to sustainable production lines, primarily due to internal and external factors (Lumbanbatu AND Wiet Aryanto 2015). Roome and Anastasiou (2002) identified three key barriers: the unsustainability of the current European production system, the limited impact of modernizing production on sustainability, and the inadequacy of current EU policies in fostering sustainable competitiveness. Additional challenges include diverse management styles and cultures, differences in cultural and linguistic approaches to collaboration, contradictory policies, limited private sector involvement in policymaking, low levels of research cooperation, absence of cross-sector initiatives, ineffective stakeholder engagement, poor knowledge sharing mechanisms, and confusion between environmental management and sustainable development (Filippov et al. 2015). These challenges necessitate new organizational methods, procedures, and cooperation with public bodies and partners (Walia et al. 2021).

The shift towards green products and sustainable resource use is gradually gaining traction among businesses. However, this transition is often gradual and only sometimes requires radical changes or significant investments (Henriksen et al., 2012). Challenges include insufficient funding for green initiatives, poor cooperation between sustainability and economic teams, lack of appropriate measures for environmental sustainability, and the absence of integrated strategies considering climate change, water scarcity, and land pollution (Edgeman et al. 2013).

Moreover, green business development poses unique challenges, such as balancing validating new climate technologies with planning for industrial-scale facilities in varying conditions and geographies. Start-ups often lead in green business due to their higher risk tolerance and agility (Veleva et al., 2014).

Veleva et al. (2014) in their study on Devens eco-industrial park, emphasize the importance of aligning business needs with sustainability challenges and establishing organizations to facilitate networking and collaboration. This approach is crucial for informing policymakers and entrepreneurs.

Henriksen et al. (2012) in the "Green Business Model Innovation Policy" report, highlight additional internal organizational and cultural barriers to adopting greener approaches. These include departmental disintegration, separation between financial and operational entities, lack of knowledge about functional sales models, challenges in training new employees, and accounting practices that discourage service-based models. Transitioning from immediate profit realization to extended amortization periods also presents a significant challenge (Aboelmaged 2012).

2.3 Opportunities for Businesses in Sustainability

In the realm of business sustainability, the practice of operating without negatively impacting the environment is increasingly crucial (Lam 2012). A green business not only focuses on profits but also considers its impact on society and the environment (Kaliski and Booker 2010). This approach contributes to the health of the business's ecosystem, fostering an environment conducive to its own thriving. However, transitioning to green business models is challenging, with financial and internal company issues often arising. As highlighted by sustainability experts, balancing sustainability with profitability remains a complex task.

One significant opportunity in this transition is energy saving and renewable energy sources. Energy Star estimates that a third of energy in commercial buildings is wasted, and small changes in energy use can lead to substantial savings and a reduced environmental impact. In production, the entire lifecycle of a product, from raw material extraction to disposal, can cause pollution and health impacts. Environmentally preferable products (EPP) can minimize these impacts, saving money and resources, reducing environmental impacts, and creating healthier workplaces.

Transportation is another area with significant environmental impact. Businesses can reduce pollution and save money by being more efficient with vehicle use, investing in vehicles with better fuel economy, and encouraging telecommuting. Additionally, tax exemptions for environmentally friendly businesses, waste reduction, and the increasing consumer demand for green products present further opportunities. For instance, 92% of millennials are more likely to prefer a company with environmentally friendly practices, according to the Cone Communications/Ebiquity Global CSR survey. Preparing for the future by adopting environmentally friendly strategies may involve expenses now but could lead to significant savings if green rules or regulations become mandatory.

Many companies are already taking steps to reduce their environmental impacts, setting both long-term and short-term targets (Beckers et al. 2013). Contrary to the common misconception, making these changes is relatively inexpensive for businesses. In fact, going green has many benefits beyond fulfilling legal and ethical responsibilities. Reducing energy consumption is a primary step, and it is important for companies to be aware of their energy usage to identify areas for improvement. This not only reduces the environmental impact but also cuts energy costs.

Waste reduction is another key area, as each company produces varying amounts of waste. The focus should be on how to reduce what is produced, whether it's cardboard, plastic, or electrical items (Qerimi 2012). Using sustainable materials in products, packaging, and marketing is another way businesses can become more sustainable. Environmentally friendly packaging can save resources, reduce environmental footprints, and satisfy consumer trends towards less excessive packaging.

Measuring and reducing carbon footprints is also crucial. For example, IKEA aims to achieve net-zero carbon emissions by 2030, setting an example for other businesses. Additionally, joining the B Corp community and becoming a Certified B Corp involves a rigorous process that assesses various aspects of the business, including supply chain, employment rights, and carbon footprint (Coke-Hamilton, 2021).

In their report, Henriksen et al. (2012) identify opportunities for companies in sustainability, such as the Federal Energy Management Program (FEMP) in the USA, which assists federal agencies in reducing energy use, costs, and emissions. Chemical Management Services (CMS) is another model where providers manage chemicals to reduce costs, risks, and environmental impacts. Design, Build, Finance, Operate (DBFO) companies engage in long-term construction projects focusing on quality and life-cycle cost reduction. Green Supply Chain Management is an integrated concept focusing on sustainable flow, where raw materials and components are sourced sustainably, and suppliers are required to align with sustainable practices.

These opportunities illustrate that adopting sustainable practices in business is not only a responsible choice but can also lead to significant benefits in terms of cost savings, market demand, and long-term viability (Edgeman et al. 2013).

3. DATA AND METHODOLOGY

Our research methodology centered around data collection through a questionnaire (table 1), predominantly targeting residents of Greece, particularly from the Attica region, which constituted 84.77% of the total responses. The rest, accounting for 15.23%, were obtained from 11 other Greek prefectures. This data-gathering process took place from May to August 2022, employing Google Forms to distribute the questionnaire. The primary channels for sharing this instrument were social media and academic platforms, leading to a substantial representation of student respondents, who comprised 37.75% of the total.

Before its full deployment, the questionnaire underwent a preliminary test with 10 individuals to ensure its reliability. The questionnaire's main objective was to assess the environmental consciousness of the respondents, their knowledge of and intention to buy green products, and their satisfaction

Table 1. Brief summary of the variables investigated

Variables investigated	Formulation of variables	Questions/Statements	Response Options
Satisfaction with green products	A high degree of satisfaction with the purchase of a green product and its use, indicating whether or not expectations regarding environmental concerns have been met.	I was satisfied with most of the green products I bought.	Scale on which I agree 1 = Strongly disagree 5 = Strongly agree
Level of information	The degree of information that the consumer has about the characteristics of green products and their impact on the environment.	What is your level of information about green products?	Scale on which I agree 1 = Strongly disagree 5 = Strongly agree
Attitude towards green products	One's general sentiment towards green products influencing one's motivation to acquire environmentally friendly products.	To what extent do you agree with the following statements about green products: (1) They are well made. (2) They are reasonably priced (3) They are as good as other products. (4) They are economical (5) They are environmentally friendly? (6) Are they healthier? (7) They have better quality/performance; (8) Green products are my first choice in a category	Scale on which I agree 1 = Strongly disagree 5 = Strongly agree
Degree of importance for a product to be green	The extent to which consumers prioritise the purchase of green products over conventional products.	How important is it for you for a product to be green?	Scale on which I agree 1 = Strongly disagree 5 = Strongly agree
Incentives for greener behaviour	Infrastructures offered to citizens that enable and encourage recycling and reuse behaviours.	Would you start recycling certain products if . . (1) Yes, if the incentive is economic. (2) Yes, if there are flexible recycling centres where I can simply drop off the items to be recycled (3) Yes, if there are more recycling point options available in my area. (4) Yes, if there was an awareness campaign about the dangers of not recycling	Multiple choice answer
Concern about the impact of modern lifestyles on the environment	Degree to which citizens care about the impact of their lifestyle on the environment.	I am concerned about the impact of my lifestyle on the environment	Scale on which I agree 1 = Strongly disagree 5 = Strongly agree

levels with these products. To enrich the understanding of consumer profiles, the questionnaire also included questions related to demographic information.

Table 2 details the socio-demographic breakdown of the 151 participants who engaged in the survey, comprising 53% females and 47% males. Age-wise, the majority of respondents were between 18 to 24 years old (40.4%), followed by the 25 to 34 age bracket (33.8%), and a smaller segment aged 35 to 44 years (17.9%). Lesser representation was observed in the age groups 45 to 54 years (6%) and 55 years and above (2%). Occupation-wise, the majority were employed (58.9%), with a significant student demographic (37.7%), a small percentage unemployed (2.6%), and a minimal fraction indicating other professional statuses (0.7%). A predominant number of participants (84.8%) were from the Attica prefecture.

This study mirrors the structure by Lakatos et al. (2021) in their investigation of the following hypotheses:

Hypothesis 1: There is a significant correlation between a positive attitude towards green products and consumer satisfaction with these products.

Hypothesis 2: The level of consumer knowledge about green products has a significant correlation with consumer satisfaction, particularly when considering consumers' positive attitudes towards these products.

Hypothesis 3: The perceived importance of a product's green status is significantly related to its market presence and consumer demand.

Table 3 outlines the descriptive statistics for the four main variables surveyed and examines their correlations. The survey data indicates a neutral consumer attitude toward green products, with an average

Table 2. The socio-demographic composition of the sample

Sex	n (Number)	%	Age	n (Number)	%
Woman	80	52.98%	18 - 24 Years old	61	40.40%
Male	71	47.02%	25 - 34 Years old	51	33.77%
Professional status			35 - 44 Years old	27	17.88%
I work	89	58.94%	45 - 54 Years old	9	5.96%
I do not work	4	2.65%	Over 55 Years old	3	1.99%
Student	57	37.75%	**Total**	**151**	**100%**
Other	1	0.66%			
Total	**151**	**100%**			

Table 3. Mean (MT), standard deviation (SD), and correlations between *survey* variables

	n	MT	TA	1	2	3	4
1. Attitude towards green products	151	3.2	0.6	1			
2. Level of information on green products	151	3.1	0.8	0.45 **	1		
3. Satisfaction with green products	151	3.5	0.8	0.69 **	0.43 **	1	
4. Importance of being a green product	151	3.5	1.1	0.50 **	0.37 **	0.29 **	1

***p<.01 (very significant)*

score of 3.2 and a technical accuracy (TA) of 0.6. Consumers' level of knowledge regarding green products is moderate (Mean=3.1, TA=0.8). The findings also show that consumers have a moderate to high satisfaction level with green products (Mean=3.5, TA=0.8) and a similar recognition of the importance of environmentally friendly products (Mean=3.5, TA=1.1). Correlation analyses suggest a positive relationship between the attitude toward green products and both the knowledge level about such products ($r=0.45$, $p<.01$) and their satisfaction ($r=0.69$, $p<.01$), as well as acknowledging the significance of a product's green status ($r=0.50$, $p<.01$). Furthermore, there is a positive correlation between consumers' information level and both their satisfaction ($r=0.43$, $p<.01$) and the perceived importance of green products ($r=0.37$, $p<.01$). Lastly, satisfaction with green products is shown to be positively, albeit less strongly, associated with the importance placed on green product attributes ($r=0.29$, $p<.01$).

In the results delineated by Table 4, the Mann-Whitney U test was utilized to evaluate the disparities in the level of information about green products among consumers across different age groups, professional statuses, and genders. The statistical analysis revealed a significant variance in the level of information contingent upon professional status ($Z=-2.049$, $p=0.039$), with employed individuals exhibiting a higher mean rank (78.78) relative to students (mean rank=65.26). Conversely, the gender and age demographics of consumers did not demonstrate significant differences, as the obtained p-values exceeded the threshold of $\alpha=0.05$.

Table 5 presents the regression model results for attitude towards green products and information level as predictors of satisfaction with green products. The analysis showed that attitude towards green products and information level explained 49% (R Square=0.49) of the variability in consumer satisfaction with green products. The regression model is statistically significant ($F(2, 148)=71.18$, $p=0.000$).

Analytical outcomes presented in Table 6 and the coefficient estimates for the predictor variables indicate a statistically significant prediction of consumer satisfaction with green products by their

Table 4. Level of information on green products by age group, professional status, and *gender*

Mann-Whitney Z (p value)		
Sex	Age	Professional status
-0.381 (0.703)	A.-1.357 (0.175)	-2.059 (0.039)
	B. -0.879 (0.379)	
	Γ. -0.317 (0.751)	

Professional status: employee vs student
Age: A. 18-24 vs 25-34, B. 18-24 vs 35-44, C. 25-34 vs 35-44

Table 5. Regression model results for attitude towards green products and information level as predictors of green *product* satisfaction

Dependent Variable: Satisfaction with green products					
R	R Square	F	df1	df2	Sig.
0.700	0.490	71.18	2	148	0.000

Table 6. Estimates for the predictor *variables*

Dependent Variable: Satisfaction with green products					
	B	**SD**	**β**	**t**	**p**
Attitude towards green products	0.845	0.090	0.615	9.376	0.000
Level of information on green products	0.158	0.066	0.157	2.396	0.018

attitude towards these products. Quantitatively, the data suggest a positive beta coefficient ($\beta = 0.615$, $p<0.01$), implying that an increment of one unit in consumer attitude towards green products is associated with a 0.615 increase in satisfaction levels.

Furthermore, the regression analysis delineated in Table 6 suggests that the level of information about green products is another significant predictor of consumer satisfaction. This relationship holds even after adjusting for the influence of consumer attitudes towards green products. Specifically, a unit increase in the information level about green products correlates with a 0.157 increase in consumer satisfaction ($\beta = 0.157$, $p<0.01$). These findings robustly support the hypothesis that a positive attitude and an informed understanding of green products are pivotal in enhancing consumer satisfaction.

Subsequent analysis, as shown in Table 7, investigated the potential dependence of recycling motivation on variables such as age, gender, and professional status. The findings indicated no significant differences in the incentives to recycle across consumer demographics, with p-values surpassing the $\alpha=0.05$ benchmark.

These results substantiate the initial hypotheses, affirming that professional status differentially impacts the level of information about green products, and that consumer attitudes and information levels are significant predictors of satisfaction with green products, while demographic variables do not significantly influence recycling motivation.

4. DISCUSSION

Our study was designed to explore the satisfaction of Greek consumers with green products, bearing in mind that our respondent sample is based on practical accessibility criteria and should be interpreted within this statistical context, which constitutes the primary limitation of our survey.

Differing from the research by Lakatos et al. (2021), where green brand satisfaction is perceived as a fulfilling experience for younger consumers—tying closely with ecological awareness and environmental accountability—our findings did not exhibit significant distinctions based on consumer gender and age. This contrasts with the 'millennial phenomenon' highlighted in the literature, where green products tend to have a pronounced preference within this demographic (Bonera et al., 2020).

Our results align with prior empirical work from Lakatos et al. (2021), confirming that a positive attitude towards green products substantially predicts purchasing intention. We also found a positive correlation between this attitude and consumers' level of green product information.

Interestingly, unlike in Lakatos et al. (2021), our data suggests that the level of information about green products in Greece varies with professional status, indicating a particular deficit regarding sustainability among younger individuals. This underscores the necessity of formulating educational policies on sustainability from an early age, as emphasized by Didham and Ofei-Manu (2015).

In our analysis, each unit increase in green product information corresponds to a 0.157 increase in consumer satisfaction ($\beta = 0.157$, $p <.01$), affirming that information level is a significant predictor of satisfaction, after controlling for attitude towards green products—a finding corroborated by Lakatos et al. (2021) and Saratha and Simon (2015).

Our research concurs with the findings from Lakatos et al. (2021) that consumers are inclined to contribute to environmental solutions through purchase decisions. They seek green products that fulfill functionality criteria like their non-green counterparts, considering quality, price, durability,

Table 7. Chi-square test results for the motivation of cyclical *behaviour*

Chi-square (p value)		
Sex	**Age**	**Professional status**
1.580 (0.664)	3.650 (0.989)	9.077 (0.430)

and usability. These findings reiterate the Lakatos et al. (2021) conclusion on highlighting green attributes in product communication and promotion in the Greek context (Lakatos et al., 2021).

Our study advocates for the provision of precise environmental information on green products. Retailers should communicate the environmental benefits, explain product features, elucidate usage benefits, and substantiate environmental claims with transparent terminology and imagery. Manufacturers are advised to prioritize sustainability in product development, aiming for minimal environmental impact throughout a product's life cycle, including recycling. Pricing strategies should reflect value beyond environmental benefits, as consumers demonstrate willingness to pay marginally more only if additional value—performance, function, design—is perceived.

Thus, our research, supported by extant literature, indicates a growing consumer market for sustainable and socially responsible products. The challenge for green marketing lies in facilitating green purchasing behaviors. When other factors are equal, environmental considerations can tip the scales in favor of a green product.

5. CONCLUSION

The transition to a circular economy represents a pivotal shift towards sustainability, emphasizing the reuse, recycling, and circulation of products and materials to extend their lifecycle and minimize waste. This approach strengthens consumer resilience, mitigates environmental degradation, and fosters natural regeneration. Circular economy initiatives spur innovation within businesses, benefiting consumers and stakeholders throughout the value chain and enhancing brand reputation and customer loyalty.

Embracing a circular economy model can alleviate environmental burdens and bolster raw material supply security, thereby enhancing business competitiveness—this, in turn, stimulates innovation, drives economic growth, and generates employment opportunities. Although the shift towards circular economy practices is gaining traction among companies, this transformation is gradual and complex.

To effectively implement a circular economy model, several strategic steps are recommended: (a) Producers should prioritize the longevity of products through intelligent and sustainable design that extends the product lifecycle. (b) The production of green products must ensure parity with conventional products in terms of quality, price, and performance to eliminate consumer hesitation in purchasing them. (c) Education on sustainable development should be integrated into curricula from early childhood, covering critical topics such as climate change, disaster risk reduction, biodiversity, poverty alleviation, and sustainable consumption. (d) Retailers need to provide consumers with clear information about the personal and environmental benefits of green products, emphasizing cost savings and ecological impact. (e) Recycling should be optimized to convert waste into new materials and energy, leveraging the potential for materials to regain their original state. (f) Government policies must incentivize green product production through fiscal measures and encourage consumer preference for sustainable goods.

The scientific community has a crucial role in expanding research on the circular economy to refine production and consumption models that maintain raw materials within the production cycle for extended periods, thereby reducing waste. Moreover, government support for such research is vital to catalyze change at a critical moment in our environmental history. Timely action is imperative to avert extensive and potentially irreversible damage to our planet due to climate change. The collective effort of these steps can significantly influence the trajectory of our environmental impact and contribute to a sustainable future.

Future research in the domain of a circular economy should focus on several key areas to further advance our understanding and implementation of sustainable practices. Firstly, empirical studies assessing the long-term economic impacts of circular business models on various industries would provide valuable insights into their viability and scalability. Investigating consumer behavior concerning circular products, especially in different cultural and socio-economic contexts, can uncover factors that drive or hinder the adoption of sustainable consumption

patterns. Interdisciplinary research is also essential to develop and refine technologies that enable the recovery, recycling, and reuse of materials, thus closing the loop in product life cycles more effectively. Moreover, comparative policy analysis can identify best practices and barriers in promoting circular economy principles by governments.

Finally, a significant research gap exists in quantifying environmental benefits derived from circular economy practices, which would help craft compelling narratives and policies for broader societal adoption. Addressing these research directions will help build a more robust foundation for the transition to a circular economy, contributing to sustainable development goals on a global scale.

COMPETING INTERESTS

The authors of this publication declare there are no competing interests.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. Funding for this research was covered by the author(s) of the article.

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