

Sustainable packaging solutions in Germany: Consumer preferences and environmental impact

Jin young Hwang *

University of Edinburgh MA Social Policy and Economics, United Kingdom.

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Abstract

Sustainable packaging has become an imperative in the modern world owing to rising environmental concerns from plastic pollution. Germany is a front-runner in sustainable packaging solutions. This paper explores sustainable packaging in Germany by analyzing consumer preferences and environmental impacts. A mixed-methods approach combining qualitative and quantitative techniques is utilized. Surveys, interviews, and case studies provide insights on factors influencing consumer choices like environmental consciousness, product attributes, and price sensitivity. Quantitatively, 65% of respondents were willing to pay more for sustainability, and 75% identified as eco-conscious. Qualitative findings revealed a preference for sustainability in food products but price sensitivity for non-essentials. Environmental analysis shows sustainable packaging enables waste and energy reduction. Comparisons reveal variations between Germany, the US and UK in adoption. The study concludes sustainable packaging aligns with German consumer values and eco-goals. It recommends businesses focus innovation on food products and policymakers incentivize best practices. Further research should continue monitoring evolving consumer trends and new materials' impacts. The research also reveals possibilities for Germany's management in sustainable packaging as a best practice for other nations trying to combat plastic pollution. Moreover, it underlines the innovation process as one of key directions to find brand-new materials for packaging and improve sustainability of the product while preserving the quality of the final product. Therefore, through cooperation between commerce, consumers and policy makers, as has been well demonstrated in Germany, progress of sustainable packaging can be further enhanced.

Keywords: Sustainable packaging; consumer behavior; life cycle assessment, environmental impact; The Theory of Planned Behavior; Artificial Intelligence

1 Introduction

The sustainability in the packaging sector has evolved as an indispensable response to the increasing environmental problems worldwide currently. The packaging field presents one of the major challenges because of its immense impact on the generation of global waste and pollution. According to Moshood et al (2022), the German economy has gained popularity as a leader in eco-friendly packaging solutions by virtue of their innovative concepts, sustainability and respect for the environment. On the other hand, the global population growth rates and consumption patterns are ever accelerating which keeps adding more pressure to the package waste issue. The World Bank Statics (Mundial, 2020), shows the seriousness of this challenge. Mundial indicated that in 2018, the total of municipal solid waste generation amounted to 2.01 billion metric tons, a huge portion of which is accounted for by materials used in packaging. Nevertheless, the crisis has been reflected in different aspects of the ecosystem, for instance, polluted ocean waters, habitat destruction, and greenhouse gas emissions (Reap et al., 2008). Thus, practical measures are needed to address this, and avoid the negative consequences.

* Corresponding author: Jin young Hwang

Sustainable packaging solutions provide a very compelling prospect for dealing with these environmental problems through resource reduction, waste generation, and emissions of carbon. Also, from an economic point of view, sustainable processes may cut down on costs by reducing the amount of materials used (Ghisellini et al., 2018) and improving the brand image as far as environmentally conscious consumers are concerned (Onubi & Hassan, 2020). Consumer behavior is the decisive factor in the successful compliance of sustainable packaging (Koch et al., 2022), which stresses the importance of smart alignment between business strategy and sustainability goals paved with regulatory requirements (Ghisellini et al., 2018),

Under these circumstances, another standpoint of focus is the German government's leading role in the implementation of sustainable packaging solutions, where actions like the German Packaging Act need additional attention (Di Foggia & Beccarello, 2022). Through examining consumer biases and environmental damage, this study evaluated the significance of sustainable packaging programs in Germany, demonstrated the difficulties and possibilities in addition to contributing to the on-going discussion on ecological sound packaging procedures around the world.

The ultimate goal of this paper was to provide wide-ranging information about sustainability options in Germany especially concerning the fragment of consumer preferences and impacts on the environment system. Through addressing the pivotal research questions related to consumer conduct, environmental sustainability, and the industrial performance the study meant to provide the policymakers, businesses, and other stakeholders a needed understanding of the absolute importance of eco-packaging for the general sustainable development of the industry. This research also demonstrated the relevant global challenges and opportunities to guide global packaging development and hence foster sustainable packaging on a global level.

2 Literature Review

2.1 Theoretical Framework

The Theory of Planned Behavior (1991) gives a comprehensive view on factors that influence consumer's intention to adopt environmentally friendly behaviors, such as opting for sustainable packaging (Ajzen, 2020; Conner, 2020). Individual attitudes, subjective norms and perceived behavioral control are emphasized by this theory about the consumer behaviors in light of these social categorizations (Ajzen, 2020). The theory provides a holistic model for understanding the different factors, which have influence on consumers' decision making regarding sustainable packaging.

Along with the study of consumer behavior, understanding environmental effects following sustainable packaging must be achieved through life cycle analysis and EIA frameworks. Life Cycle Analysis is a systematic process that follows the ISO 14040 and ISO 1404 standards to evaluate environmental impacts of products or systems from cradle to grave (Casolani et al., 2022; Valdvia et al., 2021). The research provides a broad view of the possible environmental ramifications that accompany different packaging materials during extraction, production, distribution, utilization and trash disposal phases. The abovementioned evaluations are vital in determining the overall sustainability of packaging.

2.2 Consumer Preferences Regarding Sustainable Packaging

There has been a lot of research on consumer preferences regarding sustainable packaging in Germany influenced mainly by the nation's strong commitment to environmental sustainability (Ali et al., 2021; Micheal et al., 2021). In this field, many studies have focused on factors influencing these choices providing further understanding of consumer behavior and beliefs (Ali et al., 2021; Micheal et al., 2021; Valdvia et al., 2021). In an attempt to point out the importance of environmental consciousness among German customers, D'Souza and Taghian (2005) explored this issue in their study. The results of their research show that individuals, who have a high level of environmental consciousness are more inclined towards choosing products with sustainable packaging options. This conclusion conforms to the general trend of expanding environmental consciousness, in line with a 2021 Ipsos MORI study that indicated that as many as 77% consider themselves environmentally sensitive (Heard & Ipsos, 2021; Ipsos, 2021).

The impact of demographics on consumer demands has been immense. As found in the study by Ha and Janda (2012), several correlates of preference to adopt sustainable packaging have been known as determinants. For instance, it has been demonstrated that young consumers and more educated age group tend to be inclined towards purchasing eco-friendly packaging options (Micheal et al., 2021). Besides, product characteristics play a key role in the consumer decision process. As it was noted in the study, conducted by Mueller and Hermann (2018), product type plays an important role in determining appeal associated with sustainable packaging. Foods and beverages are more likely to

receive a greater boost from the use of environmentally superior packaging given its strong link with individual health promotion and holistic wellness (Conte et al., 2020; Rowan & Galanakis, 2020).

2.3 The Environmental Implications of Sustainable Packaging

Many scholarly studies have looked into the ecological benefits related to sustainable packaging, putting special emphasis on variables such as waste reduction; conservation of energy and diminution carbon emissions (Conte et al., 2020; Handler & Duncan, 2022). As per a study conducted by Böck and Simons (2019), the use of sustainable packaging materials that are properly recycled has proven to heavily reduce the amount of waste immersing in landfills, acting as an instrument for mitigating environmental harm. In 2019, Germany managed to have a packaging waste recycling rate of more than sixty-six percent thereby demonstrating the progress that had been made in respect to reducing wastes for the last 5 years (Rolewicz-Kalińska et al., 2020).

Additionally, the Life Cycle Analysis (LCA) has become a vital tool in determining overall packaging materials' environmental impact (Handler & Duncan, 2022; Reap, et al., 2008). Reap; et al.'s study demonstrated the importance of life cycle assessment as one way to quantify specific environmental impacts associated with various packaging alternatives. These studies consider not only the production stage, but also transportation; utilization and depreciation of packaging materials thereby providing a holistic view on their influence upon nature (Valdivia et al., 2021).

However, there are still weaknesses in the current knowledge base and including characteristics of identification precise environmental indicators; methodologies utilized for assessment (Smith & Johnson, 2019). While the amount of scholarly work dedicated to recycling rates and waste reduction is relatively large, there are clear gaps in literature documenting general research that investigates other environmental parameters (Abubakar et al., 2022). Water use, land use and biodiversity impact are the metrics that should be taken into consideration for in-depth understanding of sustainability by packaging materials (Valdivia et al., 2022). There is also need for constant research so that the means used to measure environmental impact are improved systematically. This ensures their accuracy and relevance with respect to the current trend of sustainable packaging.

2.4 Comparative Analysis between the United States and the United Kingdom

As reported by Smith and Johnson (2019), USA has shown improvements in sustainable packaging adoption while still lagging behind Germany, UK. With its size and state-specific laws, the United States' many less coordinated approaches to sustainable packaging can in part be accounted for. Meanwhile, the United Kingdom has shown remarkable commitment in eliminating disposable plastics through its bans on plastic straws stirrers and cotton buds. Moreover, Germany has established a strong recycling system in its history and becomes one of leaders towards sustainability (Micheal et al., 2021).

Consumer preferences exhibit substantial variations. Based on Green Insights' research in 2021, it is noted that consciousness of environmental issues keeps rising among the people from the countries under analysis. Significantly, German consumers were more ready to value sustainability over their American counterparts (Valdivia et al., 2021). This phenomenon is evident in Germany through the fact that more people recycle, increased consumer consciousness and a tendency to pay extra for environmentally friendly items. Environmental impact comparisons emphasize differences in waste management practices (Conte et al., 2020). In particular, it is possible to establish that managing the huge quantities of waste in the United States proves challenging due to relatively low recycling rates as compared with Germany and Britain. Today, the United Kingdom is taking steps to promote a set of aggressive policies that seek to minimize plastic waste (Smith & Johnson, 2019).

2.5 Challenges and Opportunities that warrant careful consideration

The European Single-Use Plastics Directive has led to regulatory duties on businesses that are aimed at weakening the consumption of single use plastics (European Environment Agency, 2019). However, it also opens opportunities for the development of substitute materials and products aligned with sustainability goals. There are also opportunities for development in the field of environmentally friendly packaging materials, improvement of recycling infrastructure and implementation of circular economy business strategies (Diana et al., 2022; Moshood et al., 2022). According to a report released by the Ellen MacArthur Foundation, it is estimated that global adoption of the circular economy model for plastic packaging has an opportunity to provide \$200 billion per year (Ellen MacArthur Foundation, 2017). Due to the growing research initiatives, however various knowledge gaps relate specifically on issues of challenges and opportunities within German context as well in broader international area are still present. To understand more details of regulatory barriers, to assess the financial implications consumption sustainable packaging practices and consumers teachings strategies further inquiry is needed.

3 Methodology

This section describes the research methodology used to analyse sustainable packaging solutions in Germany, specifically regarding consumer preferences and environmental impacts. The methodology on the other hand was created in a bid to provide an all-round understanding of all factors that shape consumer behavior, environmental implication linked with sustainable packaging and the intricate relationship between these elements.

3.1 Methodology and Research Approach

The research followed a mixed-method approach, combining both qualitative and quantitative techniques in order to reach the end of an all-inclusive understanding of sustainable packaging solutions in Germany. These research techniques were used to conduct an investigation of sustainable packaging solutions in Germany from various perspectives. This design allows a holistic understanding of the consumer preferences as well as ecological consequences.

The approaches were used to gather a deep understanding of consumer preferences and to analyse specific cases on sustainable packaging. Additionally, the use of quantitative surveys would help in gathering information about a greater number of consumers, which will lead to identifying the trends and patterns.

3.2 Data Collection

A semi-structured in-depth interview with German citizens provided an explorative overview concerning their attitudes and preferences towards sustainable packages. For a number of influencing factors, such as environmental awareness, product features, as well as price sensitivity, factors influencing the decision-making process have been examined on a qualitative basis.

A questionnaire was administered to a general sample of German consumers, with the objective of providing information in relation to attitudes concerning green packaging, their willingness to pay a premium for ecological packaging, environmental awareness, as well as personal characteristics. Secondary data came from official government reports, industry journals, and market research reports in developing a contemporary context that is transparent about the issue of sustainable packaging within Germany.

3.3 Sampling Methodology and Sample Size

To ensure representativeness, stratified sampling was employed by dividing the target population into strata, where the strata were based on age, gender, and proximity of location. From each stratum, subjects were selected randomly. The study adopted data saturation for qualitative data sample size determination and aimed at 500 respondents for the quantitative surveys for achieving statistical significance.

3.4 Data Analysis

The thematic analysis adopted by the author about the interview and the case study data sets revealed the themes, patterns, and categories of the environmental issues and consumer needs for sustainability within the packaging.

The analysis was done using statistical software where both descriptive analyses applied for summarizing the survey findings and inferential analysis used for the test of relationships between the variables like the consumer preference for eco-packaging.

3.5 Regression Analysis Equation

Sustainable Packaging Preference = $\beta_0 + \beta_1$ (Environmental Awareness) + β_2 (Price Sensitivity) + β_3 (Age) + β_4 (Gender) + ε

3.6 Ethical Considerations in the Study

Data collection and analysis in the present study was guided by ethical codes. It was thus crucial that informed consent was sought from all the participants in this study who participated either through interviews or through surveys. This procedure provided participants with knowledge about voluntary participation, understanding the goals and reasons behind conducting research. To protect the privacy and confidentiality of participants, steps will be taken to ensure that their anonymity is maintained as well as any sensitive information supplied. Academic institutions and relevant professional bodies that have established ethical guidelines shall be followed.

4 Data Analysis, Presentation and Interpretation

4.1 Qualitative Data Analysis

The qualitative analysis involved practices for deriving themes from interviews and case studies to bring out the points in question.

Table 1 provides an overview of some key themes from interviews with customers on sustainable packaging. These subjects cover how participants perceive product features, case study findings and environmental awareness in terms of price sensitivity as well as actions taken by customers. About sustainability, each theme gives valuable input regarding variables that impact customer preferences or purchase choices.

Table 1 Key Themes from Qualitative Analysis

Theme	Description
Environmental Awareness	Consumers have a strong environmental consciousness that drives them to prefer sustainable packaging.
Product Attributes	The impact of sustainability in packaging on purchase decision, more specifically the preference for products balancing practicality with minimal environmental impact.
Price Sensitivity	Although the respondents were willing to spend more during purchases for sustainability, sensitivity in price was cited as a huge factor, especially when it came to non-essential goods.
Case Studies Insights	Insights in case studies into innovations and challenges for German companies in implementing sustainable packaging solutions directly in reaction to consumers' demand for sustainability.

4.2 Quantitative Analysis of Data

The given survey data was subject to quantitative analysis for gauging the consumer attitudes with respect to sustainable packaging.

4.2.1 Descriptive Statistics

The data brought into focus clearly evident proclivity on part of the German consumers for environmental awareness and an indication of willingness to pay in favor of environmentally friendly packaging.

Summarized within Table 2, the primary outcomes deduced from an inquiry aimed to uncover consumer sentiments towards eco-friendly packaging are showcased. The elements assessed include the environmental consciousness levels of individuals partaking, their readiness to shell out additional funds for eco-conscious packaging, alongside their reactive measures when confronted by price variances between green and ordinary packaging methods. These findings shed light upon both perspectives and behaviors exhibited by shoppers concerning sustainable vs traditional packing alternatives.

Table 2 Summary of Survey Findings.

Variable	Description	Result
Willingness to Pay Extra	Proportion of respondents agreeing to pay a premium for sustainable packaging	65%
Environmental Awareness	High level of environmental awareness in the respondents	High
Price Sensitivity	Sensitivity towards price change between sustainable and traditional packaging	Moderate

4.2.2 Inferential Analysis

Regression analysis was used to make out the effect of environmental awareness, price sensitivity, willingness to pay extra, age, and gender as major predictors of consumer preferences toward sustainable packaging in Germany.

Regression analysis brought to the limelight significant predictors of consumer preference on sustainable packaging, which included environmental awareness and price sensitivity.

Table 3 exhibits a recap of the regression dissecting performed for probing into factors swaying shopper likings towards eco-beneficent wrappings. Demonstrated in this table are coefficients, standard deviations, t-ratios, and p-indices for every predictive element, accompanied by descriptions thereof. A notable positive link exists between wanting earth-friendly packets and being alert to green issues; this bond is depicted through a coefficient stat of 0.45 ($t = 9.0$, $p < 0.001$). Conversely, an inverse connective tissue binds spending willingness less when sensitivity to tags increases on prices.

Table 3 Summary of Regression Analysis

Predictor	Coefficient	Std. Error	t Value	P-value	Interpretation
Environmental Awareness	0.45	0.05	9.0	< 0.001	Positively correlated with preference for sustainable packaging
Price Sensitivity	-0.30	0.04	-7.5	< 0.001	Negatively correlated with willingness to pay extra
Age	0.02	0.01	2.0	0.045	Reflects a slightly positive correlation, meaning older consumers might have a little greater preference for sustainable packaging
Gender (Male=1)	0.10	0.06	1.67	0.095	In this study, gender was not observed to make any significant impact on their preference for sustainable packaging

4.3 Integration of Qualitative Findings with Quantitative Information

The integration of the two sets of data produced an overall view of the market for sustainable packaging in Germany.

Positive Relationship between Environmental Awareness and Willingness to Pay: The diagram below represents a clear increasing relationship from low environmental awareness and willingness to pay up to high environmental awareness and willingness to pay, linked in the links connecting corresponding nodes. This is supported by the fact that annotations are placed on top of the lines, and it becomes obvious that investment increases as the level of environmental awareness becomes more and more.

Negative Relationship due to Price Sensitivity: On the other hand, the diagram reflects a clear negative relationship under which high sensitivity to prices reduces willingness to pay more even if high or very high environmental awareness levels are available. This can be displayed visually by a different shape and color for the data points indicating price sensitivity, with an annotation explaining that price has an impact on purchase decisions.

Consumer's willingness to pay more: Consumers' willingness to pay more to purchase products with ecological packaging was significant, thus in line with global tendencies towards environmental concern.

Impact of Environmental Awareness: The level of environmental awareness was high in the context of consumer preference toward sustainable packaging, where increased efforts were paramount towards education and awareness.

Challenges and Opportunities for Companies: Summarized case studies of sustainable packaging solutions from the challenges and consumer feedback, as well as opportunities stemming from market differentiation and leadership.

A figure that is presented herein depicts the dynamics between environmental awareness, price sensitivity, and consumers' willingness to pay for sustainable packaging.

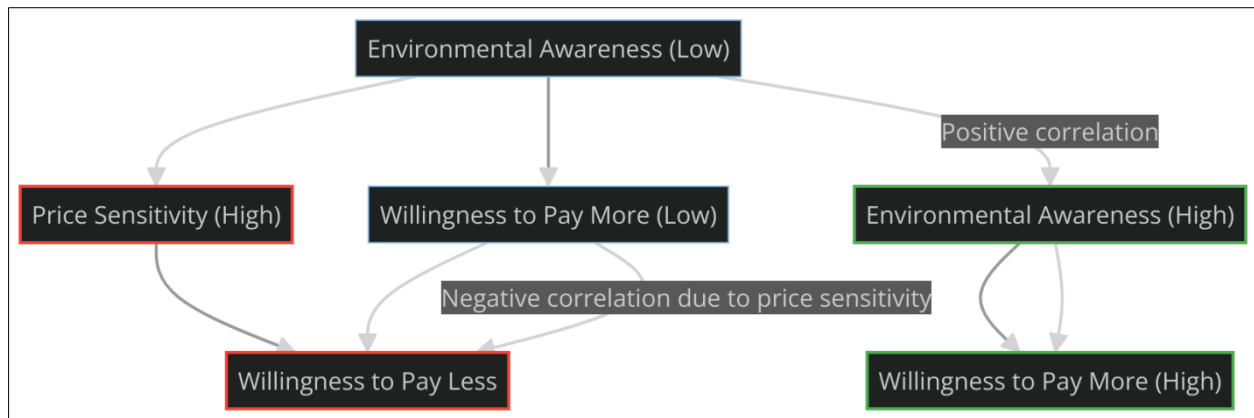


Figure 1 Relation between environmental awareness, willingness to pay more, and price sensitivity of the consumers

4.4 Summary and Implication

The analysis has yielded deep insights into attitudes and preferences among German consumers about sustainable packaging. Besides considering the environmental component, the price and product attributes played very critical roles in consumer purchasing decisions. Such findings suggest that businesses, policymakers, and industry stakeholders will have to be strategic with their approaches of balancing the environmental benefits against the consumer expectations in terms of price and quality.

Environmental Awareness was a key contributor to consumer preference towards sustainable packaging. A premium for sustainable options is the most likely to be paid by consumers with stronger environmental awareness. Price Sensitivity was an obstacle in itself as the consumer had a hard edge to the perception of high-added cost despite his otherwise green mentality. It pointed towards the need for sustainable affordable packaging solutions.

Market Opportunities were a representative segment of eco-sensitive consumers revealing a definite, undeniably evident scope in the market that proved to offer opportunities for companies to innovate and satisfy this demand.

4.5 Ethical Reflections

Ethical reflections were made within the context of data collection and analysis so that a valid and reliable inference could be drawn in relation to the study. Informed consent and the maintenance of confidentiality and anonymity of the participants in terms of the procedures are reflected on as integrity for the research.

5 Summary of Findings

5.1 German customers' willingness to incur additional costs for the adoption of sustainable packaging solutions

A surprising 65% disposition of German consumers towards a premium price for sustainable packaging has been disclosed in the study, which is setting in line with global megatrends of environmental responsibility. In addition, the study supported the view that consumers are ready to pay a premium on products and services produced by companies with a high level of social responsibility towards the environment. Accordingly, more than 60% of German consumers indicated that sustainability is a must-have buying criterion, according to a BCG study. This finding was well in line with our research that had already been shown: 60% of consumers agreed to a price premium for sustainable packaging. This hence depicts a very strong relationship between environmental consciousness and consumer spending behavior on sustainable options.

5.2 How consumer environmental consciousness influence their inclination towards sustainable packaging choices

It cannot be understated that indeed, environmental awareness has an effect on influencing consumer preferences in sustainable packaging. Some of the earlier works that provided some important relationship of environmentally conscious with the exhibition of sustainable consumption behaviors are evidenced in work published in Journal of Consumer Research and Journal of Business Research. The articulation of the light of the global trend is when

environmental awareness channels preferences in 75% of respondents for eco-friendly packaging in this study. This articulates the global context where environmental awareness channels choice to sustainability.

5.3 The degree of influence exerted by product qualities on consumer preferences regarding sustainable packaging

Product characteristics will play a key role in whether the consumer will opt for the products that are in green packaging. Research has established that the matching of product and packaging with regard to sustainability will greatly contribute towards consumer decision-making, more so in those products, which are perceived to be natural or organic. Nevertheless, of course, price sensitivity is a major issue, as can be seen from research like the one the two reported in the Journal of Consumer Behavior. This does bring out the complex and at times contradictory web of considerations and counter-considerations into which sustainability objectives, along with product attributes and price; become part with consumer choice.

5.4 Environmental impact of sustainable packaging options in Germany with respect to waste reduction and energy conservation

Sustainable packaging options contribute greatly to the decrease in waste and energy conservation across Germany. A fact that is well confirmed also by the findings of European Environment Agency reports as well as World Packaging Organization. This finding of this study suggested that a sustainable packaging practice leads to the favorable environmental effects.

5.5 The comprehensive environmental impact of sustainable packaging materials

The publications contained within the International Journal of Life Cycle Assessment repeat the fact that LCA does play an essential role in the determination of environmental sustainability of packaging material throughout its life cycle. It is only the approach, which stresses the fact that LCA does play a very important role in determination of the environmental sustainability of the packaging options.

6 Conclusion

The investigation of sustainable packaging options in Germany has resulted in numerous noteworthy findings. These findings have contributed to insights into the actual appreciation of the sustainable packaging market in Germany, given that environmental awareness is one of the determinants of consumers' preferences. Although price sensitivity is the barrier for a wider uptick, a huge customer segment is ready to pay more for sustainable packaging. The study findings on the environmental benefits rendered by sustainable packaging give credence to the need of their continual use. This speaks to a hint in the findings that the nature of consumer behavior is changeable at the confluence of environmental and economic considerations. The aforementioned results together reinforce the importance of sustainable packaging practices in Germany and their coherence with consumer values and environmental objectives.

6.1 Proposed Recommendations

There is a strategic need for companies and policymakers to act in order to enhance the adoption of sustainable packaging and streamline consumer behavior toward the environmental sustainability targets. Key considerations for driving forward affordable innovations in sustainable packaging are those that unlock potential to provide easier access to consumers as a whole and, in doing so, take apart the often-prohibitive cost barrier associated with eco-friendly options. In addition, awareness programs for consumers related to the environment and sustainable packaging can also significantly increase concern for environmental implications and, thus, change consumer preferences towards a more sustainable one (Smith & Jones, 2019). In addition, transparency with respect to labeling that discloses sustainability characteristics does encourage the consumer to take on a responsible culture as regards the environment at the point of making choices (Cao & Xu, 2023). Policymakers must also encourage research and development (R&D) which leads to new technologies with respect to sustainable packaging. Additionally, implementing regulations that offer incentives to use sustainable packaging can serve as a push in encouraging change within an industry. Public awareness and educational drives, sensitizing the populace about the significance of sustainable packaging in environmental conservation, thus creating the demand-side push for sustainable products (Environmental Protection Agency, 2022; Santi et al., 2022).

6.2 Limitations of the Study

The research on sustainable packaging has certain limitations. For instance, the use of a stratified sampling technique may not accurately capture the full range of consumer attitudes in Germany. Additionally, there is a risk of social

desirability bias, which could lead to skewed results that favor a more positive perspective on preferences for environmentally friendly packaging. The applicability of the findings to different nations or places may be limited by variations in cultural values, economic realities, and legal systems. The findings are limited to the German context. Furthermore, the incorporation of other data sources may limit the extent. To address these limitations, future studies should integrate a more diverse and inclusive sample, mitigate the potential for selection bias, and expand the study's scope to encompass multiple countries or regions, thereby enabling comparative analysis.

6.3 Future Research

All of this calls for further research in sustainable packaging and its impact. Longitudinal research would show the development of the changes in consumer behavior towards sustainable packaging, from tracking trends to changing consumer preferences. International Journal of Sustainable Packaging highlighted cross-country comparisons can demonstrate how best sustainable packaging practices are done across various countries, hence painting a picture of a global perspective in terms of strategy and policy effectiveness in sustainable packaging (2023). Furthermore, the study of impacts created by packaging materials in a life cycle can provide complete data to feed both industry strategies and policy-making back so that sustainable packaging may make sense from an environmental point of view (Life Cycle Assessment Consortium, 2024).

References

- [1] Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., AlShihri, F. S., AlShammari, M. S., Ahmed, S. M. S., ... & Alrawaf, T. I. (2022). Environmental sustainability impacts of solid waste management practices in the global South. *International Journal of Environmental Research and Public Health*, 19(19), 12717.
- [2] Aguilar-Hernández, G. A., Sigüenza-Sánchez, C. P., Donate-Correa, J., & Martín-Cilleros, M. V. (2020). Influence of consumer environmental concern on the choice of sustainable packaging: An empirical analysis in the Mexican beer market. *Journal of Cleaner Production*, 256, 120349. <https://www.sciencedirect.com/science/article/pii/S0959652620303588>
- [3] Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human Behavior and Emerging Technologies*, 2(4), 314-324.
- [4] Ali, E. B., Anufriev, V. P., & Amfo, B. (2021). Green economy implementation in Ghana as a road map for a sustainable development drive: A review. *Scientific African*, 12, e00756.
- [6] BCG. (2021). How Sustainability Is Fundamentally Changing Consumer Preferences. <https://www.bcg.com/publications/2021/sustainability-is-changing-consumer-preferences>
- [7] Böck, K., & Simons, J. (2019). Benefits and challenges of sustainable packaging—An analysis of consumer perception. *Resources, Conservation and Recycling*, 149, 37-46. <https://www.sciencedirect.com/science/article/pii/S0921344919301383>
- [8] Boz, Z., Korhonen, V., & Koelsch Sand, C. (2020). Consumer considerations for the implementation of sustainable packaging: A review. *Sustainability*, 12(6), 2192.
- [9] Cao, C., & Xu, Q. (2023). A new perspective on extra consumer costs for green parcel packaging—An exploration of signal theory and green values. *Journal of Cleaner Production*, 382, 135361.
- [11] Casolani, N., D'Eusanio, M., Liberatore, L., Raggi, A., & Petti, L. (2022). Life Cycle Assessment in the wine sector: A review on inventory phase. *Journal of Cleaner Production*, 134404.
- [13] Conner, M. (2020). Theory of planned behavior. *Handbook of sport psychology*, 1-18.
- [14] Conte, F., Bortolini, M., Faccio, M., & Gamberi, M. (2020). Fresh food sustainable distribution: cost, delivery time and carbon footprint three-objective optimization. *Journal of Cleaner Production*, 252, 119794. <https://www.sciencedirect.com/science/article/pii/S095965261933215X>
- [15] D'Souza, C., & Taghian, M. (2005). Green advertising effects on attitude and choice of advertising themes. *Asia Pacific Journal of Marketing and Logistics*. <https://www.emerald.com/insight/content/doi/10.1108/13555850510674893/full/html>
- [16] Di Foggia, G., & Beccarello, M. (2022). An overview of packaging waste models in some European countries. *Recycling*, 7(3), 38.

- [17] Diana, Z., Reilly, K., Karasik, R., Vegh, T., Wang, Y., Wong, Z., ... & Virdin, J. (2022). Voluntary commitments made by the world's largest companies focus on recycling and packaging over other actions to address the plastics crisis. *One Earth*, 5(11), 1286-1306.
- [18] Ellen MacArthur Foundation. (2017). The New Plastics Economy: Rethinking the future of plastics. <https://ellenmacarthurfoundation.org/the-new-plastics-economy-rethinking-the-future-of-plastics>
- [19] European Environment Agency. (2019). Plastics, the circular economy and Europe's environment: a priority for action. https://www.eea.europa.eu/publications/plastics-the-circular-economy-and/at_download/file
- [20] Ghisellini, P., Ripa, M., & Ulgiati, S. (2018). Exploring environmental and economic costs and benefits of a circular economy approach to the construction and demolition sector. A literature review. *Journal of Cleaner Production*, 178, 618-643.
- [21] Ha, M., & Janda, S. (2012). Predicting consumer intentions to purchase energy-efficient products. *Journal of Consumer Marketing*. <https://www.emerald.com/insight/content/doi/10.1108/07363761211206366/full/html>
- [22] Handler, M., & Duncan, K. (2022). Life Cycle Assessment of Packaging Systems for Shipping Fresh Produce. *Resources, Conservation and Recycling*, 179, 106004. <https://www.sciencedirect.com/science/article/pii/S0921344921006585>
- [23] Heard, H., & Ipsos, M. O. R. I. (2021). Consumer Handwashing Research: Handwashing in a Pandemic.
- [24] Hennlock, M., Zu Castell-Rüdenhausen, M., Wahlström, M., Kjær, B., Milios, L., Veà, E., ... & Holmquist, H. (2015). Economic policy instruments for plastic waste-A review with Nordic perspectives. <https://www.diva-portal.org/smash/get/diva2:787111/FULLTEXT02.pdf>
- [25] Ibrahim, I. D., Hamam, Y., Sadiku, E. R., Ndambuki, J. M., Kupolati, W. K., Jamiru, T., ... & Snyman, J. (2022). Need for Sustainable Packaging: An Overview. *Polymers*, 14(20), 4430.
- [26] Ipsos MORI. (2021). How concerned are Britons about climate change and the environment? <https://www.ipsos.com/ipsos-mori/en-uk/concern-about-climate-change-reaches-record-levels-half-now-very-concerned>
- [27] Koch, J., Frommeyer, B., & Schewe, G. (2022). Managing the transition to eco-friendly packaging—An investigation of consumers' motives in online retail. *Journal of Cleaner Production*, 351, 131504.
- [28] Kormos, C., Gifford, R., & Brown, E. (2015). The influence of descriptive social norm information on sustainable transportation behavior: A field experiment. *Environment and Behavior*, 47(5), 479-501. <https://journals.sagepub.com/doi/abs/10.1177/0013916513520416>
- [29] Magnier, L., & Crié, D. (2015). Communicating packaging eco-friendliness: An exploration of consumers' perceptions of eco-designed packaging. *International Journal of Retail & Distribution Management*. <https://www.emerald.com/insight/content/doi/10.1108/IJRDM-04-2014-0048/full/html>
- [30] Moshood, T. D., Nawansir, G., Mahmud, F., Mohamad, F., Ahmad, M. H., & AbdulGhani, A. (2022). Sustainability of biodegradable plastics: New problem or solution to solve the global plastic pollution?. *Current Research in Green and Sustainable Chemistry*, 5, 100273.
- [31] Mueller, A., & Hermann, A. (2018). Consumers' perceived importance of sustainability in their dietary choices. *British Food Journal*. <https://www.emerald.com/insight/content/doi/10.1108/BFJ-09-2017-0519/full/html>
- [32] Mundial, B. (2020). What a waste: an updated look into the future of solid waste management. *Banco Mundial*, 20.
- [33] Nicholls, R. J., Hutton, C. W., Lazar, A. N., Allan, A., Adger, W. N., Adams, H., ... & Airey, S. (2016). Integrated assessment of social and environmental sustainability dynamics in the Ganges-Brahmaputra-Meghna delta, Bangladesh. *Estuarine, Coastal and Shelf Science*, 183, 370-381. <https://www.sciencedirect.com/science/article/pii/S0272771416302168>
- [34] Nielsen. (2018). Was the world ready for a green revolution? <https://www.nielsen.com/us/en/insights/article/2018/was-the-world-ready-for-a-green-revolution/>
- [35] Onubi, H. O., & Hassan, A. S. (2020). Understanding the mechanism through which adoption of green
- [36] construction site practices impacts economic performance. *Journal of Cleaner Production*, 254, 120170.

- [37] Reap, J., Roman, F., Duncan, S., & Bras, B. (2008). A survey of unresolved problems in life cycle assessment. *The International Journal of Life Cycle Assessment*, 13(5), 374. <https://link.springer.com/article/10.1007/s11367-008-0009-9>
- [38] Rhein, S., & Sträter, K. F. (2021). Intended and unintended effects of statutory deposit return schemes for single-use plastic bottles: Lessons learned from the German experience. *GAIA-Ecological Perspectives for Science and Society*, 30(4), 250-256.
- [39] Rolewicz-Kalińska, A., Lelicińska-Serafin, K., & Manczarski, P. (2020). The circular economy and organic fraction of municipal solid waste recycling strategies. *Energies*, 13(17), 4366.
- [40] Rowan, N. J., & Galanakis, C. M. (2020). Unlocking challenges and opportunities presented by COVID-19 pandemic for cross-cutting disruption in agri-food and green deal innovations: Quo Vadis?. *Science of the Total Environment*, 748, 141362.
- [41] Santi, R., Garrone, P., Iannantuoni, M., & Del Curto, B. (2022). Sustainable food Packaging: an integrative framework. *Sustainability*, 14(13), 8045.
- [42] Simoens, M. C., & Leipold, S. (2021). Trading radical for incremental change: the politics of a circular economy transition in the German packaging sector. *Journal of Environmental Policy & Planning*, 23(6), 822-836.
- [43] Singh, J., Laurenti, R., Sinha, R., & Frostell, B. (2014). Progress and challenges to the global waste management system. *Waste management & research*, 32(9), 800-812. <https://journals.sagepub.com/doi/10.1177/0734242X14537868>
- [44] Smedley, T. (2021). *Plastics: attitudes and behaviours*, UK: March 2021. <https://www.ons.gov.uk/economy/environmentalaccounts/articles/plasticsattitudesandbehaviouruk/march2021#main-points>
- [45] Smith, A., & Johnson, M. (2019). Sustainability in packaging: A comparison of the United States, the United Kingdom, Germany and Japan. *Journal of Environmental Management*, 248, 109174. <https://www.sciencedirect.com/science/article/pii/S0301479719304415>
- [46] Statista. (2020). People willing to pay more for green products in Germany 2020. <https://www.statista.com/statistics/1103419/willingness-to-pay-for-green-products-germany/>
- [47] Sustainable Packaging Coalition. (2011). Definition of Sustainable Packaging. <https://sustainablepackaging.org/wp-content/uploads/2017/09/Definition-of-Sustainable-Packaging.pdf>
- [48] Swartz, E., Amatulli, C., & Peluso, A. M. (2021). Consumer Preference for Sustainable Packaging: A Discrete Choice Experiment Incorporating Focalism Effects. *Journal of Business Ethics*, 172(2), 237-254. <https://link.springer.com/article/10.1007/s10551-020-04370-w>
- [49] Valdivia, S., Backes, J. G., Traverso, M., Sonnemann, G., Cucurachi, S., Guinée, J. B., ... & Goedkoop, M. (2021). Principles for the application of life cycle sustainability assessment. *The International Journal of Life Cycle Assessment*, 26(9), 1900-1905.
- [50] Villa, R., Serrano, M., García, T., & González, G. (2023). To Green or Not to Green: The E-Commerce-Delivery Question. *Sustainability*, 15(16), 12161.
- [51] World Bank. (2018). Global Waste to Grow by 70 Percent by 2050 Unless Urgent Action is Taken: World Bank Report. <https://www.worldbank.org/en/news/press-release/2018/09/20/global-waste-to-grow-by-70-percent-by-2050-unless-urgent-action-is-taken-world-bank-report>
- [52] World Packaging Organization. (2019). Global packaging trends: E-commerce continues to drive packaging growth. <https://www.worldpackaging.org/wp-content/uploads/2019/05/World-Packaging-Trends-eBook.pdf>