

The Different Paths to the Same Journey: Identifying Consumer Segments with Distinctive Environmental Behaviors

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ABSTRACT

Prior sustainability research indicates that consumers, according to their social values and personal characteristics, might vary in terms of the specific environmental behaviors they tend to engage in. However, limited research to date has explored how consumers can be segmented into distinct clusters based on the extent of their sustainable behavior. To address this gap, the current research utilized a cluster analysis performed on data from the 2020 U.S. Sustainability Consumer Trends Database by the Natural Marketing Institute (NMI) to identify four consumer segments based on their environmental behavior patterns: Sustainability Champions, Sustainability Apprentices, Sustainability Lonewolves, and Sustainability Laggards. Of note, the Lonewolves displayed high levels of individual sustainability, despite their aversion to socially-oriented sustainability. Overall, these clusters reveal discernible attitudinal, behavioral and demographic differences, and thus have significant practical policy implications for future sustainability campaigns and intervention.

KEYWORDS

Sustainability; Cluster Analysis; Consumer Behavior; Environmental Policy; Sustainability Segmentation; Sustainable Living; Sustainable Consumption; Environmental Behavior

INTRODUCTION

As the global climate crisis intensifies, the need for extensive engagement with sustainable behavior has become ever more critical, as existing research shows that different lifestyles among consumers have a substantial impact on trends in greenhouse gas emissions.¹ However, according to a December 2024 report by the Pew Research Center, Americans are divided on the topic of climate change. While three-quarters of U.S. adults expect to make minor changes to increase sustainable behavior, less than a quarter of them are prepared to make major sacrifices.² Further, when facing the cost dilemma, recent data reveal that 54% of consumers value affordability over sustainability when it comes to their purchasing decisions.³ Existing research has developed a wide range of conceptual frameworks to describe and categorize sustainable consumer activities, often incorporating different combinations of consumer attitudes, motivations, behaviors, and contextual factors. These frameworks reflect the complexity of sustainability engagement and the challenges involved in turning environmental concern into action.

Building on these conceptual foundations, numerous studies have utilized segmentation and cluster analysis to group consumers based on sustainability-related attitudes, values, and self-reported behaviors, although a majority of these studies have classified consumers using socio-demographic characteristics, food-related lifestyles, product preferences, psychological traits, and multidimensional sustainable attitudes, which points to the need of utilizing key environmental behaviors for consumer segmentation. To date, few studies have segmented consumers based on concrete behavior indicators and even fewer studies have done so using a large, representative sample. To address this gap, the present study identifies policy-relevant consumer clusters based on consumer behavioral indicators using a large, nationally (U.S.) representative secondary dataset. This research introduces four distinct clusters that differ in levels of sustainable engagement and behavior. Understanding the differences between these clusters can provide valuable insights for policymakers, environmental advocates, and educators as they work to bridge the gap between consumers' attitudes and actions.

This paper aims to achieve three main objectives: (1) to identify distinct clusters based on consumers' key sustainable behaviors, (2) to understand and characterize these clusters based on their demographic profile and attitudes, and (3) to provide practical recommendations for promoting environmental behavior in each cluster based on their unique characteristics. The remainder of the manuscript is organized as follows. First, the theoretical background is presented. Next, the data source and methods are described, followed by the reporting of the clustering results. The paper concludes with potential recommendations for future sustainability research and policy initiatives.

THEORETICAL BACKGROUND

Conceptualizations of sustainable behavior

The World Commission on Environment and Development defines environmental sustainability as the concept of providing for current and future generations' resource and service needs without permanently risking or damaging the health of the natural world.^{4,5} Within this context, sustainable behavior is generally defined as taking on an environmentally conscious lifestyle, choosing to be environmentally responsible in one's everyday actions.⁶

Prior research demonstrates that sustainable behavior is not uniform across populations but instead varies substantially between individuals and households. For instance, Ivanova et al. revealed a diverse range of household carbon footprints based on household lifestyle, mediated by per capita gross domestic product (GDP) and influenced by purchasing power parity (PPP).¹ These findings underscore the diversity inherent in sustainable behavior and show the limitations of treating consumers as a homogenous group. Consequently, sustainability research emphasizes the necessity of differentiating consumers based on observable behaviors and lifestyle patterns to better understand their characteristics and to design more effective sustainability-oriented interventions and communications.

Frameworks for categorizing sustainable consumer behavior

A variety of conceptual frameworks have been proposed to capture the complexity of sustainable behavior of consumers using commitment, attitudes, behaviors, or contextual factors. These existing frameworks often classify sustainable behavior based on levels of individual commitment. For instance, one such framework divides sustainable behavior into three clusters labeled supportive behavior, active behavior, and lifestyle behavior, each denoting the levels of commitment an individual holds towards sustainable living.⁷ Another framework further divides sustainable commitment into seven different categories based on the attitudes of an individual as influenced by their motives.⁸

More recent frameworks utilize multidimensional approaches that incorporate variables from multiple domains. For instance, Piscitelli and D'Uggento describe a classification tree that incorporates age, gender, education, and sustainable actions to categorize levels of environmental commitment into voluntary participation in sustainable behavior, sustainable behavior that aligns with social and legal guidelines, and a lack of individual sustainable behavior.⁶ Furthermore, Geiger et al. introduce a three-dimensional framework, visually represented as a cube, in which sustainable consumption is determined by the intersecting dimensions of consumption phase (acquisition, usage, disposal), consumption area (e.g. food, housing, mobility, clothing), and sustainability (ecological, socio-economic).⁹ Yet another framework incorporates consumption phases into the model and separates sustainable behaviors into two categories: market behaviors and household behaviors.¹⁰ Altogether, these varied frameworks demonstrate that sustainable consumer behavior is multifaceted and influenced by a wide range of attitudinal, behavioral, and contextual variables. This diversity of conceptual approaches suggests that sustainable behavior is well suited to segmentation and clustering methods.

Consumer sustainability segmentation research

Given the multidimensional nature of sustainable behavior, clustering and segmentation techniques are widely employed in sustainability research to identify distinct consumer groups. Numerous studies apply cluster analysis to survey data to classify consumers based on sustainability-related attitudes, behaviors, or combinations of both. For example, Haan et al. identify four consumer segments (Convinced Sustainers, Sustainable Wannabes, Sustainable Non-Believers, and Non-Sustainers) using factors such as sustainable spending, skepticism, responsibility, support, and mobility.¹¹ Similarly, Niedermeier et al. identify six consumer segments differentiated by brand preferences, ingredient considerations, packaging, and price sensitivity.¹²

Anastasiadis et al. analyzed data from a 2023 European Union survey to cluster consumers based on their familiarity with sustainable consumption.¹³ They found strong associations between higher education levels and greater sustainability familiarity, as well as between higher household income and an increased likelihood of purchasing sustainable products. These results are similarly observed across other segmentation studies, suggesting that socio-demographic factors play a significant role in shaping sustainability-related awareness and consumption behavior.¹⁴

Other studies utilize large-scale or multi-domain data sources. Lock et al. analyze data across consumers, businesses, and media sources and identify five consumer clusters, the largest (64%) of which emphasizes both sustainability and consumption.¹⁵ These findings suggest that consumption-related sustainability concerns play an important role in shaping consumer segments.

Study	Data Source	Clustering Method	Clustering Criteria	No. Clusters	Cluster Labels	Key Characteristics
Haan et al. (2018)	Dutch general population questionnaire, N= 508	Principal axis factoring and k-means clustering	Attitudes and lifestyles	4	Convinced Sustainers, Sustainable Wannabes, Sustainable Non-Believers, and Non-Sustainers.	Different levels of sustainable attitudes and behaviors
Anastasiadis et al. (2025)	EU-wide survey, N= 3129	Clustering	Familiarity and purchasing behavior	5	Not familiar, Highly familiar, Less familiar, Very familiar, Moderately familiar	Different levels of familiarity with sustainability
Niedermeier et al. (2020)	Germany online survey, N= 1390	Choice-based conjoint experiment and latent class analysis	Brand preference and purchasing behaviors	6	Eco-friendly consumers Price-sensitive and eco-friendly consumers, Bargain hunters, Price-sensitive consumers, Brand-affine consumers, Nonbuyers	Different brands preferences based on eco-friendliness and price preferences
Lock et al. (2024)	Dutch online survey, N= 5473 and news media, N= 282 and websites, N= 74	Ward’s hierarchical clustering method	Attitudes and ethical values	5	Production & long-term, Buzzword & long-term, Environment, Long-term & consumption, Conservation & consumption	Different worldviews of sustainability and buzzwords associated with sustainability
Ahmadi Kaliji et al. (2025)	Albania face-to-face survey, N= 236	Ward’s hierarchical clustering method and k-means clustering	Food-related lifestyles	4	Health-conscious Eco-advocates, value seekers, Quality-focused traditionalists, Price-sensitive consumers	Different behaviors regarding food, price sensitivity, food preferences, and sustainable consciousness
Jasai and Kaur (2025)	Punjab survey, N= 690	k-means clustering	Innovativeness of opinion-seeking behavior	4	Enthusiast, Influencers, Image-lovers, Apathetic	Different levels of sustainable purchasing and self-image consciousness
Gazdecki et al. (2021)	Poland face-to-face survey, N=433	k-means clustering	Attitudes	3	Doers, Conscious, Reluctant	Different sustainable attitudes towards food
Pirsich and Weinrich (2018)	Germany online questionnaire, N= 620	Ward’s hierarchical clustering method	Attitudes and store choice behavior	5	Sustainability-minded, Local origin fans, Sustainability disinterested, Animal welfare concerned, Organic fans	Different attitudes towards sustainable meat and different incomes and locations
Vasileva and Ivanova (2014)	Bulgaria survey, N= 968	Furthest neighbor, Ward’s hierarchical clustering method, and k-means clustering.	Recycling behavior and attitudes	4	Environmentally sensitive, Inert, Indifferent, Recycling	Different levels of recycling behaviors and attitudes

Table 1. Overview of Select Consumer Segmentation Studies in Sustainability Research.

Additional studies segment consumers based on factors such as personality characteristics, food-related lifestyles, environmental behavior, product preferences, consumer inventiveness, and multidimensional sustainability attitudes, providing a wide range of distinct sustainable consumer types.¹⁶⁻¹⁹

In contrast, some papers are more specific in their cluster analyses, focusing on certain aspects of sustainability and consumerism to determine the consumer segments. For instance, a study analyzing consumer attitudes toward sustainable meat categories identified a total of five clusters: sustainability-minded, local origin fans, sustainability disinterested, animal welfare concerned, and organic fans. These clusters, while still providing insight into consumer sustainable behavior, offer a perspective specific to the animal meat domain.²⁰ Similar papers that concentrate on one or a few areas of sustainability allow for a more precise approach to studying environmental aspects of consumer behavior.²¹ For example, one research collecting recycling habit data from Bulgarians identified four clusters that described environmental attitudes—environmentally sensitive, inert, indifferent, and recycling—by considering attitudinal components such as pressure of social and personal norms, indifference, and environmental protection.²² These clusters characterize consumers by their environmental attitudes as influenced by general personal attitude as well as social norms. See Table 1 below for an overview of select consumer segmentation research in sustainability.

Altogether, most of the prior consumer sustainability segmentation research employs consumers' attitudes, lifestyle, preferences or values as clustering criteria. Among the few that include consumers' environmental behavior, the behavioral variables are employed together with other variables such as sustainability familiarity,¹³ brand preference, or recycling attitude.¹² Scant research to date has exclusively used consumers' environmental behavior as the sole base for clustering. Given the well-documented sustainable attitude-behavior gap, the present research aims to add to this body of literature by uncovering novel insights on consumer segments using varying types and levels of sustainable behaviors, allowing for consumer clusters to emerge based on their behavior patterns.²³ These findings may enable more actionable recommendations for effective sustainability campaigns and informed policymaking.

METHODS AND PROCEDURES

The data in this paper were collected from the 2020 U.S. Sustainability Consumer Trends Database by the Natural Marketing Institute (NMI).²⁴ These data quantify the size of the consumer market for environmentally and socially responsible products and services and measure the importance of environmental responsibility and societal issues, as well as corporate social responsibility. Furthermore, the database explores environmentally conscious behavior to determine consumer usage of sustainable products and services and quantifies purchase criteria. The database contains an annual study that has been performed in the United States since 2002 and globally since 2005, and has been used in a number of academic research and scholarly writings.^{25, 26} The 2020 report surveyed 3,000 U.S. adults in 2019 and was nationally projectable to the U.S. adult population with an accuracy at the 95% confidence level to $\pm 1.2\%$.²⁴ The study was conducted online and fielded in October 2019. Using data from this study, the present study performed an exploratory data analysis on consumer sustainability-related behavior to discover natural groupings and to determine the most appropriate managerial approaches for promoting sustainable action among various consumers.

A two-step cluster analysis was conducted to classify respondents into distinct groups based on their responses to 17 items measuring engagement in sustainable behaviors (see **Table 2**).²⁷ For these items, participants were asked to provide dichotomous ("yes" or "no") responses indicating whether they engaged in each sustainability-related behavior. This measure was selected because it represents the most direct measure of actual sustainable behavior, whereas other survey questions address broader aspects of sustainability, such as the marketplace for sustainable products and services, characteristics of consumers who purchase such products, expectations regarding corporate behavior, and general attitudes toward environmental and social issues.

The selection of this behavioral variable also reflects the key distinction between the present study and the Lifestyles of Health and Sustainability (LOHAS) segmentation approach.²⁸ Whereas the LOHAS framework employs 15 attitudinal and behavioral variables encompassing a broad range of lifestyle, health, and sustainability dimensions, the current study focuses exclusively on a single, behaviorally grounded sustainability measure as the basis for cluster formation.

The two-step cluster analysis was chosen for two primary reasons. First, it accommodates both categorical and continuous variables, whereas k-means clustering is limited to continuous variables; this feature is particularly important given the dichotomous nature of the selected behavioral items. Second, the method can automatically determine the optimal number of clusters, thereby reducing researcher subjectivity.²⁷ Using Ward's hierarchical clustering method with log-likelihood distance measures, potential cluster solutions were identified.²⁹ Although the initial analysis automatically yielded a three-cluster solution, further examination revealed highly imbalanced cluster sizes, with the largest cluster comprising 50.23% of the sample, the second-largest cluster 38.27%, and the smallest cluster only 11.50%. Additional analyses of alternative cluster solutions indicated a notable decrease in the average silhouette coefficient when moving from a four-cluster to a five-cluster solution (from 0.30 to 0.20), and the average silhouette coefficients were the same for the three- and four-cluster solutions. The four-cluster solution also yielded more balanced cluster sizes, suggesting better cluster quality and interpretability. Accordingly, the four-cluster solution was deemed the most appropriate representation of the data.

The four distinct consumer clusters were labeled based on the descriptive statistics of the sustainable behavior variables employed in the analysis (see **Table 2**). These clusters are designated as Sustainability Champions, Sustainability Apprentices, Sustainability Lonewolves, and Sustainability Laggards (hereafter referred to as Champions, Apprentices, Lonewolves, and Laggards, respectively). To provide further insights on the characteristics of these clusters, descriptive analyses on additional variables, including demographic variables, the role of sustainability considerations on consumer purchases, and the concerns regarding social, economic, and political issues, were conducted. The demographic characteristics corresponding to each cluster are presented in **Table 3**, and the descriptive results on the role of sustainable considerations in consumer purchases, and the concerns regarding social, economic, and political issues are reported in **Table 4** and **Table 5**, respectively.

	Champions (N=1081, 36.0%)	Apprentices (N=862, 28.7%)	Lonewolves (N=651, 21.7%)	Laggards (N=406, 13.5%)	Total (N=3,000)
Have become more energy conscious in my home	96.3%	75.6%	96.8%	29.6%	81.4%
Drive a more fuel-efficient car	76.6%	44.0%	63.6%	15.0%	56.1%
Use more natural products	94.5%	55.1%	95.7%	14.8%	72.7%
Donate money to an environmental group	78.4%	15.8%	0.0%	1.7%	33.0%
Use less chemicals/pesticides on my lawn/garden	92.0%	62.8%	90.2%	18.5%	73.2%
Purchase products made from recycled materials	97.0%	66.5%	96.9%	11.1%	76.6%
Use energy efficient appliances	93.9%	74.6%	94.5%	33.7%	80.3%
Use biodegradable products	94.4%	50.4%	91.9%	4.9%	69.1%
Use products with less packaging	90.9%	58.2%	95.2%	5.4%	70.9%
Buy/use fewer products in plastic packaging	90.6%	47.5%	92.9%	2.7%	66.8%
Stopped using/use fewer plastic bags in the produce and bakery departments	91.6%	53.5%	89.4%	10.8%	69.2%
Buy/use more products from companies who follow sustainable and environmentally responsible initiatives	94.6%	40.3%	77.6%	14.8%	64.5%
Conserve water	94.8%	74.9%	94.3%	28.6%	80.0%
Use organically grown products	84.6%	37.1%	67.3%	9.4%	57.0%
Recycle as much as I can	97.3%	79.1%	96.3%	37.0%	83.7%
Take part in social activism (gun reform, environmental protection, etc.)	79.3%	18.5%	0.0%	5.2%	34.6%
Use reusable containers	96.4%	87.0%	98.6%	43.1%	87.0%

Table 2. Sustainable Actions of Individual Clusters. Measurement scale: 1=yes, 0=no. The scores indicate the percentage of individuals who answered yes.

RESULTS

The first cluster, the Champions, are the most sustainable and demonstrate high levels of education, purchasing power, and overall concern for other social issues. They represent the biggest share of participants (i.e., 36.0% of the sample). This cluster is characterized by its high engagement in sustainability-related social activism (see Table 2), positive attitude toward sustainable and organically grown products, and high proportion of participants aged 18-29 and 30-39 across the clusters, 20.4% and 24.7%, respectively. These consumers are the most likely to be employed (51.5%), the most educated, and the highest-paid among the clusters as shown in Table 3. Despite their potential purchasing power, preference, and willingness to pay more for sustainable products, their purchasing decisions are ultimately still largely dependent on price (M = 3.49; see Table 4). This statistic coincides with the fact that they are more concerned about social issues such as access to health care (60.1%) and race relations (57.6%) than the U.S. stock market (25.7%) or military efforts abroad (27.8%, see Table 5).

	Champions (N=1081, 36.0%)	Apprentices (N=862, 28.7%)	Lonewolves (N=651, 21.7%)	Laggards (N=406, 13.5%)	Total (N=3000)
Age					
18-29	221 (20.4%)	173 (20.1%)	74 (11.4%)	75 (18.5%)	543 (18.1%)
30-39	267 (24.7%)	119 (13.8%)	90 (13.8%)	68 (16.7%)	544 (18.1%)
40-49	213 (19.7%)	135 (15.7%)	109 (16.7%)	98 (24.1%)	555 (18.5%)
50-64	202 (18.7%)	229 (26.6%)	190 (29.2%)	90 (22.2%)	711 (23.7%)
65+	178 (16.0%)	206 (23.9%)	188 (28.9%)	75 (18.5%)	647 (21.6%)
Gender					
Female	528 (48.8%)	467 (54.2%)	405 (62.2%)	201 (49.5%)	1601 (53.4%)
Male	553 (51.2%)	395 (45.8%)	246 (37.8%)	205 (50.5%)	1399 (46.6%)
Household income					
Less than \$15,000	58 (5.4%)	77 (8.9%)	36 (5.5%)	60 (14.8%)	231 (7.7%)
\$15,000 to \$49,999	218 (20.2%)	237 (27.5%)	174 (26.7%)	124 (30.5%)	753 (25.1%)
\$50,000 to \$124,999	437 (40.4%)	344 (39.9%)	292 (44.9%)	129 (31.8%)	1202 (40.1%)
\$125,000 to \$199,999	249 (23.0%)	124 (14.4%)	102 (15.7%)	49 (12.1%)	524 (17.5%)
\$200,000 or more	85 (7.9%)	44 (5.1%)	29 (4.5%)	15 (3.7%)	173 (5.8%)
Decline to answer	34 (3.1%)	36 (4.2%)	18 (2.8%)	29 (7.1%)	117 (3.9%)
Education					
High school or less	155 (14.3%)	188 (21.8%)	114 (17.5%)	124 (30.5%)	581 (19.4%)
Some college, but no degree	170 (15.7%)	182 (21.1%)	137 (21.0%)	79 (19.5%)	568 (18.9%)
Associate's degree	102 (9.4%)	89 (10.3%)	86 (13.2%)	38 (9.4%)	315 (10.5%)
College graduate (e.g., B.A., B.S.)	336 (31.1%)	207 (24.0%)	185 (28.4%)	92 (22.7%)	820 (27.3%)
Some graduate school, but no degree	41 (3.8%)	26 (3.0%)	29 (4.5%)	13 (3.2%)	109 (3.6%)
Graduate school degree	277 (25.6%)	170 (19.7%)	100 (15.4%)	60 (14.8%)	607 (20.2%)
Employment Status					
Employed full-time	557 (51.5%)	296 (34.3%)	231 (35.5%)	150 (36.9%)	1234 (41.1%)
Employed part-time	74 (6.8%)	65 (7.5%)	48 (7.4%)	32 (7.9%)	219 (7.3%)
Self-employed	67 (6.2%)	65 (7.5%)	42 (6.5%)	18 (4.4%)	192 (6.4%)
Retired	190 (17.6%)	238 (27.6%)	196 (30.1%)	86 (21.2%)	710 (23.7%)
Not employed, but currently seeking employment	59 (5.5%)	59 (6.8%)	27 (4.1%)	31 (7.6%)	176 (5.9%)
Not employed, and not currently seeking employment	19 (1.8%)	38 (4.4%)	22 (3.4%)	38 (9.4%)	117 (3.9%)
Currently unemployed/furloughed due to COVID-19/Coronavirus	33 (3.1%)	22 (2.6%)	24 (3.7%)	8 (2.0%)	87 (2.9%)
Was previously unemployed/furloughed due to COVID-19/Coronavirus, but am now back to work	7 (0.6%)	6 (0.7%)	9 (1.4%)	3 (0.7%)	25 (0.8%)
Student	46 (4.3%)	36 (4.2%)	11 (1.7%)	9 (2.2%)	102 (3.4%)
Homemaker	55 (5.1%)	56 (6.5%)	58 (8.9%)	41 (10.1%)	210 (7.0%)

Table 3. Cluster Profiles Based on Demographic Variables.

The second cluster, the Apprentices, represent a balanced cluster with normal distribution for age, education, employment, and a general interest in domestic issues, including conservation and sustainability. The Apprentices consistently exhibited responses that closely aligned with the overall survey mean. This cluster was characterized through trends such as a higher likelihood of home energy conservation (75.6%), but lower levels of social activism (18.5%) and donation (15.8%, see **Table 2**). Additionally, the Apprentices group exhibits a generally balanced gender distribution, with males and females comprising 54.2% and 45.8% of this cluster, respectively. The age of the Apprentices can be visualized parabolically, where participants are composed mostly of

ages 18-29 and 50-65+. Such a pattern in age was mirrored by the cluster’s employment status and education level, as the cluster has a large percentage of retired participants (27.6%) and respondents with no college degree (42.9%, see **Table 3**). In addition, this cluster shows great interest in domestic issues in the United States, including access to healthcare (53.0%), terrorism (48.7%), and the current U.S. president (48.6%), among others (see **Table 5**).

	Champions (N=1081, 36.0%)		Apprentices (N=862, 28.7%)		Lonewolves (N=651, 21.7%)		Laggards (N=406, 13.5%)		Total (N=3000)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
I am willing to pay 20% more for products which are Fair Trade certified.	3.66	1.09	2.51	1.17	2.71	1.12	2.15	1.11	2.92	1.26
I care about the environment, but my purchase is determined mainly by price.	3.49	1.23	3.95	0.90	3.66	0.98	3.83	1.04	3.70	1.08
I care about how workers are treated, but my purchase is determined mainly by price.	3.69	1.21	3.89	0.94	3.67	0.99	3.72	1.05	3.75	1.07
I prefer to buy products from manufacturers that use environmentally-friendly packaging materials	4.45	0.70	3.65	0.84	4.12	0.73	2.80	0.97	3.93	0.96
I prefer to purchase products that are manufactured in a sustainable manner	4.40	0.74	3.61	0.87	4.09	0.69	2.82	0.96	3.89	0.96
I think many products are over-packaged.	4.24	0.90	3.84	0.98	4.29	0.81	3.18	1.07	3.99	1.00
I try to teach family and friends about the benefits of purchasing environmentally-friendly products.	4.18	0.86	2.94	1.12	3.45	1.05	2.29	1.12	3.41	1.22
When I see a product that is over-packaged, I look for something else to buy.	3.76	0.98	2.83	1.06	3.27	0.96	2.29	1.08	3.19	1.14
I am not willing to pay any more for products manufactured in an environmentally friendly and sustainable way.	2.76	1.27	3.50	1.11	3.17	1.10	3.86	1.01	3.21	1.22
I am willing to pay 20% more for products manufactured in an environmentally friendly and sustainable way.	3.74	1.09	2.50	1.22	2.75	1.14	2.15	1.14	2.95	1.30

Table 4. Role of Sustainable Considerations in Consumer Purchases.

Question: Thinking about how products are made and sold, please indicate your level of agreement or disagreement with the following statements in terms of how they affect your purchasing of products. 1=Disagree Completely, 5=Agree Completely.

Overall, the third cluster, the Lonewolves, represent high involvement in sustainable behavior but low contribution in terms of social activism and donations, with a proportionally older demographic and a general concern towards domestic issues. The Lonewolves are distinct in their high involvement in sustainable activity (e.g., use reusable containers: 98.6%, home energy conservation: 96.8%, purchase produce made from recycled materials: 96.9%, recycle as much as possible: 96.3%, see **Table 2**), excluding social contribution in the form of donating money to an environmental group and taking part in social activism (gun reform, environmental protection, etc.), which both stand at 0.0%. The findings indicate that over 90% of participants in the Lonewolves cluster engaged in more than two-thirds of the sustainable actions listed (see **Table 2**).

	Champions (N=1081, 36.0%)	Apprentices (N=862, 28.7%)	Lonewolves (N=651, 21.7%)	Laggards (N=406, 13.5%)	Total (N=3000)
Access to healthcare	60.1%	53.0%	59.6%	28.3%	60.1%
Childhood obesity	39.4%	27.6%	37.3%	14.0%	39.4%
Cost of oil and gasoline	35.3%	33.9%	36.6%	25.1%	35.3%
Dependence on foreign oil/energy	34.9%	27.4%	39.5%	21.2%	34.9%
Fair labor practices	45.3%	32.1%	40.4%	17.7%	45.3%
Food waste (at home)	44.3%	30.1%	37.6%	14.0%	44.3%
Food waste (away from home, such as a restaurant)	55.0%	35.7%	50.4%	17.0%	55.0%
Hunger/Undernourishment	51.9%	37.8%	47.3%	21.4%	51.9%
Immigration policies	48.9%	48.4%	52.2%	34.7%	48.9%
Level of personal debt (credit cards, etc.)	29.9%	29.7%	29.2%	25.4%	29.9%
Military efforts abroad	27.8%	23.4%	25.4%	15.8%	27.8%
Partisanship in Congress	35.5%	35.6%	43.5%	23.9%	35.5%
Terrorism	45.7%	48.7%	53.8%	37.7%	45.7%
The quality of public schools	53.0%	46.6%	54.4%	29.1%	53.0%
The size of the U.S. debt	43.9%	46.1%	53.2%	34.2%	43.9%
The current U.S. President	56.2%	48.6%	45.9%	24.6%	56.2%
The value of my home/property	28.0%	27.8%	30.1%	19.7%	28.0%
Unpredictable rise and fall of the stock market	25.7%	21.9%	25.2%	12.8%	25.7%
Race relations in the United States	57.6%	48.1%	49.6%	26.1%	57.6%
Black Lives Matter	55.2%	39.4%	38.7%	26.6%	55.2%
None of these	3.1%	3.1%	1.7%	23.4%	3.1%

Table 5. Concerns Regarding Social, Economic, and Political Issues.
 Question: Please indicate which of the following social/economic or political issues concern you, if any. Measurement scale: 1=yes, 0=no. The scores indicate the percentage of individuals who answered yes.

A total of 21.7% of all respondents formed this cluster, and among them, 62.2% are female and 37.8% are male. Furthermore, this cluster had the largest number of elderly participants, with nearly 30% of all survey responders over the age of 65. Lonewolves display a normal distribution with education, having the lowest components at the two extremes: ‘less than high school graduate’ and ‘graduate school degree,’ 17.5% and 15.4% respectively (see **Table 3**). The Lonewolves’ responses suggest that they believe most items and products are over-packaged (M = 4.29) and they are concerned about plastic pollution, but they are unlikely to encourage their friends and family to purchase more sustainably (M = 3.45, see **Table 4**). Additionally, Lonewolves are less concerned about international issues such as the military abroad and profess more interest in issues pertaining to the United States (e.g., access to healthcare: 59.6%, the quality of public schools: 54.4%, terrorism: 53.8%, and the size of the U.S. debt: 53.2%, see **Table 5**).

The last cluster, the Laggards, demonstrate the lowest levels of sustainable behavior, as well as lower education levels and household incomes, overall being disinterested in social issues and motivated by price. This group is not only the smallest cluster, consisting of 13.5% of survey respondents, but also demonstrates the least amount of activity across all areas of sustainability. Overall, the members of this cluster have little to no enthusiasm for sustainability and environmental actions, and this lack of action is reflected in their behavior. In all categories of sustainable behavior, less than 50% of Laggards noted that they participated in that action, with the highest activity being in household sustainability, such as using reusable containers, recycling, and using more sustainable home appliances (these categories had the most positive responses at 43.1%, 37.0%, and 33.7% respectively, see **Table 2**). They have lower household incomes; 14.8% of those in this cluster indicated a household income of less than \$15,000 each year. Notably, they also are a significant portion of the least educated responders, taking up 30.5% of laggards who did not graduate from high school (see **Table 3**). Finally, their behavior demonstrates that their purchases are primarily motivated by price ($M = 3.83$), and they show lower preference for products that are produced sustainably ($M = 2.82$, see **Table 4**). Laggards are characterized by their disinterest in politics as well as socioeconomic issues, with consistently less than 40% of them indicating interest or concern in social, economic, or political issues. The highest concern reported was in terrorism, at 37.7% (see **Table 5**).

DISCUSSION

Prior sustainability research indicates that consumers, according to their social values and personal characteristics, might vary in terms of the specific environmental behaviors they tend to engage in. However, limited research to date has explored how consumers can be segmented into distinct clusters based on the extent of their sustainable behavior and even fewer studies have done so using a large, representative sample. To address this gap, the current research took the initiative and utilized a cluster analysis performed on a large national data from the 2020 U.S. Sustainability Consumer Trends Database by the Natural Marketing Institute (NMI) to identify four consumer segments based on their environmental behavior patterns. Overall, these clusters reveal discernible attitudinal, behavioral and demographic differences, and thus have significant practical policy implications for future sustainability campaigns and intervention.

Specifically, our findings have yielded four distinct clusters based on consumer sustainable behaviors: Champions, Apprentices, Lonewolves, and Laggards. Champions and Laggards represented the highest and lowest levels of sustainable action, respectively. Apprentices demonstrated moderate sustainability engagement, while Lonewolves displayed high levels of individual sustainability but lower social contribution (activism and donation), as illustrated in **Figure 1**.

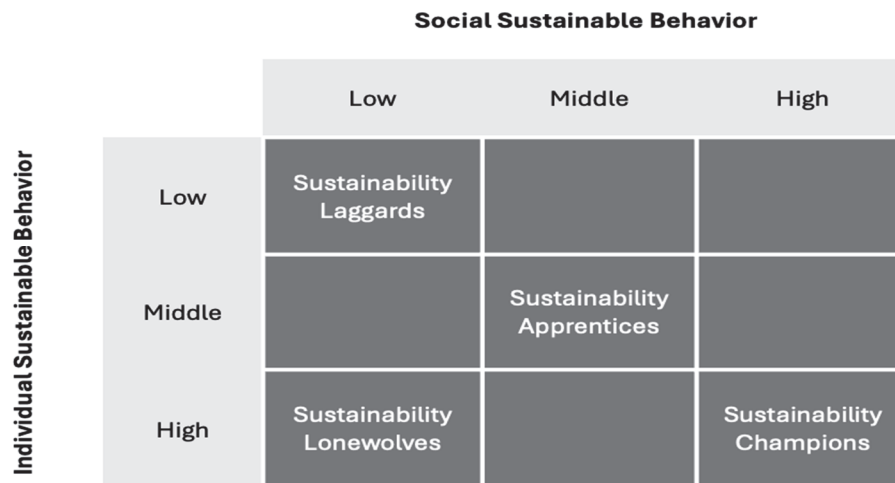


Figure 1. Individual vs. Social Sustainable Behavior.

Insights from the current research offer several important implications for sustainability practitioners and policy makers. First, the Champions were shown to participate in the greatest amount of sustainable behavior, especially through social activism. To further increase their environmental behavior, policymakers could focus on amplifying this cluster’s social activism and empowering them to make a greater impact. The Environmental Protection Agency offers more than four billion U.S. dollars in grants annually to organizations that are working towards more sustainable goals,³⁰ a movement that can be mimicked to amplify environmental awareness among the Champions. Organizations can leverage their passion by creating opportunities for greater community involvement, advocacy, and leadership in sustainability initiatives.

	Champions (N=1081, 36.0%)	Apprentices (N=862, 28.7%)	Lonewolves (N=651, 21.7%)	Laggards (N=406, 13.5%)	Total (N=3000)
I am not sure they are actually any better for the environment.	20.4%	24.4%	19.2%	21.4%	21.4%
I don't know enough about them.	16.5%	22.9%	16.9%	15.5%	18.3%
They are less convenient to use.	13.2%	12.7%	9.4%	10.8%	11.9%
They are not available at the stores/other places I shop.	24.7%	18.5%	21.7%	5.9%	19.7%
They are difficult to find at the places I shop.	31.7%	19.7%	25.0%	8.4%	23.7%
They are too expensive.	35.3%	52.6%	53.2%	45.1%	45.5%
They do not work as well as the products I usually buy.	18.5%	25.5%	22.7%	18.0%	21.4%
It's not always easy to tell whether a product is environmentally friendly or not.	33.8%	32.8%	37.3%	15.8%	31.8%
I don't know if they are actually any better for me/my family.	15.9%	23.1%	18.7%	17.5%	18.8%
Other (please specify)	0.5%	1.4%	0.8%	2.0%	1.0%
Nothing	16.2%	9.9%	11.2%	28.6%	15.0%

Table 6. Barriers to Sustainable Consumption.

Question: Which of the following, if any, prevents you from using environmentally-friendly products and services. Measurement scale: 1=yes, 0=no. The scores indicate the percentage of individuals who answered yes.

Given the large proportion of younger surveyees within the Champion cluster, modern social media offers an ideal platform for engaging with them. Businesses and individuals alike can raise awareness about environmental issues and share information about initiatives through captivating posts. While this cluster shows a preference for environmentally friendly products, price nonetheless remains a significant factor in their purchasing decisions (see **Table 6**). To potentially motivate this cluster to consistently choose sustainable options, the non-financial value of these products—particularly their health and environmental benefits—could be stressed. Highlighting these tangible advantages may resonate deeply with this cluster, especially as society continues to see a “substantial increase in the prioritization of wellness.”³¹

Second, the Apprentices exhibited intermediate levels of sustainable behavior, placing them between the high engagement of Champions and the low engagement of the Laggards. To boost their levels of sustainable behavior, policymakers could focus on heightening this cluster’s social activism and participation in donations. Working to increase the Apprentices’ sustainable actions through encouragement, promotion, and awareness will ultimately improve this cluster’s sustainable behavior. As such, one recommendation could be to provide more awareness, education, and training on the importance of sustainability for the future. Focusing on increasing awareness could improve the Apprentices’ willingness to donate or participate in social activism as they improve their understanding of the urgency of the modern climate crisis. Promoting messages of sustainable behavior through all forms of media—social media for younger age groups and traditional media for older age groups—could help the Apprentices absorb current environmental issues. Informing and potentially inspiring such a cluster with information regarding sustainability would provide the basis necessary for the Apprentices to become Champions.

Third, to promote sustainable behaviors of the Lonewolves, organizations could first emphasize sustainable action regarding plastic pollution and reusable containers when promoting and discussing environmental awareness, as this cluster has demonstrated high concern for plastic pollution. Highlighting this aspect when heightening sustainability awareness and promoting sustainable behavior relating to littering could draw more of this cluster's attention to sustainability. Second, it may be beneficial to utilize more traditional forms of media, such as newspapers and radio, as the older demographic of this cluster is more likely to consume content through such forms of media. In recent years, newspapers such as the New York Times, The Guardian, and The Wall Street Journal have published more news regarding sustainability and sustainable business and impact, which may appeal to the Lonewolves and increase sustainable behavior in this cluster. Third, previous studies have noted a correlation between those of the older demographic and traditional activism.³² As such, shifting the focus from social activism towards the petition and ratification of laws and bills could help encourage sustainable action among the Lonewolves. Finally, promoting individual action as opposed to group action (*i.e.*, sustainable behaviors that can be performed by a single individual as opposed to larger groups, such as reducing littering) is recommended, as this cluster finds little value in social activism and is less likely to communicate values of sustainability to other people. In conclusion, given the Lonewolves' old demographic and unwillingness to partake in social activism, organizations could benefit from emphasizing personal activism through traditional media.

Lastly, as the cluster exhibiting the lowest amount of sustainable behavior across all sectors, the Laggards require a unique approach to promote meaningful action. Rather than pushing for immediate, drastic change, encouraging incremental progress is recommended. Notably, among each cluster, the Laggards had the lowest yearly income, with 45.3% of respondents reporting income at or below \$49,000 (see **Table 3**). Furthermore, the purchasing behavior of the Laggards is primarily motivated by price. Actions concerned less about donation and social activism should be taken, as this cluster may not have the means to afford these measures. Rather, a heavier emphasis could be placed on promoting sustainable practices that also benefit the participants themselves. This direction could include emphasizing the health benefits of eating sustainably or the economic benefits of installing energy-efficient solar panels. Trends among the Laggards depict general disinterest in current events. In alignment with their lack of enthusiasm for sustainability, many areas of politics not concerning sustainability are also of little interest to the Laggards. As was recommended for Apprentices, it could be beneficial to improve education in current events. This action could be accomplished by spreading awareness of current events in circles that the Laggards are active in, particularly non-political spheres.

Overall, each of the four clusters has major characteristics and avenues for improving their sustainable behavior that distinguish them from each other. Creating opportunities for involvement and spreading awareness through modern social media platforms are the most effective ways to increase sustainable behavior among the Champions. By contrast, increasing awareness and education is the best way to promote sustainable action for the Apprentices, encouraging them to reach a level of sustainability on par with the Champions. Due to the Lonewolves' large proportion of older participants, emphasis should be placed on spreading awareness, specifically in the form of traditional media (*e.g.*, radio, newspaper, television), promoting individual-level sustainable behaviors (*e.g.*, purchasing decisions, household energy consciousness, recycling, *etc.*) that appeal to their preferences. For Laggards, focusing on gradual steps of increasing sustainable practices through emphasizing personal benefits and greater education is recommended. Findings from the present research, therefore, contribute novel insights that extend the existing knowledge regarding sustainable behavior. For instance, the present research's identification of the Lonewolves cluster provides valuable insights into understanding this unique yet understudied segment that might have been largely overlooked by existing literature.

CONCLUSIONS

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

There are a few limitations associated with this research that merit noting. As this paper is focused on consumer, individual-level behavior, only the aspects revolving around consumer clusters were reviewed; however, it is worth mentioning that the various clusters that might arise from a population of businesses or different media sources may reveal sustainable priorities from a different perspective of the general population, potentially offering more managerially-oriented insights. Moreover, this research relied on self-reported survey data. Although such instruments yield valuable insights into consumer attitudes and perceptions, future empirical investigations employing consumers' objective behavioral data are desired to validate the consumer clusters identified in this analysis. It is also important to acknowledge that the cluster analysis conducted in this research is exploratory in nature. Therefore, subsequent research employing confirmatory and predictive analyses will be needed to establish stable and causal linkages between consumer characteristics and sustainable behaviors.

Building on our cross-sectional clustering of sustainable behavior, two avenues for future research appear promising: longitudinal analysis of cluster dynamics and cross-cultural comparisons of cluster memberships. Consumers' engagement with sustainable

behaviors is likely to change over time in response to shifts in personal circumstances and external events. A longitudinal study would allow researchers to identify who tends to “graduate” from Laggard to Apprentice (or regress from Champion back to Lonewolf), and which external events (e.g., economic shifts, climate disasters, introduction of new technologies) cause significant shifts. These insights can be critical for timing interventions: for instance, when determining the optimal timing of messaging to prevent backsliding of Apprentices to Laggards. Additionally, sustainable behavior is deeply ingrained in cultural and institutional contexts. Across countries, perspectives on sustainability and government mandates vary. Extending the clustering approach utilized in the current research to each country in a multi-national dataset might reveal which sustainable policies work universally and which require targeted, local adaptation.

This finding reinforces prior research while also offering new insights into how sustainability differs between individual and collective levels. In particular, understanding the Lonewolves provides valuable direction for designing strategies to better engage this cluster.

Our analysis also indicates that pricing remains a significant barrier to sustainable purchasing across all clusters (see **Table 6**). Policymakers and businesses could therefore prioritize reducing the cost of sustainable products or emphasizing their added value to improve their competitiveness in the marketplace. Furthermore, organizations could tailor interventions to the unique traits of each cluster. For instance, to effectively engage Apprentices, sustainability initiatives could focus on targeting this group using both modern (social media, websites, *etc.*) and traditional (newspapers, radio, *etc.*) forms of media, in recognition of this cluster’s unique age distribution (see **Table 3**).

Overall, promoting widespread sustainable behavior requires a careful balance between policy mandate and consumer actions. It may be beneficial for Policymakers to focus on shaping purchasing habits to align sustainability consciousness with broader social and environmental goals. Addressing the barriers faced by less engaged clusters, such as the Laggards, and supporting gradual shifts in consumption patterns is essential for realizing a sustainable future.

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AUTHORS’ CONTRIBUTIONS

All authors contributed equally to this paper. Authorship was decided randomly.

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PRESS SUMMARY

This study analyzes data from the 2020 U.S. Sustainability Consumer Trends Database by the Natural Marketing Institute (NMI) and identifies four consumer segments based on environmental behavior: Sustainability Champions, Sustainability Apprentices, Sustainability Lonewolves, and Sustainability Laggards. Notably, Lonewolves demonstrated strong personal sustainability practices, despite a reluctance to engage in socially-driven sustainability efforts. These clusters exhibit clear differences in attitudes, behaviors, and demographics, offering valuable insights for shaping effective sustainability policies and targeted intervention strategies.