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Visitor Segmentation Through Sustainable Travel Behaviors: Insights from Indonesia

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ABSTRACT

Tourism's potential to contribute to sustainable development is strongly influenced by tourist behaviors. To advance sustainability in destination planning, segmentation studies tailored to behavioral patterns are essential. This study aims to identify distinct segments of urban visitors based on environmental and social sustainability practices, while also exploring generational differences. Using a two-step cluster analysis on survey data from 1,053 respondents in the Jakarta Metropolitan Area, visitors were grouped based on their reported sustainable behaviors. The analysis first determined the optimal number of clusters using the Bayesian Information Criterion (BIC) and then validated the solution through silhouette analysis. The study reveals two primary visitor clusters: one characterized by consistent pro-environmental and pro-social behaviors, predominantly comprising individuals with higher education and income; and another with more sporadic sustainable behaviors, largely associated with lower socioeconomic status. Generational distinctions were evident, with Gen Y and Gen X dominating the former cluster, while Gen Z and Baby Boomers were more prevalent in the latter. The study offers actionable insights for tailoring sustainability-focused tourism strategies across demographic profiles and contributes an important perspective from the Global South, addressing the literature's current bias toward Western contexts.

1. INTRODUCTION

Sustainable tourism has become a key strategy for balancing environmental conservation, economic development, and socio-cultural preservation — especially in rapidly developing countries like Indonesia. As one of Southeast Asia's most visited destinations, Indonesia faces increasing pressure to manage tourism growth while minimizing negative impacts on natural and cultural assets. The government has actively promoted sustainable tourism through national policies and the designation of sustainable tourism pilot destinations. However, the success of these efforts largely depends on how tourists themselves behave—how they consume resources, interact with communities, and make travel choices.

Understanding tourist behavior is thus critical for achieving long-term sustainability goals. Globally, researchers have segmented tourists based on their environmental and social orientations, identifying groups such as "eco-centric" versus "mid-centric" tourists [1], "sustainable", "medium", "low" [2], and "high" versus "low" environmental attitude segments [3]. Additionally, nuanced classifications such as "environmentally responsible" versus "general nature-based" travelers [4], "active preservers of nature and culture" versus "local culture and community seekers" [5], and "environmental", "mixed-bag environmental" [6] further illustrate the complexities in visitor profiles.

Despite the growing body of literature, there remains a notable gap in research on sustainable purchasing behavior within the Asian context [7]. The majority of studies examining the relationship between environmental attitudes and actions across generations are conducted in Western nations, with only Korea and Malaysia representing the Asian perspective in this area [6]. Moreover, while there is a growing trend towards adopting sustainable consumption habits, this inclination has not always translated into actual purchasing behavior [8]. Existing research has primarily focused on projected sustainable travel actions rather than the actual behaviors that are seen [6, 7]. In addition, many studies have focused solely on the environmental element, neglecting the economic and socio-cultural aspects [5, 9, 10].

This study addresses these gaps by segmenting urban tourists in the Jakarta Metropolitan Area based on their actual environmental and social sustainability behaviors. It also investigates generational patterns, offering insights into how sustainability engagement varies across cohorts. In doing so, the research contributes to a more localized and multidimensional understanding of visitor segmentation, informing more targeted and effective policy and planning interventions in sustainable tourism.

2. METHODOLOGY

This study employed a convenience sampling approach to collect data from urban travelers in the Jakarta Metropolitan Area. The target population comprised residents aged 17–64 who had traveled to Bandung within the previous three months. Bandung was selected as the travel destination criterion due to its strategic role as a major urban tourism hub and its high connectivity with the Jakarta Metropolitan Area. The mobility between these two regions is among the highest in Indonesia. Bandung also functions as a tourism magnet that draws a large number of urban visitors from Jakarta and surrounding cities. This high-frequency travel pattern makes Bandung a relevant context for analyzing sustainable tourism behaviors among urban travelers and enhances the study's applicability to planning in high-mobility tourism corridors. A total of 1,053 responses were collected via an online survey over six weeks (October–November 2023). While this method enabled efficient data collection, it may limit sample representativeness.

The survey included questions on socio-demographic details, travel behavior, and environmental and social sustainability practices. Items assessing sustainable behavior were adapted from established studies [5, 6] and measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Sample items include: 'I prefer visiting unique and new destinations over popular ones', 'When traveling, I tend to use eco-friendly transport options, and 'When I travel, I try to choose tourism services and products that contribute to the welfare of the local community.' The questionnaire was pre-tested with 30 respondents to ensure clarity and internal consistency.

To identify visitor segments, a two-step cluster analysis was performed. In the first step, automatic clustering used the Bayesian Information Criterion (BIC) to determine the optimal number of clusters. The final two-cluster solution was selected based on: (1) the largest BIC reduction between one and two clusters, (2) the highest ratio of BIC changes, and (3) diminishing improvements beyond two clusters.

As shown in Table 1, five cluster solutions were initially generated, with detailed calculations of distance changes. The BIC value dropped from 13261.278 (1 cluster) to 12076.385 (2 clusters). The selection of the optimal number of clusters was guided by the highest ratio of distance measures, with the two-cluster solution yielding the highest value at 1.687. This indicates a strong separation between clusters and confirms that the two-cluster model was the most appropriate for this study.

In the second step, the internal validity of the clustering was tested using a silhouette analysis. The silhouette coefficient—a measure of cohesion and separation—was calculated to assess the consistency of the clustering structure. The resulting silhouette value of 0.2, while modest, exceeds the minimum acceptable threshold of 0.0, thereby supporting the validity of the two-cluster solution [11].

Table 1. Ratio Bayesian Information Criterion (BIC)

Number of Clusters	Schwarz's Bayesian Criterion (BIC)	BIC Change[a]	Ratio of BIC Changes[b]	Ratio of Distance Measures[c]
1	13261.278			
2	12076.385	-1184.893	1.000	1.687
3	11438.993	-637.392	.538	1.313
4	10991.713	-447.281	.377	1.309
5	10687.890	-303.822	.256	1.204

a. The changes are from the previous number of clusters in the table.
b. The ratios of changes are relative to the change for the two cluster solution.
c. The ratios of distance measures are based on the current number of clusters against the previous number of clusters.

3. RESULTS AND DISCUSSION

Demographic and Travel Characteristics

The survey revealed that the majority of respondents were female (60.11%) and held an undergraduate degree (48.24%), as shown in Table 2. Jakarta residents comprised the largest share of participants (44.06%), and a significant portion (41.22%) reported a monthly income below IDR 5 million, highlighting a predominance of lower-income travelers. In terms of generational composition, Gen Z accounted for the largest group (37.51%), followed by Gen Y (31.15%), Gen X (28.96%), and Baby Boomers (2.37%).

The analysis, as seen in Table 3, also showed that most respondents travel occasionally (80.06%), with recreation being the main purpose of their trips (66.97%). Most traveled with family (59.26%) and relied on private vehicles (72.55%) as their main mode of transport. Hotels were the most common accommodation type (62.77%). Nearly all respondents planned their trips independently (96.2%), with the most frequently cited travel interests being adventure (21.56%) and nature (19.56%).

Cluster Analysis and Behavioral Segmentation

As shown in Table 4, the results of a two-step cluster analysis indicated that Cluster 1 accounts for 39.1% of the total sample (412), whereas Cluster 2 makes up 60.9% (641). It also shows that Cluster 1 had the highest agreement levels with most of the statements except when considering eco-friendly accommodation options, where both clusters show a moderate tendency with nearly identical means, with Cluster 2 having a slightly higher mean than Cluster 1.

Across both clusters, the mean scores for all listed behaviors fall within the 3.5 – 4.0 range, suggesting a moderate to strong, though not highly robust, commitment to sustainable practices. Respondents generally show an inclination toward environmentally and socially responsible travel choices, but their commitment is not at the highest levels.

Overall, the differences in mean scores and standard deviations suggest that tourists in Cluster 1 generally have stronger and more consistent environmental attitudes and behaviors compared to those in Cluster 2. While both clusters exhibit some degree of environmental consciousness, Cluster 1 demonstrates a more robust commitment to sustainable practices. Therefore, the data indicate distinct environmental attitudes and behaviors between the two clusters.

Table 2. Summary of demographics

Demographic Characteristics	Total N	Sample %
Gender		
Male	420	39.89
Female	**633**	**60.11**
Generational Cohort		
Gen Z (17 – 26 years old)*	**395**	**37.51**
Gen Y (27 – 42 years old)	328	31.15
Gen X (43 – 58 years old)	305	28.96
Baby boomers (59 – 64 years old)	25	2.37
Education		
High School	279	26.5
Diploma	140	13.3
Undergraduate	**508**	**48.24**
Postgraduate	126	11.97
Income		
< Rp 5.000.000	**434**	**41.22**
Rp 5.000.001 - Rp 10.000.000	307	29.15
Rp 10.000.001 - Rp 15.000.000	135	12.82
Rp 15.000.001 - Rp 20.000.000	85	8.07
> Rp 20.000.000	92	8.74
Residence		
Jakarta	**464**	**44.06**
Tangerang	152	14.43
Depok	142	13.49
Bekasi	171	16.24
Bogor	124	11.78

*the generational age ranges are defined based on the year 2023, as the data collection was conducted during that year.

Table 3. Summary of travel behavior

Travel Characteristics	N	%
Frequency		
Weekly	50	4.75
Monthly	160	15.19
Occasionally	**843**	**80.06**
Purpose		
Business	109	10.35
Recreation	**705**	**66.97**
Visiting family/friends	239	22.69
Travel Companion		
Alone	95	9.02
Family	**624**	**59.26**
Partner	116	11.02
Friends/Colleagues	218	20.7
Mode of Transport		
Shuttle	105	9.97
Private vehicle	**764**	**72.55**
Public transport	184	17.47
Accommodation		
Hotel	**661**	**62.77**
Villa	219	20.8
Homestay	82	7.79
Airbnb	32	3.04
Family/relative house	40	3.8
Hostel	15	1.42
Not staying overnight	4	0.38
Trip Planning		
Independent	**1013**	**96.2**
Tour/Travel	40	3.8
Travel Interest		
Adventure	**227**	**21.56**
Nature	206	19.56
Culinary	167	15.86
Health and Relaxation	145	13.77
Culture and History	189	17.95
Education	119	11.3

Table 4. Two-cluster solution for environmental attitudes and generational cohort

Environmental & Social Sustainability Behavior	Cluster 1		Cluster 2	
	Mean	SD	Mean	SD
I prefer visiting unique and new destinations over popular ones	4,015	1,101	3,956	1,090
When traveling, I tend to use eco-friendly transport options	3,583	1,385	3,534	1,425
When traveling, I tend to use eco-friendly accommodation options	3,573	1,484	3,587	1,472
When traveling, I prefer to choose more products and services that are environmentally friendly	3,619	1,128	3,463	1,174
When traveling, I always consider how my decision to buy certain products or services will impact the environment	3,757	1,060	3,652	1,155
When I travel, I try to choose tourism services and products that enhance the way of life of local communities	3,794	1,091	3,560	1,166
When I travel, I try to choose tourism services and products that contribute to the welfare of the local community	3,721	1,017	3,594	1,107
When I travel, I always choose services and products where I can involve and interact with local communities	3,913	1,050	3,722	1,165
When I travel, I try to choose tourism services and products that preserve local culture	3,726	1,127	3,677	1,153
	n	%	n	%
Gen Z (17 – 26 years old)*	0	0%	395	100%
Gen Y (27 – 42 years old)	220	67.07 %	108	32.93 %
Gen X (43 – 58 years old)	192	62.95 %	113	37.05 %
Baby boomers (59 – 64 years old)	0	0%	25	100%
Total	39.1%		60.9%	

*the generational age ranges are defined based on the year 2023, as the data collection was conducted during that year.

As the respondents in Cluster 1 were more environmentally conscious relative to the other cluster, this cluster was labeled "More Environmental Travelers." In contrast, the respondents in Cluster 2 had slightly lower agreement levels than those in Cluster 1 on many statements, including those related to preferences for unique destinations over mainstream ones,

eco-friendly transport, environmental impact consideration, and support for local communities. Thus, this cluster was labeled “Less Environmental Travelers”.

The findings further reveal distinct differences in environmental attitudes and behaviors among various generational cohorts. The demographic breakdown shows that More Environmental Travelers are primarily composed of Gen Y (67.07%) and Gen X (62.95%) individuals, whereas Less Environmental Travelers are exclusively made up of Gen Z (100%) and Baby Boomers (100%). This indicates that Gen Y and Gen X exhibit a stronger dedication to environmental and social sustainability practices compared to Gen Z and Baby Boomers.

Regarding these findings, the study also corroborates emerging evidence on Generation Z, which indicates that this cohort tends to engage only minimally in actual environmental practices despite their awareness of environmental issues. Previous studies [12, 13] highlight a discrepancy between Gen Z's environmental awareness and their practical engagement in sustainability.

Table 5. Profiling of clusters by demographic and travel characteristics

Cluster/Demographic and Travel Characteristics	Cluster 1 (More Environmental) %	Cluster 2 (Less Environmental) %
Gender (χ^2 = 0.029, p = 0.864)		
Male	15.48	24.40
Female	**23.64**	**36.46**
Education (χ^2 = 71.681, **p = 0.000)**		
High School	4.96	**21.64**
Diploma	5.15	8.2
Undergraduate	**22.88**	**25.17**
Postgraduate	6.1	5.91
Income (χ^2 = 246.063, **p = 0.000)**		
< Rp 5.000.000	6.84	**34.38**
Rp 5.000.001 - Rp 10.000.000	**11.21**	17.95
Rp 10.000.001 - Rp 15.000.000	8.07	4.75
Rp 15.000.001 - Rp 20.000.000	6.36	1.71
> Rp 20.000.000	7.03	1.71
Residence (χ^2 = 3.554, p = 0.47)		
Jakarta	**17.85**	**26.21**
Tangerang	5.7	8.74
Depok	5.79	7.69
Bekasi	5.79	10.45
Bogor	3.99	7.79
Frequency (χ^2 = 5.374, p = 0.068)		
Weekly	2.47	2.28
Monthly	6.55	8.64
Occasionally	**30.1**	**49.95**
Purpose (χ^2 = 6.545, **p = 0.038**)		
Business	4.85	5.16
Recreation	26.21	38.6
Visiting family/friends	8.57	16.62
Travel Companion (χ^2 = 5.35, p = 0.148)		
Alone	3.8	5.22
Family	**22.32**	**36.94**
Partner	5.32	5.7
Friends/Colleagues	7.69	13.01
Mode of Transport (χ^2 = 2.937, p = 0.226)		
Shuttle/travel	4.18	5.79
Private vehicle	**27.26**	**45.3**
Public transport	7.69	9.78
Accommodation (χ^2 = 10.382, p = 0.109)		
Hotel	**25.8**	**36.9**
Villa	7.1	13.7
Homestay	3	4.7
Airbnb	1.4	1.6
Family/relative house	0.9	2.9
Hostel	0.8	0.7
Trip Planning (χ^2 = 2.064, p = 0.151)		
Independent	**37.23**	**58.97**
Tour/Travel	1.9	1.9
Travel Interest (χ^2 = 8.363, p = 0.137)		
Nature	**15.30**	**25.85**
Culinary	5.42	**10.36**
Health and Relaxation	5.51	8.27
Culture and History	**7.98**	9.98
Education	4.94	6.37

More recent studies also highlight that this gap often driven by financial limitations, lack of accessible sustainable options, and the prioritization of convenience. For instance, a study on climate-aware travel behavior in Greece and the UK found that while Gen Z travelers express concern about environmental issues such as air quality and climate change, these concerns rarely translate into consistent behavioral changes, especially in transportation choices [14]. Similarly, another study that questioned whether Gen Z acts as pioneers or paradoxes in sustainable tourism, conclude that high environmental concern is not consistently reflected in travel decision-making, such as choosing eco-certified accommodations or carbon-conscious transport [15]. In Southeast Asia, research from Vietnam involving 314 Gen Z travelers showed that although sustainable tourism intentions are present, these intentions are highly influenced by availability and value perceptions, pointing to a practical barrier in converting intention into behavior [16].

Further analysis was conducted to explore the demographic and travel characteristics as well as sustainability practices within these clusters.

The chi-square analysis, as shown in Table 5, revealed statistically significant differences in education ($\chi^2 = 71.68$, df = 3, $p < 0.001$), income ($\chi^2 = 246.06$, df = 4, $p < 0.001$), and travel purpose ($\chi^2 = 6.55$, df = 2, $p = 0.038$) between the clusters. These findings indicate that Cluster 1 (More Environmental Travelers) generally includes individuals with higher educational attainment and income levels, suggesting a more affluent and educated demographic. In contrast, Cluster 2 (Less Environmental Travelers) includes a higher proportion of respondents with lower educational and income levels. The chi-square values also show non-significant differences across variables such as gender ($\chi^2 = 0.029$, df = 1, $p = 0.864$), residence ($\chi^2 = 3.55$, df = 4, $p = 0.470$), travel frequency ($\chi^2 = 5.37$, df = 2, $p = 0.068$), and others as shown in the table.

Cluster 1 (More Environmental Tourists) generally has higher educational attainment and higher income levels, suggesting a more affluent and educated demographic. On the other hand, Cluster 2 (Less Environmental Tourists) includes a higher percentage of respondents with lower educational and income levels. These differences highlight the distinct socioeconomic profiles of the two clusters, which can inform targeted strategies for promoting sustainable tourism practices.

This research supports previous studies [17, 18], which found a correlation between higher educational attainment and income with stronger environmental attitudes. Educated individuals and those with higher incomes are generally more aware of environmental issues and have greater access to resources that facilitate sustainable living. This connection underscores the importance of education and economic stability in fostering environmental responsibility and suggests that policies aimed at improving educational and economic conditions could further enhance public engagement in sustainable practices.

Regarding the purpose of travel, Cluster 2 (Mixed-Bag Environmental Tourists) has a higher percentage of respondents traveling for recreation and to visit family or friends. In contrast, Cluster 1 (Environmental Tourists) shows a lower percentage for these purposes, reflecting their possibly more focused interest in specific types of travel experiences related to environmental sustainability.

The findings categorize sustainable travel behavior into two clusters. The first cluster demonstrates a higher tendency to consider the environmental consequences of their purchases and shows a greater preference for tourism services and products that benefit local communities compared to the second cluster. However, the minimal differences between them suggest that Indonesians generally have a neutral stance on adopting sustainable travel habits. This neutrality is further evidenced by the fact that only one statement had Cluster 1 showing an average response of "agree" (represented by a "4" on the Likert scale) compared to an average response of "neutral" (a "3") on other questions. While other studies on similar topics from other nations show greater disparity among two or more clusters in their average responses [5, 6].

The second aim of this study is to comprehend distinctions or similarities in environmental and social sustainability behaviour among generations. The results show that Gen Y and Gen X exhibit a stronger dedication to environmental and social sustainability practices compared to Gen Z and Baby Boomers. The findings of this study align with previous research [19-21] indicating that environmental attitudes and involvement in sustainable practices tend to increase with age, peaking during middle adulthood before declining in older age. They suggest that individuals often become more environmentally conscious and engaged in sustainability as they mature. This trend could be attributed to increased life experience and greater financial stability, which may enable individuals to adopt and maintain sustainable practices more effectively [22]. However, as individuals advance into older age, factors such as reduced mobility, health issues, and changing priorities might contribute to a decline in environmental engagement [23, 24].

4. CONCLUSIONS

This study aims to identify segments of travellers in Indonesia, focusing on their environmental and social sustainability behaviour, with a specific case study in Jakarta. This study examines significant patterns in sustainable travel behaviors among various demographic groups, providing valuable insights that can be further explored in future research. However, to enhance the robustness and applicability of future research, several recommendations are proposed.

First, increasing the diversity of the sample by broadening the age range and educational level of participants within the Gen Z category is essential. Including both younger and older individuals within this group would provide a more comprehensive understanding of how different sub-groups within Gen Z engage with sustainable practices. This expanded approach could reveal more nuanced insights into generational differences and the factors driving sustainable behavior across various life stages.

Second, expanding the geographical scope of the study beyond Jakarta is crucial. By including visitors from different regions, the research can offer a more generalized view of sustainable travel behaviors across diverse cultural and environmental contexts. This broader scope would help identify region-specific trends and challenges, contributing to more targeted and effective sustainability strategies.

Third, improving measurement tools is necessary to capture sustainable attitudes and behaviors more accurately. Developing a more comprehensive survey that includes detailed questions on environmental attitudes, behaviors, and motivations would provide richer data and facilitate a deeper understanding of the factors influencing sustainable travel

choices. Enhanced measurement tools can help identify specific areas for intervention and support more precise policy recommendations.

Finally, conducting a triangulation study involving in-depth interviews with a subset of participants from each cluster would offer valuable qualitative insights. This approach would explore participants' values, experiences related to environmental and social sustainability, and the factors influencing their behaviors. Additionally, understanding the barriers they face in practicing sustainability could inform the development of strategies to overcome these challenges and encourage more widespread adoption of sustainable practices. Implementing these recommendations will not only improve the depth and breadth of future research but also contribute to more effective strategies for promoting sustainability in travel and beyond.

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