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Brand Audit Analysis of Hiking Waste For Sustainable Packaging Innovation

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Abstract

Waste generation in mountain tourism areas has become a critical environmental issue, driven by increasing visitor numbers and the dominance of single-use packaging. However, limited attention has been given to how hikers' consumption preferences shape waste patterns. This study aims to analyze these preferences using a brand audit approach to support eco-friendly packaging innovation. A descriptive quantitative method was applied through surveys and checklist observations involving 180 hikers along the Tetebatu hiking trail, Mount Rinjani National Park. Data were analyzed using frequency and percentage distributions. The results show that hikers predominantly prefer practical, ready-to-use products such as snacks, instant food, and bottled mineral water, which dominate the waste stream. A key finding reveals that waste generation is highly concentrated within a small number of dominant brands, indicating that specific producers disproportionately drive environmental impacts. This demonstrates that hikers' preferences significantly influence both the type and persistence of waste in mountain ecosystems. The study highlights that brand audit provides a strategic link between consumption behavior and environmental impact, offering a targeted basis for eco-friendly packaging innovation. This research contributes to sustainable tourism by emphasizing upstream interventions through product and packaging redesign, supported by collaboration among producers, policymakers, and conservation authorities.

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Keywords: brand audit; eco-friendly packaging; hiking waste; Mount Rinjani; sustainable consumption

INTRODUCTION

Environmental degradation caused by solid waste has become a growing global concern, particularly in tourism destinations such as mountain hiking trails, where increasing visitor numbers and limited infrastructure intensify environmental pressures (Obersteiner *et al*., 2021; Baral *et al*., 2023). In fragile ecosystems, unmanaged waste not only reduces aesthetic value but also threatens biodiversity, soil quality, and water systems, ultimately undermining the ecological and recreational functions of protected areas (Özbek *et al*., 2023). Plastics, food packaging, and other tourism-related waste dominate mountain environments due to their persistence and widespread use (Cordova *et al*., 2021). Therefore, understanding the sources and drivers of waste generation is essential for developing effective and sustainable management strategies.

In Indonesia, this issue is increasingly evident at major ecotourism destinations such as Mount Rinjani National Park, where rising hiking activity contributes significantly to waste accumulation along trails. Despite ongoing management efforts, challenges persist due to limited infrastructure, weak enforcement, and low compliance with environmentally responsible behavior. These conditions highlight the urgency of developing more effective and targeted approaches to address waste problems in conservation-based tourism areas. From a

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scientific perspective, waste generation in tourism is closely linked to consumption patterns and packaging design, particularly the widespread use of single-use plastics (Senese *et al*., 2023; Lau & Wong, 2024). Sustainable consumption emphasizes reducing environmental impacts by using reusable, recyclable, or biodegradable materials, while the circular economy promotes redesigning product life cycles to minimize waste. In this context, hikers' consumption behavior is a key factor determining both the type and persistence of waste in mountain ecosystems.

The brand audit approach is used to identify and link product brands to plastic waste in the environment as a basis for strengthening extended producer responsibility (EPR) policies (Cowger et al., 2024). This method involves the systematic identification and quantification of brands and product types in plastic waste across various locations to trace manufacturers' contributions to pollution (Baxter et al., 2022). The brand audit approach goes beyond an analysis of material volume and composition, as it links consumption behaviour to environmental impact and corporate accountability (Stanton et al., 2022). Results from a cross-regional study show that a small number of brands account for the vast majority of branded waste, suggesting that interventions targeting the main producers could significantly reduce pollution (Cowger et al., 2024). Tourism activities are known to increase plastic waste generation through tourists' consumption patterns, particularly from food and drink packaging consumed outside the home (Yuxi et al., 2025). Studies on waste management in the tourism sector still tend to focus on waste volume and types; therefore, integrating brand audit data is essential for formulating more specific management strategies based on consumer behaviour (Comerio et al., 2021).

This study offers a novel approach by integrating brand-level analysis with hikers' consumption preferences to identify strategic leverage points for eco-friendly packaging innovation in mountain tourism contexts. By linking dominant products and brands to their waste-generation potential, this research provides a more precise and actionable framework for intervention. This approach shifts the focus from downstream waste handling toward upstream solutions in product and packaging systems. Based on this gap, this study aims to analyze the types and brands of products carried by hikers along the Tetebatu hiking trail in Mount Rinjani National Park and to evaluate their contribution to potential waste generation. The findings are expected to support the development of eco-friendly packaging innovations and strengthen sustainable consumption practices. Ultimately, this study contributes to advancing sustainable tourism management by providing evidence-based insights for policy and stakeholder collaboration.

METHOD

Time and Place

This research was conducted over three months from September to November 2024. The study took place at the Ulem-Ulem registration post, located in the Tetebatu Resort area, SPTN Region II, Mount Rinjani National Park, East Lombok, Indonesia. This location serves as the main entry point for hikers accessing the Tetebatu hiking trail, making it a strategic site for collecting data on hikers' carried items. Geographically, the study area is situated within the coordinates of approximately 8°30′–8°35′ South Latitude and 116°24′–116°28′ East Longitude. The selection of this site was based on its function as a control and monitoring point for hiking activities, ensuring the accessibility and reliability of data collection.

Research Design

This study employed a descriptive quantitative research design using a survey approach. The descriptive quantitative method was chosen to systematically describe and quantify the types and brands of items carried by hikers without manipulating variables (Creswell, 2021). The survey approach enabled the collection of structured data from respondents through direct observation and questionnaires, allowing for objective measurement of product preferences. This design is appropriate for identifying consumption patterns and their potential contribution to waste generation. Furthermore, the use of a brand audit framework supports the analysis of product distribution and dominance within specific categories, which is widely applied in environmental and consumer behavior studies (Leblanc *et al*., 2020).

Research Population and Sample

The study population comprised all hikers who accessed the Tetebatu hiking trail during the research period. A total of 180 hikers were selected as the sample using an accidental sampling technique, where respondents were chosen based on their availability during the registration process (Sugiyono, 2020). The main variables in this study included product categories, brand names, and the number of items hikers carried. Data collection was conducted through structured questionnaires and direct observation using checklist sheets to record detailed information about each item. The tools and materials used in this study included survey forms, stationery, and documentation devices to ensure accurate data recording.

Research Procedure

The research procedure was conducted in several systematic stages following standard research methodology frameworks (Creswell, 2021). First, the preparation stage involved designing research instruments, obtaining permits, and coordinating with park management authorities. Second, the data collection stage was carried out at the registration post, where hikers were asked to report and verify the items they carried. Each group leader provided information on product names, brands, and quantities, which the researcher recorded. Third, the data verification stage ensured the accuracy and consistency of the collected data through cross-checking. Finally, the data organization stage involved categorizing

items into predefined product groups to facilitate further analysis.

Analysis of Research Data

Data analysis was performed using descriptive quantitative techniques, focusing on frequency and percentage distributions. The contribution of each brand within a product category was calculated using the following formula:

$$P = \frac{fi}{\sum f} x\ 100\%$$

Where:

P = percentage of each brand

fi = frequency of items for a specific brand

$\sum f$ = total number of items within the category

where represents the number of items for a specific brand, and represents the total number of items within the category. The results were then presented in tabular form to illustrate the dominance of specific brands. Data analysis was conducted using spreadsheet software (Microsoft Excel) to ensure accuracy and efficiency in computation. This approach is consistent with standard practices in descriptive statistical analysis for survey-based research (Field, 2020). The interpretation of results focused on identifying consumption patterns and their implications for waste generation and sustainable packaging innovation.

RESULTS AND DISCUSSION

Dominance of Instant Food Products

The results of the brand audit indicate that instant food products are among the most frequently carried items by hikers along the Tetebatu hiking trail. These products are preferred for their practicality, lightweight packaging, long shelf life, and ease of preparation during hiking. In remote mountain environments where cooking resources are limited, instant food provides a reliable and efficient source of energy intake. The distribution of instant food brands is presented in Table 1, which shows the dominance of specific brands in this category.

Table 1. Distribution of Instant Food Brands

No	Product Category	Brand Code	Frequency	Percentage (%)
1	Instant Noodles	Brand A	83	46.37
2	Instant Noodles	Brand B	77	36.87
3	Instant Noodles	Brand C	14	7.82
4	Instant Noodles	Brand D	3	1.68
5	Instant Noodles	Brand E	2	1.12

Note: *Brand names are anonymized using codes for research ethics*.

The findings reveal that two dominant brands account for more than 80% of the total number of instant food items hikers carry. This indicates a highly concentrated consumption pattern, where a limited number of brands dominate the market due to factors such as affordability, accessibility, taste familiarity, and strong brand recognition. From a consumer behavior perspective, this pattern reflects habitual consumption and risk minimization, where hikers prefer products they already trust, especially in high-risk environments such as mountain climbing. However, this dominance also implies that a small number of producers disproportionately drive environmental impacts.

A critical issue identified in this category is the widespread use of multilayer plastic packaging, which combines different materials such as plastics and aluminum. This type of packaging improves product durability and food safety. However, it is very difficult to recycle due to its complex, composite structure, so it is often sent to incineration or landfill or ends up as residual waste in the environment (Kaiser *et al*., 2017; Mumladze *et al*., 2022). Studies show that multilayer flexible packaging accounts for a substantial share of plastic packaging waste streams and is a major obstacle to achieving higher recycling rates and a circular economy in tourism-related and everyday consumption (Koinig *et al*., 2022).

Compared with similar research in mountain tourism, the dominance of a few brands in the waste stream not only reflects concentrated consumption patterns but also reveals a strategic leverage point for environmental intervention. While previous work on multilayer packaging has mainly focused on waste quantities, material composition, and technical recycling solutions (Seier et al., 2024; Yarullin et al., 2024), this study goes further by directly linking brand dominance to the potential for waste generation. This offers a more actionable framework: targeting a small number of leading brands could substantially reduce overall waste if they shift toward mono-material, biodegradable, compostable, or more easily recyclable packaging, or support advanced recycling technologies such as solvent-based delamination and chemical recycling (Mastroddi *et al*., 2025; Walker *et al*., 2020).

Nevertheless, this study also reveals a limitation in current waste management strategies, which tend to focus primarily on end-user behavior (e.g., "pack in–pack out") without addressing upstream factors such as product design and packaging systems. This highlights the need for a more integrated approach that combines behavioral interventions with producer responsibility. In this context, the concept of Extended Producer Responsibility (EPR) becomes highly relevant, where producers are held accountable for the entire lifecycle of their products, including post-consumption waste.

In conclusion, the dominance of instant food products in hikers' consumption patterns represents both a challenge and an opportunity. While these products significantly contribute to waste generation due to their packaging, their concentrated market structure enables targeted, scalable solutions. The implication of this finding is the urgent need for collaboration between producers, policymakers, and conservation authorities to promote sustainable packaging innovation, implement regulatory mechanisms, and encourage environmentally responsible consumption practices in hiking and ecotourism contexts.

Snack Products as the Largest Waste Contributor

Snack products are the most dominant category by quantity among all items carried by hikers along the Tetebatu hiking trail. This category includes various small, ready-to-eat products that are frequently consumed during hiking due to their convenience, portability, and immediate energy. In physically demanding activities such as hiking, snacks serve as quick energy boosters, making them an essential component of hikers' consumption patterns. The distribution of snack products by brand, based on audit results, is presented in Table 2, which illustrates the dominance of several brands in this category.

Table 2. Distribution of Snack Products

No	Product Category	Brand Code	Frequency	Percentage (%)
1	Snacks	Brand A	122	32.88
2	Snacks	Brand B	48	12.93
3	Snacks	Brand C	28	7.55
4	Snacks	Brand D	27	7.28
5	Snacks	Brand E	25	6.74
6	Snacks	Brand F	24	6.47
7	Snacks	Brand G	21	4.58
8	Snacks	Brand H	12	3.24
9	Snacks	Brand I	10	2.70
10	Snacks	Brand J	9	2.43
11	Snacks	Brand K	6	1.62
12	Snacks	Brand L	6	1.62
13	Snacks	Brand M	4	1.08
14	Snacks	Brand N	4	1.08
15	Snacks	Brand O	3	0.81
16	Snacks	Brand P	3	0.81
17	Snacks	Brand Q	3	0.81
18	Snacks	Brand R	3	0.81
19	Snacks	Brand S	2	0.54
20	Snacks	Brand T	2	0.54
21	Snacks	Brand U	2	0.54
22	Snacks	Brand V	1	0.27
23	Snacks	Brand W	1	0.27
24	Snacks	Brand X	1	0.27
25	Snacks	Brand Y	1	0.27
26	Snacks	Brand Z	1	0.27
27	Snacks	Brand AA	1	0.27
28	Snacks	Brand AB	1	0.27

Note: *High-frequency brands are concentrated in the top 5 positions.*

The results show that snack products have the highest frequency among categories, indicating a very high consumption rate among hikers. This dominance is driven not only by necessity but also by behavioral factors such as habitual snacking and ease of access during hiking. The small packaging size, combined with repeated consumption, leads to the accumulation of large quantities of waste. This phenomenon aligns with the concept of "high-frequency low-volume waste," in which small items, individually small, collectively create a significant environmental burden due to their volume and dispersion (World Bank, 2022). As a result, snack packaging often becomes one of the most visible forms of litter along hiking trails.

A deeper analysis reveals that their packaging characteristics exacerbate the environmental impact of snack products. Most snack products are wrapped in single-use flexible plastics, which are lightweight, inexpensive, and durable but difficult to recycle. These materials are prone to fragmentation into microplastics under environmental conditions, posing long-term ecological risks to soil and water systems. This finding is consistent with recent studies that identify snack packaging as a major contributor to plastic pollution in outdoor recreation areas and ecotourism destinations (Allison *et al*., 2021; Šagovnović & Stamenković, 2022).

Compared to previous research, this study offers a more nuanced understanding by identifying specific brands that dominate the snack category, rather than merely quantifying waste types. The concentration of consumption among certain brands suggests that waste generation is not evenly distributed but is influenced by market dynamics and brand preferences. This creates a strategic opportunity for targeted interventions, where engaging a limited number of dominant producers could yield significant environmental benefits. Such an approach aligns with emerging sustainability frameworks that emphasize upstream interventions in production and packaging systems rather than relying solely on downstream waste management.

However, the findings also highlight a critical limitation in current waste-reduction strategies, which tend to emphasize individual responsibility without adequately addressing systemic factors, such as product design and packaging innovation. While awareness campaigns and behavioral interventions remain important, they are insufficient to address the scale of waste generated by high-frequency consumption products like snacks. Therefore, a more integrated approach is required, combining consumer education with regulatory and industry-based solutions, such as eco-design standards, packaging reduction policies, and the adoption of biodegradable or reusable packaging materials.

In conclusion, snack products represent the largest contributor to waste generation in the study area due to their high consumption frequency and reliance on single-use packaging. While this presents a significant environmental challenge, it also offers a clear opportunity for intervention through targeted strategies involving key producers and stakeholders. This finding implies that

reducing waste in hiking areas requires a shift from solely behavior-based approaches toward a more comprehensive system that includes sustainable product design, producer responsibility, and innovation in packaging technologies.

Mineral Water Consumption and Plastic Waste

Mineral water is essential for hikers, as hydration is critical during hikes, particularly in mountainous environments with high physical demands and limited access to clean water. Hikers typically rely on bottled mineral water for its safety, availability, and convenience, making it one of the most indispensable items on the journey. The brand audit results show that this category is dominated by bottled water products, as presented in Table 3, indicating a strong dependence on commercially packaged drinking water.

Table 3: Distribution of Mineral Water and Soft Drink Products

No	Category	Product Type	Brand Code	Frequency	Percentage (%)
1	Mineral Water	Bottled Water	Brand A	129	55.36
2	Mineral Water	Bottled Water	Brand B	37	15.88
3	Mineral Water	Bottled Water	Brand C	27	11.59
4	Mineral Water	Bottled Water	Brand D	12	5.15
5	Mineral Water	Bottled Water	Brand E	10	4.29
6	Mineral Water	Bottled Water	Brand F	6	2.57
7	Mineral Water	Bottled Water	Brand G	6	2.57
8	Mineral Water	Bottled Water	Brand H	4	1.71
9	Mineral Water	Bottled Water	Brand I	2	0.85
10	Soft Drinks	Carbonated Drink	Brand J	16	44.40
11	Soft Drinks	Chocolate Drink	Brand K	14	38.80
12	Soft Drinks	Isotonic Drink	Brand L	3	8.33
13	Soft Drinks	Packaged Drink	Brand M	2	5.55
14	Soft Drinks	Other Beverages	Brand N	1	2.77

Note: *One dominant brand contributes more than 50% of bottled water consumption.*

The findings indicate that one dominant brand accounts for more than half of the mineral water products hikers carry. This reflects a high level of consumer trust, strong distribution networks, and brand familiarity, which influence purchasing decisions in outdoor settings. From a behavioral perspective, hikers tend to choose well-known brands to minimize health risks associated with water consumption in remote areas. However, this consumption pattern also leads to a disproportionate environmental impact, as a single brand contributes significantly to the accumulation of plastic waste along the hiking trail.

A critical issue highlighted by this finding is the extensive use of single-use polyethylene terephthalate (PET) bottles, which are widely recognized for their durability, lightweight nature, and low production cost. Despite these advantages, PET bottles pose a major environmental challenge due to their persistence in natural ecosystems and low recycling rates in remote areas. In mountain environments, where waste management infrastructure is limited, discarded plastic bottles often remain in the environment for extended periods, contributing to visual pollution and potential ecological harm. This finding is consistent with previous studies in ecotourism contexts, which identify bottled water as a primary source of plastic waste and environmental degradation (Schmidt *et al*., 2022; Li *et al*., 2024).

Compared to other studies, this research provides a more targeted insight by emphasizing the role of brand concentration in amplifying environmental impact. While previous research has largely focused on the volume of plastic waste, this study highlights how the dominance of a single brand can serve as a strategic entry point for intervention. If the leading producer adopts sustainable packaging solutions such as biodegradable bottles, recycled materials, or refillable systems, the potential reduction in plastic waste could be substantial. This perspective aligns with the concept of leverage points in sustainability, where small, targeted changes within dominant systems can generate large-scale environmental benefits.

However, the findings also reveal a systemic challenge in current waste management approaches, which tend to prioritize downstream solutions such as waste collection and disposal rather than upstream interventions. Addressing plastic waste from bottled water requires a shift toward integrated strategies that combine technological innovation, policy regulation, and behavioral change. The concept of a circular economy becomes particularly relevant in this context, emphasizing the need to design out waste, keep materials in use, and regenerate natural systems (Senese *et al*., 2023; Lau & Wong, 2024).

In conclusion, mineral water consumption represents a critical intersection between essential human needs and environmental sustainability challenges. While bottled water ensures hydration and safety for hikers, its reliance on single-use plastic packaging significantly contributes to waste generation in hiking areas. The implication of this finding is the urgent need to promote alternative solutions, such as refill stations, reusable bottles, and deposit-return systems, supported by policy frameworks and stakeholder collaboration. By integrating these approaches, it is possible to maintain access to safe drinking water while significantly reducing the environmental footprint of hiking activities.

Tissue and Non-Food Waste Contribution

In addition to food-related products, non-food items such as tissues also contribute to waste generation along the hiking trail. Although the quantity of tissue products is relatively lower compared to other categories, their presence reflects the growing need for personal hygiene among hikers during outdoor activities. Tissues are commonly used for cleaning, sanitation, and other personal needs, making them a supplementary yet important component of hikers' consumption patterns. The distribution of tissue products is shown in Table 4, illustrating the variety of brands and their proportional contributions within this category

Table 4. Distribution of Bread, Pastry, Cigarettes, and Tissue Products

No	Category	Product Type	Brand Code	Frequency	Percentage (%)
1	Bread & Pastry	Bread Product	Brand A	30	45.45
2	Bread & Pastry	Bread Product	Brand B	14	21.21
3	Bread & Pastry	Bread Product	Brand C	7	10.61
4	Bread & Pastry	Bread Product	Brand D	4	6.06
5	Bread & Pastry	Bread Product	Brand E	3	4.55
6	Bread & Pastry	Bread Product	Brand F	3	4.55
7	Bread & Pastry	Bread Product	Brand G	2	3.03
8	Bread & Pastry	Bread Product	Brand H	2	3.03
9	Bread & Pastry	Bread Product	Brand I	1	1.52
10	Cigarettes	Cigarette	Brand J	13	24.53
11	Cigarettes	Cigarette	Brand K	8	15.09
12	Cigarettes	Cigarette	Brand L	7	13.21
13	Cigarettes	Cigarette	Brand M	7	13.21
14	Cigarettes	Cigarette	Brand N	6	11.32
15	Cigarettes	Cigarette	Brand O	3	5.66
16	Cigarettes	Cigarette	Brand P	3	5.66
17	Cigarettes	Cigarette	Brand Q	2	3.77
18	Cigarettes	Cigarette	Brand R	1	1.88
19	Cigarettes	Cigarette	Brand S	1	1.88
20	Cigarettes	Cigarette	Brand T	1	1.89
21	Cigarettes	Cigarette	Brand U	1	1.89
22	Tissue	Tissue Product	Brand V	12	42.86
23	Tissue	Tissue Product	Brand W	5	17.86
24	Tissue	Tissue Product	Brand X	5	17.86
25	Tissue	Tissue Product	Brand Y	2	7.14
26	Tissue	Tissue Product	Brand Z	2	7.14
27	Tissue	Tissue Product	Brand AA	1	3.57
28	Tissue	Tissue Product	Brand AB	1	3.57

Note: Data represent the proportion of each brand within the tissue category.

The results indicate that tissue usage is relatively limited compared to other product categories; however, its environmental impact remains significant due to improper disposal practices. Unlike plastic waste, which is often visible and more easily identified, tissue waste may be partially biodegradable yet still pose environmental issues when disposed of inappropriately. In natural environments such as mountain trails, improperly discarded tissues can lead to visual pollution, unpleasant odors, and potential contamination of soil and water sources. This finding is consistent with previous studies that highlight the role of personal hygiene products in contributing to environmental degradation in tourism areas, particularly when waste management systems are inadequate (Tamizhdurai *et al*., 2024; De Mello Soares *et al*., 2022).

A deeper analysis suggests that the environmental impact of tissue waste is more closely related to user behavior than to product dominance. Unlike other product categories, tissue consumption is not concentrated within a few dominant brands, indicating a more diverse and fragmented consumption pattern. This implies that brand-based intervention strategies may be less effective for this category. Instead, the primary issue is a lack of awareness and responsibility among users regarding proper waste disposal practices. Furthermore, although some tissue products are marketed as biodegradable, their decomposition in natural environments depends on specific conditions such as moisture, microbial activity, and exposure, which may not

always be present along hiking trails (Mumladze *et al*., 2018; Jasiński *et al*., 2025).

Compared with previous research, this study emphasizes the behavioral dimension of waste generation more explicitly, particularly regarding non-food items. While many studies focus on material composition and waste volume, this research highlights the importance of user practices in determining environmental outcomes. This finding suggests that addressing tissue waste requires a shift toward behavior-oriented interventions, including environmental education, awareness campaigns, and promoting ethical hiking practices, such as the “leave no trace" principles.

In conclusion, tissue and other non-food waste categories, although less voluminous, pose unique environmental challenges closely linked to human behavior. The absence of brand dominance suggests that solutions should prioritize behavioral change over producer-focused interventions. The implication of this finding is the need for integrated strategies that combine education, regulation, and on-site facilities, such as designated waste disposal points or biodegradable waste management systems. By fostering a culture of environmental responsibility among hikers, it is possible to minimize the ecological impact of non-food waste and support the sustainability of hiking environments.

CONCLUSION

This study demonstrates that hikers' consumption patterns along the Tetebatu hiking trail are predominantly characterized by the use of practical and ready-to-use products, particularly snacks, instant food, and bottled mineral water, which contribute significantly to potential waste generation due to their high consumption frequency and reliance on single-use packaging. The brand audit analysis reveals a concentrated consumption pattern across several product categories, in which a small number of dominant brands play a major role in driving waste accumulation, indicating that environmental impacts are largely driven by specific market dynamics rather than by evenly distributed consumption. Furthermore, most of the identified products utilize plastic-based packaging that is difficult to recycle, thereby increasing the risk of persistent environmental pollution in hiking areas. In contrast, non-food items, such as tissues, pose environmental challenges primarily due to improper disposal behavior rather than brand dominance. Overall, the findings confirm that effective waste management in hiking areas requires an integrated approach that combines behavioral change among hikers, producer responsibility, and innovation in eco-friendly packaging systems. Therefore, it is recommended to strengthen collaboration among conservation authorities, producers, and visitors through sustainable packaging initiatives, environmental education, and the implementation of alternative systems, such as reusable containers and refill stations, to support environmentally responsible hiking practices.

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AUTHOR'S CONTRIBUTION

Table 5. Table of Author Contributions

Contribution Indicator	Author 1	2	3	4	5	6	7
Conceptualization	✓	✓					
Literature Review	✓	✓					
Research Design / Methodology	✓	✓					
Instrument Development	✓						
Data Collection		✓	✓	✓	✓		
Data Curation		✓		✓			
Formal Analysis	✓	✓		✓			
Data Interpretation	✓	✓	✓	✓			
Writing – Original Draft	✓					✓	
Writing – Review & Editing	✓	✓	✓		✓	✓	✓
Visualization / Tables	✓					✓	
Supervision	✓			✓			✓

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