

## **Towards a Small Sustainable Tourism Destination Through Zero Waste: Evidence and Development Strategy of Udjo Ecoland, Indonesia**



Azmi Kautsar Alim<sup>1\*</sup>, Mohamad Sapari Dwi Hadian<sup>1</sup>, Evi Novianti<sup>1</sup>, Any Ariani Noor<sup>2</sup>,  
Ayu Krishna Yuliawati<sup>3</sup>

<sup>1</sup> Master of Sustainable Tourism, School of Postgraduate, Universitas Padjadjaran, Bandung 45363, Indonesia

<sup>2</sup> Department of Business Administration, Politeknik Negeri Bandung, West Bandung 40559, Indonesia

<sup>3</sup> Faculty of Economics and Business Education, Universitas Pendidikan Indonesia, Bandung 40154, Indonesia

Corresponding Author Email: [azmi22005@mail.unpad.ac.id](mailto:azmi22005@mail.unpad.ac.id)

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### **ABSTRACT**

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Recent studies are focusing on integrated sustainable tourism through zero waste concept in response to climate change and unsustainable tourism. Therefore, this study aimed to examine the application of zero waste concept at Udjo Ecoland, a small tourism destination, and propose strategic methods for sustainable tourism development. Using a qualitative case study and in-depth representative data of SWOT-TOWS Matrix-AHP analysis, the result showed that further improvement in waste management was needed despite the initiation of zero waste program by Udjo Ecoland. SWOT-TOWS Matrix-AHP analysis results suggest the following development strategy priorities: (1) promoting staff participation and training, (2) developing environmental education and zero waste awareness, (3) developing internal policies and regulations, (4) developing broader collaboration and partnership, (5) market expansion and increasing sales, (6) further study on inorganic waste treatment. These strategies, specifically designed and assessed for Udjo Ecoland, are relevant and have potential benefits for other small tourism destinations with similar concepts, providing a valuable reference point for broader industry implications.

## **1. INTRODUCTION**

Tourism is an industry that has grown rapidly in recent decades. The positive effects of tourism on GDP and employment were empirically acknowledged, which further motivated countries to make significant investments to support industry growth [1]. According to the report of the World Travel and Tourism Council in 2023, the travel and tourism sector contributed 9.1% to the global GDP (US\$ 9.9 Trillion) and increased the workforce by an additional 27.4 million [2]. However, uncontrolled tourist populations can decrease the comfort and life quality of residents, as well as degrade the environmental quality of tourism destinations due to the overuse of resources [3, 4]. The habits of tourists who tend to be more consumptive and unconcerned about waste while on vacation also produce large amounts of waste [5], and has become a more critical, complex, and multidimensional problem in tourism destinations [6-8].

Tourism industry is consistent with most other sectors in the current world economic system, where production processes are one-way, namely the extraction of raw materials, production of goods, distribution, consumption, and ending up as waste [9]. According to the World Bank, an estimated 2.01 billion tons of urban waste was generated in 2016 and will increase to 3.40 billion tons by 2050. This population generates solid waste emissions of 1.6 billion tons of

greenhouse gas emissions, or 5% of global emissions, and tends to increase to 2.38 billion tons [10]. This has become a problem that has contributed to global warming or an increase in the average temperature of the earth's surface. According to UN Intergovernmental Panel on Climate Change (IPCC) report in February 2022, global warming has touched 1°C compared to the Industrial Revolution era in the 18th century. Without proper control measures, global warming above 6°C will result in high mortality of humans, animals, and plants, or mass extinction [11].

Climate change trends and the various problems arising from 'unsustainable tourism' have finally urged the world community and experts to synchronize integrated tourism development with the sustainable development paradigm [4], such as through zero waste. The term 'zero waste' was originally invented by an American chemist named Palmer, who developed a chemical waste treatment company in 1973 [12]. There was also a rapid development in the late 1990s as an innovation in waste management that focused on planning to manage the life cycle of materials [13]. Several sustainable tourism studies have been conducted that focus on waste management or zero waste in large tourism destinations, such as cities or more significant regions [3, 14-16], small island tourism destinations [17-19], and the hospitality industry [5, 20, 21] However, according to the search in scientific journals, no previous study provided a comprehensive view of zero

waste implementation in small tourism destinations.

Udjo Ecoland is well-known as a small tourism destination in Bandung, Indonesia, that is committed to sustainability through conservation, agro-tourism, and community empowerment [22]. However, similar to other tourism destinations, Udjo Ecoland is inseparable from the waste problem. In 2023, there were 9,827 visitors to Udjo Ecoland, with an average of 3-4 weekly tourist group visits. Most visitors do activities in the area for 4-5 hours, including lunch. Suppose one tourist is assumed to produce waste, both organic and inorganic, of 600 grams in one visit, then in a year, there will be a production of 5.886 tons or 419 kg of waste per month. The management is then forced to burn this amount of waste because there is no transportation service by the local authorities, specifically Bandung City government. Bandung City has a state of waste emergency. In 2022, the daily waste production in the city reached 1,594 tons [23]. This condition causes difficulty in accommodating the waste produced by the final disposal site [24]. The condition has become an ecological disaster, such as the Sarimukti landfill fire in August 2023 [25] or the tragedy of the Leuwigajah Cimahi landfill explosion, which leveled two villages and sacrificed 143 lives on February 21, 2005 [26]. As a result, Udjo Ecoland used zero waste principle to solve the internal waste problems.

Therefore, this study aimed to fill the gaps by providing a comprehensive analysis of applying zero waste concept in Udjo Ecoland, as a small tourism destination, as well as providing a strategic method using SWOT-TOWS Matrix-AHP analysis. The method enables the identification of optimal development, offering actionable insights for stakeholders invested in sustainable tourism practices. The results of this study provide a roadmap for Udjo Ecoland development that is consistent with sustainability goals and also valuable lessons applicable to similar small tourism destinations worldwide. By bridging theory with practical application, this study serves as inspiration for people striving to foster eco-friendly tourism experiences.

## 2. LITERATURE REVIEW

### 2.1 Small sustainable tourism destination

Tourism destinations are some of the main commodity products in tourism industry that are still debated by experts and practitioners [27]. In geography-oriented and economic tourism studies, destinations are defined as places toward which people travel and stay for a while to experience certain perceived attractions [28]. Destinations are also traditionally considered as well-defined geographic areas, including countries, islands, or cities where tourism development, planning, and impact occur. However, in the marketing management paradigm, destinations are defined as tourism products that consist of components including a combination of products and services provided locally by stakeholders to fulfill the needs of tourists [29]. A previous study also defined destination as a perceptual concept that consumers interpret subjectively, depending on the travel plans, cultural background, purpose of visit, level of education, and past experiences [30]. Some tourists consider a cruise ship as the destination, while others on the same cruise may consider the port visited during the trip.

In the context of sustainable tourism, a more holistic perspective is needed that considers all sectors and resources

to achieve sustainability [31]. Tourist destinations and tourism service providers should identify components in the service chain which, on the one hand, contribute to satisfying travellers' expectations and, on the other, symbolize the product's sustainability [32]. According to the United Nations World Tourism Organization, sustainable tourism should ensure the best use of environmental resources, respect the socio-culture of local communities, and ensure long-term viability by providing equitably distributed socio-economic benefits to all stakeholders [33]. Therefore, the Ministry of Tourism and Creative Economy then defines Sustainable Tourism Destinations as geographical areas in one or more administrative areas having tourist attractions, facilities, accessibility, and communities. These attributes complement the realization of tourism considered current and future economic, social, and environmental impacts, fulfilling the needs of visitors, industry, the environment, and local communities. Sustainable tourism destinations are divided into two criteria, namely **large-scale** (cities or extensive enough areas) and **small-scale** destinations, such as national parks, nature tourism recreation parks, tourist villages, local communities, museums, festivals, and monuments [34].

In this study, small sustainable tourism destinations are generally defined by the smaller area scale and higher sustainability standards that consider current and future economic, social, and environmental impacts. This was defined based on the regulation of the Ministry of Tourism and Creative Economy. In this context, the great paradigm of small sustainable tourism destinations has been developed as opposed to traditional mass tourism, allowing both hosts and guests to enjoy positive and worthwhile interactions, as well as shared experiences.

### 2.2 Zero waste

The term "waste" often refers to the worthless by-products created at the end of production [35]. Tourism sector generates waste in various solid, liquid, or gaseous forms, including by-products, contaminated, discarded, spilled, and outdated materials, used packaging and containers, and kitchen waste [16]. Tourism and hospitality sector inevitably generates waste, but effective management strategies can minimize the environmental impact. By reducing unnecessary packaging and converting unavoidable waste into valuable resources, the industry can strive for zero-waste operations, thereby mitigating the environmental footprint.

Zero waste directly challenges the assumption that waste is a worthless product that should be discarded or incinerated [36]. However, zero waste principle recognizes that waste is a "misallocated resource" or "resource in transition" generated during the transitional phase of production and consumption activities. Therefore, it should be recirculated into production and consumption [35]. Zero Waste New Zealand Trust proposed the first definition of zero waste as a new paradigm that changed the design of industrial systems where nature was no longer an endless provider of raw materials [37]. This new paradigm closes the 'end of the pipe' of industry into a closed circle, where products are made to be reused, repaired, and recycled to minimize and eliminate the waste generated. The definition of zero waste was later refined by Zero Waste International Alliance (ZWIA) to include the comprehensive conservation of all resources through responsible production, mindful consumption, reuse, and recovery of products, packaging, and materials. This method ensures that no waste

is sent to landfills, incinerated, or released into the environment, thereby safeguarding human health and the environment from harmful discharges to land, water, or air [38].

The application of circularity to the principle of zero waste is applied by ZWIA through the waste hierarchy or a selection of steps that can be taken to address waste. This waste hierarchy is arranged in an inverted triangle in order from redesign, reduce, reuse, recycle, material recovery, residual management, to unacceptable. The most favorable steps at the top were shown, namely less use of natural resources and pressure on the environment. Similarly, the steps that should be avoided at the bottom were "more significant use of natural resources and impact on the environment" [38]. This waste hierarchy model has specifically shown all stages of waste management but has not considered the participation of stakeholders, both service providers and visitors, which are the main components of sustainable tourism destinations. Therefore, this research aimed to develop the principle of zero waste by interpreting the waste hierarchy popularized by ZWIA into the context of small-scale sustainable tourism destinations. The model of applying the waste hierarchy in small hotels in Wales was also adopted, as well as in the UK [21] with the conceptual framework of waste management for sustainable tourism [14]. A strategic method for sustainable tourism development was defined through the integration of SWOT analysis, TOWS matrix, and AHP [39].

### 3. MATERIALS AND METHODS

The aim of this study is to identify the application of zero waste concept in the management of small tourism destinations. In this context, a strategic method that can contribute to sustainable tourism development was presented. The objectives will be studied in stages, as shown in the method flow chart in Figure 1.



Figure 1. Method flow chart

#### 3.1 Case study and limitation

This study focused on a single case study of a small tourism destination called Udjo Ecoland, which is specifically located in Cijaringao Village, Cimenyan District, Bandung Regency, West Java Province, Indonesia. In this context, the case raised as a study material is the management of sustainable tourism and the application of zero waste principle in the Udjo Ecoland area from November 2022 to December 2023.

The determinants of selecting Udjo Ecoland as the focus of the study included the categorization of the entity as a nature recreation park and a small-scale sustainable tourism destination based on the Regulation of the Ministry of Tourism and Creative Economy. This is evidenced by the total area of Udjo Ecoland, which is only 5 hectares, and the membership in Indonesian Recreation Park Business Association (PUTRI).

The name Udjo Ecoland was taken from Udjo Ngalagena, the founder of Saung Angklung Udjo [40], and Ecoland as a

manifestation of efforts to care for the future. Since 2013, Udjo Ecoland was created by a collaboration between Saung Angklung Udjo, the Forestry Department of West Java Province, and Cijaringao Village Community as a place for the manufacture and preservation of traditional West Javanese musical instruments, namely Angklung [41]. However, the entity design continued to develop, specifically in response to environmental issues and the economic sustainability of the area, becoming a sustainable tourism destination.

Ecologically, Udjo Ecoland has successfully turned critical areas into green spaces through a conservation and reforestation program that is focused on bamboo and other perennials. There are currently 50-60 bamboo clumps of various types, dominated by Black, Tali, and Gombong Bamboo. In addition, there is a bamboo arboretum called Sarupaning Awi, which conserves 26 types of local bamboo.

The social focus of Udjo Ecoland is on building a sustainable cultural ecosystem in the community around the area through empowerment programs. The community was motivated to produce eco-products, specifically in the agriculture, animal husbandry, and micro, small, and medium enterprises (MSMEs) sectors. Furthermore, manager intensively aims to form local champions through empowerment and instilling sustainable values. These local champions are believed to bring positive changes to the problems that exist in the environment.

Economically, the agronomy industry and tourism in Udjo Ecoland are the added value to conservation efforts. The agronomy industry, which focuses on productive plant agriculture such as papaya, banana, grass jelly trees, and also farming native West Java germplasm called Garut sheep has developed into 14 tourist attractions. These attractions are packed into tour packages or camping, which allows tourists to learn about nature, the process of agriculture and animal husbandry, and preserve Angklung.

#### 3.2 Qualitative assessment, observation, and interview process

The data collection process in this study used participant observation and semi-structured in-depth interviews to obtain a comprehensive and in-depth description of zero waste concept at Udjo Ecoland. During the study, the author became an assistant to the director of operations and a tour guide at Udjo Ecoland. Detailed field notes about individuals' behavior and activities in applying zero waste principle were observed. During the interview, some prepared main questions related to sustainable tourism and the concept of zero waste were asked. From determining the main topic, the question and answer process continues to flow following the direction of the conversation.

The determination of informants in this study was conducted using purposive sampling (nonprobability). This method is commonly used in qualitative studies research, specifically with small sample sizes, where besides understanding the substance of sustainable tourism and zero waste, informants must have visited and understood the field context at Udjo Ecoland. Subsequently, a decision was made on the most suitable and appropriate key informants to answer the questions in Table 1.

Data collected from field observations and interviews with informants was analyzed and tested for validity through interactive analysis and data triangulation. In this study, the condensation process was carried out by reducing data from

field notes into tables. This is the application of zero waste principles consisting of redesign, reduction, reuse, recycle, and residual management. Data reduction activities aim to select necessary data, summarize and focus on essential factors, and discard those that are unnecessary. After reducing the data, preliminary conclusions were drawn from the tabulation and summarized descriptively into the discussion results. The testing process was carried out successively in the order of (1) Udjo Ecoland Management, (2) stakeholders, and (3) experts. This process continues until answers or conclusions are obtained from all sources. After collecting all data analysis, general conclusions were drawn from each dimension until validity and credibility were achieved.

**Table 1.** Research informant list

Elements	Role
Udjo Ecoland Management	President Director
	Operation Director
	Site Manager
	Operation Manager
Stakeholder	Organic Waste Manager
	Local Community Representative
Expert	Visitors
	Practitioners
	Academicians

### 3.3 Performing SWOT analysis and tows matrix

After collecting qualitative data, SWOT analysis was conducted to determine the strengths, weaknesses, opportunities, and threats of implementing zero waste at Udjo Ecoland. In SWOT analysis, strengths are internal positive factors or advantages owned by Udjo Ecoland. Meanwhile, weaknesses are internal negative factors that inhibit the application of zero waste at Udjo Ecoland. Opportunities are favorable external conditions that managers can use, while threats are external negative factors that pose risks in developing zero waste at Udjo Ecoland [39, 42]. SWOT analysis results were then derived into TOWS matrix to develop strategic options from the external-internal analysis [43], as shown in Table 2. The combined strategy results obtained from TOWS matrix were used to identify solutions and promote the development of zero waste principles in Udjo Ecoland.

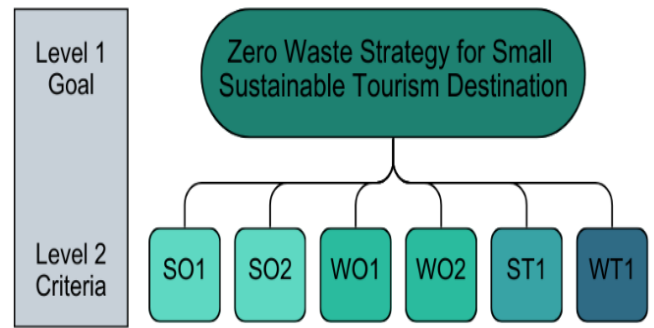
**Table 2.** TOWS matrix

	Internal Strengths	Internal Weaknesses
External Opportunities	SO Strategy	WO Strategy
	Strategies that use strengths to take advantage of opportunities	Strategies that minimize weaknesses to take advantage of opportunities
	ST strategies	WT strategies
External Threats	Strategies that use strengths to overcome threats	Strategies that minimize weaknesses and avoid threats

### 3.4 Application of AHP method

AHP method was applied to determine the optimal strategy in TOWS matrix. AHP is a decision-making method that uses pairwise comparisons to measure the relative importance of factors in a decision. This is a structured method that helps decision-makers break down complex problems into smaller,

more manageable parts, and identify the most critical factors to consider [44]. More specifically, AHP measures the relative importance of the strategies formed in TOWS matrix and helps determine the best [39].



**Figure 2.** AHP decision hierarchy

The first step is to establish a hierarchical model that identifies different levels of the decision problem, from the objective to the criteria and sub-criteria [44, 45]. In this step, a decision hierarchy was built for pairwise comparisons between factors and groups of TOWS matrix. The first level (goal) includes the development of zero waste strategies for small sustainable tourism destinations and the second (criteria) is the choice of TOWS strategies, as shown in Figure 2.

**Table 3.** Relative priority scale

Relative Priority	Definition
1	Equal important
3	Moderate important
5	Essential or strong importance
7	Very strong importance
9	Extreme importance
2,4,6,8,10	Intermediate values between the two adjacent judgments

The second step was to compare pairwise using the nine-point importance scale as shown in Table 3 [46]. Evaluation was carried out through face-to-face interviews to maximize response rates and ensure that AHP components were clearly understood by respondents [47]. All evaluators provided preferences for each criterion during pairwise comparisons. This assessment was conducted on a group of experts from various backgrounds, such as the leaders and managers of Udjo Ecoland, sustainable tourism destination managers, sustainable waste managers, activists on zero waste issues, and related academics with a minimum academic degree of master. In selecting decision-makers, the knowledge of the expert group, experience, and level of progress was essential, not the sample size [48].

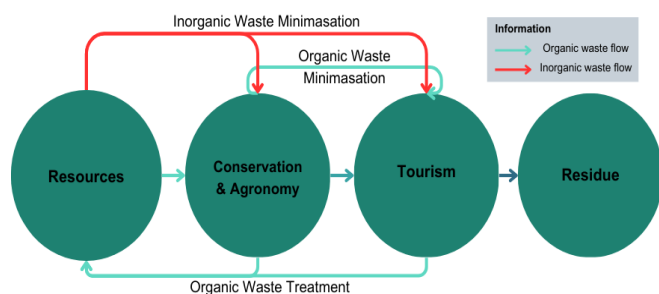
The final step was to analyze the pairwise comparison results using Microsoft Excel-based BPMSG AHP for decision-making [49]. The software builds a matrix in which rows and columns represent the same components in the decision hierarchy. Furthermore, consistency ratio (CR) was calculated to determine the consistency of the evaluation, and the upper limit of acceptable CR is 0.1 [44]. A CR not > 0.1 is accepted and decisions are made based on the normalized values. In a case where the consistency ratio exceeds the limit, the decision maker should revise the pairwise comparison [39, 45].

## 4. RESULTS AND DISCUSSION

### 4.1 Zero waste practices in Udjo Ecoland

#### 4.1.1 The idea and design

The idea of establishing Udjo Ecoland is a form of positive expansion from Saung Angklung Udjo in developing community-based tourism in harmony with nature. In this perspective, humans and nature are viewed as interconnected and interdependent, with both having equal importance. This understanding shows the need for humans to coexist with nature, rather than exercising domination, and to prioritize preservation and conservation efforts to protect the natural world. In addition, the Udjo Ecoland entity is an inseparable unity with the community. Udjo Ecoland exists because people engage in farming, raise livestock, and make art. The community will continue to farm, raise livestock, and make art because of the support from Udjo Ecoland. This relationship becomes an unbroken circle where both humans and nature live to support each other. In the context of zero waste, the belief is that human activities should be designed to return to nature, leaving no lasting impact, and providing benefits to the environment. This method aims to create a circular system where resources are continually cycled back into the natural world, promoting sustainability and harmony with nature.



**Figure 3.** Zero waste design at Udjo Ecoland

The beliefs of Udjo Ecoland were developed into a production flow design in a closed circle to realize sustainable tourism, as shown in Figure 3. First, all components in Udjo Ecoland area are a living ecosystem where conservation, empowerment, agriculture, livestock, and Angklung production efforts must consistently run daily with or without tourism. Second, the design connects the conservation and agronomic industries with tourism by integrating production flows where all live to support each other. Finally, the design was enhanced with organic waste treatment to cover the waste production flow in both the agronomy and tourism industries. In general, this design has successfully reduced waste, extended product life, and added value to all components in Udjo Ecoland, but it has yet to recycle non-organic waste.

The principles and design developed by Udjo Ecoland are a manifestation of the top step in the waste hierarchy. These principles redesign systemic changes that develop the linear production system towards a closed circle model to avoid unnecessary consumption and address the root causes of waste generation [38]. There is also a connection with the model proposed by Radwan, in which the first step of waste management requires managers to prioritize environmental responsibility. Therefore, there will need to be a commitment to make various waste management efforts and establish clear procedures for waste management [21].

#### 4.1.2 Stakeholders engagement

Udjo Ecoland realizes that implementing zero waste concept is almost impossible without the collaboration and support of stakeholders. Therefore, all vendors who work with Udjo Ecoland must support the principle of zero waste, such as using environmentally friendly packaging and or providing a waste material return scheme. In December 2022, Udjo Ecoland built a collaboration with the organic waste transportation and processing community in Bandung called Ngadaur for handling organic waste in the area. This collaboration includes space utilization, waste management, and education in Bale Riksa Bumi, also known as the house that cares for the earth.

The result of this study was consistent with previous reports that showed the importance of stakeholder collaboration in implementing zero-waste principles [19, 21]. However, in practice, this collaboration faces many problems. Conflicts of interest and the lack of coordination and communication between Udjo Ecoland manager and stakeholders have led to miscommunication in the implementation. This has led to the failure of some initiatives and cooperation. The issues faced by Udjo Ecoland are part of a broader global pattern, also seen in popular tourism destinations across the European Union, where stakeholder interests often clash, leading to communication challenges and conflicts that can impede progress [15].

#### 4.1.3 Waste minimization

Udjo Ecoland has made a series of efforts to minimize waste in all sectors, including conservation, agro-industry, and tourism, including producing organic and inorganic waste. Efforts have been made to reduce the use of hazardous materials, achieving an 80% organic agricultural practice, utilizing forage and fermentation, and eliminating the use of chemical pesticides in the area. Meanwhile, in tourism sector, the focus is on reducing single-use plastics by substituting with reusable materials and providing water stations scattered around the area.

The management promotes the use of local materials for construction, production, and consumption. About 80% of the materials used for buildings around the area were obtained from local environmental resources, such as Mahogany Wood and Gombong Bamboo for building construction. Similarly, some raw materials for tourists use local materials, such as fruits, vegetables, and processed beverage ingredients. There was also an attempt to reduce the use of electricity by drawing water without the help of machines. Water was taken from the river at a higher point to ensure flow using gravity into the main reservoir at the top of the hill. The collected water is then flowed back to the entire area using gravity, both for livestock, agriculture, bathrooms, and other tourism facilities.

This initiative is representative of the reduce and reuse steps in the waste hierarchy, where managers must be able to consider various ways to reduce waste and hazardous materials during the production stage [38]. This result is consistent with previous studies that showed the importance of waste reduction and outlined several practices to minimize waste in tourism destinations and hotels [5, 14]. However, this initiative was still constrained by the resistance of local communities, specifically in the dependence on single-use plastics, which was the toughest challenge in maintaining consistency at Udjo Ecoland.

4.1.4 Waste treatment

Udjo Ecoland has enhanced zero waste implementation by closing the waste production flow in the agronomy and tourism industries through organic waste treatment. In the agronomy industry, agricultural and livestock waste were used as animal feed and plant fertilizer, respectively. The Lemprak cage model, or cages with cement floors covered with rice husks, facilitates the processing of animal waste into compost. Waste urine and feces mixed with rice husks are harvested at a certain period and refrigerated for one night before use. In addition, the collected goat urine was used as a natural pesticide.

In tourism sector, organic waste from tourists' food was collected and fermented to be used as poultry feed or delivered to Bale Riksa Bumi for collection, sorting, and reprocessing. Public kitchen waste, such as bread, fruit, and food scraps is gently chopped into kitchen waste porridge for maggots to eat. Some types of fresh fruits were processed into liquid organic compost and Eco Enzyme. Residues and other hard materials that are difficult to chop, such as durian peels and bones, are piled up and dried to become briquettes or composted. Bale Riksa Bumi has a capacity of up to 5 tons/month and is currently running at 2-3 tons/month.

The last step taken by Udjo Ecoland is a manifestation of recycling in the waste hierarchy that promotes mechanically sorting and recycling waste materials into new products [38]. This result is also consistent with the report of previous studies that various efforts and appropriate waste management mechanisms to ensure waste can be further used as a resource [14, 17]. However, these efforts are hindered by one major problem, namely the failure of Udjo Ecoland to adequately manage most of the inorganic waste. Plastic waste generated, both from internal consumption and tourists, will only be collected and then burned periodically. This problem was caused by a lack of knowledge to develop inorganic waste management with limited human resources.

4.2 Zero waste strategy for Udjo Ecoland

4.2.1 SWOT analysis and TOWS matrix

Table 4. SWOT analysis and TOWS matrix

	Internal Strengths S1-Strong idea and value S2-Integrated system design S3-Waste minimisation and treatment initiative	Internal Weaknesses W1-Communication barrier W2-Lack of human resources W3-Untreated inorganic waste
	SO Strategy	WO Strategy
External Opportunities O1-Sustainability trend O2-Waste problem in Bandung City	SO1-Market expansion and increased sales SO2-Creating broader collaboration and partnership ST strategies	WO1-Encourage staff participation and training WO2-Developing further research on inorganic waste treatment WT strategies
External Threats T1-Unsustain local community and customer behaviour T2- Climate change	ST1-Developing environmental education and zero waste awareness	WT1-Developing internal policies and regulations

Source: Processed by researchers (2023)

After qualitative data collection, SWOT Analysis was conducted to holistically evaluate the implementation of zero waste at Udjo Ecoland based on internal and external factors. The evaluation results were then formulated with the guidance of experts through TOWS matrix for sustainable tourism at Udjo Ecoland, as shown in Table 4.

4.2.2 The overall priority of TOWS matrix determined by AHP analysis

Pairwise comparisons were conducted to measure the relative importance of factors in a decision in order to obtain the most effective and ideal strategy in TOWS matrix. AHP method has been applied in this study to prioritize the strategies mentioned in TOWS matrix. The results shown in Table 5 have a suitable strategy consistency ratio as evidenced by a value of less than 0.1. The experts identified strategy WO1, or foster staff participation and training, as the most ideal, with the highest score of 25.6%. This was followed by strategy ST1, WT1, SO2, SO1, WO2, with scores of 23.5%, 20.5%, 14.3%, 8.1%, and 7.9%, respectively. The results of SWOT-TOWS Matrix-AHP analysis as a whole show as follows:

Table 5. The priorities of criteria AHP

Level 1 Goal	Level 2 Criteria	Weight (%)	Rank
Zero waste strategy for small sustainable tourism destination	SO1-Market expansion and increased sales	8.1%	5
	SO2-Creating wider collaboration and partnership	14.3%	4
	WO1-Encourage staff participation and training	25.6%	1
	WO2-Developing further research on inorganic waste treatment	7.9%	6
	ST1-Developing environment education and zero waste awareness	23.5%	2
	WT1-Developing internal policies and regulations	20.5%	3

Source: Processed by researchers (2023)

Encourage staff participation and training: Experts consider that miscommunication and a lack of human resources are the main problems at Udjo Ecoland. These two factors cause difficulty in implementing the idea of zero waste built by the organization leadership. Therefore, there is a great need to communicate meaningful incentives and awareness to maximize staff participation and transform externally acquired knowledge into internal organizational values [50]. A good way to achieve this is by integrating zero waste as a significant part of an organization's induction training program by educating on why and how to manage waste [21]. Managers can also build intensive discussion spaces, such as weekly meetings or monthly upskilling, as a contextual and sustainable internal learning mechanism.

Developing environment education and zero waste awareness: Udjo Ecoland is built on the principle of interdependence with the community and nature, developing a mutually influential relationship with customers. This

principle shows the importance of providing awareness about waste management to tourists and communities as a sustainable process [14]. Collective awareness can be achieved through environment-based education that aims to gain a deeper understanding of the impact of tourism on the environment [51]. In this case, managers incorporate an understanding of zero waste and sustainable tourism into each tour program through information boards, activity modules, and tour guide interpretation materials. Managers can also implement a reward and punishment program as a form of motivation given to visitors.

Developing internal policies and regulations: According to experts, the development of internal regulations and policies will maintain consistency and lock in the previous two strategies. A strategic framework based on policies and regulations can guide the direction, shape, and structure of tourism development [52]. The policy must be formulated as an integrative system that addresses important issues, regulates destination competitiveness, and is oriented toward sustainability. In this context, stakeholder engagement is crucial to ensure policies are effective, meet needs, comply with regulations, and empower communities [50, 53]. Consequently, formulated policies can include a comprehensive analysis of environmental carrying capacity, visitor management (including numbers and activities), waste management protocols, stakeholder engagement and feedback mechanisms, standard operating procedures (SOPs), climate change adaptation strategies, and monitoring and reporting systems.

Creating broader collaboration and partnership: The fragmented and heterogeneous nature of tourism industry naturally requires collaboration and partnership among stakeholders [54]. In the context of zero waste, the implementation of sustainable waste management without support from the ecosystem around the area will require enormous effort and capital. Therefore, experts advise managers to collaborate with several stakeholders, including various levels of government, non-governmental, waste management and auditing, companies, travel agents, and other tourism organizations. This can be achieved by participating in exhibitions, conferences, and consortiums related to zero waste and sustainable tourism. However, in zero waste collaboration, cooperation decisions must be based on one main consideration, the environment and not the economy [21]. The collaboration should ensure that zero waste initiatives or all options in the hierarchy are implemented, waste management capacity is improved, and community participation is fostered [19].

Market expansion and increase sales: Experts argued that the increasing number of people interested in sustainability has a great potential for the sustainable industry to expand the market. This is because a more aware population will demand a new position from the companies [44]. The potential can be used by asserting Udjo Ecoland position on sustainability and developing products and services, such as tour packages that are specifically themed on zero waste. However, strategies for promoting sustainability and sustainable tourism must use strong verbal and visual cues designed to the culture and language of diverse target groups [32]. In this case, managers widen the market from middle to upper-class communities with better environmental awareness and education levels. Additionally, zero-waste principle can also be developed by integrating local wisdom and Sundanese culture, developing a

robust campaign that is disseminated through social media platforms and mass media channels.

Developing further research on inorganic waste treatment: Most experts agree on the urgency of inorganic waste management in Udjo Ecoland. However, this is not prioritized, because, in the local context, Indonesia has 65% mixed organic waste [55]. The experts argued that managers must first manage organic waste, followed by the prevention and management of inorganic waste production. Furthermore, a previous study provided many examples of organic waste management in the world that can be implemented in Udjo Ecoland. An example is that managers can build a centralized and decentralized internal waste infrastructure, such as providing three bins and creating drop-off points or recycling depots. This will send the inorganic waste to third parties or recycling industries to be reprocessed into new products [35].

## 5. CONCLUSION

In conclusion, the assessment of zero waste concept implementation in Udjo Ecoland showed consistency with the waste hierarchy and opportunities for further improvement. The greatest strength of Udjo Ecoland was the commitment to living in harmony with nature and local communities. The principle was also successfully interpreted into a production flow design, integrated into a closed circle through zero waste. A series of initiatives were also implemented to reduce and reuse waste in the field. However, these efforts still encountered several obstacles, such as communication and human resource problems that caused the inadequate implementation of zero waste principle.

From SWOT-TOWS Matrix-AHP analysis, the strategy developed should focus on building better internal management readiness before considering more excellent external opportunities for organisational development. The first step was to conduct training, including raising staff participation and providing awareness about good waste management to tourists and the community as an ongoing process. The development of internal regulations and policies was also needed to maintain consistency and lock in the previous two strategies. Furthermore, broader cooperation and market expansion were developed, and increased sales by capitalizing on the positive growth of sustainability trends worldwide. Lastly, further studies should be conducted to address leakages in inorganic waste management.

This study contributed to a systematic understanding of sustainable tourism destination management and waste practices by tapping into the perspectives of managers and experts. By synthesizing the insights, a strategic blueprint for zero waste initiatives at Udo Ecoland was developed, facilitating the implementation of effective sustainable measures. The strategies devised through an assessment of Udjo Ecoland's unique context may serve as a model for fostering sustainable tourism initiatives in other regions. The adaptable nature of this method showed the potential to catalyze sustainable tourism practices, particularly in achieving zero waste objectives across diverse contexts. However, this study was limited due to the availability of little data on inorganic waste treatment. Future studies could use various methods to analyze the effective and affordable implementation of inorganic waste treatment in small sustainable tourism destinations.

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## REFERENCES

- [1] Tahiri, A., Kovaci, I. (2017). The theory of sustainable tourism development. *Academic Journal of Business, Administration, Law and Social Sciences*, 3(1): 343-349.
- [2] World Travel & Tourism Council. (2022). Economic impact reports. <https://wtcc.org/Research/Economic-Impact>, accessed on Jan. 20, 2024.
- [3] Piippo, S., Juntunen, A., Kurppa, S., Pongrácz, E. (2014). The use of bio-waste to revegetate eroded land areas in Ylläs, Northern Finland: Toward a zero waste perspective of tourism in the Finnish Lapland. *Resources, Conservation and Recycling*, 93: 9-22. <https://doi.org/10.1016/j.resconrec.2014.09.015>
- [4] Yoopetch, C., Nimsai, S. (2019) Science mapping the knowledge base on sustainable tourism development, 1990-2018. *Sustainability*, 11(13): 1-17. <https://doi.org/10.3390/su11133631>
- [5] Frleta, D.S., Zupan, D. (2020). Zero waste concept in tourism. In 51st International Scientific Conference on Economic and Social Development, pp. 157-167.
- [6] Denafas, G., Ruzgas, T., Martuzevičius, D., et al. (2014). Seasonal variation of municipal solid waste generation and composition in four East European cities. *Resources, Conservation and Recycling*, 89: 22-30. <https://doi.org/10.1016/j.resconrec.2014.06.001>
- [7] Skordilis, A. (2004). Modelling of integrated solid waste management systems in an island. *Resources, Conservation and Recycling*, 41(3): 243-254. <https://doi.org/10.1016/j.resconrec.2003.10.007>
- [8] Styles, D., Schönberger, H., Galvez Martos, J.L., Institute for Prospective Technological Studies. (2013). Best environmental management practice in the tourism sector: Learning from frontrunners. Publications Office of the European Union.
- [9] da Silva, P.M., da Silva, L.M., Echeveste, S.S. (2021). Circular economy in tourism and hospitality: Analysis of scientific production on the theme. *European Journal of Tourism, Hospitality and Recreation*, 11(1): 45-53. <https://doi.org/10.2478/ejthr-2021-0005>
- [10] Kaza, S., Yao, L., Bhada-Tata, P., Van Woerden, F. (2018). What a waste 2.0: A global snapshot of solid waste management to 2050. <https://doi.org/10.1596/978-1-4648-1329-0>
- [11] IPCC. (2022). Summary for policymakers. <https://doi.org/10.1017/9781009325844.001>
- [12] Veleva, V., Bodkin, G., Todorova, S. (2017). The need for better measurement and employee engagement to advance a circular economy: Lessons from Biogen's "zero waste" journey. *Journal of Cleaner Production*, 154: 517-529. <https://doi.org/10.1016/j.jclepro.2017.03.177>
- [13] Tennant-Wood, R. (2003). Going for zero: A comparative critical analysis of zero waste events in southern New South Wales. *Australasian Journal of Environmental Management*, 10(1): 46-55. <https://doi.org/10.1080/14486563.2003.10648572>
- [14] Das, A.S., Diwakar, D.G. (2019). Solid waste management for sustainable tourism. *International Journal of Applied Social Science*, 6(2): 399-406.
- [15] Ezeah, C., Fazakerley, J., Byrne, T. (2015). Tourism waste management in the European Union: Lessons learned from four popular EU tourist destinations. *American Journal of Climate Change*, 4(5): 431-445. <https://doi.org/10.4236/ajcc.2015.45035>
- [16] Dileep, M.R. (2007). Tourism and waste management: A review of implementation of "zero waste" at Kovalam. *Asia Pacific Journal of Tourism Research*, 12(4): 377-392. <https://doi.org/10.1080/10941660701823314>
- [17] Sealey, K.S., Smith, J. (2014). Recycling for small island tourism developments: Food waste composting at Sandals Emerald Bay, Exuma, Bahamas. *Resources, Conservation and Recycling*, 92: 25-37. <https://doi.org/10.1016/j.resconrec.2014.08.008>
- [18] Wang, K.C.M., Lee, K.E., Mokhtar, M. (2021). Solid waste management in small tourism islands: An evolutionary governance approach. *Sustainability*, 13(11): 5896. <https://doi.org/10.3390/su13115896>
- [19] Willmott, L., Graci, S.R. (2012). Solid waste management in small island destinations: A case study of Gili Trawangan, Indonesia. *TÉOROS*, pp. 71-76. <https://doi.org/10.7202/1036566ar>
- [20] Pham Phu, S.T., Hoang, M.G., Fujiwara, T. (2018). Analyzing solid waste management practices for the hotel industry. *Global Journal of Environmental Science and Management*, 4(1): 19-30. <https://doi.org/10.22034/gjesm.2018.04.01.003>
- [21] Radwan, H.R., Jones, E., Minoli, D. (2010). Managing solid waste in small hotels. *Journal of Sustainable Tourism*, 18(2): 175-190. <https://doi.org/10.1080/09669580903373946>
- [22] Alim, A.K., Hadian, M.S.D., Novianti, E., Noor, A.A. (2023). Sustainable tourism as an effort to preserve culture and environment in Udjo Ecoland, Cimenyan, Bandung Regency. *Jurnal Pariwisata Pesona*, 8(2): 240-250. <https://doi.org/10.26905/jpp.v8i2.11120>
- [23] Aliansi Zero Waste Indonesia. (2023). Menilik Alasan di Balik Bandung 'Masih' Darurat Sampah, dan Solusi Berkelanjutan yang Telah Ada. Aliansi Zero Waste Indonesia. <https://aliansizerowaste.id/2023/09/25/menilik-alasan-di-balik-bandung-masih-darurat-sampah-dan-solusi-berkelanjutan-yang-telah-ada/>, accessed on Jan. 20, 2024.
- [24] Bandung Bergerak. (2023). Bandung (lagi-lagi) darurat sampah. BandungBergerak.id. <https://bandungbergerak.id/foto/detail/133/bandung-lagi-lagi-darurat-sampah>, accessed on Jun. 13, 2023.
- [25] CNN Indonesia. (2023). Kebakaran TPA Sarimukti belum padam, makin meluas. CNN Indonesia. <https://www.cnnindonesia.com/nasional/20230824145932-20-990029/kebakaran-tpa-sarimukti-belum-padam-makin-meluas>, accessed on Jan. 20, 2024.
- [26] kumparan. (2020). Bom waktu itu bernama sampah makanan. kumparan. <https://kumparan.com/kumparannews/bom-waktu-itu-bernama-sampah-makanan-1sey9ZZUcFw>, accessed on Jun. 13, 2023.
- [27] Saraniemi, S., Kylänen, M. (2011). Problematizing the concept of tourism destination: An analysis of different theoretical approaches. *Journal of Travel Research*, 50(2): 133-143. <https://doi.org/10.1177/0047287510362775>
- [28] Hall, C.M. (2000). *Tourism Planning: Policies,*



- Processes, Relationships. UK, Prentice Hall.
- [29] Cooper, C., Wanhill, S. (2005). *Tourism Development: Environmental and Community Issues*. England, Addison Wesley Longman.
- [30] Buhalis, D. (2000). Marketing the competitive destination of the future. *Tourism Management*, 21: 97-116.
- [31] Dodds, R. (2007). Sustainable tourism and policy implementation: Lessons from the case of Calviá, Spain. *Current Issues in Tourism*, 10(4): 296-322. <https://doi.org/10.2167/cit278.0>
- [32] Bausch, T., Schröder, T., Tauber, V. (2024). What is to be sustained? The polysemy of sustainability and sustainable tourism across languages and cultures. *Journal of Sustainable Tourism*, 32(1): 108-131. <https://doi.org/10.1080/09669582.2022.2124260>
- [33] United Nation World Tourism Organization. (2013). *Sustainable tourism for development*. Spain, World Tourism Organization.
- [34] Kemenparekraf. (2021). Peraturan Menteri Pariwisata dan Ekonomi Kreatif/Kepala Badan Pariwisata dan Ekonomi Kreatif Republik Indonesia nomor 9 tahun 2021 tentang pedoman destinasi pariwisata berkelanjutan. JDih Kemenko Bidang Kemaritiman dan Investasi. <https://jdih.maritim.go.id/id/permen-parekraf-no-9-tahun-2021>.
- [35] Zaman, A. (2022). Zero-waste: A new sustainability paradigm for addressing the global waste problem. In the *Vision Zero Handbook*. Springer International Publishing.
- [36] Glavič, P., Lukman, R. (2007). Review of sustainability terms and their definitions. *Journal of Cleaner Production*, 15(18): 1875-1885. <https://doi.org/10.1016/j.jclepro.2006.12.006>
- [37] Zero Waste New Zealand Trust. (2002). *Zero Waste New Zealand Trust 2002*. <http://www.zerowaste.co.nz/>, accessed on Jun. 13, 2023.
- [38] Zero Waste International Alliance. (2022). *Waste hierarchy*. <https://zwia.org/zwh/>, accessed on Jun. 13, 2023.
- [39] Datta, K. (2020). Application of SWOT-TOWS matrix and analytical hierarchy process (AHP) in the formulation of geoconservation and geotourism development strategies for Mama Bhagne Pahar: An important geomorphosite in West Bengal, India. *Geoheritage*. <https://doi.org/10.1007/s12371-020-00467-2>
- [40] Musthofa, B.M., Gunawijaya, J. (2016). Strategi keberhasilan proses pemberdayaan masyarakat melalui pengembangan kreativitas seni tradisi: Studi kasus Saung Angklung Udjo, Bandung, Jawa Barat. *Sosio Konsepsia*, 5(1): 325-339. <https://doi.org/10.33007/ska.v5i1.158>
- [41] Rosyadi, R. (2012). Angklung: Dari angklung tradisional ke angklung modern. *Jurnal Patanjala*, 4(1): 26-40. <https://doi.org/10.30959/ptj.v4i1.122>
- [42] Akola, J., Chakwizira, J., Ingwani, E., Bikam, P. (2023). An AHP-TOWS analysis of options for promoting disaster risk reduction infrastructure in informal settlements of Greater Giyani Local Municipality, South Africa. *Sustainability (Switzerland)*, 15(1): 267. <https://doi.org/10.3390/su15010267>
- [43] Weihrich, H. (1982). The TOWS matrix: A tool for situational analysis. *Long Range Planning*, 15(2): 54-66.
- [44] Oliveira, R.C., Nääs, I. de A., Garcia, S. (2023). Combining SWOT with AHP for analyzing the adoption of a circular economy in the apparel industry in Brazil. *Recycling*, 8(5): 73. <https://doi.org/10.3390/recycling8050073>
- [45] Kisi, N. (2019). A strategic approach to sustainable tourism development using the A'WOT hybrid method: A case study of Zonguldak, Turkey. *Sustainability*, 11(4): 964. <https://doi.org/10.3390/su11040964>
- [46] Saaty, R.W. (1987). The analytic hierarchy process: What it is and how it is used. *Mathematical Modelling*, 9(5): 161-176. [https://doi.org/10.1016/0270-0255\(87\)90473-8](https://doi.org/10.1016/0270-0255(87)90473-8)
- [47] Morgan, R., Lesueur, M., Henichart, L.M. (2014). Fisheries diversification: A case study of French and English fishers in the channel. In *Social Issues in Sustainable Fisheries Management*, pp. 165-182.
- [48] Saaty, T.L., Özdemir, M.S. (2014). How many judges should there be in a group? *Annals of Data Science*, 1(3-4): 359-368. <https://doi.org/10.1007/s40745-014-0026-4>
- [49] Goepel, K. (2018). Implementation of an online software tool for the analytic hierarchy process (AHP-OS). *International Journal of the Analytic Hierarchy Process*, 10(3): 469-487. <https://doi.org/10.13033/ijahp.v10i3.590>
- [50] Agyabeng-Mensah, Y., Tang, L., Afum, E., et al. (2021). Organisational identity and circular economy: Are inter and intra organisational learning, lean management and zero waste practices worth pursuing? *Sustainable Production and Consumption*, 28: 648-662. <https://doi.org/10.1016/j.spc.2021.06.018>
- [51] Sakellari, M., Skanavis, C. (2013). Sustainable tourism development: Environmental education as a tool to fill the gap between theory and practice. *International Journal of Environment and Sustainable Development*, 12(4): 313-323. <https://doi.org/10.1504/IJESD.2013.056316>
- [52] J.R.B., Crouch, G.I. (2010). A model of destination competitiveness/sustainability: Brazilian perspectives. *Revista de Administração Pública*, 44(5): 1049-1066. <https://doi.org/10.1590/S0034-76122010000500003>
- [53] Dolezal, C., Novelli, M. (2022). Power in community-based tourism: Empowerment and partnership in Bali. *Journal of Sustainable Tourism*, 30(10): 2352-2370. <https://doi.org/10.1080/09669582.2020.1838527>
- [54] Tuohino, A., Konu, H. (2014). Local stakeholders' views about destination management: Who are leading tourism development? *Tourism Review*, 69(3): 202-215. <https://doi.org/10.1108/TR-06-2013-0033>
- [55] KLHK. (2022). *Capaian kinerja pengelolaan sampah*. <https://sipsn.menlhk.go.id/sipsn/>, accessed on Jun. 13, 2023.