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Strengthening Environmentally Sustainable Hospitality Practices Through Waste Management at Pacific Palace Hotel, Batam City

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ABSTRACT

The implementation of environmentally sustainable hospitality practices (ESHP) has become increasingly important in supporting sustainable tourism development. According to data published by Bank Indonesia in 2026, the tourism sector was recognized as having significant potential to contribute to economic development in Batam City. Therefore, tourism development should not focus solely on economic growth but should also integrate environmental sustainability into hospitality operations. This study aimed to examine the implementation of ESHP at Pacific Palace Hotel in Batam City and their contribution to sustainable tourism development. The study specifically focused on plastic waste management, food waste management, and the use of environmentally friendly materials and products in hotel operations. The findings indicated that ESHP were implemented through plastic waste segregation and management, food waste processing, reductions in single-use materials, and the adoption of more environmentally friendly products. These initiatives reflected the hotel's commitment to minimizing its environmental impact and supporting sustainable tourism development in Batam City. However, their implementation faced several challenges, including inadequate supporting infrastructure, investment costs, and the need to improve employees' environmental awareness and consistency in adopting sustainable practices. Accordingly, strengthening standard operating procedures (SOPs), providing ongoing environmental education and training, developing integrated waste management systems, and allocating dedicated financial resources were identified as essential measures for improving ESHP implementation. Effective implementation of these measures was expected to contribute to environmental conservation while enhancing the competitiveness and long-term sustainability of the hospitality and tourism sectors in Batam City.

INTRODUCTION

The hospitality industry plays a strategic role in tourism development, employment generation, and regional economic growth (Dogru et al., 2020; Harwood et al., 2022; Konovalova et al., 2018; Modi, 2024; Thommandru et al., 2023; КИФЯК & КИФЯК, 2024). However, hotel operations also involve substantial consumption of food, water, energy,

packaging, cleaning materials, and other resources, generating considerable amounts of plastic and organic waste. These conditions highlight the need to integrate environmental responsibility into hospitality management while maintaining operational efficiency. In this context, Environmentally Sustainable Hospitality Practices (ESHP) provide a framework for promoting responsible resource utilization, waste reduction, reuse, recycling, and the adoption of environmentally friendly materials and products. Such practices have become increasingly important because sustainable tourism requires not only economic growth but also responsible environmental resource management (Alola et al., 2022; Filimonau et al., 2023; Han et al., 2010; Herini et al., 2024; Widiana et al., 2022).

Waste management is a critical component of ESHP, as improperly managed waste contributes to environmental degradation and the loss of potentially valuable resources. Husein (2026) highlighted that unresolved waste management challenges in Indonesia have implications extending beyond environmental degradation to human capital development and economic growth. In the hospitality sector, plastic waste generated from bottles, packaging, disposable amenities, and single-use materials requires systematic reduction, segregation, reuse, and recycling. Similarly, kitchen and food waste generated by restaurants, banquet services, and other food service operations represents a substantial source of organic material that can potentially be recovered and converted into valuable products. Recent studies have emphasized the importance of food waste prevention, reduction, recovery, and circular economy approaches in hospitality operations (Ally et al., 2024; Cárdenas et al., 2024; Lagioia et al., 2024; Montesdeoca-Calderón et al., 2024; Nhubu & Mbohwa, 2024; Santos-Peñate et al., 2023; Srijuntrapun et al., 2022).

A broader approach to organic waste management can be developed through biological waste valorization and circular bioeconomy principles. Suitable organic waste can be processed using black soldier fly (BSF) larvae (Hermetia illucens), which can convert appropriate organic substrates into insect biomass. Subject to appropriate technical, sanitary, and regulatory controls, the resulting biomass may be utilized as an ingredient in livestock or aquaculture feed, while the residual material, commonly referred to as frass, may undergo further treatment for agricultural applications. This process offers opportunities to establish a circular biological system connecting organic waste management, BSF larvae cultivation, feed production, poultry farming, aquaculture, and food production, thereby creating potential economic value. Accordingly, waste can be regarded not merely as material requiring disposal but as a recoverable resource within an interconnected and productive ecosystem (Dzepe et al., 2023; Ganesan et al., 2024; Musthofa et al., 2025; Yıldırım-Aksoy et al., 2023).

This approach is particularly relevant to Batam City, where tourism has been identified as an important sector with substantial potential to support regional economic development. The strategic importance of tourism was highlighted during the Batam Investment Forum 2026, held on August 13, 2026, as reported by Bisnis Indonesia (2026). However, the expansion of tourism and hospitality activities must be accompanied by environmental responsibility, as increased tourism activity can intensify resource consumption and waste generation. Consequently, strengthening environmentally sustainable practices in hotels can contribute to environmental conservation while supporting the long-term competitiveness of Batam's tourism industry.

Within this context, Pacific Palace Hotel in Batam City represents a relevant partner for strengthening ESHP through an integrated waste management approach. A preliminary assessment of the hotel's operational context indicated the need to improve employee environmental awareness, waste segregation, systematic management of plastic and kitchen waste, and the consistent adoption of environmentally friendly practices. Transitioning from conventional waste disposal to waste reduction and biological resource recovery also requires improvements in employee knowledge, practical skills, standard operating procedures (SOPs), and organizational commitment (Ikhide et al., 2023; Rubel et al., 2023).

To address these challenges, the community engagement program adopted an integrated approach involving education, awareness-raising activities, practical training, and ongoing mentoring. Educational activities focused on improving employees' understanding of ESHP, environmental responsibility, plastic pollution, organic waste management, and circular bioeconomy principles. Awareness-raising activities aimed to foster collective environmental awareness and organizational commitment to sustainable hospitality operations. Practical training emphasized waste segregation at the source, reductions in single-use materials, plastic waste management, and appropriate kitchen waste handling. The program also introduced the potential application of BSF larvae-based bioconversion for suitable organic waste and its possible integration with poultry farming and aquaculture systems. Wasiman et al. (2026) demonstrated that environmental education and participatory engagement could strengthen awareness and encourage behavioral changes in plastic waste management, supporting the relevance of educational and participatory approaches in hospitality settings (Nurhayati & Nurhayati, 2023). Furthermore, ongoing mentoring was designed to facilitate the consistent application of acquired knowledge and skills in daily hotel operations. Through continuous guidance, employees could identify operational barriers, improve waste management practices, and establish procedures that incorporated environmental responsibility into routine activities. This approach extended beyond one-time environmental awareness initiatives by promoting continuous organizational learning and behavioral change.

The program also introduced a waste-to-value approach, in which suitable organic waste could serve as an input for biological conversion processes rather than being immediately discarded. Within a controlled system, the conceptual integration of kitchen waste management, BSF larvae cultivation, poultry farming, aquaculture, and the production of economically valuable outputs illustrated the potential relationship between environmental sustainability and economic opportunities. Such a model could reduce waste disposal requirements, improve resource efficiency, and generate additional value through recovered biological resources. Nevertheless, biological conversion processes and the utilization of insect biomass in livestock or aquaculture feed must comply with applicable safety, hygiene, nutritional, environmental, and regulatory requirements.

Integrating plastic waste management, organic waste valorization, employee capacity building, and circular biological processes offered a comprehensive approach to strengthening ESHP in the hospitality sector. Rather than focusing exclusively on waste reduction, the program promoted a transition from a linear waste disposal model toward a circular, resource recovery-oriented hospitality system. This approach positioned employees not merely as recipients of environmental policies but as active participants in identifying operational challenges, implementing sustainable solutions, and maintaining environmentally responsible

practices. Accordingly, this community engagement program aimed to strengthen the capacity of Pacific Palace Hotel employees to implement ESHP through education, awareness-raising activities, practical training, and continuous mentoring, with particular emphasis on plastic waste management, kitchen waste treatment, environmentally friendly materials, and the introduction of biological waste valorization. Ultimately, the program was expected to improve environmental awareness and operational practices while promoting a circular system that integrated waste reduction, biological conversion, resource recovery, food production, and economic value creation. Through this approach, Pacific Palace Hotel could contribute to improved environmental performance at the organizational level and support the broader development of a more sustainable, competitive, and environmentally responsible tourism industry in Batam City.

METHOD

Community Engagement Design

This community engagement program employed a participatory, action-oriented approach to strengthen Environmentally Sustainable Hospitality Practices (ESHP) at Pacific Palace Hotel in Batam City. The program addressed operational environmental challenges, particularly plastic and kitchen waste management, the reduction of single-use materials, and the adoption of environmentally friendly practices. Activities included environmental education, awareness-raising sessions, practical training, and mentoring to enhance employee knowledge, encourage behavioral change, and support sustainable waste management practices. Hotel management and employees actively participated in identifying waste management challenges, implementing improvement measures, and evaluating program activities to promote organizational commitment and the consistent adoption of environmentally responsible practices.

Location and Participants

The programme was conducted at Pacific Palace Hotel, Batam City, Indonesia. The hotel was selected as the community engagement partner because of its role in supporting the hospitality and tourism sector in Batam and its potential to strengthen environmentally sustainable operational practices.

The participants consisted of relevant hotel employees and management personnel whose activities were directly associated with housekeeping, kitchen operations, food services, waste handling, and other operational processes. Their involvement was important because employees directly influence the generation, separation, handling, and utilisation of waste in daily hotel operations.

Stages of the Programme

The community engagement programme was implemented through four interconnected stages:

1. Initial Assessment and Problem Identification

   The first stage involved identifying existing waste-management practices and environmental challenges within Pacific Palace Hotel. Particular attention was given to the generation and handling of plastic waste and kitchen waste, waste-segregation practices, the use of single-use materials, and employees' awareness of environmental sustainability. The assessment provided the basis for determining the focus of subsequent interventions.

2. Education and Socialisation
   The second stage focused on strengthening participants' understanding of ESHP and sustainable waste management. Participants were introduced to the principles of waste reduction, source segregation, reuse, recycling, environmentally friendly materials, and responsible resource utilisation. The socialisation activities also introduced the concepts of biological waste valorisation, circular bioeconomy, and waste-to-value, including the potential use of black soldier fly larvae (Hermetia illucens) to process suitable organic waste.
3. Practical Training
   The training stage translated theoretical knowledge into practical skills. Participants were trained to distinguish and separate plastic and organic waste at source, reduce unnecessary single-use materials, and manage suitable kitchen waste more systematically. The programme also introduced the potential biological cycle. The training emphasised that biological conversion must be conducted under appropriate hygiene, safety, nutritional, environmental, and regulatory conditions.
4. Mentoring and Follow-up
   The final stage involved continuous mentoring to support the consistent application of sustainable practices in daily hotel operations. Participants were assisted in identifying implementation barriers, improving waste segregation, maintaining environmentally responsible practices, and considering the integration of ESHP into operational procedures. Mentoring also aimed to encourage sustainable habits and strengthen organisational commitment beyond the implementation period.

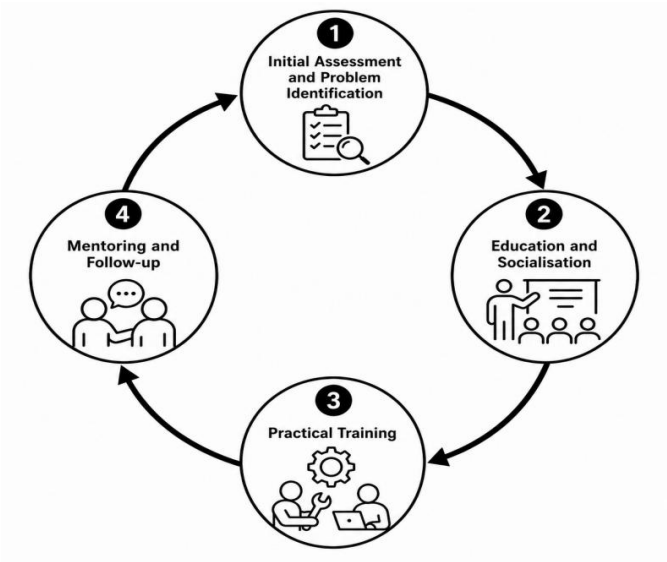


Figure 1. Environmentally Sustainable Hospitality Practices Implementation Cycle

Program Evaluation

Programme evaluation was conducted to assess changes in participants' understanding, environmental awareness, and practical ability to implement ESHP. The evaluation focused on understanding of ESHP and sustainable waste management, ability to distinguish and segregate plastic and organic waste, awareness of the environmental impacts of single-use materials,

understanding of biological waste valorisation and circular bioeconomy principles, ability to identify potential resource-recovery opportunities from suitable kitchen waste and consistency in applying sustainable waste-management practices following the intervention.

Evaluation was conducted through observation, discussion, participant responses, and comparison of practices before and after the intervention. The results were used to identify improvements, remaining challenges, and areas requiring further assistance.

Data Analysis

Data obtained during the programme were analysed descriptively and qualitatively. Information from observations, discussions, participant responses, and mentoring activities was organised according to five dimensions: (1) environmental awareness, (2) waste-management practices, (3) employee participation, (4) biological waste valorisation, and (5) potential economic value creation.

The analysis focused on identifying changes in participants' knowledge and practices as well as barriers encountered during implementation. The findings were subsequently interpreted using the ESHP framework to assess the contribution of the programme to sustainable hospitality practices at Pacific Palace Hotel.

Community Engagement Outcomes

The programme is expected to strengthen employees' understanding of ESHP, improve waste-segregation practices, increase awareness of plastic and kitchen-waste management, and enhance their capacity to implement environmentally responsible practices in daily hotel operations. In addition, the programme introduces a circular waste-management perspective, in which suitable organic waste can potentially be converted into biological resources and connected with poultry or aquaculture activities.

Ultimately, the programme seeks to strengthen an environmentally responsible organisational culture at Pacific Palace Hotel through the integration of education, behavioural change, sustainable waste management, biological resource recovery, and economic value creation. This approach is expected to contribute to more sustainable hospitality operations and support the broader development of sustainable tourism in Batam City.

RESULTS AND DISCUSSION

Identification of Partner Problems

The initial assessment at Pacific Palace Hotel, Batam City, identified several issues related to the implementation of Environmentally Sustainable Hospitality Practices (ESHP). The main problems concern the management of plastic and kitchen waste, employee awareness, waste segregation, and the limited integration of waste-management practices with resource recovery and economic value creation.

Plastic waste is generated from various hotel activities, including food and beverage services, guest amenities, packaging, and other operational activities. Although some waste-management practices have been implemented, further strengthening is required to ensure consistent source segregation, reduction of single-use materials, and appropriate handling of recyclable materials. Inconsistent practices may reduce the potential environmental benefits of waste management and increase the volume of waste requiring final disposal.

A second issue concerns kitchen and food waste. Food preparation and food-service activities generate organic waste that has potential for further utilisation. However, without

appropriate segregation and treatment, organic waste is generally regarded primarily as waste requiring disposal. This condition represents a lost opportunity to introduce biological waste valorisation and a circular approach in which suitable organic materials can potentially be converted into useful biological resources.

Employee Capacity and Behaviour

The implementation of ESHP is also influenced by employees' environmental knowledge, skills, and consistency. Employees are directly involved in activities that generate and manage waste; therefore, differences in understanding and environmental awareness can result in inconsistent waste-segregation and handling practices.

The problem is not solely a lack of knowledge, but also the need to transform knowledge into consistent operational behaviour. Employees require practical guidance regarding waste identification, source segregation, reduction of single-use materials, and appropriate handling of organic waste. Continuous education, training, and mentoring are therefore required to support behavioural change and strengthen organisational environmental culture.

Limited Integration of Waste-to-Value Practices

Another identified problem is the limited integration between conventional hotel waste management and waste-to-value practices. Plastic waste and organic waste require different treatment strategies, yet both can be managed within an integrated ESHP framework. Plastic waste can be reduced, reused, recycled, or appropriately disposed of, whereas suitable organic waste can potentially be directed towards biological resource recovery.

The potential use of black soldier fly larvae (Hermetia illucens) or maggot provides an alternative approach to organic waste management. Suitable kitchen waste can potentially serve as a substrate for maggot cultivation, with the resulting biomass potentially supporting appropriate poultry or aquaculture feed systems. However, this concept requires adequate knowledge, waste segregation, technical procedures, hygiene controls, and appropriate monitoring. Therefore, the challenge is not simply introducing maggot cultivation but developing an understanding of how biological waste valorisation can be safely integrated into a circular hospitality system.

Root Causes of the Problems

Based on the initial analysis, the problems at Pacific Palace Hotel can be grouped into several interconnected factors:

Table 1. Root Causes of the Problems

Problem Area	Main Issue	Potential Impact
Plastic waste	Inconsistent reduction and segregation	Increased residual waste and loss of recyclable resources
Kitchen waste	Limited utilisation of suitable organic waste	Loss of biological and economic potential
Employee capacity	Differences in knowledge and environmental awareness	Inconsistent implementation of ESHP
Operational procedures	Need for stronger and more consistent procedures	Difficulty maintaining sustainable practices
Resource recovery	Limited waste-to-value integration	Potential economic value remains unexplored
Circular practices	Limited connection between waste and productive activities	Hospitality operations remain predominantly linear

These problems are interconnected. Therefore, inadequate employee knowledge can influence waste segregation; inadequate segregation can limit recycling and biological processing; and limited processing can prevent the transformation of waste into productive resources. Over all, the intervention needs to address knowledge, behaviour, operational procedures, and resource recovery simultaneously rather than treating waste management as an isolated technical problem.

Priority Problems to Be Addressed

Based on the problem analysis, the community engagement programme prioritises four areas. First, strengthening employees' understanding of ESHP and sustainable waste management. Second, improving the segregation and management of plastic and kitchen waste at source. Third, introducing the principles of biological waste valorisation and circular bioeconomy, particularly the potential role of maggot in processing suitable organic waste. Fourth, strengthening employees' capacity through education, socialisation, practical training, and continuous mentoring.

These priorities are designed to address the gap between environmental awareness and practical implementation. The programme therefore seeks to establish a more systematic approach in which sustainable waste management becomes part of daily hotel operations and, where technically feasible, suitable waste streams can be connected with resource-recovery activities.

The problem analysis consequently establishes the basis for the proposed intervention at Pacific Palace Hotel: strengthening ESHP through employee capacity building, improved waste segregation, plastic-waste reduction, organic-waste valorisation, and the introduction of a circular waste-to-value perspective. This integrated approach is expected to support both environmental improvement and the development of more sustainable hospitality practices in Batam City.

CONCLUSION

The community engagement program at Pacific Palace Hotel in Batam City demonstrated that Environmentally Sustainable Hospitality Practices (ESHP) could be strengthened through an integrated approach involving education, awareness-raising activities, practical training, and mentoring. The program emphasized the importance of enhancing employees' knowledge and practical skills in managing plastic and kitchen waste, reducing single-use materials, and incorporating environmentally responsible practices into daily hotel operations.

The program also introduced a circular waste-to-value approach, particularly through the potential use of suitable kitchen waste for biological conversion using black soldier fly (BSF) larvae (Hermetia illucens). This approach established a conceptual link between organic waste management, biological resource recovery, poultry farming, aquaculture, and potential economic value creation. Accordingly, organic waste was recognized not merely as material requiring disposal but as a potential resource within a circular production system.

The findings further suggested that successful ESHP implementation depended not only on adequate infrastructure but also on employee awareness, active participation, consistent practices, and organizational commitment. Therefore, strengthening environmental sustainability in hospitality operations required continuous employee capacity building and the

integration of sustainable practices into standard operating procedures. Overall, the program contributed to promoting environmentally responsible practices at Pacific Palace Hotel and offered a framework for supporting sustainable and competitive tourism development in Batam City.

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CONFLICT OF INTEREST

The author states that there are no conflicts of interest, whether personal, commercial, or financial, that can affect the implementation and results of this study.

AUTHOR'S CONTRIBUTION

Alice Erni Husein, Daniel Cassa Augustinus, Inda Sukati, and Mariska Putri Pratiwi contributed to research design, data collection and processing, result analysis, and article manuscript preparation.

GENERATIVE ARTIFICIAL INTELLIGENCE USAGE STATEMENT

In the process of compiling this article, the author uses generative artificial intelligence (AI) as a tool in language refinement, writing structure, and grammar improvement. The use of AI is carried out on a limited basis and remains under the supervision of the author. All data, analysis, interpretation, and scientific substance in this article have been checked and verified by the author. The author is solely responsible for the accuracy, authenticity, and final content of the manuscript.

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