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Sustainablility of Hospitality Industri, Opportunities and Obstacles Case Study: Food Waste Mitigation

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ABSTRACT

This study aims to analyse the influence of sustainability practices in increasing competitiveness in Indonesia, especially in the hospitality industry, with a primary focus on strategies for managing food waste generated by hotels. Globally, awareness of environmental issues is growing very well, and the hospitality industry (horeca: hotels, restaurants, cafes) is expected to contribute significantly to sustainability activities but also improve its position in the market. Through a quantitative method approach with a sample of 214 hotels in Jabodetabek, it is hoped that this study can analyse the sustainability initiatives that have been carried out to date and the resulting impacts, especially their influence on increasing business process efficiency, customer satisfaction and brand reputation. Market pressure, internal business processes and food waste mitigation, as well as hotel commitment to Sustainable Development are key factors measured in this study. The research findings show that hotels that are actively involved in food waste mitigation show improved operational performance, cost savings, and increased customer loyalty. In addition, this study identifies key factors that facilitate the successful implementation of sustainability practices, including staff contributions to business process efficiency, stakeholder engagement in production processes, and the use of technology that can provide hotel operational efficiency. This research contributes to the understanding of how sustainable practices can serve as a competitive advantage in the hospitality industry in the future, and offers practical recommendations for hotel management and policymakers to promote a more sustainable and resilient hospitality sector in Indonesia and globally.

This study recommends that the government develop incentive policies for hotels that implement food waste mitigation practices and require sustainability certification as a hotel operational requirement. Hotel management needs to integrate waste tracking and AI forecasting technology, strengthen employee training, and build collaboration with food banks for the redistribution of food suitable for consumption

Keywords: Lean Supply Chain Management*; Market Pressures; Food Waste Mitigation; Sustainable Development; Hotel Sustainability Jakarta.*

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INTRODUCTION

The hospitality industry in Indonesia plays an important role in the national economy with a significant contribution to GDP and job creation. PHRI data shows that the accommodation, food and beverage sectors contribute 2.6% to the national GDP, while the tourism sector reaches 5.5%, with Jakarta contributing 16.6% to regional GDP and absorbing 603 thousand workers. However, the sector faces major challenges related to sustainability, especially the increasingly urgent issue of food waste. Reports (Bappenas, 2021) disclosing losses *Food Loss and Waste* (FLW) Indonesia in 2000-2019 reached 213-551 trillion-rupiah, equivalent to 4-5% of Indonesia's GDP. Data (KLHK, 2019) shows that household waste accounts for 62% with food waste 44% of the composition, where in Jakarta, 30-35% of hotel and restaurant waste is food waste (Kehutanan Kementerian Lingkungan Hidup & Kehutanan, 2024). This condition poses serious problems from economic, environmental, and social aspects that threaten the competitiveness of the Indonesian hotel industry in a global market that is increasingly concerned about sustainability.

Food waste in the hospitality sector is rooted in the demands of excellent service that drive abundant stocks, lack of technical knowledge, budget constraints, and low management commitment, especially in small hotels. Global competition that cares about sustainability poses significant market pressure, as seen from *Online Travel Agent* as Booking.com with "*Travel Sustainable*", Agoda with "*Eco-Friendly deals*", and Trip.com with the GSTC (*Global Sustainable Tourism Council*). (Rani et al., 2024) proving that market pressure has a significant effect on waste-friendly procurement. From the operational side, (M. Zahid et al., 2024) Demonstrate approach *Lean Supply Chain* based *Natural Resource-Based View* (NRBV) successfully lowered *Food Waste* in Pakistan, confirming that supply chain efficiency is a crucial factor in food waste mitigation.

Despite the various studies that have been conducted, there are still significant gaps in the literature. (Awan et al., 2024) validates the positive effects of green business commitments but has not tested its mediating role on sustainable development. (M. Zahid et al., 2024) successfully proven effectiveness *Lean Supply Chain* in lowering *Food Waste* however, it does not explore the influence of external factors such as market pressures. Thus, there has not been a study that comprehensively integrates *Lean Supply Chain Management* (LSCM), *Market Pressure* (MP), and *Sustainable Development* (SD) with *Food Waste Mitigation* (FWM) as a mediating variable in the context of the Indonesian hospitality industry.

Based on the identification of the problem and *research gap*, this study aims to analyze the influence of *Lean Supply Chain Management* (LSCM) and *Market Pressure* (MP) on *Food Waste Mitigation* (FWM) and its impact on *Sustainable Development* (SD) in Jakarta star hotels. This study constructs four main variables: (1) *Market Pressure* (MP) as a representation of external pressures from customers, competitors, and regulations that encourage sustainable practices; (2) *Lean Supply Chain Management* (LSCM) as a strategic approach to supply chain management to reduce waste and improve operational efficiency; (3) *Food Waste Mitigation* (FWM) as an organization's ability to manage and reduce food waste throughout the supply chain; and (4) *Sustainable Development* (SD) as the achievement of economic, environmental, and social balance according to the *Triple Bottom Line principle*. The theoretical framework of the research is based on *the Natural Resource-Based*

View (NRBV) which places the natural environment as a strategic resource to determine the long-term sustainability of the organization. This research is expected to provide an academic contribution by enriching the literature *on sustainability management* and *hospitality studies*, as well as a practical contribution by providing empirical guidance for hotel industry players in formulating effective food waste management strategies and providing an empirical basis for the government to formulate policies that encourage the adoption of *green practices* in line with SDG target 12.3 regarding global *food waste* reduction by 2030.

LITERATURE REVIEW

Natural Resource-Based View (NRBV)

In contrast to RBV which focuses on economic efficiency and capability, NRBV places the natural environment (Natural Environment) as a strategic resource that determines the long-term sustainability of the organization. In context Hospitality Industry, NRBV theory explains how organizations build a competitive advantage through internal ability to manage natural resources sustainably (Filimonau & De Coteau, 2018; Zahid et al., 2024). Study (M. Zahid et al., 2024) in Pakistan proves the practice Lean Supply Chain Environmentally Oriented Able to Reduce Food Waste significantly and improve hotel efficiency, reinforcing NRBV's view that an organization's ability to manage natural resources efficiently is a strategic capability which is difficult for competitors to imitate.

Lean Supply Chain Management (LSCM)

Lean Supply Chain Management (LSCM) is a strategic framework that prioritizes waste reduction, operational efficiency, and responsiveness to customer needs across the supply network (Ionel, 2024). LSCM builds on lean principles originally developed in the manufacturing context but is increasingly applied in broader supply chain settings, including logistics and service industries, to streamline processes and eliminate non-value-added activities (Rossini et al., 2024). The core lean principles—identifying value, mapping the value stream, creating continuous flow, implementing pull systems, and pursuing perfection—are foundational to optimizing supply chain operations and enhancing competitive advantage (Ionel, 2024)

Recent sustainable supply chain research highlights that integrating lean practices with waste reduction efforts enhances operational performance and supports environmental goals, particularly when aligned with sustainability frameworks (Wiśnicki et al., 2024). In the hospitality context, although empirical studies specifically on lean supply chain in hotels remain limited, research trends indicate growing interest in sustainable supply chain management that incorporates waste minimization and responsiveness to market dynamics (Susanti & Pariwisata Bali, n.d.). Key LSCM performance indicators commonly examined in the literature include lead time, waste reduction, process efficiency, and sustainability outcomes, reflecting both operational excellence and environmental performance (Ikpe & Shamsuddoha, 2024)

Market Pressure (MP)

In context *Hospitality*, Market pressure proved to be a major trigger for adoption *Green Innovation* and food waste management programs (Bux et al., 2025; Elkhwesky et al., 2024; Rani et al., 2024) proving that market pressures have a significant effect on waste-friendly procurement and green supply chain management practices that improve the company's internal efficiency.

Food Waste Mitigation (FWM)

Concept *Food Waste Mitigation* It relates to the organization's ability to manage and reduce food waste throughout the supply chain, from menu planning to consumption. Recent research (Rakesh & Mahendran, 2024) demonstrate the integration of digital technologies such as *Waste Tracking* and *AI forecasting* able to reduce food waste by up to 25%. Theoretically, FWM includes three main components: *Operational Efficiency*, *Employee Awareness*, and *Technological Integration*. (Lévesque et al., 2022) found that the implementation of *Food audit* and *Redesign menu* can lower *Food Waste* up to 30%, demonstrating the importance of a systematic approach in FWM to improve cost efficiency and a positive image of the organization.

Sustainable Development (SD)

Sustainable Development In the hospitality industry, it is a sustainable development concept applied by the *Hospitality* with the aim of balancing the operational needs of hotels with environmental preservation, improving social welfare, and long-term economic sustainability. The environmental dimension includes the hotel's efforts to minimize ecological impact through energy efficiency, water conservation, waste reduction, *Green Purchasing*, and *Green Building*. Economic sustainability focuses on creating long-term profits without harming the environment. The social dimension includes improving the well-being of employees, guests, and the surrounding community. Implementing hotels *Sustainability* Proven to increase profitability through efficiency *Resource*, positive reputation, and consumer preferences (Aït-Kaddour et al., 2024).

Inter-Variable Relationships

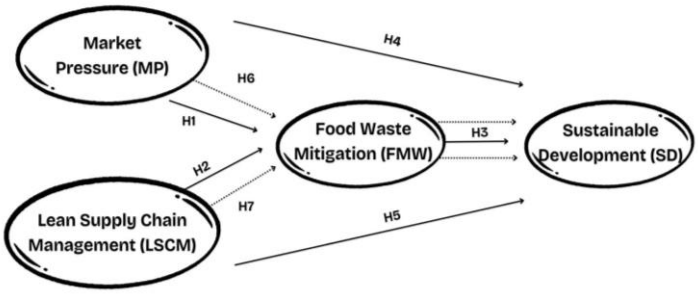
Based on NRBV theory and empirical studies, there is a close relationship between LSCM, MP, FWM, and SD. (M. Zahid et al., 2024) prove that LSCM has a significant effect on reducing *Food Waste*. (Rani et al., 2024) shows that MP encourages waste-friendly procurement practices. (Khan et al., 2022) finding ethical leadership and green HR policies have an effect on employees' eco-friendly behavior, key to successful practice implementation *lean*. (Ma et al., 2024) found that strong CSR increases employee commitment to implementing sustainability practices. (Cardenas et al., 2024) demonstrate effective circular economy practices in reducing *Food Waste* If supported by economic incentives and regulatory policies, it confirms that market pressures and operational efficiency have an impact on sustainability through food waste mitigation mechanisms.

Research Hypotheses and Frameworks of Thought

Based on theoretical and empirical studies, this study proposes seven hypotheses: H1: *Market Pressure* has a positive effect on *Food Waste Mitigation*; H2: *Lean Supply Chain Management* has a positive effect on *Food Waste Mitigation*; H3: *Food Waste Mitigation* has a positive effect on *Sustainable Development*; H4: *Market Pressure* has a Positive Effect on *Sustainable Development*; H5: *Lean Supply Chain Management* has a positive effect on *Sustainable Development*; H6: *Market Pressure* has a positive effect on *Sustainable Development* with *Food Waste Mitigation* as a mediator; H7: *Lean Supply Chain Management* has a positive effect on *Sustainable Development* with *Food Waste Mitigation* as a mediator. The conceptual framework describes the relationship between exogenous variables (LSCM and MP), mediator variables (FWM), and endogenous variables (SD) in the context of the Jakarta hospitality industry based on NRBV theory. Based on the development of the hypothesis described, a conceptual framework can be created schematically that

describes the relationship between *Lean Supply Chain Management* (LSCM), *Market Pressure* (MP), *Food Waste Mitigation* (FWM), and *Sustainability Development* (SD) in the context of the hotel industry in Greater Jakarta (Figure 1).

Figure 1. Research Framework of Thought



H1: Market Pressure (MP) has a positive effect on Food Waste Mitigation (FWM)
H2: Lean Supply Chain Management (LSCM) has a positive effect on Food Waste Mitigation (FWM)
H3: Food Waste Mitigation (FWM) has a positive effect on Sustainable Development (SD)
H4: Market Pressure (MP) has a positive effect on Sustainable Development (SD)
H5: Lean Supply Chain Management (LSCM) has a positive effect on Sustainable Development (SD)

METHOD

This study uses a quantitative approach with the *Explanatory Research* which aims to explain the causal relationship between variables *Market Pressure*, *Lean Supply Chain Management* (LSCM), *Food Waste Mitigation*, and *Sustainable Development* at a star hotel in Jakarta. A quantitative approach was chosen to quantitatively measure the relationships between variables and test hypotheses through structured scientific procedures. The main analysis techniques using *Structural Equation Modeling* (SEM) based *Partial Least Square* (PLS) with the help of SmartPLS software version 4.2.9. SEM is a combination of factor analysis and regression analysis that allows researchers to test several dependent variables simultaneously with several independent variables, and to be able to analyze research problems that have a relatively complex series of relationships with statistical testing simultaneously.

The study population was all managers at 496 three- to five-star hotels in Jakarta, mainly in positions of *Executive Chef*, *F&B Manager*, *Purchasing Manager*, *Warehouse/Store Keeper*, and *Sustainability Officer*. Sampling technique using *purposive sampling* With criteria: one hotel per respondent, a three- to five-star hotel, having an in-house restaurant or catering, the respondent worked for at least one year in the relevant department, and understood the hotel's food supply chain process. The number of samples is determined based on the table (Krejcie & Morgan, 1970) which is an expansion of the formula *Small Sample Techniques* by *National Educational Association* (NEA). Based on data from BPS DKI Jakarta Province in 2024 with a population of 496 hotels (rounded to 480 hotels), the number of samples needed is 214 respondents.

This study uses primary data obtained directly from respondents through the distribution of a questionnaire with a five-point Likert scale: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly Agree. The data collection technique uses a questionnaire survey

method that is distributed online and offline. Before full deployment, a pilot test is carried out to ensure that each question item is understood correctly. The data analysis technique uses SEM-PLS through the evaluation of measurement models (*outer model*) and structural models (*inner model*). The *evaluation of the outer model* included a convergent validity test (*outer loading* ≥ 0.70 and AVE ≥ 0.50), a discriminant validity test (*Fornell-Larcker* and HTMT criteria < 0.90), and a reliability test (*Cronbach's Alpha* and *Composite Reliability* ≥ 0.70). The evaluation *of the inner model* was carried out through the values of the path coefficient, *R Square* (R^2), *F Square* (f^2), and *Q Square* (Q^2) using *the bootstrapping procedure*. The hypothesis is accepted if the t-statistic > 1.96 and *the p-value* < 0.05.

RESULTS AND DISCUSSION

Results

This research takes 3-, 4-, and 5-star hotel objects located in the Greater Jakarta area. The selection of star hotels as the focus of the study is based on the intensity of competition that is increasingly fierce along with the development of social media and *online travel agent* (OTA) platforms. These platforms are now starting to integrate sustainability features in the hotel descriptions shown to potential guests. This condition creates increasing market pressure, especially with regulatory support that leads to environmental protection. Various hotels, especially those with international networks, have started to implement sustainability commitments as an added value. Concrete steps taken include saving electrical energy, utilizing solar power, and optimizing the production process as a form of responsibility for environmental sustainability.

Based on the questionnaire distributed, this study succeeded in collecting 214 respondents from star-rated hotels in Greater Jakarta. The distribution of respondents can be seen in the following table:

Table 1. Respondent Characteristics by Hotel Type

Hotel Type	Number of Respondents	Percentage
3 stars	40	18,06%
4 stars	91	42,52%
5 stars	83	38,78%
Total	214	100%

The majority of respondents came from 4-star hotels with a percentage of 42.52%, followed by 5-star hotels at 38.78%, and 3-star hotels at 18.06%. Interesting findings were obtained when identifying the level of application of sustainability principles where most hotels do not have international certifications such as *green key* or *green globe certification*.

Table 2. Hotel Characteristics Based on Sustainability Practices

Hotel Type	Percentage that has implemented sustainability	Percentage that hasn't implemented sustainability
3 stars	11,05%	88,95%
4 stars	30,52%	69,48%
5 stars	38,43%	61,57%

5-star hotels show higher sustainability adoption than 3- and 4-star hotels. This confirms the preliminary data that sustainability awareness is still concentrated in high-star hotels.

Respondent profiles by job title show a representative distribution to assess the hotel's commitment to sustainability.

The position *of sustainability officer* dominated with 22.42%, followed by *purchasing* (17.28%), *executive chef* (13.55%), *food & beverages* (13.08%), *general manager* (12.61%), *warehouse/storekeeper* (12.14%), and *sales* (8.08%). This diversity of positions ensures that the data obtained reflects the comprehensive perspectives of the various departments directly involved in sustainability implementation.

Hypothesis testing using *the bootstrapping* method resulted in acceptance of all seven hypotheses proposed.

Table 3. Hypothesis Testing

Variable	β value	t value	p values	Hypothesis
Market Pressure → Food Waste Mitigation	0,351	4,413	0,000	Accepted
Lean Supply Chain Management → Food Waste Mitigation	0,493	6,431	0,000	Accepted
Food Waste Mitigation → Sustainable Development	0,319	3,266	0,001	Accepted
Market Pressure → Sustainable Development	0,339	3,310	0,001	Accepted
Lean Supply Chain Management → Sustainable Development	0,261	2,597	0,009	Accepted
Market Pressure → Food Waste Mitigation → Sustainable Development	0,112	2,497	0,013	Accepted
Lean Supply Chain Management → Food Waste Mitigation → Sustainable Development	*0,157*	*2,777*	*0,006*	*Accepted*

The Effect of Market Pressure on Food Waste Mitigation

The results of the study show that *Market Pressure* has a significant effect on *Food Waste Mitigation* with a coefficient value of 0.351, the value of *p-values* of 0.000 < 0.05, and t-statistic of 4.413 > 1.960. These findings are in line with Sun (2024) research that found that market pressures from customers and competitors play a significant role in driving green innovation in the hospitality industry. The market pressures experienced by star-rated hotels, especially those stemming from OTA platforms and consumer expectations of sustainability practices, are pushing hotels to implement food waste mitigation efforts more seriously. (Rani et al., 2024) added that market pressures have a significant effect on waste-friendly procurement and green supply chain management practices.

The Effect of Lean Supply Chain Management on Food Waste Mitigation

Lean Supply Chain Management proven to have the strongest influence on *Food Waste Mitigation* with a coefficient of 0.493, *p-values* 0.000, and t-statistic 6.431. These findings confirm the results of the study (S. M. Zahid, 2023) that indicates that the implementation of *Lean Supply Chain* Lower *Food Waste* and improve the efficiency of hotel sustainability. The implementation of efficient supply chain management, including the optimization of food procurement, storage, and distribution processes, significantly contributes to the reduction of food waste. (Lévesque et al., 2022) in his case study found that the application of *Food audit* and *Redesign menu* can lower *Food Waste* up to 30%, which supports the importance of a systematic approach in supply chain management. (Khan et al., 2022) reinforcing these findings by showing that ethical leadership and green HR policies have an effect on employees' eco-friendly behavior, which is key to successful practice implementation *lean* at the hotel.

The Effect of Food Waste Mitigation on Sustainable Development

Food Waste Mitigation have a positive and significant effect on *Sustainable Development* with a coefficient of 0.319, *p-values* 0.001, and t-statistic 3.266. Reducing food waste not only provides economic benefits through operational cost savings but also contributes to the achievement of sustainable development goals. (Dhir et al., 2020) in a systematic review they emphasized that the HoReCa sector accounts for a significant portion in the *Food Waste* global and requires a new managerial approach. (de Visser Amundson & Kleijnen, 2020) adding that more than 70% *Food Waste* in the hotel *avoidable* and can be minimized through proper stock and portion management. (Ma et al., 2024) found that strong CSR increases employee commitment to implementing sustainability practices, which explains why food waste mitigation contributes significantly to the achievement of sustainable development through whole-of-the-world engagement *Squirrel* hotel.

The Influence of Market Pressure on Sustainable Development

The research findings show that *Market Pressure* has a direct effect on *Sustainable Development* with a coefficient of 0.339, *p-values* 0.001, and t-statistic 3.310. These results confirm that external pressures from customers, competitors, and regulations not only drive food waste mitigation efforts, but also contribute directly to the hotel's sustainability achievements. (Elkhwesky et al., 2024) found that the implementation of sustainable practices increased post-pandemic in response to changing consumer expectations and global market demands. (Cardenas et al., 2024) support these findings by showing that circular economy practices have proven effective in reducing *Food Waste* If supported by economic incentives and regulatory policies, which confirms that market pressures have a direct impact on the sustainability of organizations in the hospitality industry.

The Influence of Lean Supply Chain Management on Sustainable Development

Lean Supply Chain Management has a direct effect on *Sustainable Development* with a coefficient of 0.261, *p-values* 0.009, and t-statistic 2.597. These findings show that supply chain efficiency not only reduces food waste but also contributes directly to the achievement of sustainability goals through increased operational efficiency, cost reduction, and optimization of resource utilization. (Basana et al., 2022) reinforcing these findings by showing that the implementation of green supply chain practices through internal integration, *Upstream*, and *downstream* improve the performance of green hotels. (King & Lenox, 2001) adding that companies that implement sustainability practices gain long-term financial benefits, which confirms that LSCM contributes significantly to the economic, environmental, and social dimensions of sustainable development in the hospitality industry.

The Role of Food Waste Mitigation Mediation in the Relationship between Market Pressure and Sustainable Development

The role of mediation *Food Waste Mitigation* confirmed in the relationship between *Market Pressure* and *Sustainable Development* with a coefficient of 0.112, t-statistic of 2.497, and *p-value* 0.013. These results show that market pressures not only have a direct effect on sustainability, but also through food waste mitigation mechanisms as mediator variables. These findings are in line with research (Rani et al., 2024) which shows that the hotel's response to market pressures is manifested through concrete operational practices such as waste-friendly procurement and food waste management. (Bux et al., 2025) reinforcing these findings by showing that circular practices in hospital food services are able to significantly

reduce carbon footprints, indicating that food waste mitigation is an important mechanism that links external pressures to the achievement of organizational sustainability goals.

The Role of Food Waste Mitigation Mediation in the Relationship between Lean Supply Chain Management and Sustainable Development

Food Waste Mitigation It has also been shown to mediate the relationship between *Lean Supply Chain Management* and *Sustainable Development* with a coefficient of 0.157, t-statistic of 2.777, and *p-value* 0.006. These findings confirm that supply chain efficiency contributes to sustainability not only directly, but also through the reduction of food waste as a mediation mechanism. These results are in line with the theory *Natural Resource-Based View* (NRBV) which emphasizes that an organization's internal ability to manage natural resources can be a sustainable competitive advantage. (S. M. Zahid, 2023) support these findings by proving that the implementation of *Lean Supply Chain* NRBV-based succeeded in lowering *Food Waste* and improving the sustainability performance of hotels in Pakistan. This shows that food waste mitigation efforts are *strategic capability* which links internal operational efficiency with the achievement of overall sustainable development goals.

CONCLUSION

This study proves that *Lean Supply Chain Management* (LSCM) and *Market Pressure* (MP) have a significant effect on *Food Waste Mitigation* (FWM) with LSCM as the most dominant factor (β=0.493). FWM has been proven to mediate the relationship between LSCM and MP to *Sustainable Development* (SD), strengthening the Natural *Resource-Based View theory* that the internal ability to manage natural resources becomes a sustainable competitive advantage. The theoretical implications of this study enrich the *sustainability management literature* by integrating operational and external variables in one comprehensive model. The practical implications suggest that hotel management needs to strengthen supply chain efficiency and respond to market pressures through food waste mitigation programs to increase competitiveness and support the achievement of SDG 12.3, given that only 38.43% of Jakarta's five-star hotels have implemented formal sustainability commitments.

This study recommends that the government develop incentive policies for hotels that implement food waste mitigation practices and require sustainability certification as a hotel operational requirement. Hotel management needs to integrate *waste tracking* and *AI forecasting* technology, strengthen employee training, and build collaboration with *food banks* for the redistribution of food suitable for consumption. Future research can extend geographical coverage to other cities in Indonesia for generalization of results, explore the role of digital technology moderation and hotel size, use a *mixed method approach* for in-depth understanding, test additional variables such as *green leadership* and *organizational culture*, as well as conducting longitudinal studies to analyze the long-term impact of the implementation of LSCM and FWM on hotel sustainability performance in the context of changing global market dynamics.

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