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REDUCING FOOD WASTE THROUGH CIRCULAR ECONOMY: EVIDENCE FROM HOSPITALITY PRACTICES

Abstract: *This paper explores the application of circular economy (CE) principles within the hospitality industry through a case study of Ibis Skopje City Center, part of the Accor hotels group. The focus is on strategies to reduce food waste - one of the most significant sustainability challenges in the sector. Using qualitative research methods, including semi-structured interviews and internal data analysis, the study examines how the hotel integrates CE strategies such as waste prevention, resource tracking, food repurposing, and guest behavior modification. Central to the implementation is Gaia, a digital monitoring tool that enables precise food waste tracking across service categories. Between 2018 and 2023, the hotel achieved a 63% reduction in food waste, largely due to operational redesigns (e.g., portion control, kitchen reuse), employee training, and guest engagement initiatives. The findings underscore the viability of CE practices in hospitality and highlight the importance of digital tools, stakeholder involvement, and supportive policy frameworks. This case contributes to the growing discourse on circular business models in service-based industries and offers a replicable blueprint for sustainable transformation in hotel management.*

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Introduction

The hospitality industry stands as one of the largest contributors to global food waste, while simultaneously being a major consumer of non-renewable resources such as water, energy, and raw materials (Bohdanowicz, 2006; FAO, 2017). Hotels, in particular, operate within consumption-intensive environments, where high service standards and customer expectations frequently result in surplus food production, inefficient inventory practices, and elevated levels of waste generation (Papargyropoulou et al., 2014). Traditionally, such operations have been shaped by linear economic models characterized by the “take-make-dispose” logic—where resources are extracted, used briefly, and discarded without systematic recovery or reuse. These models are becoming increasingly unsustainable amid growing environmental degradation, economic volatility, and heightened social awareness of global inequality (UNEP, 2021).

In response to these challenges, the CE has emerged as a paradigm aimed at redefining economic systems in a way that decouples growth from resource consumption. CE strategies emphasize the retention of value within economic and biological systems by minimizing waste, extending product life cycles, and restoring ecological systems (Geissdoerfer et al., 2017; Bocken et al., 2016). Within the hospitality industry, and food services in particular, CE implementation involves practices such as portion control, food redistribution, composting, design optimization, and the use of digital tools to track and reduce food loss (Principato et al., 2021).

This paper investigates the integration of CE principles into hotel operations through a qualitative case study of Ibis Skopje City Center, a hotel operating under the international Accorhotels group. The findings of this case study offer valuable insights into how CE principles can be operationalized in real-world hospitality settings, demonstrating their practical viability, strategic benefits, and potential for replication across similar service-based industries.

1. IMPLEMENTING CIRCULAR ECONOMY PRINCIPLES IN HOSPITALITY

The concept of the circular CE has gained considerable traction as an alternative to the traditional linear economic model of “take–make–dispose”, which is largely unsustainable in the context of growing environmental degradation, resource scarcity, and increasing waste generation. CE seeks to close material loops by retaining the value of resources within the system through reuse, recycling, and regeneration (Geissdoerfer et al., 2017). At its core, CE is predicated on three principles: designing out waste and pollution, keeping products and materials in use for as long as possible, and regenerating natural systems (Ellen MacArthur Foundation, 2013). While CE has seen extensive application in manufacturing and urban infrastructure, its adaptation to the service economy - particularly the hospitality sector - remains in the early stages of development and requires more sector-specific frameworks and empirical case studies.

Hotels consume vast amounts of water, energy, and food in delivering complex, round-the-clock services, and their operations generate significant environmental impacts throughout the supply chain (Bohdanowicz, 2006). As a result, the hospitality industry has a dual role: it contributes to environmental degradation, but also holds potential to drive the shift toward sustainable, circular systems.

Operationally, hotels generate food waste at various stages of their service lifecycle - from procurement and storage to food preparation, guest consumption, and post-consumption disposal. A circular approach to hospitality requires interventions across this entire value chain. This includes preventative strategies such as demand forecasting, menu redesign to minimize perishable ingredients, staff training to reduce preparation waste, and real-time monitoring systems to track inefficiencies. Beyond prevention, circular strategies may also involve redistribution of surplus food, repurposing edible trimmings, and composting unavoidable organic waste (Papargyropoulou et al., 2014).

The significance of food waste within the CE discourse is particularly acute due to its scale and embedded resource intensity. Globally, approximately one-third of all food produced for human consumption is lost or wasted, translating to about 1.3 billion tonnes annually (FAO, 2017). In the hospitality sector, food waste constitutes around 12% of the total food wasted worldwide, placing it as the third largest contributor after households and food manufacturing (UNEP, 2021). Given that hotels often operate buffets, cater for events,

and maintain large-scale kitchens, the overproduction and disposal of food is frequently normalized as a cost of doing business (Pirani & Arafat, 2016).

From a CE perspective, food waste represents a critical breakdown in the value retention of biological resources. Unlike technical materials, food waste cannot be reused in its original form but must instead be cycled through regenerative processes such as composting or anaerobic digestion to close the biological loop (Bocken et al., 2016). The focus often shifts to inner-loop strategies such as portion control, consumer awareness, and kitchen reuse - all of which are more readily actionable within existing hotel structures (Alexander et al., 2013).

Moreover, behavioural factors further complicate the challenge of food waste in hospitality. Guests may over-serve themselves at buffets, under-consume due to portion size dissatisfaction, or leave behind culturally unfamiliar food items. Studies show that tourists waste more food in hotels than they do at home, driven by perceived abundance and the “all-inclusive” mentality (Wang et al., 2021). In this regard, the CE framework extends beyond logistics and infrastructure - it requires a reconfiguration of guest engagement strategies to influence consumption behavior and promote shared responsibility for resource use (Filimonau & Delysia, 2019).

In sum, the literature emphasizes that implementing CE in hospitality is not solely a technical or operational issue but a strategic and cultural one. Hotels must reimagine their food systems holistically, integrating data-driven monitoring tools, staff empowerment programs, sustainable procurement, and consumer education. Although structural and regulatory barriers persist - such as the absence of food donation legislation in many countries or limited access to composting facilities - the potential for the hospitality industry to contribute meaningfully to circularity is substantial. Real-world case studies, such as the one presented in this paper, are essential to demonstrate that CE principles are not only theoretically applicable but also practically viable in complex service environments.

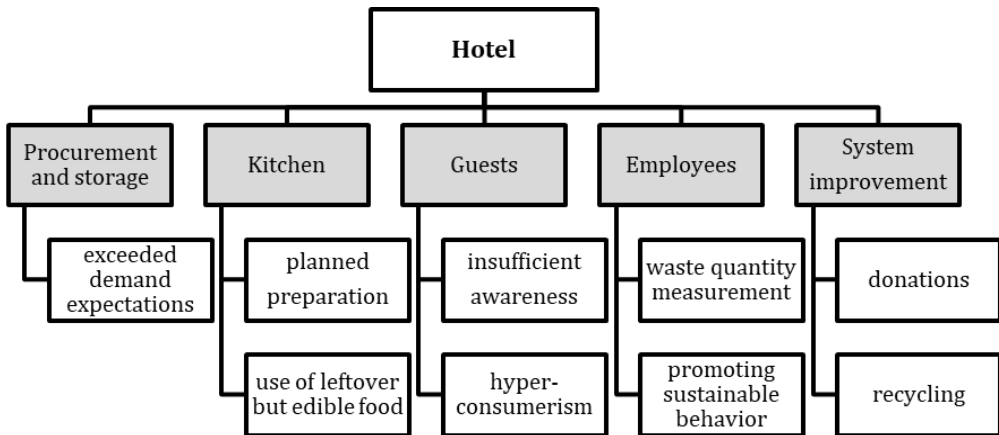
2. INTEGRATING CIRCULAR ECONOMY PRINCIPLES IN HOSPITALITY OPERATIONS: A QUALITATIVE STUDY OF FOOD WASTE MANAGEMENT PRACTICES

Given the nature of the research problem, this paper employs a qualitative methodological approach to examine how CE principles are integrated into hotel operations, with a particular focus on food waste management. As

highlighted by Aditya and Kurniawati (2023), qualitative methods are effective for uncovering nuanced perspectives and identifying patterns that are not easily captured through quantitative approaches.

The study was conducted through semi-structured interviews with key personnel from the Ibis Skopje City Centre, a hotel operating under the international Accor hotels brand. This method provided the flexibility to guide conversations around specific themes while allowing participants to elaborate on relevant experiences and provide contextual examples. The interviewees included the hotel’s general manager, deputy general manager, and head chef - individuals directly involved in both strategic planning and day-to-day food operations. Their insights were essential to understanding how sustainability directives from the global Accor group are translated into localized practices and how operational decisions impact food waste generation and reduction.

Figure 1: Framework for Identifying Key Food Waste Issues



Accor hotels, founded in 1967 and headquartered in France, is one of the world’s leading hospitality groups, with operations in 110 countries and a portfolio of more than 30 brands catering to various market segments, ranging from luxury to economy. The company’s global sustainability initiative, Planet 21, serves as a guiding framework for all its properties in implementing environmental and social responsibility goals.

The interview protocol was carefully developed to align with the research aims and was informed by a review of existing literature on food waste and CE strategies in the hospitality sector. The questions addressed several key areas, including comparative implementation of sustainability measures,

food loss tracking systems, waste reduction trends, guest engagement strategies, and long-term plans for donation, recycling, or composting. Additional questions focused on identifying the most commonly discarded food items, the underlying causes of waste during kitchen operations, reuse practices, and guest behavior related to food consumption. Participants were also asked to provide estimates of average food waste per guest and to reflect on any age-related patterns observed among customers in relation to food leftovers.

The structure of the interview itself is the result of a structured review of the key elements within the hotel food supply chain and the potential deficiencies that lead to the generation of undesirable amounts of food waste. (see Figure 1).

Responses were analysed thematically, and content was cross-referenced with internal documentation and corporate sustainability resources provided by Accor. This triangulation of data sources increased the validity of findings and allowed for a comprehensive understanding of the hotel's food waste management strategy through the lens of CE principles. The overall design of the inquiry was guided by a framework that mapped key nodes of food loss within the hotel value chain, providing a conceptual tool for interpreting operational gaps and identifying intervention points.

3. EMPIRICAL RESULTS ON CIRCULAR FOOD PRACTICES IN HOSPITALITY

3.1 Organizational Profile and Respondent Insights

In the hospitality sector, employees play a pivotal role in the successful implementation of sustainability initiatives, particularly in food waste management. Prior research emphasizes the importance of staff education, role-specific expertise, and individual attitudes toward sustainability in determining the effectiveness of environmental practices (Park et al., 2014). Accordingly, this study conducted in-depth interviews with key personnel from Ibis Skopje City Center.

Senior management representatives and the head chef were identified as most suitable sources of information's due to their involvement in both strategic planning and day-to-day operations. Since kitchen activities represent a primary source of food waste, insights from culinary staff were especially valuable (Sezerel et al., 2023).

The Ibis Skopje City Center is a centrally located, four-star hotel with 110 guest rooms. The hotel operates a self-service breakfast buffet and offers

light snacks and fruits at its café. This buffet format introduces both opportunities and risks regarding food waste, depending on how consumption is managed and monitored.

3.2 Practices, Outcomes, and Behavior

The interviews reveal that food waste is managed through a structured system rooted in Accor hotels' broader corporate sustainability program. Accor has adopted a group-wide digital reporting tool, Gaïa, which enables hotels to track waste generation daily and report results monthly. The system records waste from food preparation, buffet service, à la carte operations, and employee canteens, alongside the number of meals served, allowing precise calculation of food waste per guest.

At Ibis Skopje City Center, this system is used to guide sustainability practices and ensure alignment with group objectives. Key measures implemented at the hotel include replacing large buffet plates with smaller ones (21 cm), eliminating individual packaging for condiments, pre-portioning fruit servings, and introducing visual prompts that inform guests about the impact of food waste. Staff are trained regularly, and sustainability communication is integrated into guest interactions.

The data provided by the hotel indicate a significant reduction in food waste over a five-year period. In 2023, food waste totalled 1,868 kg or 60 grams per guest, down from 3,456 kg or 98 grams per guest in 2018 - a reduction of 63%. Approximately 40% of the waste originates from food preparation activities, while guest plate waste primarily includes cereals, meats, and fruits. Visually imperfect fruits and vegetables are frequently repurposed into composites or sauces.

Guest behavior emerged as a major contributing factor to waste. Youth groups and guests from less sustainability-aware cultures were found to waste more food, often due to over-serving at buffets. By contrast, guests from more developed countries showed greater awareness and more responsible consumption behavior.

4. DISCUSSION: OPERATIONALIZING CIRCULARITY IN HOTEL FOOD SYSTEMS

The findings from Ibis Skopje City Center illustrate how a structured and standardized approach to food waste management can yield substantial environmental and operational benefits within a hotel setting. The integration

of digital tools such as Gaïa allows for accurate measurement, which is widely recognized as a prerequisite for meaningful reduction. Accorhotels' strategy of mandating waste tracking across various stages of service exemplifies a practical application of CE principles within the hospitality industry.

The reduction of waste by 63% over five years aligns with broader sustainability targets set by the group and reflects the effectiveness of combining data-driven monitoring with behavioral interventions. As noted by Kallbekken and Sælen (2013), changes such as reducing plate size and adding motivational messaging can significantly influence consumer behavior, especially in buffet environments. Moreover, repurposing food that would otherwise be discarded aligns with CE priorities to retain value and minimize loss across the supply chain (FAO, 2017).

The case also underscores the critical role of staff in driving circular practices. Frontline employees - particularly kitchen staff - must be equipped with training and resources to manage waste proactively (Filimonau et al., 2019). Likewise, communication with guests is essential to creating a culture of responsible consumption. This dual focus on internal operations and consumer-facing education exemplifies the systemic thinking required to implement circularity effectively (Corrado & Sala, 2018).

However, several barriers remain. Interviews suggest that external constraints - such as the absence of food donation laws and insufficient infrastructure for composting or redistribution - limit the full realization of circular strategies. These findings are consistent with previous research indicating that systemic and regulatory support is often lacking in food service contexts (Jamnani & Jamnani, 2024).

Finally, the study reinforces that food waste behavior is influenced by demographic and cultural variables. While some studies downplay the role of gender (Hamerman et al., 2018), the evidence here supports the notion that younger guests and less sustainability-aware groups are more prone to waste. This suggests that guest profiling and tailored awareness campaigns could further enhance waste reduction outcomes.

Overall, the experience of Ibis Skopje illustrates a replicable model of circular food management within a mid-sized hotel that is part of a global network. Its success demonstrates how the hospitality industry can move beyond symbolic sustainability gestures and achieve measurable progress through coherent, data-informed strategies and cross-functional engagement.

Conclusion:

This paper has explored how the integration of CE principles in hotel operations - specifically in food waste management can contribute to sustainability outcomes in the hospitality sector. Drawing on a qualitative case study of Ibis Skopje City Center, part of the global Accor hotels network, the research highlights the strategic value of institutionalized sustainability frameworks and the role of measurement, training, and behavioural interventions in achieving tangible environmental impact.

Accor, one of the world's largest and most diverse hotel groups, demonstrates strong corporate sustainability. Operating in 110+ countries with over 5,300 properties, the group aims to cut food waste by 50% by 2030 through Gaïa, its digital waste tracking platform. As of September 2023, 71% of hotels had adopted Gaïa, with full rollout planned by 2025.

The case of Ibis Skopje City Center demonstrates the effectiveness of such a strategy. The hotel achieved a 63% reduction in food waste over a five-year period, decreasing from 3,456 kg in 2018 to 1,868 kg in 2023- equivalent to a reduction from 98 grams to 60 grams of waste per guest. These results were achieved through a combination of operational adjustments (e.g., smaller serving plates, elimination of single-use packaging), staff training, and targeted guest communication. Such measures align closely with CE principles, particularly in terms of resource optimization, waste minimization, and value retention.

The paper also identifies critical structural barriers to deeper circular transformation. These include the absence of enabling legislation for food donation, limited access to infrastructure for composting and recycling, and the lack of tax incentives to encourage sustainable investment. In addition, societal attitudes - shaped by cultural norms and consumer behaviour-remain significant obstacles to reducing food waste at the source. Findings show that younger guests and those from less sustainability-aware contexts tend to waste more, while guests from more developed countries show greater awareness and restraint.

The broader implication of this case study is that robust waste management systems, when embedded within a coherent sustainability strategy, can yield significant environmental and operational benefits for hotels. However, such efforts must be supported by conducive policy environments, staff capacity building, and continuous guest engagement. The integration of measurement

technologies, such as Gaia, plays a pivotal role in not only quantifying performance but also in fostering accountability across all levels of hotel operations.

Ultimately, the experience of Ibis Skopje City Center reinforces the importance of aligning hotel business models with CE objectives. As global environmental challenges intensify and regulatory scrutiny increases, hospitality organizations must move beyond symbolic commitments and adopt systemic, data-driven, and participatory approaches to sustainability. This case offers a replicable model for mid-sized hotels operating under international brands and contributes valuable empirical evidence to the evolving discourse on circularity in the service sector.

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