



# **Towards Sustainable Food Waste Management in the Hospitality Sector of Ajman, UAE: A Step Towards Achieving SDGs**

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## **ABSTRACT**

The hospitality industry, particularly hotels, plays a significant role in the prevalent issue of food waste. The World Wildlife Fund's (WWF) research highlights that UK hotels discard around 289,700 tonnes of food annually, most of which ends up in landfills. This problem encompasses two phases of waste—pre-consumption and post-consumption. Pre-consumer food waste occurs before reaching the customer, including excess food during purchasing, storage, or preparation due to overproduction. Post-consumer waste comprises leftover food. This issue not only presents a growing concern but also a promising business prospect.

The United Nations estimates that a third of the world's food supply is wasted, with 14% lost during manufacturing and 17% potentially recoverable between sale and consumption. Food loss and waste contribute to approximately 8% of global greenhouse gas emissions. This study aims to evaluate the existing food waste management practices in selected hotels within Ajman, UAE, and establish a pathway to mitigate the generated quantities. To achieve this goal, four hotels were examined, encompassing both five-star and four-star establishments. The findings indicate that the average food waste generation per person in hotels is under 2 kg/day. However, the World Wildlife Fund recommends a target of 0.5 kg/person/day—a benchmark for efficient food waste management.

*Keywords:* organic waste, Hospitality industry, food waste, SDGs.

## **1. INTRODUCTION**

Food, an essential element for human survival, provides not only sustenance but also a source of nutrients, energy, comfort, and enjoyment. Beyond its nutritional significance, food carries a tapestry of positive emotions and cultural connotations, shaping personal and societal attitudes towards consumption. Individual and communal experiences influence one's relationship with food and the choices made around eating habits. These choices, often rooted in cultural and familial norms established early in life, profoundly impact behaviors related to food (Board, 2020).

However, within the entire food production and consumption cycle, an alarming amount of food is lost to waste. The journey from farms to distributors, retailers, and ultimately to consumers can encounter numerous points of inefficiency and mismanagement. Causes of food waste range from issues like mold, vermin, and improper temperature control to spoilage during cooking or even deliberate discarding. Depending on the circumstances, this waste can be classified into different categories (Food Waste, 2022):

**Food Loss:** Occurs between the harvesting of produce and its arrival at the consumer due to mishandling and improper practices.

**"Waste" Food:** Edible food intentionally discarded before reaching consumers due to various reasons.

The Middle East and North Africa (MENA) region faces significant challenges in managing food waste. Alarming statistics from Sankar (2022) estimate that West Asian countries waste approximately 110 kg of food per person annually. The MENA region's food waste problem is further highlighted by data from the Food and Agriculture Organization (FAO), which reveals an annual per capita food waste of around 250 kg—almost double the global average. Notably, countries within the Gulf Cooperation Council, such as Saudi Arabia and the United Arab Emirates, contribute significantly to global food waste, with annual per capita figures of 427 kg and 197 kg respectively (Al Eithan, 2021).

Amidst these challenges, the United Arab Emirates (UAE) hospitality sector plays a pivotal role. Driven by an increase in visitor arrivals, the industry has experienced substantial growth, contributing to the UAE's economic diversification beyond the oil and gas sector. Luxury hotels, resorts, and shopping destinations, particularly in Dubai and Abu Dhabi, have made the UAE a prominent global tourist attraction (Ahmad, 2022).

This article focuses on food waste management in the context of the hospitality sector, with a specific spotlight on selected hotels in Ajman. In the hospitality setting, food waste can be categorized into pre-consumer and post-consumer waste. Pre-consumer waste involves food discarded before reaching consumers, encompassing stages like purchasing, storage, and preparation. On the other hand, post-consumer waste refers to uneaten food after a meal concludes (Zrnić et al., 2022).

Despite the economic benefits and role in supporting tourism and cultural exchange, the hospitality industry is also a significant contributor to global food waste. Hotels, in particular, generate substantial amounts of food waste annually (Bhajan et al., 2022). The implications of this waste are far-reaching, negatively impacting natural resources, the environment, and efforts to address nutritional disparities in low-income communities.

This study aims to assess the current state of food waste management within selected hotels in Ajman, charting a path towards waste reduction. Through a series of steps, the research aims to address the question: What is the prevailing situation regarding food waste in these selected hotels, and what are the quantifiable levels of food waste generated?

The UAE has demonstrated a steadfast commitment to achieving the United Nations Sustainable Development Goals (SDGs), striving to harmonize economic growth with social development and environmental protection. As a pivotal sector within the UAE, the hospitality industry plays a crucial role in these efforts. One pressing concern

within this industry is food waste, which holds the potential to undermine sustainable development objectives. This study, conducted in the Emirate of Ajman, UAE, delves into the realm of sustainable food waste management in the hospitality sector. By investigating the practices of selected hotels, we not only contribute to the broader conversation on food waste reduction but also align our endeavors with the UAE's pursuit of SDGs. As we navigate the intricacies of food waste management, our actions resonate with the UAE's aspiration to create a better, more sustainable future for its citizens and the global community.

*Present Situation:*

In alignment with a recent local directive from the Ajman government, a noteworthy development has taken place in waste management practices within the chosen hotels. The prevailing approach involves the segregation of waste at its origin. This segregation categorizes waste into two distinct groups: wet waste and dry waste. Notably, each category is systematically managed to ensure effective waste disposal.

Within the dry waste classification, materials such as glass, metal cans, plastics, paper, and cardboard form the constituents of recyclable components. In contrast, the wet waste category predominantly encompasses food residuals and other organic matter. This differentiation aids in streamlining waste management processes, see figure 1.



Figure 1: waste classification based on the local order.

*Literature review:*

The Sustainable Development Goals (SDGs) have cast a spotlight on the imperative of curbing food waste. Among the objectives under Goal 12, which centers on "ensuring sustainable consumption and production patterns," a pivotal aim is to diminish food losses across production and supply chains. An even more ambitious objective within this framework is the aspiration to lower global per capita food waste at the retail and consumer level by the year 2030 (Gheoldus, n.d.). Highlighting the urgency of this issue, the hospitality and food service industry accounted for a significant portion of food waste. In 2018, this sector incurred losses of around £3.2 billion, contributing to 12% of the UK's total post-farm gate food waste, totaling 1.1 million tons. Strikingly, nearly three-quarters of this waste comprised discarded food, while the remaining fraction consisted of inedible portions (Parry et al., 2020).

Food waste presents both a growing concern and a potential avenue for profitable innovation. In the United States alone, the Environmental Protection Agency (EPA) projected that more than 63 million tons of food were wasted in 2018 across commercial, institutional, and home settings. Strategies to manage this waste included methods such as animal feed, bio-based materials processing, composting, and more. Alarmingly, food waste ranked

highest among all types of discarded materials sent to landfills or incineration plants, marking 24% for landfills and 22% for combustion with energy recovery (Sustainable Management of Food Basics (US EPA, 2023).

Addressing food waste management necessitates a multifaceted approach, involving governmental policies, industry initiatives, and individual contributions. No universal "best practice" applies, as the most effective methods depend on various factors like economic and cultural contexts. However, several proven practices have emerged to combat food waste (Szulecka et al., 2019):

**Prevention:** The primary approach to reducing food waste involves preventing it at its source through improved inventory management, enhanced food labeling, and consumer education.

**Redistribution:** Surplus food that cannot be prevented can still serve a purpose by being redirected to those in need, through mechanisms like food banks and charitable organizations.

**Composting:** Food waste can be converted into valuable compost, enriching soil quality and simultaneously reducing greenhouse gas emissions.

**Anaerobic Digestion:** Large-scale food waste management can be achieved through anaerobic digestion, transforming food waste into biogas for energy generation (Aljaradin, M., & Persson, K. M. 2016).

**Government Policies:** Governments play a pivotal role in shaping food waste management through policies such as reduction targets, waste-related taxation, and disposal regulations.

#### *Best Practices in the world:*

Around the globe, an array of practices has been embraced to effectively combat the pervasive issue of food waste. These strategies, often intricate and adapted to the unique characteristics of individual communities, underscore the significance of considering local cultural, economic, and social nuances. As diverse as the nations they originate from, these practices exemplify the innovative steps taken towards curbing food waste on a broader scale. Let's delve into a few remarkable examples:

#### **South Korea: A Pioneer in Pay-as-You-Throw**

South Korea stands as a beacon of excellence in food waste management, propelled by its pioneering "pay-as-you-throw" system introduced in 2013. This ingenious approach charges households in accordance with their food waste generation. The result? A substantial 30% reduction in food waste, marking a resounding triumph for sustainability (Kim et al., 2011).

#### **France: A Paradigm of Legislative Innovation**

France has unfurled an impressive array of policies to tackle food waste head-on. Their efforts encompass a ban on supermarkets discarding unsold food and an enticing tax incentive for businesses channeling surplus edibles to charitable causes. The resounding impact of these measures is evident in a 30% reduction in food waste since 2016, revealing the potency of legislative ingenuity (Mourad, 2015).

#### **Japan: Embracing the "Mottainai" Ethos**

In Japan, the essence of "mottainai," meaning "waste nothing," is deeply ingrained. This cultural ethos has spurred a multifaceted approach to diminish food waste. Initiatives include a nationwide campaign promoting the purchase of imperfect produce and a progressive system that transforms food waste into invaluable fertilizer. Japan's holistic strategy resonates with the nation's reverence for resources (Liu et al., 2016).

### **Denmark: Orchestrating Holistic Change**

Denmark's endeavors to combat food waste encompass an extensive spectrum of policies. From taxing plastic packaging to a government-backed program aiding restaurants and hotels in waste reduction, their multifarious initiatives have culminated in a noteworthy 25% decrease in food waste since 2010. Denmark's comprehensive approach exemplifies the power of collective action (Martinez-Sanchez et al., 2016).

These examples underscore a crucial lesson: there's no one-size-fits-all solution to the global food waste predicament. Tailoring strategies to local dynamics, these nations have demonstrated the paramount significance of synergy between governments, industries, and individuals. Moreover, they echo the profound impact of innovative policies that champion sustainability and resilience in the face of this multifaceted challenge. As the world rallies toward achieving the Sustainable Development Goals, these remarkable instances of success provide a blueprint for fostering change and enacting meaningful progress in the fight against food waste.

## **2. MATERIALS AND METHODS**

In pursuit of the study's objectives, an on-site investigation was conducted across four diverse hotels within Ajman. This research sought to delve into their food waste management strategies, involving a comprehensive assessment of their practices and procedures.

The study selected a representative sample of hotels to ensure a comprehensive understanding of food waste management practices. To capture a range of perspectives, the chosen hotels were classified based on their star ratings. The sample included three five-star hotels and one four-star hotel.

Primary data were collected through structured questionnaires tailored to each hotel's unique operations. The questionnaires were designed to encompass vital aspects of food waste management, including daily food production, measures employed for waste reduction, and the facilities' waste handling capacity. Hotels Under Study: **Ajman Hotel:** A five-star hotel with 180 rooms and four restaurants. **Ajman Saray Hotel:** A five-star hotel with 205 guest rooms and an array of seven dining options.. **Fairmont Ajman:** A five-star hotel with 252 rooms and a variety of dining facilities. **Al-Ain Hotel:** A four-star with a single kitchen servicing breakfast buffets and à la carte dining.



Figure 2: Ajman Hotel



Figure 3: Ajman Saray Hotel



Figure 4: Fairmont Ajman Hotel



Figure 5: Al-Ain Hotel

#### Data Collection Process:

Upon gaining access to the premises, detailed questionnaires were administered to relevant personnel in each hotel. These questionnaires were meticulously designed to extract information regarding daily food production volumes, strategies employed to minimize food waste, and the establishments' capacity to manage waste.

The focus of this investigation was on scrutinizing the food waste management systems in the selected hotels. These establishments adhered to waste segregation practices prescribed by municipal regulations, primarily involving the division of waste into two categories: wet and dry waste. The source of food waste primarily stemmed from kitchen operations. An integral part of this process involved scheduled collections by bee'ah, a key waste management entity, occurring every 12 hours to transport and weigh waste at the source.

This research methodology paved the way for a thorough exploration of food waste management practices within diverse hotels in Ajman. By engaging with a range of establishments, this study aimed to gather insights that contribute to a deeper understanding of effective strategies, enabling the development of sustainable food waste management solutions.

### **3. RESULTS AND DISCUSSION**

The dataset employed in this study constituted primary data obtained through meticulous field measurements of waste weights directly from collection bins. To ensure accuracy and impartiality, this data collection process was executed by an external entity. The entrusted organization for waste collection is Bee'ah Group, a prominent Sharjah-based establishment founded in 2007. Renowned for its commitment to sustainability, Bee'ah Group operates through a dynamic public-private partnership model. To ensure comprehensive insights, data collection was specifically confined to the month of February, aligning with the relevant season. The primary focus of our investigation was quantifying organic waste, encompassing both agricultural and food-based waste streams.

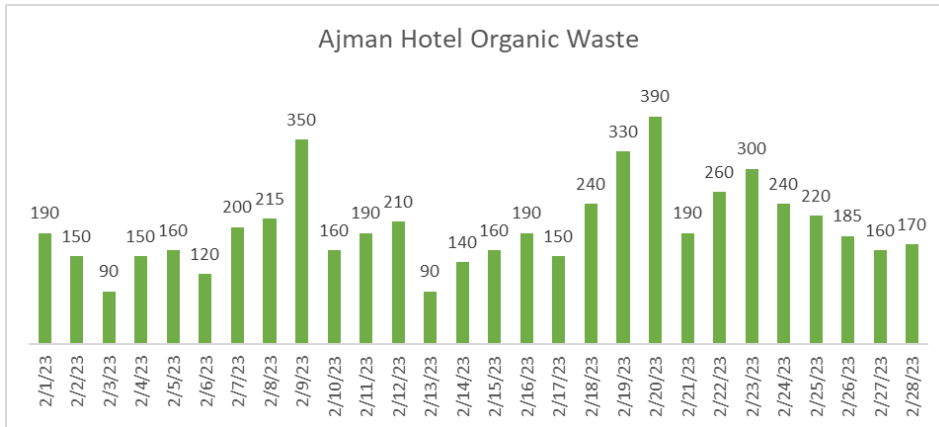


Figure 6: Organic waste in Ajman Hotel

Figure 6, Among the notable observations is the peak organic waste quantity recorded on February 20th, which reached a substantial 390 kilograms for that specific day. Conversely, the base of waste generation during the study occurred at 90 kilograms, emphasizing a significant range between the highest and lowest values. This substantial variation between the peak and trough points of data underscores the intricate dynamics at play in organic waste generation at Ajman Hotel. The discernible fluctuations could potentially be attributed to various factors such as varying occupancy rates, culinary operations, events, and other elements influencing food consumption patterns.

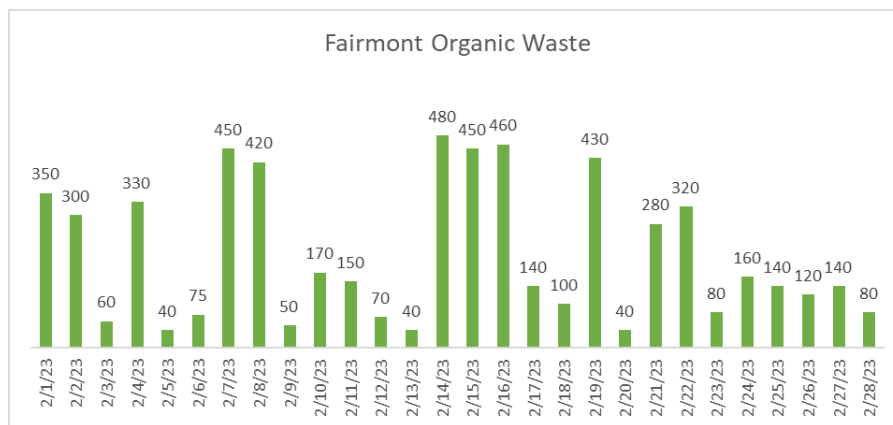


Figure 7: Organic waste in Fairmont Hotel

In Figure 7, A notable observation from the presented graph is the peak organic waste measurement, notably reaching 480 kilograms. This zenith corresponds to specific periods, likely coinciding with higher occupancy nights or specific offerings provided by the hotel. Conversely, the trough of waste generation during the study period registered at 40 kilograms, indicative of a distinctive ebb in waste production. The substantial range between the highest and lowest data points accentuates the hotel's versatile waste generation patterns. These fluctuations might be attributed to varying factors such as guest numbers, culinary activities, special events, and offerings that contribute to fluctuations in organic waste production.

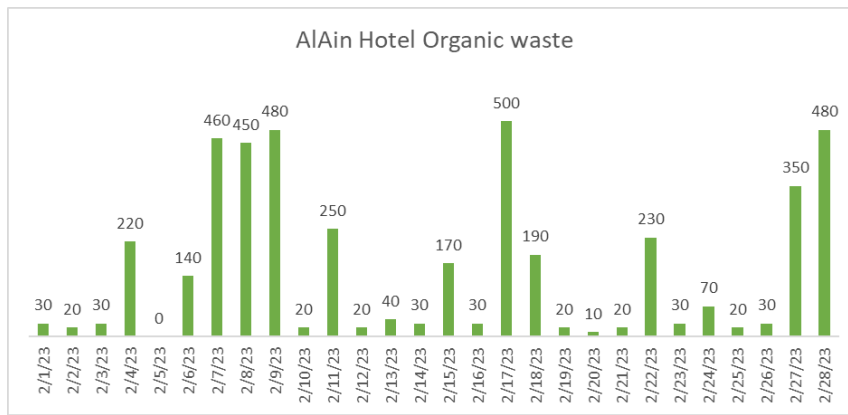


Figure 8: Organic waste in AlAin hotel

In Figure 8, showcasing a notable range of organic waste accumulation. Specifically, the pinnacle of waste generation is represented by a substantial 500 kilograms. This noteworthy value aligns with periods that might correlate with heightened activity or events within the hotel. Intriguingly, a unique data point emerges – a "Zero" waste day, a compelling testament to the variability in waste production strategies employed by the hotel. The span between the highest data point and the recorded "Zero" waste day emphasizes the inherent fluidity within AlAin Hotel's waste generation landscape. The diverse factors influencing organic waste creation, such as occupancy, culinary events, and guest activities, contribute to this intriguing spectrum.

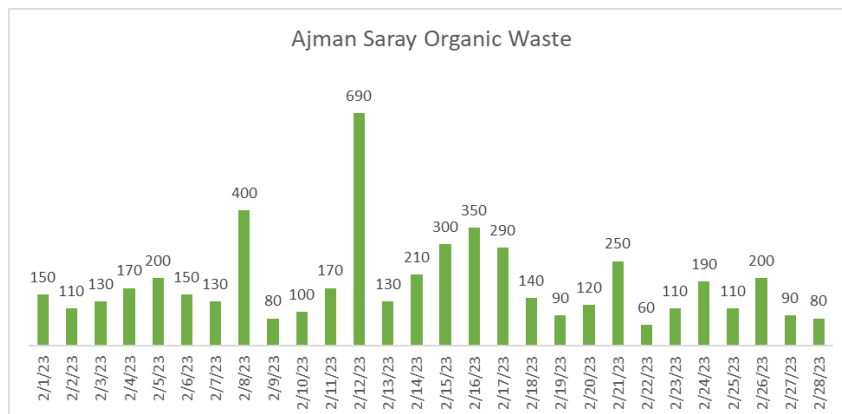


Figure 9: Organic waste in Ajman Saray hotel

In Figure 9, A prominent observation stemming from the data graph is the discernible rise in organic waste during weekends. This elevation can be attributed to heightened occupancy levels and the hosting of events, which collectively contribute to increased waste generation during these periods. This trend underscores the interplay between occupancy rates, culinary services, and special events in influencing the hotel's waste footprint.

The graph prominently illustrates the pinnacle of waste accumulation, marked by a substantial 690 kilograms. This zenith is often associated with occasions of high occupancy and event-centric activities. In contrast, the nadir of waste production recorded during the study stands at 60 kilograms, offering a clear depiction of the data's fluctuating nature.



*Estimation of Waste Generation per Capita:*

To enhance the precision of our findings, we embarked on calculating the waste generation per guest. This calculation was achieved by computing the average number of guests present on various days of the week at each respective hotel. This approach allowed us to better understand the quantum of waste generated in relation to the number of occupants, leading to a more comprehensive and nuanced assessment of our study's outcomes.



Figure 10: Organic waste generation in all hotel / capita

In Figure 10, the guest count variation at Ajman Hotel, spanning from 274 to 202 across the week. Over the course of our research, guests exhibited an average daily waste production of 0.88 kilograms per person. Figure 6 further illustrates the guest distribution at Fairmont Hotel, fluctuating between 374 and 303 weekly guests. Throughout our investigation, an average waste generation of 0.64 kilograms per person per day was observed. Moving to Figure 7, we encounter the guest dynamics at Alain Hotel, ranging from 200 to 25 guests during the week. Within the scope of our study, an average daily waste output of 1.14 kilograms per person was noted. Figure 8 portrays the generation unit at Ajman Saray Hotel, presenting a weekly guest count spanning from 374 to 303. Our research highlighted an average production of 0.56 kilograms per person per day among guests at this hotel.

Collectively, the selected hotels exhibited an average waste generation of 0.8 kilograms per person per day, surpassing the global generation standard. It's worth noting that various factors—hotel size, geographical location, and the variety of culinary offerings—may influence the optimal waste generation unit in hotels. However, the ideal benchmark often cited stands at 0.5 kilograms of waste per guest per day, as advocated by the WWF's "Hotel Kitchen" initiative. This guideline aligns with the notion that this quantity of waste can be efficiently managed, recycled, and integrated into the hotel's waste management framework without contributing to environmental detriment. Moreover, some establishments have set even more stringent targets, aiming for as low as 0.3 kilograms of waste per guest per day, further exemplifying the concerted efforts within the industry to curtail food waste (World Wildlife Fund, 2017). The intricate interplay of these factors underscores the endeavor towards sustainable waste management practices within the hotel sector.

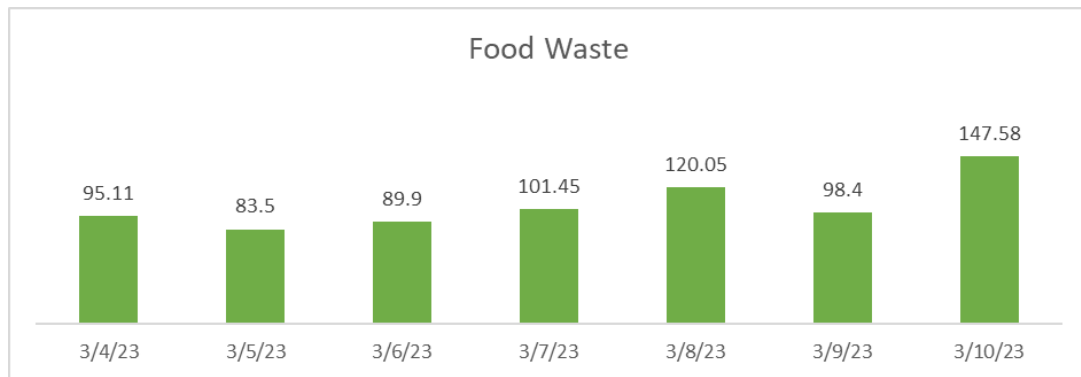


Figure 11: Food Waste in Ajman Saray Hotel

In Figure 11, we examine the food waste data collected from Ajman Saray Hotel over a week. This specifically looks at waste that comes from food, not other kinds of waste. The information indicates that less food waste is being generated compared to the overall organic waste. However, it's still higher than what the WWF recommends as a good goal. This suggests that although there's improvement in reducing food waste, there's more effort needed to reach the sustainability targets.

#### 4. CONCLUSION

Food waste is a critical global issue with far-reaching impacts on the economy, society, and environment. Despite producing sufficient food to nourish the global population, nearly one-third of it is discarded, squandering valuable resources like water, land, and money, while contributing to greenhouse gas emissions. Addressing this challenge necessitates a collective commitment from individuals, businesses, and governments to confront food waste at every stage of its lifecycle. This entails enhancing agricultural practices, minimizing overproduction, strengthening food distribution systems, and educating consumers about meal planning, responsible shopping, and composting. Collaborative efforts to reduce food waste can ensure equitable access to nutritious sustenance while safeguarding our planet's resources and fostering a brighter future. During the study, certain limitations emerged, including a lack of comprehensive awareness about waste classification and disposal processes. Selected hotels encountered discrepancies in applying waste regulations due to ambiguities, such as the absence of specified container colors. Additionally, confusion prevailed among stakeholders regarding food waste management guidelines. These challenges were surmounted through the involvement of waste management inspectors and collaborative efforts with entities like Bee'ah Company and the municipal authority. These engagements facilitated problem-solving and regulatory alignment. By reducing food waste, we contribute to SDG 12, which aims to ensure sustainable consumption and production patterns. Our study underscores that achieving SDG 12 requires concerted efforts from various stakeholders. In response to these insights, several recommendations emerge to enhance food waste management practices:

**Clarify Regulations:** Clearly define waste management regulations, including container colors, to mitigate divergent interpretations.

**Promote Awareness:** Raise awareness among stakeholders about food waste regulations through educational initiatives.

**Stakeholder Cooperation:** Foster ongoing collaboration among relevant entities to establish a cohesive waste management approach.

**Regular Oversight:** Implement consistent inspections by waste management experts to ensure adherence to standards and timely corrective actions.

**Government Involvement:** Enforce detailed regulations, especially within the hospitality sector, to establish waste generation limits, storage guidelines, and compliance incentives.

## 5. ACKNOWLEDGMENT

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