

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 9; September 2026; Page No. 290-296

Received: xx-06-2026
Accepted: xx-07-2026

Indexed Journal
Peer Reviewed Journal

The food waste management gap: From prevention to diversion in urban food-service establishments in India

¹Varaganti Sowmya, ²Sampriti Baruah, ³Ali Baba Md and ⁴Ramesh P

¹P.G. Scholar Department of Agricultural Economics, College of Agriculture, Rajendranagar, Hyderabad, Telangana, India

²Head, Sustainable Agriculture, Food Land and Water Program, WRI, India

³Field officer, Cost of cultivation Scheme, Department of Agricultural Economics, College of Agriculture, Rajendranagar, Hyderabad, Telangana, India

⁴Assistant professor, Department of AABS, College of Agricultural Engineering, Kandi, Sangareddy, Telangana, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i9d.4203>

Corresponding Author: Varaganti Sowmya

Abstract

Hostels and restaurants are among the fastest-growing components of urban India's food-service sector, yet the factors that drive food waste within them, and the practices these establishments adopt to manage the waste they generate, remain poorly documented. This paper draws on a study of 30 restaurants and 30 hostels in Hyderabad city to examine (i) the key factors contributing to food waste and (ii) the food waste management practices currently adopted by these establishments, using a structured interview schedule, in-depth interviews, non-participant observation and key informant interviews, analysed through reflexive thematic analysis, and evaluated against the US Environmental Protection Agency (US EPA) Wasted Food Scale and a Modified, weighted version of the scale developed for the study. Restaurant waste was primarily attributed to pre-consumer causes poor demand forecasting, supplier-driven over-procurement outpacing storage capacity, and precision-related kitchen losses while hostel waste was traced mainly to consumer-stage plate waste linked to fixed menus, attendance mismatches and resident taste fatigue. Six recurring themes emerged across both establishment types: forecasting blind spots, procurement-storage mismatches compounded by pest infestation, preparation-stage inefficiency, rigid service formats, distinctive consumer behaviours (fee-based entitlement in hostels, content-driven over-ordering in restaurants), and an enabling environment of negligible staff training and waste monitoring. Prevention-oriented practices were almost universally reported, but rarely reinforced by systematic waste measurement or staff training, and diversion beyond prevention donation, animal feeding, composting remained bounded; consequently, 90.0 per cent of restaurants and 86.7 per cent of hostels fell in the lowest, "Bronze/Basic," tier of the Modified US EPA Wasted Food Scale, with no significant difference between the two establishment types in overall diversion quality. The findings point to a persistent gap between the near-universal, but shallow, adoption of preventive measures and the near-absence of structured diversion practice, and the paper concludes with recommendations for closing this gap through structured demand forecasting, routine waste weighing, staff training, and municipally supported diversion infrastructure.

Keywords: food waste management; drivers of food waste; food-service establishments; Wasted Food Scale; reflexive thematic analysis; hostels and restaurants; Hyderabad, India

1. Introduction

Rapid urbanization and lifestyle reorientation in India's metropolitan cities have catalyzed the expansion of the food-service sector, with restaurants and hostels emerging as significant, though poorly documented, contributors to urban food waste and to the burden placed on municipal solid-waste systems (FAO, 2019; UNEP, 2024). Hyderabad, one of India's fastest-growing metropolitan cities and a major hub for education, information technology and food services, illustrates this pattern acutely: its dense and expanding network of hostels and restaurants generates consumer-level food waste of a kind distinct from the post-harvest losses that dominate India's rural food system (NABCONS, 2022). Recent regulatory enforcement in the city has exposed the structural vulnerabilities underlying this waste pest-infested

produce, corroded equipment and improperly managed waste were documented across dozens of inspected hostels (Baski, 2024; Reddy, 2025) ^[2, 22] even as monitoring capacity has remained limited relative to the scale of the public-health risk (Baski, 2026) ^[3]. Cutting food waste in this sector requires more than knowing how much is wasted. It requires understanding why it is wasted, and what establishments currently do about it, since management is the point at which an establishment upholds genuine control. At the same time, generation itself is shaped by many interacting operational and behavioural factors that extend only partially into that sphere of control. This distinction provides impetus for the present paper, which reports findings from a broader study of food waste generation and management practices in Hyderabad's hostels and restaurants, concentrating

particularly on two of its three original objectives: (i) to identify the key factors contributing to food waste in these establishments, and (ii) to document and evaluate the food waste management practices currently adopted by them. The quantity of food waste generated the study's first objective is drawn upon here only as necessary background, since restaurants in the parent study were found to generate significantly more food waste than hostels, both in absolute terms (35.73 kg v/s 19.97 kg/establishment/day) and as a proportion of food wasted (12.70% v/s 7.53%); it is the factors behind this waste, and the establishments' response to it, that form the subject of the present paper. Food waste management is conventionally understood not as a single practice but as a hierarchy of pathways of decreasing environmental preference from preventing waste at source, through donation, upcycling and animal feeding, to composting and anaerobic digestion, and finally to landfill, incineration or disposal down the drain (US EPA, 2025). Establishments that manage food waste well are expected not merely to prevent what they can, but to divert what they cannot prevent as far up this hierarchy as possible. Whether India's urban food-service establishments do so and what stands in the way where they do not is the central question addressed here, framed as a gap between the prevention that establishments almost universally claim to practice and the diversion that a hierarchy-based evaluation shows they rarely achieve.

2. Materials and Methods

2.1 Study area and sampling

The study was conducted in Hyderabad city, Telangana, purposively selected as a rapidly urbanizing metropolitan centre with a dense concentration of food-service establishments. Thirty hostels were selected using simple random sampling from across the city's institutional and IT-hub clusters, and thirty restaurants were selected using simple random sampling, with five restaurants drawn from each of the six administrative zones demarcated by the Greater Hyderabad Municipal Corporation (GHMC). Primary data were collected using a structured interview schedule administered to hostel mess in-charges, supervisors, cooks, helpers and students, and to restaurant managers, procurement managers, chefs and servers. Data were collected from key informants, including the food safety officer and RUCO-FSSAI purchasing manager.

2.2 Identifying factors contributing to food waste

Beyond the pre-defined categories captured on the structured schedule, the factors contributing to food waste were investigated qualitatively through three complementary methods: (i) semi-structured, in-depth interviews (40–50 minutes) with kitchen staff, chefs, hostel supervisors, restaurant managers, procurement staff and serving staff, covering causes of waste at the procurement, preparation and consumption stages; (ii) non-participant direct observation of food preparation, storage, serving and leftover patterns before and after peak service hours; and (iii) key informant interviews with a municipal food safety officer and an

FSSAI-RUCO (Repurpose Used Cooking Oil) purchasing manager. The resulting qualitative corpus in-depth interviews with 30 restaurant and 30 hostel respondents, open-ended remarks volunteered by an equal number of proprietors and supervisors, observation notes, and the two key informant transcripts was analysed using Braun and Clarke's (2006; 2019) ^[4, 5] six-phase reflexive thematic analysis (RTA): familiarization with the data; generation of initial, inductive codes capturing both semantic and latent meaning; generation of initial themes clustered across the procurement, storage, preparation and consumption stages; review of themes for internal coherence; definition and naming of themes; and production of the final thematic account. RTA was chosen because the qualitative evidence was drawn from multiple respondent categories and multiple methods across two structurally different establishment types, requiring a technique capable of identifying patterns of meaning that recur across, as well as diverge between, these sources, rather than a fixed, consensus-driven codebook.

2.3 Evaluating food waste management practices

Information on current management practices prevention, measurement, segregation, and utilization or disposal was collected through the structured interview schedule and summarized using frequencies and percentages. The US EPA Wasted Food Scale (US EPA, 2025), which ranks twelve management pathways from most to least environmentally preferred (prevent, donate, upcycle, feed animals, leave unharvested, anaerobic digestion with beneficial use of digestate/biosolids, compost, anaerobic digestion with disposal of digestate/biosolids, apply to land, landfill, incinerate, send down the drain), was used only as the conceptual basis for a Modified US EPA Wasted Food Scale developed for the present study.

Because the single-pathway categorical scale cannot capture the fact that an establishment typically diverts its waste across more than one pathway simultaneously, and because restaurants and hostels differ structurally in scale, procurement pattern and access to diversion channels, a Modified US EPA Wasted Food Scale was developed for the study, consistent with the composite, weighted approach used in indices such as FOODRUS (Amador-Cervera *et al.*, 2024) ^[1]. The modified tool collapses the twelve US EPA pathways into six weighted tiers (Table 1), and a Weighted Score (range 1.00–6.00) was computed for each establishment as the sum of the products of the fraction of its total food waste diverted to each tier and the corresponding tier points:

$$\text{Weighted Score} = (w_1 \times 6) + (w_2 \times 5) + (w_3 \times 4) + (w_4 \times 3) + (w_5 \times 2) + (w_6 \times 1)$$

where w_i is the fraction of the establishment's total food waste diverted to Tier i ($\sum w_i = 1$). Establishments were further classified into four performance bands: Platinum/Leader (5.00–6.00), Gold/Advanced (3.50–4.99), Silver/Developing (2.50–3.49) and Bronze/Basic (1.00–2.49), allowing a more granular, establishment-type-sensitive comparison than the categorical ranking alone.

Table 1: Weighted scoring tiers of the Modified US EPA Wasted Food Scale

Tier	EPA Pathway	Weight	Environmental & Circular Impact
Tier 1	Prevent Wasted Food (Source Reduction)	6	Eliminates all upstream resource consumption
Tier 2	Donate & Upcycle Food	5	Keeps edible food in the human supply chain
Tier 3	Feed Animals	4	Displaces the need for dedicated agricultural feed
Tier 4	Anaerobic Digestion, Composting & Industrial Uses	3	Recycles nutrients, recovers bioenergy, or recycles grease
Tier 5	Land Application	2	Returns nutrients to soil ecosystems
Tier 6	Landfill, Incineration & Send Down Drain	1	High GHG (methane) emissions; no circularity

Group comparisons between restaurants and hostels used Welch's independent-samples t-test, appropriate where unequal variances are assumed.

3. Results and discussion

3.1 Factors contributing to food waste generation

3.1.1 Factors identified through the structured schedule

Restaurant respondents attributed food waste mainly to over-production (60.0%), poor demand forecasting (43.3%) and demand fluctuations (40.0%), with unavoidable kitchen waste (trimmings, peels, bones) cited by 20.0 per cent. In hostels, demand fluctuations, over-production and poor demand forecasting were equally dominant (36.7% each), alongside low taste/quality of food (33.3%), student/customer attitude and behaviour (43.3%), unavoidable kitchen waste (26.7%), poor menu planning (26.7%) and over-cooking/preparation errors (16.7%) (Table 2).

Table 2: Factors contributing to food waste as reported on the structured schedule (multiple responses)

Factor	Restaurants (%)	Hostels (%)
Over-production	60.0	36.7
Poor demand forecasting	43.3	36.7
Demand fluctuations	40.0	36.7
Unavoidable kitchen waste (trimmings, bones, peels)	20.0	26.7
Student/customer attitude and behaviour	—	43.3
Low taste/quality of food	—	33.3
Poor menu planning	—	26.7

At the plate-waste level, over-ordering (50.0%), dietary restrictions (26.7%), large serving/portion size (23.3%) and unsuitable dish combinations (23.3%) led in restaurants, whereas poor cooking quality/taste dissatisfaction (56.7%), large serving/portion size (36.7%), unhygienic serving conditions (33.3%), dietary restrictions (26.7%) and unsuitable dish combination (26.7%) dominated in hostels, with only 16.7 per cent reporting deliberate/behavioural waste (Table 3). Since hostel meals are typically served in fixed quantities, plate waste there appears driven more by palatability than by portion size, unlike restaurants where customers self-select quantity.

Table 3. Stated reasons for plate waste in restaurants and hostels (multiple responses)

Reason for plate waste	Restaurants (%)	Hostels (%)
Large serving / portion size	23.3	36.7
Unsuitable dish combination	23.3	26.7
Over-ordering	50.0	—
Deliberate / behavioural waste	—	16.7
Poor cooking quality/ taste dissatisfaction	—	56.7
Dietary restrictions	26.7	26.7
Unhygienic serving conditions	—	33.3

3.1.2 Reflexive thematic analysis of factors contributing to food waste

While the structured schedule quantified factors against pre-defined categories, the qualitative data generated through in-depth interviews, direct observation and key informant interviews allowed a fuller account of why food is wasted. Six themes emerged from the reflexive thematic analysis, each associated with a particular stage of the food-service process.

Theme 1 Forecasting blind spots: production decoupled from real-time demand.

Across all 30 restaurant interviews, poor demand forecasting emerged, without exception, as the principal driver of waste, with preparation as the locus of maximum loss; “better demand forecasting” was volunteered as the leading corrective recommendation in every interview. Production planning relied on informal, experience-driven reference to past sales rather than any formal forecasting tool. In hostels, forecasting failure operated through the attendance register rather than sales history: cooking was planned “based on attendance,” but this failed to capture same-day deviations, compounded by structural attendance shocks such as holiday periods (cited by 56.7% of hostel respondents) and examination periods (33.3%). Both key informants the RUCO-FSSAI purchasing manager and the food safety officer corroborated forecasting failure as a principal driver, consistent with Maganha *et al.* (2025)^[16], Filimonau *et al.* (2019) and Crocker *et al.* (2025)^[8, 10].

Theme 2 Procurement economics and storage constraints: the persistent challenge of pest infestation.

Procurement in both establishment types was driven primarily by supplier economics rather than measured need: bulk buying attributable to supplier discounts was recorded in 76.7 per cent of restaurant interviews and 53.3 per cent of hostel interviews. This economic logic frequently exceeded storage capacity restaurants reported meat left unrefrigerated after over-procurement, while every hostel interviewed (100%) reported having a refrigerator, yet observation found that vegetables were, in practice, “left behind on the ground” rather than refrigerated. Storage rooms in both establishment types were near-universally pest-affected, with no pest-control traps observed in either type, a pattern the food safety officer confirmed directly across the roughly 100 establishments inspected monthly. These findings resonate with Charlebois *et al.* (2015)^[6] on back-of-house inventory issues and Kumar and Prashar (2022)^[14] on inadequate refrigeration among Hyderabad households.

Theme 3 Preparation precision and error: inefficiencies in kitchen-stage practices. Kitchen-stage waste in restaurants was described in terms of precision and error rather than simple carelessness: portioning in 80.0 per cent of interviews was reported as based “on type and cost” of the dish rather than anticipated demand, and cutting or trimming losses were referenced in 93.3 per cent of interviews, with meat named the single most frequently wasted raw kitchen item (73.3%). In hostels, kitchen-stage errors were rarely tied to presentation, and instead reflected peeling, cutting and cooking losses compounded by poor-quality supplied vegetables and rushed cooking under fixed time and quantity constraints consistent with Mokrane *et al.* (2023) and Dhir *et al.* (2020)^[9, 18].

Theme 4 Rigid service formats: misalignment with variable appetite. All 30 restaurants reported serving food in fixed, standardized portions regardless of individual appetite, and every restaurant interview traced at least one service-stage trigger most commonly excess serving relative to the order (60.0%) for food reaching the table in excess of what was consumed. Hostels exhibited the same rigidity from the opposite direction: menus fixed weekly or monthly, with portion decisions on the serving line resting on the server's own hunger assessment (36.7%) or the dish's visual appeal (20.0%) rather than the individual guest's stated need. This structural contrast maps onto the waste-composition pattern reported for the parent study, in which kitchen (pre-consumer) waste was the largest single component in restaurants (38.1%) while plate (consumer) waste dominated in hostels (47.6%).

Theme 5 Taste fatigue and entitlement: novel consumer behaviour. Hostel students' plate waste was attributed, without exception, to boredom arising from menu repetition (100% of interviews), compounded by dislike of specific recurring dishes. A subset of responses reframed waste as an entitlement rather than an unintended outcome: since the mess fee is fixed irrespective of consumption, some students appeared to treat discarding food as a paid-for prerogative (“because they pay, they serve,” volunteered in 16.7% of interviews). Restaurant customers displayed a distinct profile, including indecisive, mid-order behaviour change and a social-media-driven pattern in which customers ordered food primarily to photograph or film it rather than to consume it, corroborated by direct observation. This technology-mediated ordering behaviour is not prominent in the international restaurant-waste literature and represents a locally distinctive extension of the attitudinal and behavioural-intention models of Watanabe *et al.* (2023)^[26] and Chun T'ing *et al.* (2021)^[7], consistent otherwise with Rani *et al.* (2024) and Lorenz *et al.* (2017)^[15, 21] on hostel-type entitlement and taste-driven waste.

Theme 6 An enabling environment of low monitoring, training and regulatory compliance. The operational and behavioural drivers identified in Themes 1–5 persisted within a wider structural environment offering little corrective feedback: staff training was reported by only 10.0 per cent of restaurants and no hostels; no establishment of either type had undertaken a customer-awareness initiative; and no establishment formally weighed or systematically recorded

its food waste. Both key informants situated this within a wider compliance gap, with the food safety officer observing that compliance with the Food Safety and Standards Act (2006) and municipal solid-waste rules “remain poor across both restaurants and hostels.” This theme functions less as an independent driver of waste than as the enabling backdrop against which the other five themes are able to persist largely unchecked.

Taken together, the reflexive thematic analysis converges with, and substantially deepens, the structured-schedule findings: both sources identify poor demand forecasting and over-production as the dominant restaurant-side driver, located at preparation, and demand/attendance fluctuation and taste-related dissatisfaction as the dominant hostel-side drivers, located at consumption. Consistent with the multi-factorial view of food waste drivers established in the literature (Crocker *et al.*, 2025; Mokrane *et al.*, 2023)^[8, 18], no single cause dominates; rather, forecasting, procurement, storage, preparation, service format and consumer behaviour interact within a largely unmonitored operating environment and these same operational and behavioural roots, in turn, help explain the modest, prevention-only character of the food waste management practices examined next.

3.2 Food waste management practices

3.2.1 Prevention practices

All restaurants (100%) and all hostels (100%) reported adopting preventive measures demand forecasting, menu planning, portion-size control and batch cooking indicating universal, if imperfect, awareness of overproduction. All establishments reported following First-In-First-Out (FIFO) inventory management, yet over-purchasing and inadequate air circulation in storage areas were common, and pest infestation cockroaches, rodents, houseflies, mites, ants, worms was widespread. Only 10.0 per cent of sampled restaurants provided staff training, against 90.0 per cent of restaurants and 100 per cent of hostels that did not; no sampled establishment of either type had undertaken a customer-awareness initiative.

3.2.2 Measurement, segregation, and utilization/disposal

No sampled establishment measured its food waste systematically. Visual estimation was recorded in only 16.7 per cent of restaurants and 3.3 per cent of hostels, with the remaining 83.3 per cent and 96.7 per cent, respectively, estimating waste visually but not recording it. Waste segregation was practiced by 63.3 per cent of restaurants and 53.3 per cent of hostels, chiefly a plate-waste/kitchen-waste split. Utilization practices such as upcycling, anaerobic digestion, composting and application to land were not observed in any sampled establishment. Donation was reported by 13.3 per cent of restaurants and 10.0 per cent of hostels, with no NGO collaborations reported in either type, while animal feeding was reported by 20.0 per cent of restaurants and 40.0 per cent of hostels. Waste not utilized by establishments was directed entirely to GHMC, which routes it to landfill.

3.2.3 Mapping of restaurants and hostels practices against the categorical US EPA Wasted Food Scale

On the categorical scale, all restaurants (100%) and all hostels (100%) reported prevention as a practiced tier.

Among restaurants, animal feeding (Tier 3) was the most common utilization practice (20.0%), followed by donation (Tier 2, 13.3%); among hostels, animal feeding was more prevalent still (40.0%), with donation reported by 10.0 per cent. All establishments of both types also fell into Tier 6 (landfill), since unutilized waste collected by GHMC is ultimately landfilled.

3.2.4 Evaluation against the Modified US EPA Weighted Score

Because the categorical scale ranks each establishment by only its single best-reported practice, the Modified US EPA Weighted Score (Section 2.3) was computed for every establishment based on the actual proportion of waste it diverted to each tier. The mean Weighted Score was 1.63 (SD = 0.63, range 1.00–3.24) for restaurants and 1.57 (SD = 0.64, range 1.00–2.93) for hostels; an independent-samples Welch's t-test found no statistically significant difference between the two groups ($t = 0.38$, $df = 58$, $p = 0.70$). Despite generating a significantly lower proportion of food waste, hostels were thus not meaningfully better placed than restaurants on the food-waste management hierarchy once diversion practice itself was weighted: the large majority of both restaurants (90.0%) and hostels (86.7%) fell in the lowest, Bronze/Basic, band, and none reached the Gold/Advanced or Platinum/Leader bands (Table 4).

Table 4: Distribution of restaurants and hostels by Modified US EPA weighted-score performance tier

Score Range	Performance Tier	Restaurants (n=30)	Hostels (n=30)
5.00 – 6.00	Platinum / Leader	0 (0.0%)	0 (0.0%)
3.50 – 4.99	Gold / Advanced	0 (0.0%)	0 (0.0%)
2.50 – 3.49	Silver / Developing	3 (10.0%)	4 (13.3%)
1.00 – 2.49	Bronze / Basic	27 (90.0%)	26 (86.7%)

Notably, 11 of the 30 restaurants (36.7%) and 15 of the 30 hostels (50.0%) recorded the minimum possible score of 1.0, indicating no diversion whatsoever beyond source reduction. This nuances the categorical comparison: while a larger share of hostels engage in some diversion (40.0% divert to animal feeding, versus 20.0% of restaurants), a larger share of hostels also engage in none at all, reflecting greater polarization in hostel practice against a more evenly, if still thinly, spread level of diversion among restaurants. A weak-to-moderate positive correlation was observed between the Weighted Score and the proportion of food wasted for both restaurants ($r = 0.47$) and hostels ($r = 0.30$), suggesting that establishments generating proportionally more waste tend to divert a somewhat larger share of it plausibly because larger volumes of surplus make donation and animal-feeding arrangements more logistically viable rather than the inverse. This uniformly low level of diversion is consistent with Srijuntrapun *et al.* (2022) [23], who found continuous food-waste management policies rare even among large hotels in Thailand, and with Gaiani *et al.* (2018) [12] on the persistent gap between consumer awareness of food waste and actual diversion behaviour. It also reinforces the case made by Papargyropoulou *et al.* (2014) [20] and Amador-Cervera *et al.* (2024) [1] for weighted, hierarchy-based composite indices over single-category rankings, since the Modified Scale reveals a polarization between minimal and partial diverters

that the categorical ranking alone does not capture. The near-total absence of Gold/Advanced and Platinum/Leader performers in both establishment types suggests considerable room for improvement, in line with Ioannidis *et al.* (2021) [13] on the cost and brand benefits of reduce-reuse-recycle adoption in hospitality, and with Martin-Rios *et al.* (2018) [17], whose distinction between reactive, cost-driven adopters and proactive adopters of more radical solutions mirrors the Bronze-dominated profile observed here.

3.2.5 The prevention–diversion gap: restaurants versus hostels

Hostels' lower proportional waste (7.53% versus 12.70% in restaurants) might suggest superior management, and hostels do report more frequent use of animal feeding than restaurants. However, the Weighted Score evaluation shows this advantage does not extend to overall diversion quality: both establishment types are concentrated in the Bronze/Basic band, and all establishments of both types ultimately route unutilized waste to landfill via GHMC. This indicates that hostels' lower proportional waste is better explained by their more standardized, fixed-format service and procurement scale than by any measurably superior management practice (Section 3.1). The gap documented here, then, is not primarily between restaurants and hostels, but between prevention and diversion within both: prevention is formally prioritized and near-universally claimed, yet is rarely reinforced by measurement, training or customer engagement, while diversion beyond prevention remains minimal, informal, and dependent almost entirely on eventual disposal through the municipal system.

4. Conclusion and recommendations

Food waste in Hyderabad's hostel and restaurant sector is a multifactorial problem, arising from the interaction of forecasting, procurement, storage, preparation, service format and consumer behaviour within a largely unmonitored operating environment, rather than from any single cause. Restaurants and hostels generate this waste through structurally distinct pathways restaurants primarily through pre-consumer, kitchen-stage losses tied to forecasting, procurement and preparation, and hostels primarily through consumer-stage plate waste tied to fixed service formats, resident taste fatigue and perceptions of entitlement but both operate within a common enabling environment of limited staff training, absent systematic waste measurement and uneven regulatory compliance. Current management practices in both establishment types are prevention-oriented in principle but shallow in practice. Prevention is formally prioritized, yet rarely supported by systematic measurement, staff training or customer engagement; diversion beyond prevention remains minimal and is largely dependent on eventual disposal through GHMC, placing the overwhelming majority of establishments at the lowest end of the sustainable food-waste hierarchy, with no significant difference between restaurants and hostels once diversion is weighted and compared establishment by establishment. The principal opportunity for improvement identified by this analysis therefore lies in closing the gap between the near-universal but shallow adoption of preventive measures and the development of effective, measurable and diversified food-waste management practices.

Based on these findings, the following recommendations are offered:

Restaurants should move from informal, experience-based demand estimation toward structured demand-forecasting practice, and hostels should strengthen real-time linkage between attendance registers and cooking quantities, to reduce over-production at source. Establishments of both types should adopt basic, low-cost food waste measurement regular weighing rather than unrecorded visual estimation so that progress can be tracked and the true cost of waste is made visible to management. Cold-chain and pest-proof storage infrastructure should be strengthened, and procurement quantities aligned with actual storage and freezer capacity, to reduce raw-material spoilage, particularly of meat in restaurants. Regular staff training in portion control, inventory management and waste-conscious food handling should be instituted, given that only 10 per cent of restaurants and no hostels currently provide it. Upcycling of kitchen waste such as preparing soups from vegetable scraps, leftovers, or raw meat and bones should be encouraged as a low-cost diversion practice presently absent from the sample. Establishments should be encouraged and facilitated, including through NGO partnerships, to formalize surplus-food donation and redistribution channels, none of which were reported in the sample despite regulatory encouragement. Composting, anaerobic digestion and application to land absent from the sampled establishments should be promoted through municipal incentives or GHMC-supported infrastructure to shift establishments up the food-waste hierarchy rather than defaulting to landfill.

Hostels should reconsider rigid, centrally fixed weekly or monthly menus and server-led portioning in favour of periodic resident feedback and more flexible portion-taking, to address menu-fatigue- and entitlement-driven plate waste. Restaurants should address service-stage miscommunication (order mix-ups, delays) through staff training and consider how portion-flexible menu design might mitigate the emerging, content-driven over-ordering behaviour identified among customers. Regulatory bodies should strengthen enforcement of FSSAI hygiene and municipal solid-waste management compliance, given the food safety officer's observation that compliance remains poor across both restaurants and hostels. Civic authorities, including GHMC, may consider a simplified, low-cost waste-quantification and diversion-incentive scheme tailored to small and medium food-service establishments, to move a larger share of establishments out of the Bronze/Basic performance band identified in this study.

4.1 Limitations and scope for future research

This paper draws on a cross-sectional sample of 60 establishments in one city and therefore does not capture seasonal variation in the factors driving waste or in management response, nor does it include establishments outside Hyderabad; findings on factors and practices should accordingly be read as indicative of urban Indian food-service establishments of this type rather than as nationally representative. Qualitative findings, being based on respondent accounts and observation, may be subject to recall or observer bias. Future research could usefully extend the reflexive thematic analysis of drivers, and the Modified Weighted Score evaluation of management practice, to

larger, seasonally repeated, multi-city samples; examine the distinctive, content-driven ordering behaviour identified among restaurant customers as an emerging consumer-side driver in its own right; and evaluate, longitudinally, the causal effectiveness of specific interventions demand-forecasting tools, staff training programmes, and NGO donation partnerships in moving establishments from prevention toward genuine diversion.

References

1. Amador-Cervera M, Angarita-Zapata JS, De La Calle Vicente A, Alonso-Vicario A. The FOODRUS index: assessing suitability for effective food loss and waste prevention management under an integral perspective. *Waste Manag.* 2024;179:32-43.
2. Baski S. Now, food safety officials find hostels in a pickle. *Times of India.* 2024 Jun 18. Available from: <https://timesofindia.indiatimes.com/city/hyderabad/food-safety-officials-find-pest-infested-vegetables-and-unhygienic-kitchen-conditions-in-hostels/articleshow/111069599.cms>
3. Baski S. Many food poisoning cases in city, but fewer violations. *Times of India.* 2026 Jan 5. Available from: <https://timesofindia.indiatimes.com/city/hyderabad/many-food-poisoning-cases-in-city-but-fewer-violations/articleshow/126339285.cms>
4. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol.* 2006;3(2):77-101.
5. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qual Res Sport Exerc Health.* 2019;11(4):589-597.
6. Charlebois S, Creedy A, Von Massow M. "Back of house"-focused study on food waste in fine dining: the case of Delish restaurants. *Int J Cult Tour Hosp Res.* 2015;9(3):278-291.
7. Chun T'ing L, Moorthy K, Gunasaygaran N, Sek Li C, Omapathi D, Jia Yi H, *et al.* Intention to reduce food waste: a study among Malaysians. *J Air Waste Manag Assoc.* 2021;71(7):890-905.
8. Crocker R, Sucheran R, Dorasamy N. A critical review of factors contributing to food waste in the food service industry. *Tour Leisure.* 2025;14(3):537-543.
9. Dhir A, Talwar S, Kaur P, Malibari A. Food waste in hospitality and food services: a systematic literature review and framework development approach. *J Clean Prod.* 2020;270:122861.
10. Filimonau V, Fidan H, Alexieva I, Dragoev S, Marinova DD. Restaurant food waste and the determinants of its effective management in Bulgaria: an exploratory case study of restaurants in Plovdiv. *Tour Manag Perspect.* 2019;32:100577.
11. Food and Agriculture Organization of the United Nations. The state of food and agriculture 2019: moving forward on food loss and food waste reduction. Rome: FAO; 2019. doi:10.4060/ca6030en.
12. Gaiani S, Caldeira S, Adorno V, Segrè A, Vittuari M. Food wasters: profiling consumers' attitude to waste food in Italy. *Waste Manag.* 2018;72:17-24.
13. Ioannidis A, Chalvatzis KJ, Leonidou LC, Feng Z. Applying the reduce, reuse, and recycle principle in the hospitality sector: its antecedents and performance implications. *Bus Strategy Environ.* 2021;30(7):3394-

3410.

14. Kumar TB, Prashar D. Assessing household food waste in Hyderabad city. *Adv Appl Math Sci*. 2022;21(5).
15. Lorenz BAS, Hartmann M, Langen N. What makes people leave their food? The interaction of personal and situational factors leading to plate leftovers in canteens. *Appetite*. 2017;116:45-56.
16. Maganha I, Andrade Martins AF, Moreira CC, Silva Moura De Sá LF, De Almeida Brito LF, De Araújo SA, *et al*. Unveiling food waste: a case study of a restaurant specializing in Japanese cuisine in Brazil. *Waste Manag Bull*. 2025;3(4):100261.
17. Martin-Rios C, Demen-Meier C, Gössling S, Cornuz C. Food waste management innovations in the foodservice industry. *Waste Manag*. 2018;79:196-206.
18. Mokrane S, Buonocore E, Capone R, Franzese PP. Exploring the global scientific literature on food waste and loss. *Sustainability*. 2023;15(6):4757.
19. NABARD Consultancy Services. Study to determine post-harvest losses of agri produces in India. New Delhi: NABCONS; 2022. Available from: https://www.mofpi.gov.in/sites/default/files/phl_study_final_report_07.12.2022_2.pdf
20. Papargyropoulou E, Lozano R, Steinberger JK, Wright N, Ujang ZB. The food waste hierarchy as a framework for the management of food surplus and food waste. *J Clean Prod*. 2014;76:106-115.
21. Rani R, Kumar A, Kumar R. Analysis of food wastage in girls' hostels: a case of Sector 14, Panjab University Chandigarh. *Int J Geogr Geol Environ*. 2024;6(1):495-501.
22. Reddy N. Hostels in trouble after kitchen safety violations found. *Telangana Tribune*. 2025 May 24. Available from: <https://www.telanganatribune.com/hostels-in-trouble-after-kitchen-safety-violations-found/>
23. Srijuntrapun P, Sukwong P, Marshall A. The role of food waste hierarchy as Thai hotels seek to fulfill their corporate social responsibility. *Heliyon*. 2022;8(10).
24. U.S. Environmental Protection Agency. U.S. Environmental Protection Agency [Internet]. Washington (DC): U.S. Environmental Protection Agency; 2025. Available from: <https://www.epa.gov>
25. United Nations Environment Programme. Food Waste Index Report 2024 [Internet]. Nairobi: United Nations Environment Programme; 2024. Available from: <https://www.unep.org/resources/food-waste-index-report-2024>
26. Watanabe EADMDM, Freitas MGMTD, Demo G. Food waste in restaurants: evidence from Brazil and the United States. *J Int Food Agribus Mark*. 2023;35(3):283-304.