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# WASTE MANAGEMENT PRACTICES AND HEALTH SECURITY AMONG FOOD VENDORS IN MAKURDI LOCAL GOVERNMENT AREA, BENUE STATE. NIGERIA.

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**Abstract**
Records have shown that 2.01 billion tonnes of waste are generated annually, with 80% not being recycled. This study explores Waste Management Practices (WMP) among food vendors and health security in Makurdi LGA, Benue State. The study examined the WMP adopted by food vendors and assess the impact of poor WMP on health security in Makurdi LGA. The study is anchored on Protection Motivation Theory (PMT) and its design is cross-sectional survey. Multistage sampling technique was used, with a sample size of 333 food vendors determined by the Salant and Dillman (1994) method, from an estimated population of 2352 food vendors. Quantitative data were analysed using descriptive statistics and chi-square tests at $p \leq 0.05$ through the Statistical Product and Service Solution (SPSS) while Content analysis was utilised for the qualitative data. Findings revealed that, 50% of food vendors reported having proper waste management facilities and disposing of waste once or twice daily, poor WMP led to environmental degradation, bad odors, food spoilage, and increased disease risk among customers and health security measures taken by food vendors included storing food in airtight containers, washing hands with soap and water before handling food, and cleaning utensils properly after use. The hypothesis test results ($t=323$, $p<.05$) supported the first alternate hypothesis. The study concluded that while many food vendors adopted effective waste management practices, there were variations in their implementation. It recommended that BENSESA should conduct comprehensive public awareness campaigns on waste management and disposal methods.

**Key words:** waste management, food vendors, health security, vending sites, food health.

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## Introduction

Data from Global Waste Statistics (GWS) estimates that 2.01 billion tonnes of municipal waste are generated annually, with less than 20% being recycled, leading to large quantities ending up in landfills (GWS, 2022). The report also highlights that with the global population expected to reach 10 billion by 2050, the UN predicts a 70% increase in waste generation, amounting to 3.4 billion metric tons by 2050. The report raises concerns about low-income countries, which manage only about 48% of urban waste, compared to high-income countries that collect 90% or more. The GWS (2022) report for the third quarter of 2022 indicates that Sub-Saharan Africa is the fastest-growing region for domestic and commercial waste generation, followed by North Africa, South Asia, and the Middle East, where over 50% of waste is left in open dumps (Global Waste Statistics, 2022).

In Nigeria, it is estimated that an average person generates about 0.49 kg of solid waste per day, with households and commercial centers contributing nearly 10% of the total urban waste burden. Approximately two-thirds of this waste is indiscriminately dumped on streets and in drains, posing serious environmental health hazards (Orhorhoro & Oghoghorie, 2019; Sylvester & Ikudayisi, 2021). This situation has significant implications for human and environmental health, as well as the overall wellbeing of the ecosystem.

Effective waste management is crucial for the sustainable subsistence of the global environment and public health security in both industrial and developing countries (Abubakar, et. al., 2021). Poor waste management has become a significant public health issue, particularly in urban areas of developing nations. For example, outbreaks of diseases like cholera and diarrhea in Nigerian cities are often attributed to improper waste disposal (Omang, et. al., 2021; Ichipi & Senekane, 2023; Raphela, Manqele & Erasmus, 2024).

Waste is broadly defined as any discarded, unwanted material resulting from human or animal activities (Ferronato & Torretta, 2019). It can be categorized into liquid, solid, and gaseous forms, with solid waste being the most challenging to manage. Open burning and dumping are common waste disposal methods in low-income countries, contributing to environmental and public health concerns (Ferronato & Torretta, 2019).

Solid waste management is a significant challenge in Nigeria, with many cities struggling to control waste generation and disposal (Kumar et al., 2017). Solid waste includes garbage, refuse, and sludge, all of which are generated in Makurdi LGA of Benue State, Nigeria, posing a significant challenge for local waste management agencies (Nwogwugwu & Ishola, 2019).

Food handlers, including vendors and professional caterers, play a crucial role in the food industry. Poor personal hygiene and lack of knowledge about public health concerns can lead to the spread of infectious diseases (Engdaw, Tesfaye&Worede,2023). According to the World Health Organization (WHO, 2021), foodborne diseases affect up to 30% of the population in developed countries each year, with up to 2 million deaths annually in developing countries. Improper waste

management around food handlers can exacerbate these issues, leading to the spread of diseases like diarrhea (WHO, 2021).

The food sector is vital for employment, income generation, and providing affordable food, especially for lower-income groups in urban areas. Food vendors are an integral part of the food supply chain, contributing significantly to human and economic development. In Nigeria, urban dwellers spend a substantial portion of their food budget on street foods, highlighting the importance of food vendors (Adeosun, Oosterveer & Greene, 2023; Mwangi, 2022).

Despite regulations aimed at protecting health security, the food market in Nigeria faces numerous challenges, including inadequate supervision and weak enforcement of food hygiene regulations (Barnabas, et. al., 2024). Lack of training on food safety and hygiene practices is common among food handlers, leading to the risk of contamination at all stages of food handling. Food vendors often operate in unsanitary conditions, with improper storage and preparation practices, posing health risks to both vendors and customers (Onyeaka, et. al., 2021).

Many cities and towns have poorly regulated food vendor operations, raising concerns about food safety and hygiene standards. Makurdi, a rapidly growing urban center, provides a suitable environment for the food trade, which is often conducted under unhealthy conditions. This situation underscores the need for improved waste management and health security practices among food vendors to protect public health.

Over the past decade, human activities, particularly food vending and lifestyle changes, have significantly increased waste generation. Annually, around 2.01 billion tonnes of solid waste are produced, but less than 20% is recycled (Akindele&Bilesanmi–Awoderu, 2021). Much of this waste end up in landfills, where it decays and attracts mosquitoes, flies, and other vectors. This situation has raised concerns about public waste management and the efforts of government and waste management agencies, especially regarding commercial waste. In Makurdi LGA, the Benue State Environmental Sanitation Authority (BENSESA) and private waste collectors gather waste from open dump sites and designated public collection points. Despite these efforts, waste management issues persist, particularly among food vendors, which this study aims to investigate. Poor waste management poses a threat to health security and the environment and can disrupt businesses like restaurants.

Several studies have examined waste management practices and their impact on public health. For example, Ezeudu, et. al., (2022) and Musa, et. al., (2023) investigated waste management in healthcare centers in Nigeria and Kaduna respectively and highlighted challenges such as insufficient funding, lack of awareness, inadequate training, ineffective legislature, and absence of data. Ohwoasa & Biose (2023) studied status of solid waste management practices in Sapele, Delta State, Nigeria, found a lack of proper guidelines, legislative support, Sapele people require health education, a consistent supply of garbage collection

facilities, and authorized final disposal locations. These will urge them to follow proper and suitable waste management methods.

However, these studies did not focus on food vendors or Makurdi LGA. This study is significant as it explores waste management practices among food vendors, the impact of poor waste management on health security, and ways to improve waste management and health security in Makurdi LGA and specifically examined waste management behaviour (WMB) adopted by food vendors and the effect of poor WMP on health security in Makurdi LGA

**Research Hypotheses**

From the foregone, the following hypothesis suffice:

**$H_0$:** Waste management practices do not differ across categories of food vendors in Makurdi LGA.

**$H_1$:** Waste management practices differ across categories of food vendors in Makurdi LGA.

## Literature

### Waste management practices (WMP) adopted by food vendors

Food vending is an industry that is prone to generating wastes randomly as they prepare, process and dispense food (consumable) products. Many cities and countries have put new laws into place to heavily tax companies that produce excess amounts of waste or create potentially harmful effects on the air and the ecosystem.

The Environmental Protection Agency [EPA] (2023) asserts that generated wastes must be managed through reuse, recycling, storage, treatment, energy recovery, and/or disposal or other releases to the environment. Most municipal solid wastes and hazardous wastes are managed in land disposal units. For hazardous and industrial wastes, land disposal includes landfills, surface impoundments, land treatment, land farming, and underground injection. To EPA (2023) approaches to waste management evolved primarily to health concerns and the need to control odours. In the past, waste often was deposited on land just outside developed areas. Land disposal created problems such as ground water contamination, methane gas formation and migration, and disease vector hazards (Allen-Taylor, 2023).

### Effect of poor WMP on health security among food vendors

Effects associated with waste management inefficiencies vary widely but are influenced by in-corrosive substances or chemicals found in waste and how they are managed. Although there is no direct/crystal link between effects in waste management and the defects/infirmities on human health and the environment. This is because improper/poor management of waste among food vendors may result to contaminated breeding grounds where vectors and other germs fest and potentially cause disease outbreaks in a given community (Allen-Taylor, 2023). Other effects have been outlined to include: degraded human/natural environment, hazardous secretion of unhealthy chemicals into atmosphere, among several others.

## Theory

Protection Motivation Theory (PMT), introduced by Richard W. Rogers in 1975, explains the factors driving risk prevention and protective behaviors (Rogers, 1983; Preissner, Kaushal, Charles, &Knauper, 2023). Rogers and Prentice-Dunn suggest that individuals' decisions to engage in protective behaviors are motivated by their desire to shield themselves from threats like natural disasters, climate change, and nuclear explosions (Rogers, 1983; Preissner et al., 2023). They argue that people weigh risks against potential benefits, making decisions based on risk appraisal and the effectiveness of coping strategies.

Scholars of PMT highlight 'threat appraisal' as a cognitive process where individuals assess the severity and likelihood of a threat. This involves evaluating the perceived severity of the threat and the perceived vulnerability to its impacts. A higher perception of severe vulnerability increases motivation for risk prevention, while lower perceived benefits from protective practices inhibit such behaviors. This process, known as threat and coping appraisal, influences individuals' motivation to engage in protective behaviors.

These theoretical assumptions are relevant to waste management practices, which aim to protect the environment and enhance public health. Food vendors in Makurdi LGA generate varying types of waste, and their management practices differ based on their perception of environmental and health risks. Vendors' threat appraisal and coping strategies, as outlined in PMT, influence their waste management behaviors. These assumptions can be applied to both personal and governmental efforts to ensure sustainable waste management practices that protect public health and the environment.

## Method

The cross-sectional survey research design and the multistage sampling procedure were adopted for this study. Using multistage sampling technique, as well as Salant and Dillman (1994) sample size determinator, a sample size was 333 while the estimated population of food vendors were 2352**.** Quantitative data were analysed using descriptive statistics. Percentage and frequency counts were used to describe and measure significance, while one way analysis of variance was used to test hypothesis.

# Results

**Table 1: Socio-Demographic Characteristics of Respondents**

| Variables | Frequency (N=326) | Percentage % |
|---|---|---|
| **Sex of Respondents** | | |
| Male | 68 | 20.9 |
| Female | 258 | 79.1 |
| **Age of Respondents** | | |
| Below 18 Yrs | 21 | 6.4 |
| 19 – 29 yrs | 124 | 38 |
| 30 – 40 yrs | 133 | 40.8 |
| 41 – 51 yrs | 33 | 10.2 |
| 52 yrs Above | 15 | 4.6 |
| **Education of Respondents** | | |
| No formal education | 75 | 23 |
| Formal | 222 | 68.1 |
| Vocational (Catering, baking) | 29 | 8.9 |
| **Categories of food vendors** | | |
| Unprocessed (Raw food items) | 76 | 23.3 |
| Processed (Cooked/prepared food) | 227 | 69.6 |
| Mixed (Both processed and unprocessed foods) | 23 | 7.1 |

The survey revealed that a significant majority of respondents were female (79.1%), highlighting a strong female presence in the food vending sector. The largest age group among respondents was 30-40 years (40.8%), indicating that middle-aged individuals are heavily involved in this industry. The presence of respondents below 18 years (6.4%) suggests potential child labor or family involvement in food vending. A notable portion of respondents (68.1%) had formal education, which could positively impact their knowledge of hygiene and food safety practices. However, 23% had no formal education, indicating a diverse mix of educational backgrounds within the industry.

Most respondents (69.6%) were engaged in selling processed food, which typically requires more stringent food handling and hygiene practices compared to unprocessed food. This predominance of processed food vendors suggests that the study's findings are more reflective of their practices and challenges. It also underscores the critical role these vendors play in ensuring public health security in Makurdi LGA, Benue State.

### Waste management practices (WMP) adopted by food vendors in Makurdi LGA

Analysis in this section emphasised findings on the waste management practices adopted by food vendors in Makurdi LGA of Benue State.

**Table 4: Waste management practices adopted by food vendorsinMakurdi LGA**

| Variable | Frequency (N = 326) | Percent % |
|---|---|---|
| **Do you know what waste management** | | |
| Yes | 155 | 47.5 |
| No | 51 | 15.6 |
| Not sure | 120 | 36.8 |
| **Do you have proper waste management facility in place** | | |
| Yes | 163 | 50.0 |
| No | 146 | 44.8 |
| Never | 11 | 3.4 |
| Not Sure | 6 | 1.8 |
| **How often do you dispose of your waste** | | |
| Twice a day | 133 | 40.8 |
| Once daily | 98 | 30.1 |
| Anytime | 15 | 4.6 |
| Twice a week | 13 | 4.0 |
| Weekly | 13 | 4.0 |
| Twice a month | 36 | 11.0 |
| Once a month | 10 | 3.1 |
| Once in two months | 8 | 2.4 |
| **Do you always separate your waste into different categories** | | |
| Always | 157 | 48.2 |
| Sometimes | 166 | 50.9 |
| Never | 3 | .9 |
| **Do you have access to recycling facilities** | | |
| Yes | 42 | 12.9 |
| No | 211 | 64.7 |
| Not sure | 73 | 22.4 |
| **What kind of waste management did you adopt** | | |
| **Open dumping** | | |
| Agree | 233 | 71.5 |
| Disagree | 88 | 27.0 |
| Not sure | 5 | 1.5 |
| **Burning/Incarceration** | | |
| Agree | 157 | 48.2 |
| Disagree | 166 | 50.9 |
| Not sure | 3 | .9 |
| **Burying** | | |
| Agree | 146 | 44.8 |
| Disagree | 180 | 55.2 |
| **Decomposing** | | |
| Agree | 85 | 26.1 |
| Disagree | 241 | 73.9 |
| **Landfill** | | |
| Agree | 57 | 17.5 |

A notable 36.8% of food vendors were uncertain about waste management practices, highlighting the need for better awareness and education. Over 40% of vendors lacked adequate waste management facilities, which can result in improper disposal and environmental contamination. Although most vendors dispose of waste daily, a significant portion does so less frequently, increasing the risk of pollution and health hazards. Additionally, the majority of vendors do not separate waste into different categories, which hampers recycling and proper disposal efforts. A large majority (71.5%) rely on open dumping, a method that can contaminate water sources and attract pests.

Findings from an informant aged 52 years old male coordinator who also was a health officer in BENSESA revealed that:

> *Waste management involves waste collection, and transportation and disposal of waste. We have collection facilities for waste management, the services of BENSESA remains as the Agency saddled with enforcement of sanitation laws, the agency provide waste bins, leather bags for food vendors but the menace of dumping waste indiscriminately still persists, we have tried but the poor mentality of the people has been a major challenge. However, the Benue State Government has partnered a private waste management company, NEBAT for improved sanitation through BENSESA and Benue State ministry of water resources and environment to improve the poor sanitary condition of the state. Our challenge in collecting and transporting solid waste in Makurdi and environs has been inadequacy of containers and collection vehicles, truck breakdowns, non-accessible roads and financial constraints from cost recovery challenges. Solid Waste Management should be the concern of everybody (KII/BENSESA Coordinator/Makurdi/2024).*

Another male key informant aged 45 years, supervisory member of BENSESA in Makurdi, had this to say:

> *Waste collection is s a very vigorous activity as it affects the health condition of the people positively, because, when waste is collected at the appropriate time, using the rightful tools, it reduces environmental health hazards that could have attract the bacteria. It helped to reduce bad odour that could have caused pollution to the people within the environment, the agency adopts stationary containers system for waste collection and waste containers, buckets, bins, remain at strategic points of waste generation for food vendors to dumped their waste, The attitude of food vendors towards waste management is unsanitary constitute nuisance. The financial challenges faced by the agency and Private waste Managers in procuring machines and equipment that will facilitate the collection and disposal of waste within Makurdi has cause poor service coverage(KII/BENSESA Supervisor/Makurdi/2024).*

From the above, waste collection if not properly done and at the appropriate time, can affect the health of the people.

The effect of poor WMP on health security in Makurdi LGA.

Analysis in this section focuses on effects of poor waste management practices on health security within Makurdi LGA.

**Table 7: Effects of poor WMP on health security**

| Effects | Frequency (N=326) | Percent % |
|---|---|---|
| Foodborne Illnesses | 103 | 31.6 |
| Water Contamination | 21 | 6.4 |
| Vector-Borne Diseases | 21 | 6.4 |
| Environmental Degradation | 73 | 22.4 |
| Air Pollution | 108 | 23.1 |

A significant portion of respondents (31.6%) believe that poor waste management can lead to foodborne illnesses, which is a major concern due to the range of health issues contaminated food can cause. Additionally, 6.4% of respondents identified water contamination as a health risk, noting that improper disposal of food waste can pollute water sources and increase the risk of waterborne diseases. Another 6.4% recognized the connection between poor waste management and vector-borne diseases, as improper waste disposal can create breeding grounds for mosquitoes, flies, and other disease-carrying insects.

Furthermore, 22.4% of respondents acknowledged the negative environmental impact of poor waste management, including air and water pollution. Air pollution, identified by 23.1% of respondents, is particularly associated with the burning of waste.

**The findings were corroborated from some key informants. Accordingly, a male managerial staff of the BENSESA aged 52stated that**

> *Improper waste disposal can lead to food contamination. Waste attracts pests like flies, rats, and cockroaches, which can spread diseases such as salmonella, E. coli, and cholera. Contaminated food can cause foodborne illnesses among consumers, posing a significant health risk (KII/BENSESA Coordinator/Makurdi/2024).*

Another female operational staff of BENSESA aged 48 years stated that:

> *Inadequate waste management can result in the release of harmful pollutants into the environment, affecting air and water quality. Burning waste releases toxic fumes, while improper disposal can contaminate groundwater sources. Poor air and water quality can lead to respiratory problems, skin infections, and other health issues among food vendors and nearby residents (KII/BENSESA Waste collector/Makurdi/2024)*

Another male operational staff of BENSESA aged 38 years stated that:

> *Accumulated waste provides breeding grounds for disease-carrying vectors such as mosquitoes and flies. These vectors can transmit diseases like malaria, dengue fever, and typhoid fever, posing a direct health threat to food vendors and their customers(KII/BENSESA Waste/Makurdi/2024).*

Another male operational staff aged 42 years stated that:

> *Effective waste management practices contribute to overall community health. By reducing the risk of disease transmission and environmental pollution, food vendors can help safeguard the health and well-being of their customers and the surrounding population.Food vendors who maintain clean and hygienic environments through proper waste management practices build trust and loyalty among customers. A positive reputation for food safety and hygiene can attract more customers and enhance business success (KII/BENSESAWaste collector/Makurdi/2024).*

These findings underscore the serious health and environmental consequences of inadequate waste management in the region. Implementing effective waste management strategies is crucial to mitigate these risks and protect public health.

## Test of Hypothesis

**The study proposed that:**

**$H_0$:** Waste management practices do not differ across categories of food vendors in Makurdi LGA

**$H_1$:** Waste management practices differ across categories of food vendors in Makurdi LGA

| Waste Management Practices | Variance Measure | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Do you have proper waste management facilities in place | Between Groups | 2.852 | 2 | 1.426 | 4.485 | **.012** |
| | Within Groups | 101.116 | 318 | .318 | | |
| How often do you dispose of your waste | Between Groups | 79.049 | 2 | 39.525 | 10.966 | **.000** |
| | Within Groups | 1153.422 | 320 | 3.604 | | |
| Do you separate your waste into different types | Between Groups | 41.916 | 2 | 20.958 | 8.787 | **.000** |
| | Within Groups | 770.428 | 323 | 2.385 | | |
| Do you have access to recycling facilities | Between Groups | 7.891 | 2 | 3.946 | 8.199 | **.000** |
| | Within Groups | 155.437 | 323 | .481 | | |

The table above presents the results from analysis of variance on waste management practices and how they differ across categories of food vendors in Makurdi LGA. *t*= (318,320 & 323), *p*< .05, *s*. with Probability (Sig.) values across all variables been $\leq$ .05, this result indicates that there is statistical significance on the variance between groups for all dependent variables. Implying that waste management practices differ between categories of food vendors in Makurdi LGA.

**Decision:**

Based on statistical inference from One-way ANOVA, the null hypothesis which stated that 'Waste management practices do not differ across categories of food vendors in Makurdi LGA.' was rejected, while considering the alternate hypothesis which states that 'Waste management practices differ across categories of food vendors in Makurdi LGA'.

**Discussion**

Findings on the methods of handling waste by food vendors in Makurdi LGA showed that, that government provided designated places to empty wastes, but not everywhere such facilities were required. Findings on the methods of waste collection methods by food vendors revealed that 34.0% (111) respondents used plastic bags, 29.1% (95) respondents used containers with covers, 10.1% (33) respondents used containers without covers while 26.7% (87) respondents reported that they dumped the waste on the ground. Methods of waste collection at the final disposal sites showed that 64.7% (211) respondents were of the view that there are closed trucks, 22.4% (73) respondents reported that there were pick-ups, open trucks, wheel barrows and hand carrying. Sanusi and Sarfo (2016), who found that even in Keta Lagoon in the Volta Region of Ghana, majority of households were dumping their refuse openly. The same findings were made by Ule (et al (2021) who also

found that, waste removal in Makurdi was done only once in a while, the implication is that, the removal of waste in Makurdi metropolis was poor, as it was done only quarterly. This finding is similar with the findings of Ogwueleka (2009), revealed that in Nigeria like most developing countries, wastes are commonly dumped in open dumps, uncontrolled landfills where a waste collection service is not organised. Dumps are located along or beside major roads. Ferronato& Torretta, (2019) Global Waste Statistics, (2022) also noted that refuse spreads into the road, blocking traffic and the wastes are burnt in the open on the side of the road. Open dumping of waste cannot be considered as a long-term environmental method of disposal.

The major challenges of waste management among food vendors were lack of designated areas of waste disposal, lack waste disposal facilities, poor policy implementation, no provision of appropriate public waste bin/collection too much cost of handling waste. The findings agree withEzeudu, et. al., (2022) and Musa,et. al., (2023) who observed that insufficient funding, lack of awareness, inadequate training, ineffective legislature and implementation of policy, and absence of dataconstituted a challenge for waste management.

This is because improper/poor management of waste among food vendors may result to contaminated breeding grounds where vectors and other germs fest and potentially cause disease outbreaks in a given community (Allen-Taylor, 2023). Other effects have been outlined to include: degraded human/natural environment, hazardous secretion of unhealthy chemicals into atmosphere, among several others.

## Conclusion

The findings of this study highlight the significant challenges associated with waste management practices among food vendors in Makurdi LGA, Benue Statewhile the government has provided designated waste disposal sites, these facilities are not available everywhere they are needed. Food vendors in Makurdi LGA use various methods for waste collection, with a significant number using plastic bags and containers with covers. However, a notable portion still dumps waste directly on the ground/roadside. At final disposal sites, most respondents reported the use of closed trucks, but others mentioned less effective methods like open trucks and hand carrying.

The study highlights that waste removal in Makurdi is infrequent, often done only quarterly, leading to poor waste management. This aligns with findings from other regions, such as Ghana and other parts of Nigeria, where open dumping and uncontrolled landfills are common. These practices result in environmental degradation, traffic blockages, and health hazards due to open burning of waste.

Major challenges identified include the lack of designated disposal areas, inadequate facilities, poor policy implementation, and high costs of waste handling. These issues are compounded by insufficient funding, lack of awareness, inadequate training, and ineffective legislation.

The prevalence of improper waste disposal methods among food vendors such as open dumping and burning can lead to breeding grounds for disease vectors, causing potential outbreaks and posing serious threats to public health and environmental sustainability. It also degrades the environment and releases harmful chemicals into the atmosphere.

**Recommendations**

The study therefore recommended that:

i. Benue State Environmental and Sanitation Agency (BENSESA) should embark on an all-inclusive and intensive public awareness campaign on proper waste management, disposal approaches and hygiene practices.
ii. Strictly enforcing regulations related to food safety and waste management to ensure compliance.
iii. The local and state government should provide modern waste management facilities via strategic distribution of waste bins, and enforce proper usage particularly among food vendors within the local government.
iv. Working with local authorities to develop and implement comprehensive waste management plans.

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