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Descriptive Study of Waste Generation and Management in the Joint Lecture Building State University of Malang

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Abstract

Background: *The State University of Malang has substantial potential for solid waste generation due to the high density of academic activities. Although general estimates of waste volume are available, detailed data on waste characteristics and composition within campus facilities remain limited. This study aims to quantify waste generation at the food courts of the A19 and A20 Joint Lecture Buildings, evaluate existing waste management practices, and assess the potential for recyclable waste utilization.* **Methodology:** *A quantitative descriptive approach was applied. Waste generation measurements were conducted in accordance with the Indonesian National Standard SNI 19-3964-1994 by analyzing waste production and composition over eight consecutive days. Average waste generation per seat, waste volume, and specific gravity were calculated, and waste materials were classified based on their characteristics and sources.* **Findings:** *The results indicate daily variations in waste generation, with average rates of 0.14 kg/seat/day at Food Court A19 and 0.07 kg/seat/day at Food Court A20. The dominant waste fractions were paper, plastic, and food waste, reflecting consumption patterns within the study area. Variations in waste volume were associated with fluctuations in academic activities and food service operations. Organic waste shows potential for eco-enzyme production and takakura composting, while paper and plastic waste may be managed through structured collection programs.* **Contribution:** *This study provides site-specific empirical data on waste generation rates and composition within a higher education campus, supporting data-driven improvements in campus-scale waste management strategies.*

Keywords: *State University of Malang; Waste Generation; Waste Management; Waste Types*

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INTRODUCTION

Human activities inherently generate residual materials, including solid waste. Waste is defined as discarded materials resulting from human or societal activities, and its management has become increasingly critical due to population growth and rising consumption patterns (Awino & Apitz, 2025). These dynamics have contributed to a continuous increase in daily waste generation (Febria et al., 2014). At the global level, this issue remains persistent, with UNEP 2024 projecting that waste generation could increase by up to 70% by 2050, accompanied by management costs estimated to reach USD 640 billion annually (Lenkiewicz, 2024).

Indonesia has experienced significant demographic expansion and shifts in consumption behavior, which have contributed to the continuous escalation of national solid waste generation. However, the development of waste management infrastructure has not kept pace with the increasing waste volume, resulting in systemic inefficiencies, particularly in urban environments (Arif et al., 2024; Labibah & Pulungan, 2025). This situation has made waste management a more complex challenge in various regions, including Malang City (Arif et al., 2024). Official records from the Malang City Environmental Agency reported an average daily waste generation of 731.29 tons in 2024, with 98.68 % processed through existing management mechanisms. Historical data indicate that household activities accounted for approximately ±660 tons/day in 2017, followed by waste originating from traditional markets and industrial operations (Widyaningsih & Herumurti, 2017). hese figures highlight the substantial contribution of anthropogenic activities to urban waste generation, including those associated with institutional and educational settings.

Higher education institutions represent a notable sector with considerable waste generation potential due to their high population density and continuous operational activities. According to the Central Statistics Agency of East Java Province, Malang City hosts 53 higher education institutions, comprising both public and private universities (BPS, 2025). Among these, the State University of Malang has experienced sustained growth in physical infrastructure and academic capacity. Institutional data from 2025 indicate a total academic population of 59,384 students, supported by 1,443 lecturers and 903 academic staff members (Universitas Negeri Malang, 2025). The scale and intensity of academic activities, combined with ongoing campus expansion, suggest a substantial contribution to regional solid waste generation.

The expansion of academic populations and facilities has been accompanied by a proportional increase in waste production. Increases in occupied space and diversification of activity-related waste sources have been identified as key drivers of waste escalation within institutional environments (Nabil & Muljaningsih, 2025; Veronica & Prajati, 2024). Sucahyo & Fanida (2021) emphasized that increased human activity significantly impacts the volume of waste produced. Although campus operations tend to follow relatively stable annual cycles, variations in student presence and institutional events can generate temporal fluctuations in waste generation (Smyth et al., 2010). Despite this, many universities rely on generalized estimations of waste volume, while detailed data regarding waste characteristics and material composition remain limited (Kahmeyer et al., 2011). This gap indicates a critical need

for systematic quantification and characterization of institutional waste to support evidence-based and sustainable waste management strategies.

This study aims to describe the waste generation in the food courts of the A19 and A20 Joint Lecture Buildings, waste management practices, and recycling potential at the State University of Malang. The study addresses the existing research gap regarding quantitative and compositional waste data in the university. The findings are expected to support the development of a data driven and contextually appropriate campus waste management system.

METHOD

Types of Research

This study adopted a quantitative research design employing descriptive statistical analysis to evaluate solid waste generation and composition within the State University of Malang. The analysis focused on waste generated at the food courts of the A19 and A20 Joint Lecture Buildings. Data processing involved the calculation of average waste generation per seat, waste volume, and specific gravity, as well as the classification of waste types based on their material characteristics and sources.

Location & Research Subjects/Objects

The research was conducted at two primary locations within the State University of Malang, namely the food courts located on the third floor of the A19 and A20 Joint Lecture Buildings. The research objects comprised solid waste generated from daily academic and food service activities involving students, lecturers, and staff. Additional contextual information was obtained through observations and interviews with cleaning personnel and facilities management staff responsible for waste handling within the study area. Waste sampling was conducted over eight consecutive days at designated collection points where waste was routinely accumulated in both food courts. These sampling locations are illustrated in Figure 1.

Sources and Data Collection Techniques

Data sources comprised primary and secondary data. Primary data were obtained through direct measurements of solid waste generation and unstructured interviews. Waste generation measurements were conducted in accordance with the Indonesian National Standard SNI 19-3964-1994 for the measurement and sampling of municipal solid waste (SNI, 1994). Sampling locations were selected using a purposive sampling approach based on criteria representing waste composition, material characteristics, and the intensity of academic activities. Sampling was conducted at the A19 and A20 Joint Lecture Buildings. Unstructured interviews were carried out with personnel responsible for waste management within the campus environment, including two cleaning staff members and one representative from the Facilities and Infrastructure Unit of the State University of Malang. Secondary data were obtained through a review of relevant literature related to waste generation and campus activities.

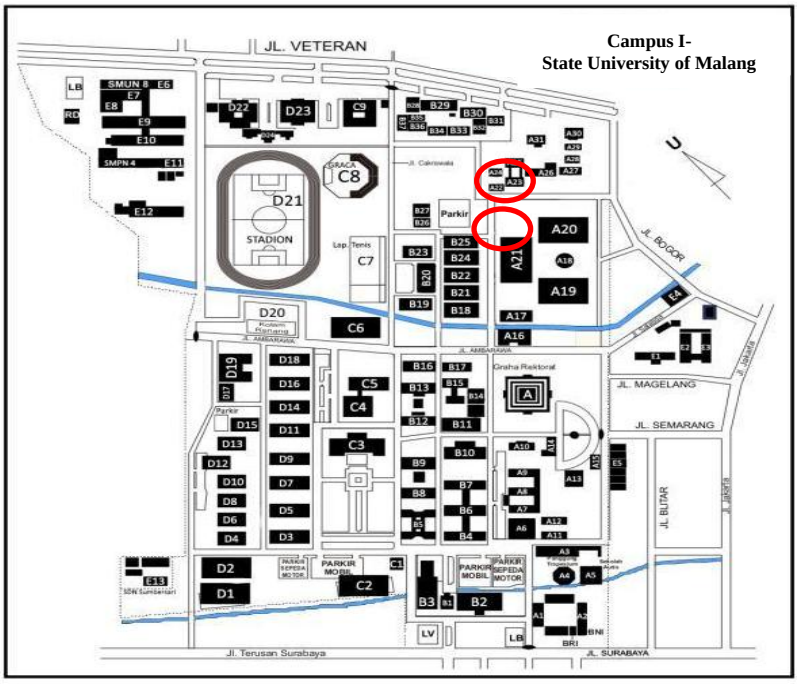

Figure 1. Sampling Location (on the Red sign)

Research Instruments

The instruments used in this study included a sampling container in the form of a 120 liter plastic bag (100 × 120 cm), a volume measurement box with a capacity of 0.017 m³ (36.5 × 24 × 19.5 cm), a 30 cm ruler, a WeiHeng 50 kg digital hanging scale, stationery, masks and gloves.

Data Collection Procedures

The data collection procedure begins by identifying the sampling locations and counting the number of seats in the Food Court areas (Joint Lecture Buildings A19 and A20). The research instruments are then prepared. The next step involves the collection and measurement of waste generation samples. This process includes distributing labeled plastic bags to waste sources one day prior to sampling, recording the number of units for each waste generator, and collecting the filled plastic bags. All collected bags are then transported for weighing and documentation of waste mass. Before measuring waste volume, the measuring box is calibrated. The waste is placed into the box, compacted, and the box is tapped three times on the ground to standardize density. The compacted waste volume is then measured and recorded, followed by weighing and documenting the waste mass. All stages of the procedure are documented as part of the research data.

Data Analysis Techniques

This study collects several types of data, including waste weight, volume, and generation rate, which are calculated using the following formulas:

$$\text{Weight of Waste} = \text{Final Weight} - \text{Initial Weight} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\text{Volume} = \text{Length x Width x Height} \quad \text{..... (2)}$$

$$\text{Waste Generation} = \frac{\text{Weight of Waste}}{\text{Number of Seats/Area Size}} \quad \text{..... (3)}$$

RESULT AND DISCUSSION

Universities represent environments with a high potential for daily solid waste generation due to the scale and intensity of academic and non-academic activities. Growth in campus populations, including students, academic staff, and administrative personnel, has been shown to correlate directly with increases in waste generation. Fluctuations in campus activity levels across academic calendars further contribute to temporal variations in waste production. Previous studies have reported waste generation rates ranging from 95 to 220 kg per day in educational and office environments, underscoring the role of higher education institutions as significant contributors to daily waste generation (Meilani et al., 2021), indicating that educational institutions are significant contributors to daily waste production.

Effective waste management within university settings is therefore essential, particularly in mitigating adverse environmental and social impacts associated with improper waste handling. Inadequate waste management practices may disrupt environmental aesthetics, generate unpleasant odors, and reduce user comfort, thereby potentially interfering with teaching and learning activities (Aprillia et al., 2019). At Universitas Negeri Malang, waste is broadly classified into two primary categories: organic (wet) and inorganic (dry) waste. This classification plays a critical role not only in quantifying waste generation but also in informing the design and implementation of structured and sustainable campus waste management systems.

Waste generation data collected at the food courts of the A19 and A20 Joint Lecture Buildings over an eight-day observation period are summarized in Tables 1 and 2. These data provide an empirical basis for evaluating spatial and temporal variations in waste generation within campus food service facilities and support further analysis of waste composition and management potential.

Table 1. Waste Generation Data of the Food Court at Joint Lecture Building A19

Days	Weight (Kg)	Volume (m^3)	Spesific Weight (Kg/m^3)	Waste Generation (Kg/seat)
1	5.53	0.06	100.45	0.13
2	4.82	0.09	56.71	0.11
3	3.50	0.06	58.74	0.08
4	6.09	0.10	59.71	0.14
5	7.93	0.13	62.16	0.18
6	6.48	0.11	58.60	0.15
7	6.29	0.10	61,67	0.14
8	7.10	0.12	59.66	0.16

Based on the data presented in Table 1, waste generation at the Food Court of the A19 Joint Lecture Building exhibited noticeable daily variability over the eight-day observation period. The average waste generation rate was recorded at 0.14 kg/seat/day, with values ranging from 0.08 to 0.18 kg/seat/day. The highest waste generation was observed on Day 5, while the lowest value occurred on Day 3. Variations in waste volume and specific weight indicate fluctuations in waste density, which may be associated with differences in daily food service activities and campus occupancy levels.

Table 2. Waste Generation Data of the Food Court at Joint Lecture Building A20

Days	Weight (Kg)	Volume (m^3)	Spesific Weight (Kg/m^3)	Waste Generation (Kg/seat)
1	1.60	0.02	106.67	0.03
2	2.84	0.05	55.69	0.06
3	3.33	0.05	65.20	0.07
4	0.14	0.02	8.24	0.00
5	5.54	0.09	59.25	0.11
6	4.98	0.09	58.53	0.10
7	5.62	0.09	60.11	0.11
8	1.95	0.03	57.35	0.04

As shown in Table 2, waste generation at the Food Court of the A20 Joint Lecture Building was generally lower than that observed at A19. The average waste generation rate was 0.07 kg/seat/day, with daily values ranging between 0.00 and 0.11 kg/seat/day. The lowest waste generation occurred on Day 4, indicating minimal food service activity on that day. Overall, the lower waste generation at A20 suggests differences in usage intensity, customer volume, or operational characteristics compared to A19.

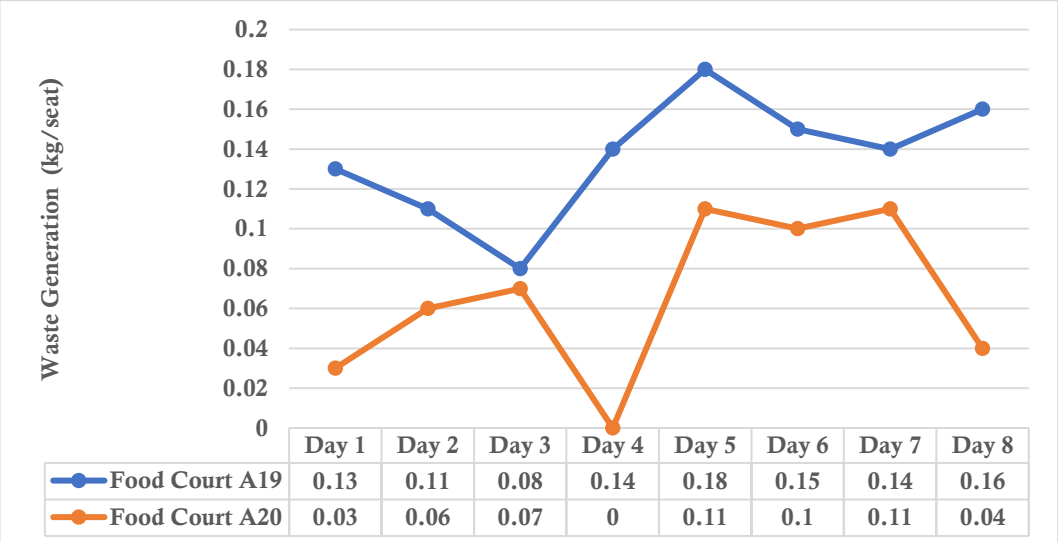

Figure 2. Line Chart of Waste Generation over 8 Days

Overall, waste generation data from both food courts demonstrate temporal fluctuations throughout the observation period. These variations influenced the total volume of waste generated and reflect differences in daily activity intensity across locations. A comparative overview of waste generation trends for both food courts is illustrated in Figure 2.

Figure 2 illustrates temporal variations in waste generation at the food courts of the A19 and A20 Joint Lecture Buildings over the eight-day observation period. Waste generation patterns indicate a strong association between activity intensity and the volume of waste produced, with higher academic and food service activity corresponding to increased waste generation. Overall, waste generation at Food Court A19 consistently exceeded that of A20, reflecting differences in usage intensity and operational characteristics between the two locations.

Observations at the Food Court of Joint Lecture Building A19 show that waste was generated every day. During the first to the third day of observation, Mid-Semester Examinations were taking place, resulting in relatively lower waste volume compared to days four to eight, when regular lectures resumed. The highest peak of waste generation occurred on day five, indicating an increase in activity and the number of students visiting the food court. A similar pattern was also observed at the Food Court of Joint Lecture Building A20, where the activities included lectures and Mid-Semester Examinations. However, a difference was noted on the fourth day, during which no waste was generated. This occurred because the building was used for a campus ceremonial event, the Professorship Inauguration Ceremony, causing regular academic activities to stop and reducing waste volume compared to other days.

The variation in measured waste volume demonstrates a clear relationship between activity levels and the amount of waste produced, where higher activity generates greater daily waste volume. Masrida (2017) states that the amount of waste produced varies daily depending on the activities taking place. The waste generated in the campus environment originates from the activities of lecturers, administrative staff, and students, with the food court being the highest contributor as it serves as the main consumption area for food and beverages. This aligns with global findings showing that the average waste generation per individual in higher education institutions is strongly influenced by the daily activities of the academic community, with the main waste composition consisting of organic waste, paper, and plastic (Guerreiro et al., 2024). Ishak et al., (2013) also emphasize that daily activities such as eating, mobility, and academic routines directly contribute to the volume of generated waste. Additionally, waste volume continues to increase in line with the growth of the population present and the intensity of activities conducted in the area (Nalhadi et al., 2020).

Type of Waste

Waste can be classified according to its sources and material characteristics, both of which determine appropriate management strategies. Based on source, waste is commonly categorized into household, industrial, agricultural, construction, and medical waste. From a material perspective, waste is typically classified into organic waste, inorganic waste, hazardous and toxic waste (B3), and radioactive waste. Organic waste consists of biodegradable materials such as food residues and garden

waste, which can be processed through composting or anaerobic digestion to produce compost or biogas (Khoso et al., 2025). In contrast, inorganic waste, including plastic and metal, is generally recyclable and plays a critical role in reducing environmental burdens when properly managed (Jayadi et al., 2022). Improperly managed hazardous and toxic waste (B3) can pollute the environment and pose health risks (Rizaldy, 2024). Hazardous and toxic waste (B3), if inadequately handled, poses significant risks to environmental and human health, underscoring the importance of specialized handling within circular economy–based waste management systems (Yuniar et al., 2024).

The types of waste generated at the Joint Lecture Building food court at State University of Malang are highly diverse. The characteristics and composition of waste vary significantly depending on campus activities (Helelo et al., 2019). Observations indicate that waste generated in campus food courts is dominated by organic waste, alongside substantial proportions of plastic and paper waste (Dewilda & Julianto, 2019). Based on observations, common types of waste include paper, plastic, and predominantly food waste. Food courts generate organic waste in nearly all activities (Brigita & Rahardyan, 2013). This waste falls into the category of household waste, consisting of kitchen waste generated during food preparation and leftovers from visitors. Understanding the types and characteristics of waste present in a particular area is essential for effective waste management, as it helps minimize environmental impacts while enhancing resource management efficiency.

Waste Management

Waste management at State University of Malang involves a process consisting of waste collection, transfer, and transportation using large waste bins. These bins are routinely transported twice a day, in the morning and afternoon. They are then taken by sanitation staff to a temporary disposal site located beside the Joint Lecture Building A20 using a waste truck. This procedure aligns with Pascawati et al., (2023b), who state that once waste enters the container, the next steps include collection, transportation, and transfer from its source to the Temporary Disposal Site. This process ensures that waste does not accumulate in one place, which could lead to environmental pollution. Improper waste management can negatively affect public health (Sukarmawati et al., 2023).

Waste management at State University of Malang relies on the use of several campus Temporary Disposal Sites located at designated points. The temporary disposal site used to accommodate waste from the food court of the Joint Lecture Building is located behind Building A19 and is equipped with a waste truck stationed in a walled but roofless area. Before being taken to the temporary disposal site, waste is placed in bins available around the food court area, totaling six bins. The temporary waste storage site must remain clean, covered, and emptied regularly. Temporary waste storage activities must follow the guidelines stated in SNI 3242:2008.

The waste bins used at State University of Malang include four labeled bins separating wet waste, cans and bottles, newspapers, and paper waste. This bin separation system aims to support recycling processes and improve waste management efficiency (Pascawati et al., 2023a). However, despite having separate bins, the waste becomes mixed once transferred to the temporary disposal site. Additionally, there are

two bins used for mixed waste, in which all types of waste both dry and wet are disposed of without labels or sorting. These mixed bins are provided due to the high volume of waste generated at the food court.

(a) **(b)**

Figure 3. Labeled and Separated Waste Disposal Bins (a) and Mixed Waste Disposal Bins (b)

The provision of designated plastic bottle disposal bins within the State University of Malang environment is a strategic effort to support sustainable waste management and enhance environmental awareness among students and staff. Public awareness has been proven to be a key factor in the success of waste management, and the availability of facilities such as segregated bins in strategic locations can significantly improve source level waste separation practices (Dewi et al., 2023; Safitri et al., 2025; Wahyudi & Sanusi, 2025). This initiative aims to facilitate waste sorting at the source. Easily accessible plastic bottle bins placed in strategic areas such as cafeterias, libraries, and other public spaces can encourage active participation from the entire campus community. When access to bins is convenient, active participation in separating and disposing of waste by type increases, thereby positively impacting the environment (Juliawan et al., 2023). Therefore, the provision of specialized bins, combined with education and environmental awareness campaigns, becomes an important strategy to promote sustainable waste management and support environmentally friendly behavior within the campus and the broader community (Hasibuan et al., 2024; Mamu et al., 2025).

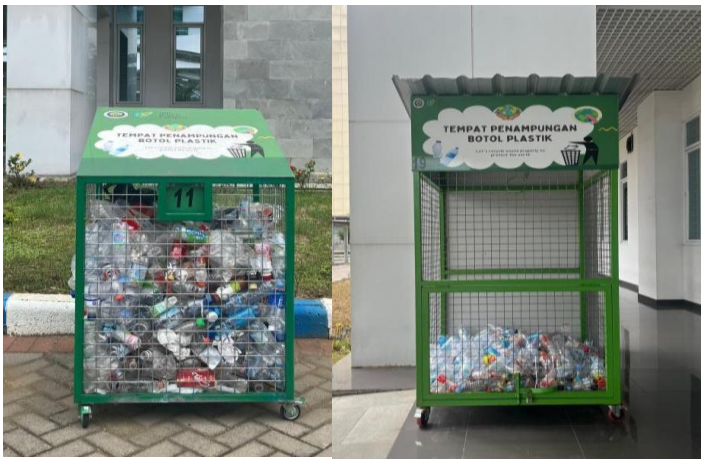

Figure 4. Designated Plastic Bottle Waste Disposal Bin

Proposed Waste Management

The increasing volume of waste has negative impacts on environmental health and socio-economic conditions (Indartik et al., 2018). Effective waste management is therefore necessary as an alternative strategy to minimize high waste generation and optimize waste handling at State University of Malang. Law No. 8 of 2008 on Waste Management defines waste management as a systematic, continuous, and comprehensive activity in waste reduction and handling. According to Malang City Regional Regulation No. 7 of 2021, Article 13, waste generators are required to limit waste generation, which can be achieved by creating a waste reduction plan or program. Article 14 also mandates that waste generators must recycle waste, either independently or in collaboration with other parties.

Effective waste management must consider the types of waste and apply sustainable strategies. Based on Government Regulation No. 81 of 2012, individuals and managers of public facilities are required to manage waste, including compaction, composting, and recycling. Another strategy for sustainable waste management involves implementing the 5R principles (Reduce, Reuse, Recycle, Replace, and Replant) as a comprehensive approach to minimize waste generation and extend the lifecycle of resources is another strategy for sustainable waste management, and its community-based implementation can reduce waste generation by approximately 40.83% (Kristianto & Rosariawari, 2022). Reduce aims to decrease the amount of waste at its source, reuse enables the reapplication of still-serviceable products or packaging, recycle supports the reprocessing of materials into new products, replace encourages the use of more environmentally friendly alternative materials, and replant (composting) provides a method for managing organic waste (Meiwinda et al., 2024).

To improve the waste management system at State University of Malang, the author proposes the first recommendation, namely the establishment of a special division responsible for calculating and monitoring waste generation, composition, and for following up on the allocation process of waste from the initial collection point to the temporary disposal site. In addition, efforts should be made to reuse waste that still has economic value through waste bank and waste donation programs. The waste bank program will focus on managing recyclable dry waste such as plastic bottles, cans, and paper. A waste bank is a collective dry waste management system in which residents or members of the academic community deposit sorted waste, which is then managed, recycled, or sold using a system similar to banking deposits (Rahmi et al., 2020; Rangkuty et al., 2024).

Through waste banks, waste that was previously considered worthless can be transformed into economically valuable resources or useful materials. This not only reduces the volume of waste sent to final disposal sites and lowers pollution, but also supports the circular economy (Atmanti & Rejekiningsih, 2024; Irfana et al., 2023; Rangkuty et al., 2024). Waste banks also serve as a medium for environmental education and awareness, encouraging the active participation of the community or students in sorting, collecting, and recycling waste, thereby fostering a culture of cleanliness and environmental responsibility (Hendrawan et al., 2023; Saputri et al., 2025; Yuliana, 2025). Waste banks have been successfully implemented at various universities, such as Universitas Pembangunan Panca Budi and Universitas Diponegoro (Rangkuty et al., 2024; Sumiyati et al., 2025). The effectiveness of waste

banks is reflected in their contribution to reducing waste volume sent to final disposal sites, fostering environmental awareness, and increasing active involvement of academic communities in recycling activities (Rahmi et al., 2020; Saputri et al., 2025), while also providing economic benefits for students. Therefore, waste banks represent an innovative solution that integrates environmental, economic, and social aspects in sustainable waste management.

The second program is the waste donation initiative, which aims to increase the awareness of State University of Malang residents, encouraging them to place wet waste into designated bins, so that it can be further processed in collaboration with campus partners or student activity units. This program repurposes wet waste such as fruit peels, vegetable scraps, and leftover food. Fruit peels and vegetable scraps can be processed into eco enzyme. Eco enzyme is a liquid produced from the fermentation of organic waste such as fruit peels or vegetable scraps, sugar (molasses or palm sugar), and water, fermented under anaerobic conditions for approximately 2–3 months (Fajri et al., 2022). This solution can be made using a 3:1:10 ratio of fruit peels, sugar, and water, and then stored in a closed container for the fermentation process (Langsa et al., 2024; Muslimaini et al., 2024). Eco enzyme offers various benefits aside from functioning as a liquid organic fertilizer, it can also serve as a natural cleanser, antiseptic, and alternative to household chemicals, making it useful for washing, mopping floors, cleaning campus facilities, and daily use (Hikma & Zamli, 2025; Komarudin et al., 2023; Sari & Basmantra, 2023). The use of eco enzyme can be part of a green campus program because it reduces the burden of organic waste while providing environmentally friendly cleaning agents or campus facility care products.

Meanwhile, leftover food waste can be reprocessed into fertilizer using the Takakura method. Takakura composting is an organic composting method that uses a porous basket (Takakura basket) along with mulch (fibers or fermentation media) to process household organic waste simply, quickly, and without unpleasant odors (Mappau & Islam, 2022; Nurita et al., 2023; Warjoto et al., 2018). This organic waste treatment method originated in Japan. It is used because the composter design allows it to be placed and operated indoors. Takakura is suitable for household or campus environments because it is space efficient, easy to implement, and effective in processing leftover food or organic waste from dormitories or canteens into compost that can be used as fertilizer or planting media (Aziz et al., 2024; Seme et al., 2025). Thus, producing eco enzyme and applying the takakura method on campus not only contributes to waste reduction but also encourages active participation in environmental conservation efforts.

CONCLUSION

This study demonstrates that waste generation at the food courts of the A19 and A20 Joint Lecture Buildings at the State University of Malang exhibits clear daily variability, with average generation rates of 0.14 kg/seat/day at Food Court A19 and 0.07 kg/seat/day at Food Court A20, reflecting differences in activity intensity and utilization patterns. The dominant waste fractions identified were organic waste, plastic, and paper, indicating that food consumption activities represent the primary source of waste generation within the campus environment. These findings highlight

significant opportunities for waste reduction and resource recovery, particularly through eco-enzyme production and takakura composting for organic waste, as well as structured segregation, collection, and donation programs for recyclable materials. As the first site-specific empirical assessment of waste generation and composition at the State University of Malang, this study addresses a critical data gap and provides a data-driven foundation for the development of context-specific waste management strategies and institutional policies aimed at improving sustainability performance in higher education environments.

REFERENCES

Aprillia, R., Teknik, J., Universitas, P., Lingkungan, T., Nahdlatul, U., & Kalimantan, U. (2019). Waste Management Strategy Through Analysis of Waste Generation and Characteristics at Nahdlatul Ulama University, West Kalimantan. *Jurnal Teknologi Lingkungan Lahan Basah*, *07*(02), 8–12. **[*In Indonesian language*]**

Arif, M., Sumarmi, Mutia, T., & Prasad, R. R. (2024). Pentahelix-based TPS3R Waste Management Model to Realise a Sustainable Malang City. *Jurnal Kajian, Penelitian Dan Pengembangan Pendidikan*, *12*(1), 610–623. https://doi.org/10.31764/geography.v12i1.22406 **[*In Indonesian language*]**

Atmanti, H. D., & Rejekiningsih, T. W. (2024). Making Value of Household Waste through Waste Bank. *Journal SINOMIC*, *3*(4), 1301–1314. https://doi.org/https://doi.org/10.54443/sj.v3i4.413

Awino, F. B., & Apitz, S. E. (2025). Solid waste management in the context of the waste hierarchy and circular economy frameworks : An international critical review. *Integrated Environmental Assessment and Management*, *20*(1), 9–35. https://doi.org/10.1002/ieam.4774

Aziz, R., Ruslinda, Y., Pratiwi, H. A., Rahmi, J., & Jonrinaldi. (2024). Comparison of Composting Method using Black Slodier Fly Larvae and Takakura Method on Compost Quality and Quantity. *Journal of Civil Engineering and Vocational Education*, *11*(1), 205–216. https://doi.org/https://doi.org/10.24036/cived.v11i1.511

BPS. (2025). *Number of Higher Education Institutions, Lecturers, and Students (Public and Private) under the Ministry of Higher Education, Science, and Technology by District/City in East Java Province, 2024*. Badan Pusat Statistik Provinsi Jawa Timur. https://jatim.bps.go.id/id/statistics. Accessed on 12 August 2025 **[*In Indonesian language*]**

Brigita, G., & Rahardyan, B. (2013). Food Waste Management Analysis in Bandung City. *Jurnal Teknik Lingkungan*, *19*(1), 34–45. https://doi.org/https://doi.org/10.5614/jtl.2013.19.1.4

Dewi, S. R., Nugraha, F. A., & Nasution, H. (2023). Raising Awareness of Environmental Hygiene and Health Through a Movement Promoting Discipline in Separating Organic and Non-Organic Waste. *Jurnal Pengabdian Masyarakat Indonesia (JPMI)*, *3*(5), 695–701. https://doi.org/https://doi.org/10.52436/1.jpmi.1701 **[*In Indonesian language*]**

Dewilda, Y., & Julianto, J. (2019).). Study of Waste Generation, Composition, and Recycling Potential as a Basis for Waste Management Planning in the Campus Area of Universitas Putra Indonesia (UPI). Proceeding of *Seminar Nasional Pembangunan Wilayah Dan Kota Berkelanjutan*, *1*(1), 142–151. https://doi.org/10.25105/pwkb.v1i1.5270 **[*In Indonesian language*]**

Fajri, I. A., Elvis, P. A., Fitri, S. R., Sari, D. P., & Karlinda, A. E. (2022). Learning About Processing Organic Waste into Eco Enzymes in the Tematik Village, Andalas Regency. *Communnity Development Journal*, *3*(2), 948–951. https://doi.org/https://doi.org/10.31004/cdj.v3i2.5131 **[*In Indonesian language*]**

Febria, S., Darmayanti, L., & Asmura, J. (2014). Study of Waste Generation and Composition as a Basis for Planning a Waste Management System at the Bina Widya Campus of the University of Riau. *JOM Fteknik, 1*(2), 1-11. **[*In Indonesian language*]**

Guerreiro, M. J. R., Torrijos, V., & Soto, M. (2024). A Review of Waste Management in Higher Education Institutions : The Road to Zero Waste and Sustainability. *Environments*, *11*(293), 1–24. https://doi.org/https://doi.org/10.3390/environments11120293

Hasibuan, N., Riski, A., Usman, A., Ritonga, T., & Rahman, T. (2024). Public Education Through Communication Campaigns in Increasing Recycling Participation. *Jurnal Pemberdayaan: Publikasi Hasil Pengabdian Kepada Masyarakat*, *8*(3), 144–149. https://doi.org/https://doi.org/10.12928/jpm.v8i3.11377

Helelo, A. B., Senbeta, A. F., & Anshebo, S. T. (2019). Assessment of Solid Waste Management (SWM) Practices in Hawassa University Campuses, Ethiopia. *J. Appl. Sci. Environ. Manage.*, *23*(6), 1081–1086. https://doi.org/https://dx.doi.org/10.4314/jasem.v23i6.13

Hendrawan, K. T., Qomariyah, U. N., & Atmojo, C. T. (2023). Strengthening Waste Bank in Campus "BaSCamp" as Environmental Conservation Learning Device at STKIP PGRI Jombang. *Gandrung: Jurnal Pengabdian Kepada Masyarakat*, *4*(2), 1200–1207. https://doi.org/https://doi.org/10.36526/gandrung.v4i2.2825

Hikma, N., & Zamli. (2025). Eco Enzyme, From Waste to Blessing: Emphasising that Kitchen Waste can be Something Valuable and Useful. *Jurnal Pengabdian Sosial*, *2*(11), 4706–4710. https://doi.org/https://doi.org/10.59837/fgy8ag89 **[*In Indonesian language*]**

Indartik., Suryandari, E. Y., Djaenudin, D., & Pribadi, M. A. (2018). Household Waste Management in Bandung City: Added Value and Economic Potential. *Jurnal Penelitian Sosial dan Ekonomi Kehutanan, 15*(3), 195–211. https://doi.org/10.20886/jpsek.2018.15.3.195-211

Irfana, T. B., Harjono, R. N., & Diana, T. B. (2023). Evaluation of Waste Bank Program : Transformative Impact on Community Welfare, Environment, and Economy. *Research Horizon*, *3*(5), 585–594. https://doi.org/10.54518/rh.3.5.2023.177

Ishak, N. R., Mahayuddin, S. A., & Mohamed, M. R. (2013). Generation and Composition of Solid Waste in University Campus. *Conference: Colloqium on Administrative Science & Technology*, 1–4.

Jayadi, Y. I., Malappiang, F., & Susanti, S. (2022). Inorganic Waste Recycling. *JPB: Jurnal Pengabdian Barelang*, *4*(1), 60–65. https://doi.org/10.33884/jpb.v4i1.4673 **[*In Indonesian language*]**

Juliawan, E., Purnamasari, I. A., & Jumardan, R. (2023). Raising Public Awareness of Cleanliness by Providing Waste Bins at Ayu Lestari Beach, Kolaka Regency, Southeast Sulawesi. *Jurnal Abdi Masyarakat Indonesia (JAMSI)*, *3*(4), 1111–1116. https://doi.org/https://doi.org/10.54082/jamsi.814 **[*In Indonesian language*]**

Kahmeyer, M., Miller, C., Neppel, K., Ronnebaum, C., Webber, J., & Zinke, B. (2011). *Waste Characterization Study for KSU Recycling*. Riyadh: King Saud University.

Khoso, A. R., Bhutto, S., & Suyuhan, W. (2025). Challenges and Opportunities in Solid Waste Management for Sustainability in District Hyderabad, Pakistan. *Sustainable Processes Connect*, *1*, 1–10. https://doi.org/10.69709/SusProc.2025.102931

Komarudin, A., Avivah, E., Pamungkas, N. P., & Fahda, A. (2023). Eco Enzyme: Efforts to Utilise Household Waste for the Health of the Pecangakan Village Community. *Jurnal Pengabdian Masyarakat Dan Keislaman*, *01*(01), 16–30. https://doi.org/10.62490/profetik.v1i01.341 **[*In Indonesian language*]**

Kristianto, A., & Rosariawari, F. (2022). Implementation of the Concept of Household Waste Management using the 5R Method (Reduce, Reuse, Recycle, Replace, and Replant) Based on the Community in the Kebraon Area of Surabaya City. *Envirous Teknik Lingkungan*, *2*(2), 63–69. https://doi.org/10.33005/envirous.v2i2.112 **[*In Indonesian language*]**

Labibah, L., & Pulungan, M. A. (2025). Evaluation of Waste Management Using Dynamic System Modelling in Ponorogo Regency. *Jurnal Al-Azhar Indonesia, 10*(1), 24–32. http://dx.doi.org/10.36722/sst.v10i1.3316 **[*In Indonesian language*]**

Langsa, T. A., Dhaifullah, M. D., Fatekhah, P. N., Nurjamilov, M. R., Sigit, P., & Sitogasa, A. (2024). Utilisation of Organic Fruit Peel Waste Through Eco Enzymes as a Sustainable Solution in Mlaja, Madura. *Jurnal Pengabdian Masyarakat (ENVIRONATION)*, *4*(1), 1–7. **[*In Indonesian language*]**

Lenkiewicz, Z. (2024). *Beyond an Age of Waste*. USA: Unites Nations Environment Programme.

Mamu, K. Z., Suaib, S. O., Junus, N., & Tunggati, M. T. (2025). Building Public Awareness in Household Waste Management. *Selaparang: Jurnal Pengabdian Masyarakat Berkemajuan*, *9*(4), 1–10. https://doi.org/10.31764/jpmb.v9i4.32599 **[*In Indonesian language*]**

Mappau, Z., & Islam, F. (2022). Training on Household Waste Management using the Takakura Composting Method. *Poltekita: Jurnal Pengabdian Masyarakat*, *3*(2),

258–267. https://doi.org/10.33860/pjpm.v3i2.1077 **[*In Indonesian language*]**

Masrida, R. (2017). Study of Waste Generation and Composition as a Basis for Waste Management at Campus II of Bhayangkara University, Jakarta. *Journal of Environmental Engineering and Waste Management*, *2*(2), 69–78. https://doi.org/10.33021/JENV.V2I2.221 **[*In Indonesian language*]**

Meilani, S. S., Masrida, R., Hasaya, H., & Navanti, D. (2021). Potential for Waste Recycling from the Bhayangkara University Campus in Greater Jakarta. *Radial: Jurnal Peradaban Sains, Rekayasa, Dan Teknologi*, *9*(1), 75–80. https://doi.org/10.37971/radial.v9i1.222 **[*In Indonesian language*]**

Meiwinda, E. R., Fadhli, M., Hasibuan, R., & Zikri, A. (2024). 5R-Based Waste Management (Reduce, Reuse, Recycle, Replace, Replant) as an Implementation of Civics Education at SD Negeri 137 Palembang. *Jurnal Dehasen Untuk Negeri*, *3*(2), 241–246. https://doi.org/https://doi.org/10.37676/jdun.v3i2.6434 **[*In Indonesian language*]**

Muslimaini, A., Apriani, E., Marlina, I., Sanni, J., & Syarmila. (2024). Processing Organic Waste into Eco Enzymes at the Household Level. *Jurnal Media Abdimas*, *3*(3), 6–12. https://doi.org/https://doi.org/10.37817/mediaabdimas.v3i3.3744 **[*In Indonesian language*]**

Nabil, M. H., & Muljaningsih, S. (2025). Analysis of the Effects of Demographic and Socioeconomic Factors on the Amount of Solid Waste Generation in Regencies and Cities in East Java During the 2019-2023 Period. *Journal of Development Economic and Social Studie*, *4*(4), 1-13.

Nalhadi, A., Syarifudin, Habibi, F., Fatah, A., & Supriyadi. (2020). Community Empowerment in the Utilisation of Household Waste into Liquid Organic Fertiliser. *Wikrama Parahita: Jurnal Pengabdian Masyarakat*, *4*(1), 43–46. https://doi.org/10.30656/jpmwp.v4i1.2134 **[*In Indonesian language*]**

Nurita, Islam, F., Akbar, F., & Mubarak, F. (2023). The Effectiveness of Takakura Composters and Simple Composters in Making Organic Waste Compost. *Jurnal Sanitas Profesional Indonesia*, *4*(1), 1–11. https://doi.org/10.33088/jspi.4.01.21-31 **[*In Indonesian language*]**

Pascawati, N. A., Lustiyati, E. D., Untari, J., & Ramadanti, D. P. (2023a). A Waste Analysis and Management Plan in Higher Education Institutions in Accordance with the Green Campus Concept (Case Study: Respati University Yogyakarta). *Higiene*, *9*(2), 50–63. https://doi.org/10.24252/higiene.v9i2.35459 **[*In Indonesian language*]**

Pascawati, N. A., Lustiyati, E. D., Untari, J., & Ramadanti, D. P. (2023b). Waste Management in Higher Education Institutions in Accordance with the Green Campus Concept (Case Study: Respati University Yogyakarta). *Dinamika Lingkungan Indonesia*, *10*(2), 70–81. https://doi.org/10.31258/dli.10.2.p.70-81 **[*In Indonesian language*]**

Rahmi, K., Taher, A., & Gadeng, A. N. (2020). Contribution of Syiah Kuala University Waste Bank to Waste Reduction on Campus. *Jurnal Pendidikan*

Geosfer, *5*(2), 1–6. https://doi.org/10.24815/jpg.v5i2.21538 **[*In Indonesian language*]**

Rangkuty, D. M., Saputra, M. I., Wardah, S., Pembangunan, U., & Budi, P. (2024). The Role Of Waste Bank and The Concept Of Green Economy at Universitas Pembangunan Panca Budi. *International Journal of Economics, Commerce, and Management*, *1*(3), 376–389. https://doi.org/10.62951/ijecm.v1i3.187

Rizaldy, A. (2024). Implications of the Use of Hazardous and Toxic Materials (B3) in Meeting Basic Household Needs on the Environment. *Jurnal Wilayah, Kota Dan Lingkungan Berkelanjutan*, *3*(1), 1–11. https://doi.org/10.58169/jwikal.v3i1.396 **[*In Indonesian language*]**

Safitri, A., Oktaviani, M., Saepurohman, E., & Nurpriatna, A. (2025). Socialisation of Waste Management and Provision of Waste Bins to Enhance Environmental Awareness. *Jurnal Pengabdian Dan Pemberdayaan*, *1*(1), 23–35. https://journal.stai-kharisma.ac.id/index.php/radjabhupati/article/view/211 **[*In Indonesian language*]**

Saputri, D. Y., Asrowi, Sukarmin, & Riyadi. (2025). An Analysis of Campus Waste Bank Management to Support Sustainable Development. *Social, Humanities, and Educational Studies*, *8*(1), 845–854. https://doi.org/10.20961/shes.v8i1.99869

Sari, T. P., & Basmantra, I. N. (2023). Utilization of Household Organic Waste to Become Eco Enzyme in Efforts to Empower the Economy of the Rejasa Village Community. *VIVABIO Jurnal Pengabdian Multidisiplin*, *5*(2), 78–83. https://doi.org/10.35799/vivabio.v5i2.46516. **[*In Indonesian language*]**

Seme, A. K., Antoh, A. B., Marasabessy, D., Way, J. R., & Kumune, R. R. (2025). Manufacture of Composters and Takakura for Processing Organic Waste. *Casuarina: Environmental Engineering Journal*, *2*(2), 79–84. https://doi.org/10.33506/ceej.v2i2.4348 **[*In Indonesian language*]**

Smyth, D. P., Fredeen, A. L., & Booth, A. L. (2010). Reducing solid waste in higher education: The first step towards 'greening'a university campus. *Resources, Conservation and Recycling*, *54*(11), 1007–1016. https://doi.org/10.1016/j.resconrec.2010.02.008

SNI. (1994). *Methods for Collecting and Measuring Samples of Urban Waste Generation and Composition*. Jakarta: Badan Standardisasi Nasional (BSN). **[*In Indonesian language*]**

Sucahyo, F. M., & Fanida, E. H. (2021). Innovation in Waste Management to Generate Electricity from Waste (PLTSa) by the Surabaya Sanitation and Green Open Space Agency (DKRTH) (Case Study at the Benowo Final Disposal Site (TPA) in Surabaya). *Publika*, *9*(2), 39–52. https://doi.org/10.26740/publika.v9n2.p39-52 **[*In Indonesian language*]**

Sukarmawati, Y., Murti, R. H. A., & Jawwad, M. A. S. (2023). The Impact of Open Dumping on Air Quality at the Gohong Final Waste Processing Site (TPA). *Envirotek: Jurnal Ilmiah Teknik Lingkungan*, *15*(1), 34–38. https://doi.org/10.33005/envirotek.v15i1.218 **[*In Indonesian language*]**

Sumiyati, S., Budiharjo, M. A., Sarminingsih, A., Ramadhan, B. S., Destiasari, A., Anwar, N. F., Imani, S. P., Salsa, E., Prasasty, G. A., Ramadhan, H. I., Firdausy, A. M., & Zayanah, F. N. (2025). Implementation of Waste Management through the Dipo Waste Bank Campus Waste Bank at Diponegoro University Towards a Green Campus. *Jurnal Ilmu Lingkungan*, *23*(2), 500–506. https://doi.org/10.14710/jil.23.2.500-506 **[*In Indonesian language*]**

Universitas Negeri Malang. (2025). *Statistics of Malang State University*. Universitas Negeri Malang. https://statistik.um.ac.id/

Veronica, M., & Prajati, G. (2024). Evaluation Existing Condition of Waste Generated Based on Population and Population Density in Batam City. *Journal of Green Engineering for Sustainability*, *2*(1), 16–21.

Wahyudi, I. L., & Sanusi, A. R. (2025). Provision of Waste Bins to Raise Awareness of Waste Sorting Among the Community of Dawuan Barat Village. *Abdima Jurnal Pengabdian Mahasiswa*, *3*(2), 1275–1286. https://journal.ubpkarawang.ac.id/index.php/AJPM/en/article/view/8581/5402 **[*In Indonesian language*]**

Warjoto, R. E., Canti, M., & Hartanti, A. T. (2018). The Takakura Composting Method for Processing Household Organic Waste in Cisauk, Tangerang. *Jurnal Perkotaan*, *10*(2), 76–90. https://doi.org/10.25170/perkotaan.v10i2.306 **[*In Indonesian language*]**

Widyaningsih, R. M., & Herumurti, W. (2017). Waste Generation and Reduction in Klojen District, Malang City. *Teknik ITS*, *6*(2), 468–473. https://doi.org/10.12962/j23373539.v6i2.24825 **[*In Indonesian language*]**

Yuliana. (2025). The Effectiveness of the Waste Bank Program on Clean and Healthy. *HealthSmart : Jurnal Kesehatan Masyarakat*, *1*(1), 37–51. https://doi.org/10.64146/xva2t804

Yuniar, D. A., Farhan, A., & Kamal, U. (2024). Corporate Responsibility: Analysis of Hazardous Waste Management Policy Based on Circular Economy Principles. *Jurnal Multidisiplin Ilmu Akademik*, *1*(3), 121–134. https://doi.org/10.61722/jmia.v1i3.1369 **[*In Indonesian language*]**

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