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Towards Sustainable Waste Management: Profiling the School Waste in Eastern Potia National High School

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ABSTRACT

The management of solid waste at rural schools is relatively overlooked, given its potential for environmental sustainability. In this study, Eastern Potia National High School, Alfonso Lista, Ifugao, Philippines, was monitored daily for 20 days. Using the Waste Analysis and Characterization Study (WACS) protocol, we assessed the volume, composition, generation rate, and density of waste from the waste sources within the school. The analyses showed that biodegradable waste with a predominantly food waste component was the highest at 71.82%, with the school canteen providing the greatest proportion. Recyclable and residual waste comprised 16.73% and 11.45%, respectively, with no special waste generated. The volume of waste, particularly, increased on special events such as exam days, Valentine's Day, and parent–teacher conferences, displaying the influence of school events on waste generation. Therefore, school-based interventions such as the implementation of composting, waste segregation, and integrating environmental education within school curricula are recommended. This research supports UN Sustainable Development Goal (SDG) 12 (Responsible Consumption and Production) by providing actionable information regarding context-based and activity-driven waste management in rural educational institutions.

INTRODUCTION

Solid waste, comprising trash, sludge, and refuse from various sources (Golwala et al. 2021), has become an important international issue because of its serious environmental, health, and economic impacts (Mahajan 2023). An estimated 2.01 billion metric tons of municipal solid waste (MSW) is generated globally annually, with approximately 33% of this amount not managed appropriately (Kaza et al. 2018). This is alarming and is expected to nearly double by 2050 to 3.8 billion metric tons (United Nations Environment Programme 2025), highlighting the seriousness of the need for sustainable and context-specific waste management systems.

This problem is especially noticeable in emerging economies, such as the Philippines. From 2012 to 2016, the average daily generation of solid waste increased from 37, 427.46 to 40, 087.45 metric tons (Mawis 2019). This problem is compounded by limited infrastructure, lack of public awareness, and poor implementation of environmental policies. Valenzuela et al. (2018) found that existing deficits in chemical waste management among learners and non-teaching personnel underscore the importance of more effective integration of environmental education into curricular programs.

Schools are microcosms of general waste management problems. Studies have recorded typical school waste items, such as food waste, plastics, paper, and organic waste, which are mainly handled improperly because of poor segregation and waste disposal facility systems (Chatira-Muchopa et al. 2019). Such poor management raises the risk of disease and environmental deterioration (Ampofo 2020). The problem is typically aggravated by the lack of fundamental facilities,

such as waste bins and functional material recovery facilities (MRFs) (Ugwu et al. 2020). Researchers have recommended holistic waste management systems— such as composting, recycling, and curriculum-based awareness programs—to effectively deal with these problems (Debrah et al. 2021).

Nonetheless, several educational organizations, particularly those in rural and under-resourced settings, continue to adhere to wasteful and inefficient waste disposal practices. Paper waste remains a problem in educational institutions (Goa & Sota 2017); hence, student-driven initiatives such as paper recycling (Noer & Wistara 2024) are important. In addition, poor waste profiling and characterization hinder the formulation of effective waste management programs, frequently leading to the improper treatment of toxic waste and increased environmental risk (Justin et al. 2018). As Niska & Serkkola (2018) pointed out, precise waste profiling is key to maximizing the efficiency of collections and recycling and to devising cost-efficient, sustainable systems.

Schools are important platforms for fostering environmental awareness by engaging children in experiential learning processes such as recycling and composting (Camarillo & Bellotindos 2021). However, rural schools are underrepresented in research, and many still have limited infrastructure, poor monitoring, and few waste education programs (Khandelwal & Choudhary 2024, Utami et al. 2024).

Eastern Potia National High School in Ifugao's Alfonso Lista is one such example of these systemic problems. The institution is facing haphazard waste disposal, poor segregation techniques, and underuse of its MRF because of the unavailability of proper equipment. Although programs like the "Recycled Parol" project have been undertaken, such programs have not been consistent and have not had lasting impacts. Unresolved concerns regarding waste segregation and dumping still pose a threat to the environment in schools. While some studies have examined waste generation and waste management in urban and well-resourced schools, there is a lack of information about daily trends in waste generation in rural public high schools, particularly during seasons when activity intensity varies. Understanding how examination days, holidays, or meeting days influence waste generation would inform more context-dependent waste interventions. In addition, the research supports the Republic Act 9003 (Ecological Solid Waste Management Act of 2000) and the United Nations' Sustainable Development Goal 12, which promotes a culture of responsible consumption and production in institutions.

This study contributes to the literature on school-based SWM in rural areas and can serve as a model for other institutions seeking to develop evidence-based, locally appropriate waste management systems. More broadly, this study evaluated the 20-day trend in daily waste generation at Eastern Potia National High School and determined the generation rate, percent composition, volume of generated waste, and bulk density.

MATERIALS AND METHODS

This study followed a descriptive research design and used a waste analysis and characterization (WACS) approach, as utilized by Ngohayon & Tulagan (2022a).

Data collection was conducted in Eastern Potia National High School, where the campus areas were categorized based on EcoGov (2011) (as cited by Ngohayon & Tulagan 2022b) waste generator categories. These categories were modified based on the context of the school and included the following: (1) institutional waste sources comprising classrooms, office spaces, laboratories, and meeting rooms-areas of teaching, administration, and amenities for minor food consumption, and (2) commercial waste sources, including food service areas such as canteens where food is prepared, eaten, and cleaned up, as presented in Table 1.

Fig. 1 shows the areas of the generators on the school campus. Each building was provided with different trash bins for all types of waste.

A standard procedure for waste collection, modified from Diaz & Warith (2005), was applied for one month, excluding weekends and holidays; thus, a total of 20 days were considered. Waste bins were labeled as biodegradable, recyclable, residual, and special wastes and were provided in strategic campus locations, including classrooms, office spaces, the cafeteria, and common areas. Waste was weighed daily using an electronic balance to calculate the generation rates on an average daily basis. Waste composition was analyzed by segregating waste into biodegradable, recyclable, residual, and special categories by weight and

Table 1: Categories of waste generators.

Waste Generators	Category	Daily People*
Grade 7 Classroom	Institutional	68
Grade 8 Classroom	Institutional	63
Grade 9 Classroom	Institutional	71
Grade 10 Classroom	Institutional	71
Administration Building	Institutional	6
Faculty Room	Institutional	23
Canteen	Commercial	7
Total		309

*Population based on the school population of the Department of Education (2025).

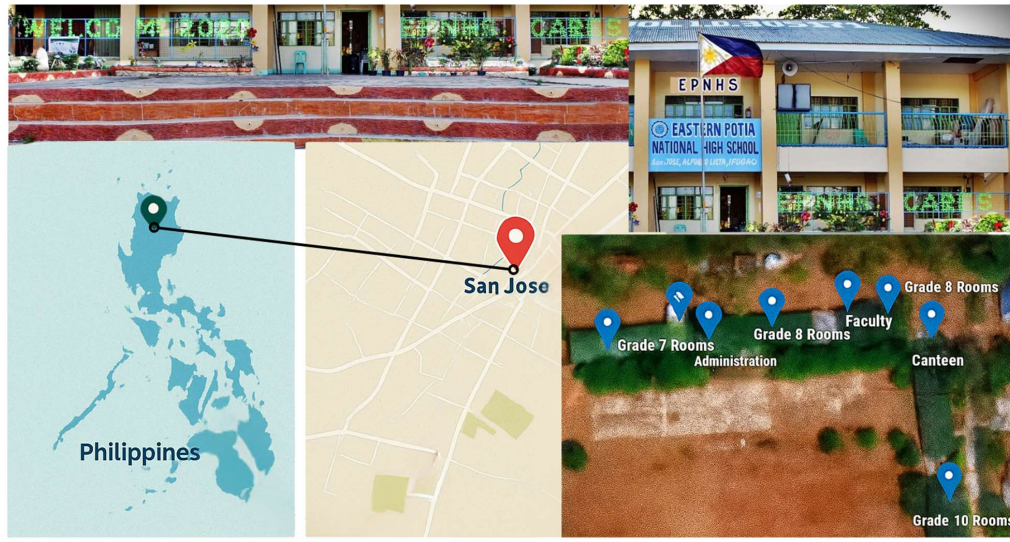

Fig. 1: Locations of different waste generators.

percentage. Bulk density was determined by compacting each type of waste into a container of a known volume and weighing its contents.

The generation rate was calculated using the formula provided by Kawai and Tasaki (2015):

Generation Rate = (Total Mass of SW)/(Number of Units per sample) …(1)

The gravimetric composition of each waste type was calculated using the following formula provided by Miguel et al. (2016):

% type of mass = (Mass of Type of Waste)/(Total Mass of SW) ×100 …(2)

The bulk density was calculated using the formula provided by Palanivel & Sulaiman (2014):

Bulk Density = (Total Mass of SW)/(Bulk Volume of SW) …(3)

Data were collected over 20 days to account for variations in school activities (such as exams, school fairs, or extracurricular events) that might have influenced waste generation. The one-month waste quantification sampling spanned different parts of the grading period to capture variations in daily routines.

RESULTS AND DISCUSSION

Percent Composition of the Generated Waste

Table 2 shows that the predominant waste in Eastern Potia National High School (EPNHS) is biodegradable (71.82%). Food waste is the most dominant at 48.87%, and

Table 2: Percentage of generated waste at Eastern Potia National High School.

	Biodegradable Waste [%]				Recyclable Waste [%]			Residual Waste [%]	Special Waste [%]
	Used Papers	Paper Containers	Food Waste	Soiled Paper	Plastic Cups	Plastic Bottles	Plastic Cutleries	Plastic Wrappers	
Canteen	0.00	9.96	44.74	0.11	0.67	1.11	0.30	5.15	0.00
Administration Building	0.67	0.08	0.00	0.24	0.00	0.24	0.00	0.13	0.00
Faculty Room	0.49	0.54	0.34	0.36	0.50	0.58	0.01	0.96	0.00
Grade 7 Classroom	0.09	1.28	1.32	1.55	0.83	1.90	0.00	1.52	0.00
Grade 8 Classroom	0.02	1.13	1.23	1.56	0.58	1.86	0.00	1.45	0.00
Grade 9 Classroom	0.04	1.06	0.72	1.62	0.57	2.37	0.03	1.01	0.00
Grade 10 Classroom	0.12	0.86	0.52	1.17	0.16	5.01	0.02	1.24	0.00
Total	1.43	14.91	48.87	6.61	3.31	13.07	0.36	11.45	0.00
Grand Total				71.82			16.73	11.45	0.00

Table 3: Volume of waste generated by Eastern Potia National High School.

	Biodegradable Waste [m^3]	Recyclable Waste [m^3]	Residual Waste [m^3]	Special Waste [m^3]
Canteen	0.70	0.79	0.37	0.00
Administration Building	0.07	0.02	0.01	0.00
Faculty Room	0.12	0.08	0.09	0.00
Grade 7 Classroom	0.35	0.31	0.10	0.00
Grade 8 Classroom	0.27	0.25	0.33	0.00
Grade 9 Classroom	0.25	0.39	0.11	0.00
Grade 10 Classroom	0.21	0.42	0.10	0.00
Total	1.97	2.25	1.10	0.00

its source was identified as the canteen because of everyday food preparation and food service. Used paper and paper containers are also included in the same category and were found in classrooms and offices due to regular academic and administrative practices. Recyclables accounted for 16.73%, and plastic bottles (13.07%) and plastic wrappers (11.45%) were the largest subcategories. Residual waste accounted for 11.45%, consisting of non-recyclable packaging material. No special waste was collected during the study period.

The dominance of biodegradable waste, especially food waste, corresponds to that observed in rural Philippine schools, where packaged meals and catering services predominate breakfast through dinner consumption (Latugan et al. 2024, Sağlam & Aydın 2024). However, this level of food wastage here (48.87%) exceeds that of several urban public high schools, which usually vary from 35% to 45% (Kasavan et al. 2020), indicative of structural inefficiencies within meal services and insufficient food recovery practices. This is due to the observed oversupply and large serving portions that do not reflect the variability of students' appetites, lack of food redistribution programs, and use of perishable meal types without corresponding storage. Hence, this problem requires careful canteen planning guidelines for meals, variable portions, and collaborations for food recovery.

The composition of waste also indicates behavioral impacts. Increased recyclable waste from Grades 9 and 10 study spaces implies higher consumption of commercially packaged foods among mature students, driven by more purchasing freedom and a preference for convenience foods. This is consistent with Alfitri et al. (2020), who state that consumption patterns according to age coincide with high single-use plastic consumption. The inclusion of special awareness programs for high-grade students, in addition to prohibitions of specific types of packaging within campus facilities, can help prevent such amounts.

Residual waste, although proportionally smaller (11.45%), is mostly non-recyclable snack food packaging from both canteen sales and surrounding shops. As residuals must be disposed of in a landfill, moderate quantities create environmental and logistical problems. From the bulk density figures computed during this study, residuals are relatively high-density, involving less bin volume but long-term landfill storage, compared to organics. From a strategic perspective, this would mean that sending low-density, high-biodegradable waste fractions to composting would lessen bin capacity and reduce collection frequency, and adopting a procurement policy that minimizes products that generate residuals.

The absence of special waste, while positive from a health and safety standpoint, also reflects the limited scope of laboratory activities and hazardous material use in this rural school setting. This contrasts with urban science-focused institutions, where laboratory chemicals and e-waste constitute a measurable fraction of the total waste (Valenzuela et al. 2018).

Volume of Generated Wastes

The volume of waste generated at ENHS was categorized as biodegradable, recyclable, residual, and special waste, as shown in Table 3. Most of the biodegradable waste was generated by the canteen (0.70 m^3), followed by Grade 7 (0.35 m^3) and Grade 8 (0.27 m^3). For recyclable waste, the canteen generated a volume of 0.79 m^3, followed by Grade 10 (0.42 m^3) and Grade 9 (0.39 m^3). The overall volume of residual waste for all areas was 1.10 m^3, with the majority being generated by the canteen (0.37 m^3). Special waste was not generated at any of the locations assessed (0.00 m^3). Overall, 1.97 m^3 of biodegradable waste, 2.25 m^3 of recyclable waste, and 1.10 m^3 of residual waste were generated by the school.

Recyclables comprised the highest total volumetric quantity (2.25 m^3), primarily light but large packaging, such as PET bottles, cartons, and snack pouches. These were abundant across academic and food service zones, indicative of a broad single-use packaging dependency. The highest levels of recyclables were observed in higher-grade classrooms (Grades 9–10), where likely purchasing decisions are greater, packaged beverage and snack consumption

is higher, and activities involving print media modules or project work are integrated within the curriculum (Cosma et al. 2021). Canteen sales also constituted a high amount, with most beverages and snack foods being packaged in recyclable packaging. A high volumetric representation of recyclables against their comparatively low weights is a typical property of packaging materials, such as PET bottles and snack pouches. The volumetric difference indicates the need for high-capacity bins to contain this material despite its relatively low mass. Studies similar to this one within schools in Malaysia have reported similar observations. For example, Kasavan et al. (2020) reported that PET bottles and cartons were highly visible in volumetric terms and contributed negligibly to the total mass, pointing to the need for special collection and compaction arrangements.

Biodegradable waste (1.97 m³) was the second-highest volume category and created different management issues. Its higher water content, odor, and quick decomposition nature mean that it needs to be collected more frequently, especially from food preparation zones. This category was mainly generated from the canteen, with supplementary inputs from kitchen food scraps, fruit rinds, and classroom compostable papers. This echoes the study by García-Herrero et al. (2021), who reported that institutional food preparation facilities commonly have organic refuse as the central focus of collection schedules. Evidence from Antón-Peset et al. (2021) indicates that specific didactic measures, in this case, student-initiated monitoring of food wastage, can decrease by 30% and boost pro-environmental behaviors.

Although residual waste is the smallest fraction by volume (1.10 m³), it represents a persistent issue, consisting mainly of multilayer snack packaging that is neither recyclable nor compostable. These materials, destined for landfill disposal, highlight the limitations of current segregation practices and the need for procurement policies that favor alternative packaging. The absence of special waste is consistent with the school's limited use of hazardous materials, aligning with national observations that such waste streams are negligible in non-laboratory-intensive public secondary schools (DENR 2021).

Generation Rate of the Generated Wastes

Table 4 shows the daily waste generation rate at Eastern Potia National High School, classified into biodegradable, recyclable, residual, and special waste in different buildings. The data indicate that most of the school's waste output consists of biodegradable waste, weighing 31.99 kg per day. The canteen is the source of biodegradable waste with the highest generation rate of 30.47 kg per day. This is because of food preparation waste, kitchen trash, and leftovers, making the canteen the highest contributor to the waste generation profile of the school. In addition, although the canteen has only seven staff, most of the consumers are students, faculty, and staff who generate waste in the canteen area. This is supported by Supangkat & Herdiansyah (2020), who state that the population directly affects waste generation; thus, more consumers generate more waste. Moreover, other buildings, such as the admin office, faculty room, and classrooms, contribute relatively small volumes to the biodegradable waste stream.

The total amount of recyclable waste produced by the school was 2.32 kg per day. Among the classrooms, the highest amount of recyclable waste was recorded by the Grade 10 class, which was 0.25 kg per day. This is interesting considering that the Grade 9 class also had a student population of 71 but generated slightly less recyclable waste (0.14 kg per day), indicating differences in classroom materials used in the activities. This was attributed to the projects given to the Grade 10 students, who thus produced more recyclable waste, such as plastics. The high student populations in Grades 7 to 10 (63 to 71 students per day) accounted for the consistent production of recyclables from paper and plastic consumption. The combined student population of the faculty room and the administration building (six and 23 individuals per day, respectively) accounted for lower but proportional levels of recyclable waste.

Table 4: Generation rate of waste at Eastern Potia National High School.

	Biodegradable Waste [kg. day^{-1}.building^{-1})	Recyclable Waste (kg. day^{-1}.building^{-1})	Residual Waste [kg.day^{-1}. building^{-1})	Special Waste [kg.day^{-1}. building^{-1}]
Canteen	30.47	1.37	2.23	0.00
Administration Building	0.55	0.14	0.07	0.00
Faculty Room	0.25	0.18	0.13	0.00
Grade 7 Classroom	0.21	0.14	0.06	0.00
Grade 8 Classroom	0.21	0.12	0.06	0.00
Grade 9 Classroom	0.17	0.14	0.04	0.00
Grade 10 Classroom	0.13	0.25	0.04	0.00
Total	31.99	2.32	2.63	0.00

Table 5: Bulk densities of the waste generated by Eastern Potia National High School.

	Biodegradable Waste [kg.m^{-3}]	Recyclable Waste [kg.m^{-3}]	Residual Waste [kg.m^{-3}]	Special Waste [kg.m^{-3}]
Canteen	30.47	38.24	62.82	0.00
Administration Building	290.65	9.57	5.81	0.00
Faculty Room	45.52	40.33	30.03	0.00
Grade 7 Classroom	74.55	31.84	56.28	0.00
Grade 8 Classroom	73.99	33.1	37.18	0.00
Grade 9 Classroom	55.25	34.35	26.03	0.00
Grade 10 Classroom	49.89	47.17	39.58	0.00
Total	637.33	234.6	257.73	0.00

Residual waste in the school totals 2.63 kg per day. The canteen was again the main source, with a yield of 2.23 kg per day, because of packaging material, disposable, and non-recyclable waste related to food services. The comparatively low waste generated in classrooms and offices is consistent with their functional purpose and the size of the population.

Furthermore, the data show zero generation of special waste in all buildings. The non-existence of special waste is a result of the minimal utilization of hazardous chemicals or materials that would generate special waste; hence, no such waste was generated during the 20-day profiling period. Moreover, damaged electronics were reported to the property custodian for proper government clearance; thus, they were not disposed of at the school level.

Bulk Density of the Generated Wastes

Table 5 presents the bulk densities of the waste collected at Eastern Potia National High School in terms of kilograms per cubic meter (kg.m^{-3}). The bulk density indicates the compactness or volume occupied by waste and how often waste is collected, the storage space it will require, and the costs associated with its disposal.

The canteen, although responsible for the greatest weight of generated waste, has the lowest bulk densities of biodegradables (30.47 kg.m^{-3}) and recyclables (38.24 kg.m^{-3}), and a relatively intermediate bulk density for residual waste (62.82 kg.m^{-3}). This is characteristic of waste generated by food products, which are voluminous but light because they are organic and contain a high amount of water, and have air trapped in the food waste. This is supported by Zhu et al. (2020), who reported that food waste has a low bulk density when compared with other types of waste. However, the low bulk density implies that regardless of the canteen generating a high weight of waste, it takes up much space and must be collected frequently to avoid spillage and toxic gases (Zhang et al. 2020).

Conversely, the admin building has an unusually high bulk density for biodegradable waste (290.65 kg.m^{-3}), despite minimal daily waste generation by weight. This implies that the waste generated here consists of denser and more compact waste, possibly comprising paper waste, craft trimmings, or heavier organic waste instead of normal food waste. Although paper waste is common in schools, it can be an opportunity for the circular economy (Adeniyi et al. 2023). The low bulk densities of the recyclable (9.57 kg.m^{-3}) and residual waste (5.81 kg.m^{-3}) in the admin building also imply that they are generated in minimal amounts and are possibly light materials, such as shredded paper or soft plastics.

Classrooms have different bulk densities. Grade 7 and 8 had higher biodegradable densities of 74.55 and 73.99 kg.m^{-3}, respectively, and the highest recyclable waste density of 47.17 kg.m^{-3} by Grade 10. The comparatively high bulk densities in classrooms imply that waste materials, such as used paper, containers, and packaging waste, are packed more tightly and have less volume; hence, they are easier to store before disposal. Residual waste densities in classrooms varied from 26.03 to 56.28 kg.m^{-3}, as their composition may vary depending on different activities, classes, or segregation practices. The total bulk densities across the school revealed that biodegradable waste had the highest density (637.33 kg.m^{-3}), followed by residual waste (257.73 kg.m^{-3}) and recyclables (234.6 kg.m^{-3}). This pattern emphasizes that, while biodegradable waste dominates in terms of volume and weight, residual and recyclable wastes are also significant and relatively dense, thus requiring proper storage and management. Similarly, Dahlawi and Sharkawy (2021) found that higher educational institutions in Saudi Arabia had more recyclable waste, such as paper and plastics, that require proper management.

Daily Volume and Generation Rate

Fig. 2 and Fig. 3 show the profiled volume and rate of waste generation over 20 days, indicating the trends in waste accumulation within various sectors in schools. Fig. 2

indicates the volume of generated waste, the peaks of which occur on days 4, 8–11, and 18, whereas Fig. 3 indicates the rate at which waste is generated daily and how rapidly waste builds up during activities or on special occasions.

In the initial five days, the volume and generation rate were moderately high, probably because teachers were preparing administrative papers, including the filing of SALN (Statement of Assets, Liabilities, and Net Worth), exam printing, and other papers. These five days reflected peak office activity, and consequently, more papers were consumed, with administrative offices such as Bio_Admin and Rec_Admin leading in paper usage. However, on days 5 and 6, which were examination days, the generation rate decreased, as shown in Fig. 3. The decreased rate indicated less movement by students and minimal canteen usage during examination days, which are usually characterized by silence and discipline, reducing consumption and socializing.

In contrast, Days 8 and 9 show observable peaks in both volume and waste generation rate, probably due to pre-Valentine's Day shopping. Student activities, including gift purchases, class decoration, parties, and sharing of food, are prevalent during this period, resulting in a peak in packaging material, plastics, and food waste. Such a buildup reflects the intensity of activities even before the formal Valentine's Day celebration on Day 10 (February 14, 2025). Significantly, although Day 10 registers a peak in the rate, it is slightly

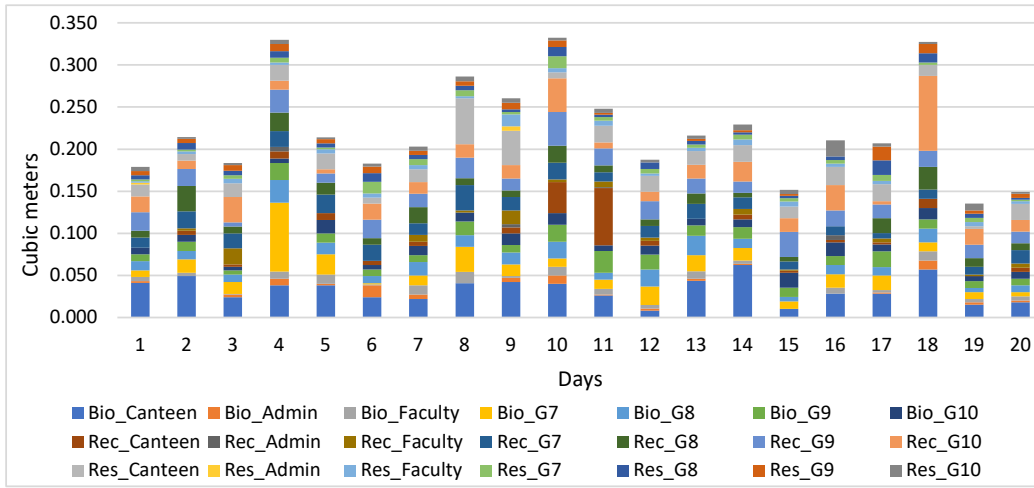

Fig. 2: Profiled volume of waste generated over 20 days.

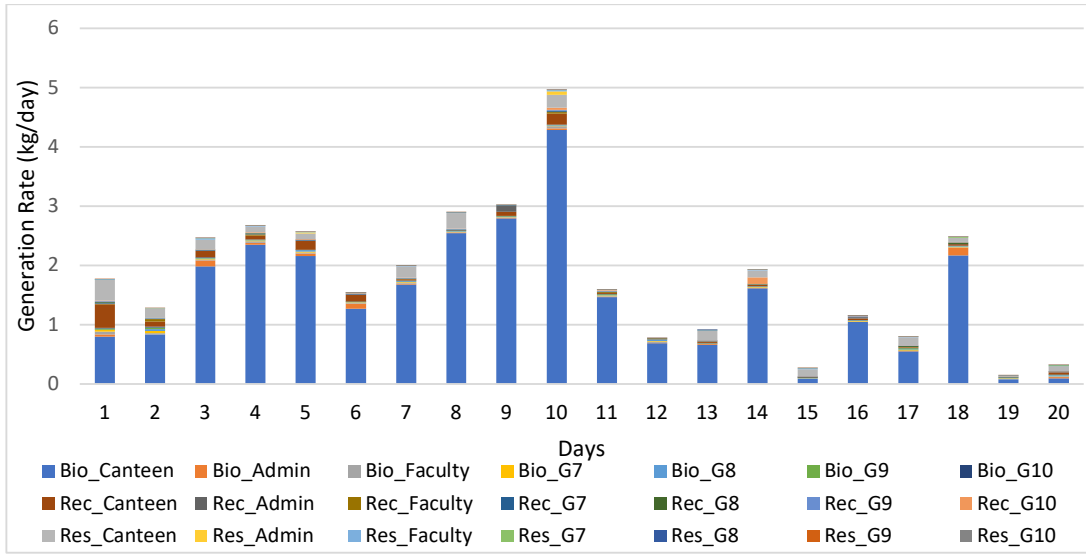

Fig. 3: Profiled waste generation rate for 20 days.

lower in volume than Days 8 and 9. This may indicate that although the volume of total waste was not at a peak, it was produced intensively in a short time frame, perhaps from confined events or class parties.

Between days 1 and 14, the school community is involved in preparing athletes for the provincial meet, and this is contributing towards a consistent stream of waste from areas around the canteen because of heightened consumption of food. Figures on day 13 also rise, arguably for a culmination event or a period of intensified training. Day 18 also registers a high figure for waste, coinciding with the PTA meeting, with guests included, materials such as printed programs or handouts, and catering services, which result in greater waste output and rate. Both the volume and rate of generation typically fall off by day 14, suggesting a return to normal scholarly activity with reduced participation in extracurricular or outside activities.

These results indicate strong event or occasion dependency in the generation of waste. Administrative work, sports training, celebrations by students, and institutional gatherings have a strong bearing on the volume and rapidity of waste generation. These imply the need for pre-planning waste management, wherein resources, such as bins, waste segregation facilities, and staff, are pre-adjusted according to the school calendar. Promoting digital processes, waste-free celebrations, and eco-friendly event culture may also reduce peak waste generation, particularly on the identified peak activity days.

The students' behavior, volume, bulk density, and composition of waste exhibit a relationship through observed patterns within the EPNHS. Large volumes of lightweight recyclables, such as PET bottles and snack packs, reflect a culture of convenience-oriented consumption, particularly among upper-grade students who consume ready-to-consume beverages and packaged snacks. This consumption inflates the volumetric share of recyclables without correspondingly contributing to the overall waste mass, as validated by their low bulk density values. Conversely, the canteen's dominance in biodegradable waste is a function of both the high moisture content and the food service model, where generous portions, limited leftovers management, and the absence of food-sharing policies lead to heavy, odorous organic waste streams. Bulk density data further show that certain categories of waste need to be collected more frequently to avoid odor and pest problems, while voluminous, lightweight recyclables necessitate larger-capacity storage bins or compaction units despite their relatively low mass. By correlating these observations with school calendar schedules and observed peaks of behavior, for example, the school can better optimize bin size, bin locations, and collection frequency, minimizing eventual overflow incidents and enhancing waste diversion effectiveness.

CONCLUSIONS

This study demonstrates that while Eastern Potia National High School has a relatively effective segregation practice, the present waste management system is disproportionately troubled by canteen-generated biodegradable waste and the volumetric dominance of lightweight recyclables. These patterns are closely tied to behavioral factors such as the consumption of packaged snacks and beverages among upper-grade students and the absence of food waste reduction strategies in food service areas, as well as structural factors such as inadequate storage for bulky recyclables and insufficient collection frequency for dense, odorous organics.

To address these challenges, schools should implement targeted waste reduction and diversion measures that go beyond basic segregation. For biodegradable waste, portion control policies, leftover redistribution, and composting initiatives could substantially reduce daily organic loads while providing educational value. For recyclables, investing in compaction equipment or expanding bin capacity could improve storage efficiency, particularly during the high-activity periods identified in the school calendar. Residual waste reduction will require procurement policies that favor recyclable or compostable packaging and discourage multilayer plastics.

More generally, behavior-change communication would be strengthened through integration with operational planning, for example, by matching collection schedules with peak event-driven waste. Collaborations with recycling businesses or local government units would further diversify off-site disposal alternatives. By intermingling data-driven operational changes with community outreach, the EPNHS can develop a model of waste handling that is both environmentally responsive and enhances the learning environment.

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