

Urban Solid Waste Sorting in a Growing City of Ghana

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Abstract

Waste sorting is an important process in recycling and safe disposal of waste materials. Challenges and factors affecting urban solid waste sorting in the Metropolitan City of Tamale-Ghana were determined. 84.5% respondents had formal education with 73.7% of this percentage having no knowledge on solid waste sorting. Waste is disposed of in a mixed form and not sorted. Skip containers (58.80%), dustbins (22.47%), door-to-door service (10.57%) and pit system (8.2%) were the disposal methods. In URAs, 30.3% sorted waste at the point of generation compared to 21.4% in PRAs and 17.2% in TCM. Out of the total interviewed, 65.05% were willing to sort waste provided the facilities are available. Provision of different skip containers for URA and CM regarding different waste collection was said to be feasible in waste sorting. Waste collection and transportation logistics were few resulting in limited coverage and irregular collection services. Direct payment was not made for waste disposal. Education and provision of enough and different waste collection containers is important if waste sorting is to be undertaken.

Keywords: *Waste, Sorting, Urban, Disposal, Solid*

1. Introduction

According to Wikipedia, waste sorting is the process by which waste is separated into different elements. Waste sorting can occur manually at the household and collected through kerbside collection schemes, or automatically separated in materials recovery facilities or mechanical biological treatment systems.

In every aspect of human life, several unwanted materials (newspapers, broken bottles, aluminum cans, flower trimmings, etc) are generated. These materials are discarded simply because they are considered waste to that effect. The total stream of waste generated within a community is often categorised into municipal waste, industrial waste, constructional and demolition waste (CTMA, 2004).

In Africa, Municipal Solid Waste Management constitutes one of the most crucial health and environmental problems facing governments of

African cities (Achankeng, 2003). This is because, even though these cities are using 20-50% of their budget in solid waste management, only 20-80% of the waste is collected. The uncollected or illegally dumped wastes constitute a disaster for human health and environmental degradation (Achankeng, 2003). The amounts of waste generated also vary within countries, according to the income group from which it originates. The high and middle income groups in many countries have adopted Westernised consumption patterns. The richer the citizens, the more waste is generated, as the case of Accra-Ghana, high income groups generate 0.6kg/capita/day, middle income groups, 0.4 kg/capita/day and low-income groups 0.3 kg/capita/day (Lardinois *et al.*, 1995).

Waste management occupies a vital place in the economies of both developed and developing countries. Urbanisation in Ghana has made the management of solid waste very crucial in the

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areas of public health and environment, especially in the capital cities, since these areas serve as the gateways to the country for foreign investors and tourists. Poor form of these cities can deter foreign investors (IRIN, 2004).

Most of the cities in Ghana practise the open dump system of waste disposal, which is in a more or less uncontrolled manner, Tamale Metropolis is no exception. Since the system is not highly engineered, it poses numerous challenges to both public health and the environment.

Sorting and recycling of waste have numerous benefits and is also environmentally friendly compared to the other methods of waste disposal. Sorting and separation of Municipal Solid Waste is gaining importance in various sectors. According to Henry *et al.* (2005), with the increasing cost of raw materials, recycling provides a cheaper source of raw materials for manufacturing industries.

Challenges to solid waste sorting in Tamale Metropolis of Ghana by examining the methods of solid waste management, as well as attitudes and resources available for solid waste management formed this study.

2. Materials and Methods

Study Area

Tamale is a commercial city in Northern Ghana. It is located within the Guinea Savannah and characterized by sparse vegetation. It is the capital of Northern Region of Ghana with an estimated population of 537,986 (as of 2012). Tamale lies between latitude 9° 15' and 9° 05' N and longitude 0° 45' and 1° 0' W at an altitude of 185 m above sea level.

The city is said to have developed and transformed very fast within the last few years and is reputed to be the fastest growing city in West Africa.

Types and Sources of Data

Both primary and secondary data were used in conducting the study. The primary data was obtained mainly from the administration of questionnaires and observation, while the secondary data were obtained from the Tamale Metropolitan Assembly, Ghana Statistical Service, Zoomlion Ghana Limited and Digital Cleaners,

which are waste collection organisations in the Metropolis.

Sampling Procedure and Data Collection

Both purposive and simple random sampling techniques were used in data collection. Four key areas in the Metropolis were purposively selected for the study. They were grouped into Planned Residential Area (PRA) – NORRIP/VRA bungalows, Unplanned Residential Area (URA) – Sabonjida Community, the Tamale Central Market (TCM) and Waste Collection Organisation (WCO). Educational level was also used in the categorisation of the respondents so as to see the effect of education level on waste sorting in the Metropolis.

Simple random sampling techniques was used to administer thirty (30) questionnaires to each of the groups except the Waste Collection Organisation to which three (3) questionnaires were administered.

Data Analysis

The data was analysed using the Statistical Package for the Social Sciences (SPSS) version 16. Statistical results were presented in graphs, simple statistics and pictorially.

3. Results and Discussions

Educational Status of Respondents

The survey generally revealed that out of the ninety (90) respondents interviewed, 6.7% have had basic education, 42.2% attained secondary level of education and 35.6% had tertiary level of education while 15.5% constituted those with no formal education.

Specifically, educational status of the respondents at the unplanned area was 43.3% for secondary education, 23.4% had no formal education, 30% had tertiary level education and 3.3% had basic level education.

The traders in the Central Market recorded the highest level in secondary education (53.4%) whilst 23.3% have had tertiary education. Respondents with no formal education and the basic education were 13.3% and 10% respectively.

Respondents in the Planned Residential Area recorded 63.3% for tertiary level education whilst

36.7% had secondary education. The educational level of respondents is as presented in Figure 1.

Solid Waste Collection and Disposal systems at the Household Level

The disposal of household solid waste is one of the essential elements in management of waste in the Metropolis. Generally, it was established that skip

containers (58.80%) and dustbins (22.47%) were the most widely used methods of waste disposal. The skip containers were common in low class residential areas such as the Unplanned Residential community whilst the dustbins were mostly used in the Planned Residential Areas. Door-to-door service (10.57%) was also common among the Planned Residential Areas.

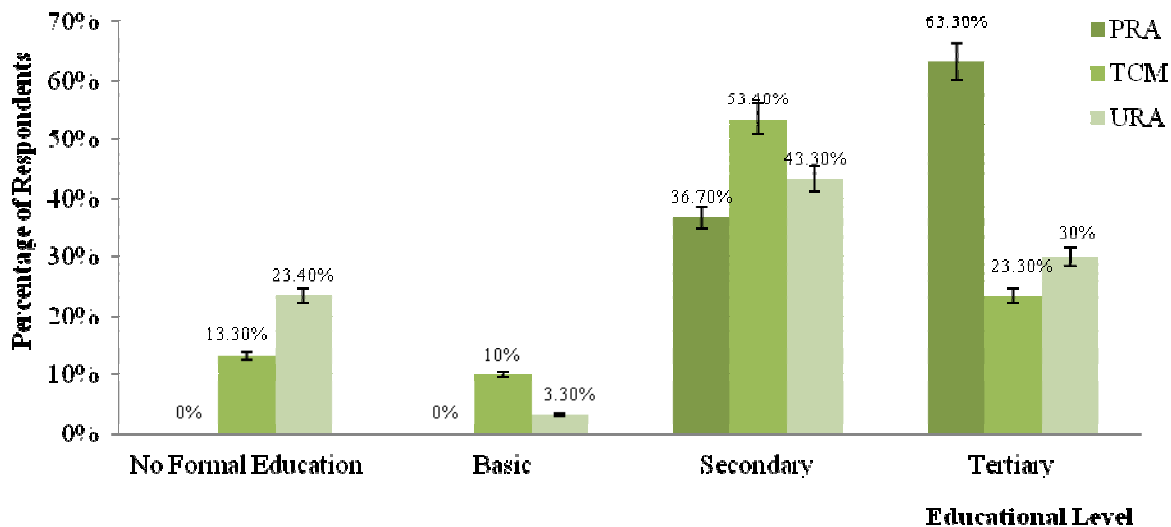


Figure 1: Educational Level of Respondents

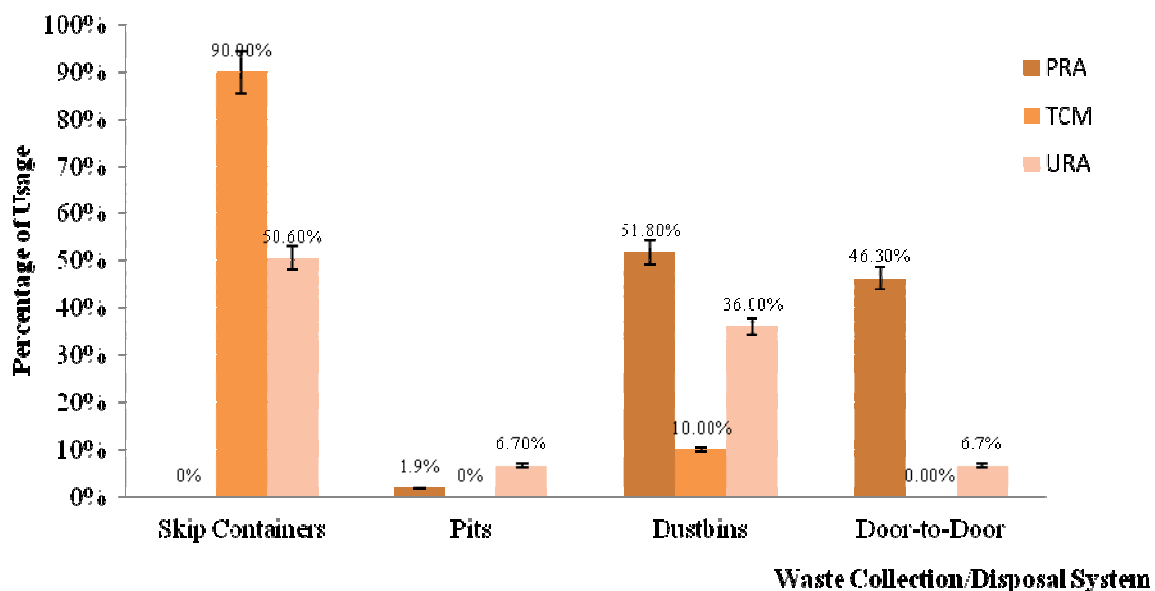


Figure 2: Waste Collection/Disposal Systems and Level of Usage

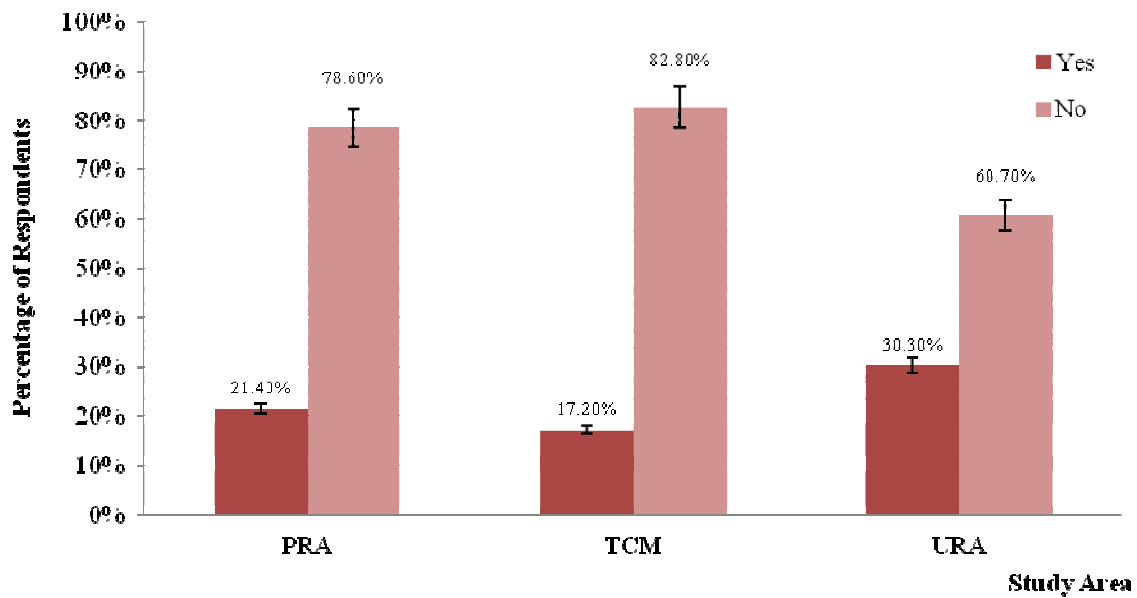


Figure 3: Level of Solid Waste Sorting in Tamale Metropolis

The least was the pit system which constituted 8.2% and it was used in both the Planned and Unplanned Residential Areas. Pit systems are mostly associated with burning of the waste which generates toxic fumes into the environment. According to Wiernaah (2007), burning is not environmentally friendly since it may release carbon dioxide and methane which are major contributors to global warming.

Figure 2 indicates the level of usage of the various waste collection and disposal systems in the Metropolis. The high usage of the skip containers at the market signifies that the level of solid waste sorting will be minimal since the skip containers were designed purposely for the collection of mixed waste. The use of the skip containers was also high among the URAs indicating wide usage as a communal waste collection system. At the PRA, skip containers were not being used whilst the pit disposal system had a very low usage (1.9%). The pit and door-to-door system were not used at the market. It is clear that due to the limited space in the market area, the use of the pit system and door-to-door service were not being practised.

Solid Waste Sorting in the Metropolis

The waste management organisations in the Metropolis do not collect sorted waste and this was said not to be their prime aim. At the household level, waste sorting was practised but not with the

aim of having a sorted waste for recycling or reuse. It was done mainly when the waste involved is hazardous and also when sharp objects like broken bottles are involved. Putrefying materials were also sorted during waste disposal to prevent unwanted obnoxious smells.

The private informal sector such as waste scavengers and itinerant waste buyers in urban solid waste management also took active part in solid waste sorting, however they were not recognised. These categorise sorted waste with the main aim of selling to the recycling units especially when metallic containers are available. Reusable containers like bottles and sometimes plastics which are also sorted by these groups are common at the landfill site. There were no designed programmes to build their capacities in waste sorting. The types of solid waste sorted include: metals, plastics, cardboards and food residues.

Figure 3 illustrates that 30.3% of the people sorted waste at the point of generation at the URAs as compared to 21.4% in the PRAs and 17.2% of the respondents in the TCM. The low level of waste sorting in the study area could emanate from the fact that the WCOs in the Metropolis do not collect sorted waste. It was therefore not a pre-requisite for the collection and disposal of solid waste in the Metropolis.

The results of the study indicates clearly that educational level or status did not have any effect on the sorting of waste.

Awareness of Solid Waste Sorting

In a rapidly growing city like Tamale, issues of Municipal Solid Waste Management are of major importance. The increase in Municipal Solid Waste generation is said to be rapid as this has a direct relation with urbanisation and population growth. Urbanisation is much associated with affluence and also diversity in food product consumption. The collection and safe disposal of waste material is therefore very important if a clean and human friendly environment is to be kept.

Even though from the survey, 84.5% of the respondents have had formal education this does not necessarily translate into those with knowledge on solid waste sorting. The results indicate that 73.7% of the respondents do not know about solid waste sorting.

According to UNEP (2005), an accurate knowledge of the quantity and composition of the waste input is essential to the success of a resource

recovery undertaking or a knowledge of several other properties of solid waste are also required for proper planning, designing, and operation of waste management programmes.

Specifically, CM had 93.3%, URA recorded 80% and the PRA 47.8% representing respondents who did not have knowledge on the sorting of solid waste material at the household level.

The high percentage recorded at the CM and URA indicates waste collection organisations were indifferent in the form waste is collected and therefore education on the sorting of solid waste has not been undertaken.

For the residents of PRA, it can be deduced that the high level of awareness (52.2%) on solid waste sorting is likely to have been a result of a greater proportion of them having been educated outside the country and specifically in countries where solid waste sorting is being practised.

The awareness and or knowledge level of respondents regarding solid waste sorting is presented graphically in Figure 4.

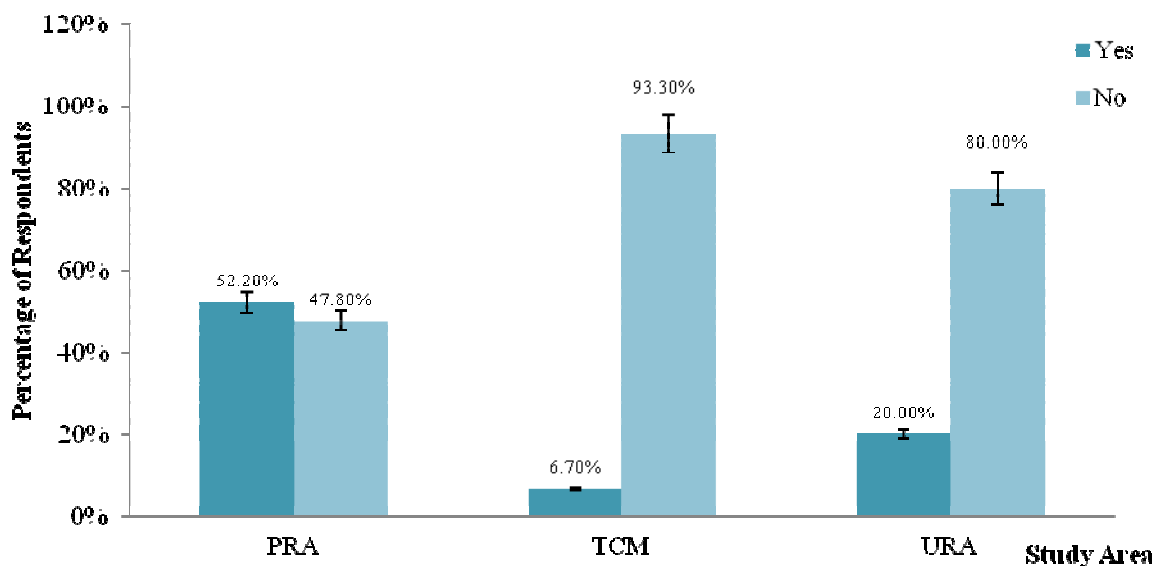


Figure 4: Knowledge Level on Solid Waste Sorting

Willingness to Sort Waste

According to UNEP (2005), local residents' preferences for particular types of waste service, their willingness to source separate recyclable materials, their willingness to pay for the service, and their capacity to move waste to communal collection points, all have an impact on the overall waste system. Incentives can therefore affect residents' preferences and behaviour.



Plate 1: Sorted Metal Containers
at Gbalahi Landfill

Out of the total respondents interviewed, 65.05% were willing to sort their waste provided the necessary facilities were made available. The provision of especially different skip containers for the URA and CM areas coupled with education on solid waste sorting was indicated to yield good results if implemented.

Also, for respondents in these areas, benefits of solid waste sorting include;

- Employment for individuals who engaged in recycling of especially aluminium cans and materials into cooking utensils,
- Feed for livestock from the organic waste particularly during the lean season,
- Users of door-to-door services also emphasised that waste generated when sorted will allow them to sell, especially to waste scavengers, the metals and plastics and will make some savings and,
- Due to the sale of metals and plastics to waste scavengers, the quantity of waste for collection by waste collection organisations and the cost of disposal will be reduced.

On the contrary, solid waste sorting was said to;

- Consume the time of the waste sorters and thus discourages its practise,
- Have no direct use for households,
- Be expensive because of the cost element in the purchasing of the different waste collection containers and,
- Require space in households for the waste collection containers which is also to be a major constraint.

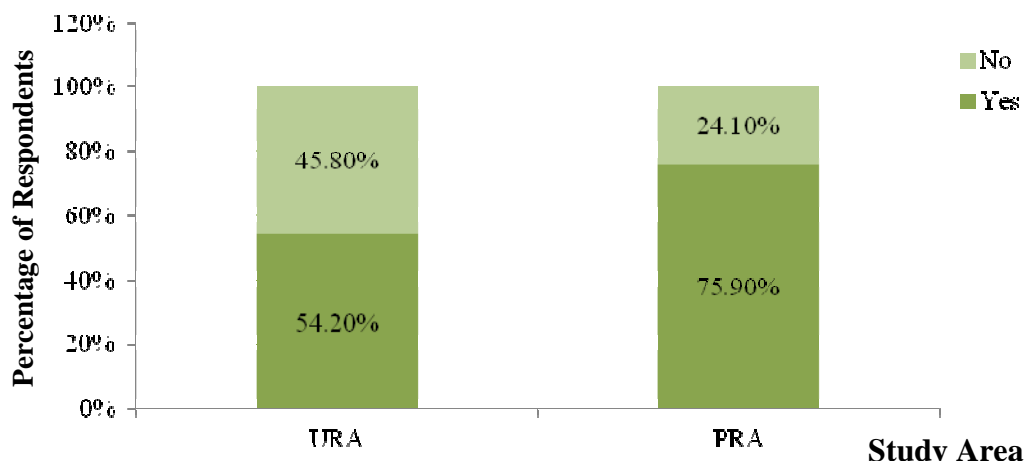


Figure 5: Willingness to Sort Solid Waste in Tamale Metropolis

Figure 5 illustrates that 54.2% of the respondents in the URA were willing to sort solid waste if they were provided with different waste containers while at the PRA, 75.9% of the respondents were ready to sort solid waste at the point of generation. At the CM, respondents were not ready to sort waste as they indicated that waste collection organisation had the responsibility of general handling and sorting of waste materials.

Payment for Waste Disposal in the Metropolis

According to Waste Collection Organisation – Zoomlion Ghana Limited, no direct payment was made by the waste generators especially those who used the skip containers.

Except the PRA, payment for waste collection and disposal was so pronounced among waste generators in the Metropolis. In the PRA, the dominant waste collection and disposal system was the door-to-door service by the WCO.

In the URA, payment for waste collection and disposal was about 21.7% of the respondents indicating those who practice the door-to-door collection system.

Payment for waste collection in the CM was mainly to waste collection porters who delivered the waste to the skip containers located at vantage points in the market area. They, however, did not pay directly to the waste collection organisation but contributed to the waste management at the Market area by paying to the Metropolitan Assembly.

Waste Collection Facilities in the Metropolis

In the Metropolis, waste collection and transportation as well as safe disposal is very important to maintaining a clean and safe environment. The Tamale Metropolitan Assembly indicated that the facilities that are used in the collection, transportation and disposal of waste in the Metropolis include skips, tricycles, dustbins, compaction trucks and graders amongst others.

From the survey, Zoomlion Ghana Limited, the main waste management organisation in the Metropolis had 76 skips, 1,200 dustbins and 5 skip trucks for waste collection and transportation in the Metropolis.

The facilities in the Metropolis for waste collection and transportation were inadequate and said to be

the cause for the irregular collection services and low collection coverage.

The main disposal site of solid waste in the Metropolis is the Gbalahi landfill, located about 13 km from the city centre. Puopiel (2010) indicated that an ideal sanitary landfill should have the following functional elements: weighbridge, internal access, treatment plant, leachate collection system, gas recovery system and it should be far from human settlements and existing water bodies.



Plate 2: Fire Burning Disposed Waste at Gbalahi Landfill

The facilities in the Gbalahi landfill are not functional and the landfill is close to human settlement. Disposed waste material is heaped very high and fire set to it (Plate 2) to reduce the amount of waste. The fumes and noxious gases are therefore released to the environment and especially the inhabitants of the community.

4. Conclusion

The survey established that solid waste sorting is not being practised in the Tamale Metropolis and the knowledge level is low. Sorting is only done by waste scavengers who are interested in the economic value of some waste material. High formal education level of 84.5% does not really translate directly into knowledge level of solid waste sorting even though a high percentage of 73.7% was recorded. Waste sorting is being practised even though not pronounced as it is 30.3% in the URAs, 21.4% in PRAs and 17.2% in TCM. Willingness to sort waste stood at 65.05%

with an indication of the provision of the necessary facilities.

Inadequate waste disposal facilities such as, skips and dustbins for waste disposal results in the use of the pit system where garbage is burnt in open fire which releases toxic fumes and noxious gases into the environment.

Low collection coverage and irregular collection services of waste are a result of limited waste collection facilities.

Collection and disposal facility provision and education on waste sorting when undertaken in the Metropolis will have an effect on the waste handling and disposal situation in the Tamale area of Ghana.

Since the local authorities in the Tamale area are not interested in the collection of sorted waste, a local authority policy of waste sorting could be developed and implemented.

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