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# Solid Waste Disposal in Ghana: A Study of The WA Municipality

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## Abstract

Many cities in Ghana have no controlled system for waste disposal. Waste is burned in pits, dumped in random locations, or disposed of in uncontrolled dumps without any further management. All these actions harm public health and the environment. The objective of the study is to assess solid waste disposal practices in relation to sex, age and educational level in the Wa Municipality. The research instruments used for the study were questionnaire, interview and personal observation. Simple correlation analysis was employed to determine among others the combined effect of age, sex and educational level on the solid waste disposal methods of households in the study area. Statistical tests of significance were performed to determine the models reliability at predicting future outcomes. Graphs, percentages and tables were used for analysis of the findings. The study revealed that sex, age and educational level negatively correlated with the solid waste disposal methods in the Wa Municipality. The study also revealed that, open dumping of solid waste is a common practice in the Wa municipality. While some employ the service of drains to transport their solid wastes out of their sight, some directly dump their solid wastes by the road sides. The study thus, recommends that the Wa Municipal Authorities should stop the use of the open dumping site and construct an engineered landfill for the disposal of solid waste in the Wa Municipality.

**Keywords:** solid waste, disposal, Wa Municipality

## 1. Introduction

One of the most obvious impacts of rapidly increasing urbanization and economic development can be witnessed in the form of heaps of municipal solid waste. Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health. Where intense human activities concentrate, such as in urban centres, appropriate and safe solid waste management (SWM) are of utmost importance to allow healthy living conditions for the population (Zurbrugg, 2002).

According to Hwa (2007), solid-waste management is a major challenge in urban areas throughout the world. Without an effective and efficient solid-waste management program, the waste generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the environment.

In developing countries, the approach to managing waste has mainly focused on getting rid of the trash, with very little or no attention paid to waste minimization or recovery efforts (Demanya, 2006). If a household can find a nearby site simply to dump the waste, it has solved its disposal problem, regardless of the cost this dumping may impose on others.

Many cities have no controlled system for waste disposal. Waste is burned in pits, dumped in random locations, or disposed of in uncontrolled dumps without any further management. All these actions harm public health and the environment. Controlled waste disposal can help improve and protect the health of local populations and preserve valuable environmental resources, such as groundwater and drinking water (United States Environmental Protection Agency, 2002).

Human activity is increasing the concentration in the atmosphere of greenhouse gases. This is expected to result in a significant warming of the earth's surface and other associated changes in climate within the next few decades. The greenhouse gases that are making the largest contribution to global warming are carbon dioxide ( $CO_2$ ), methane ( $CH_4$ ) and nitrous oxide ( $N_2O$ ). All three are produced during the management and disposal of wastes (Smith A. et al, 2001).

Open dump of solid waste is a common practice in the developing world. While some employ the service of streams to transport their solid wastes out of their sight, some directly dump their solid wastes by the road sides. In some part of Ghana, refuse is generally buried, though some heedless burning is sometimes observed (Igoni, et al., 2007). Several Ghanaians have considered it a cheap way of disposing off their solid wastes by setting the mixed wastes on fire in a little corner in their backyard or in a very open place. Even, mountains of mixed solid

wastes in so-called designated places are set on fire, causing serious and dangerous environmental pollution.

Solid waste disposal has become a problem in many urbans. With the increase in population and with rapid industrialization, the problem will aggravate further (Diaz, 2000 in Tidon, 2000). Furthermore, solid waste menace is a serious concern all over the world and its effective disposal and management are hot topics of discussion today. Since the magnitude of issues related to solid waste varies with location and time, area specific studies need to be carried out to derive management plans adequate to the region (Harilal et al, 2007).

The objective of the study is to assess solid waste disposal practices in relation to sex, age and educational level of residents in the Wa Municipality. The rest of the paper is organized as follows: Section 2 is the literature review. Following is the methodology in section 3. The results and discussion is presented in section 4. Lastly section 5 is the conclusion of the study.

## 2. Literature Review

Solid wastes could be defined as non-liquid and nongaseous products of human activities, regarded as being useless. It could take the forms of refuse, garbage and sludge (Leton and Omotosho in Babayemi and Dauda, 2009).

Urban or growth centres are facing the problem of waste disposal. The large concentration of people, animals, manufactured goods, automobiles and all kinds of commodities, altogether contribute to waste management problems. If not properly disposed of, domestic and industrial waste can look ugly, emit foul smell and become a haven for insects, rats and other animals that spread diseases (Tidon, 2000).

According to USAID (2009), thousands of tons of solid waste are generated daily in Africa. Most of it ends up in open dumps and wetlands, contaminating surface and ground water and posing major health hazards. Many cities have no controlled system for waste disposal. Waste is burned in pits, dumped in random locations, or disposed of in uncontrolled dumps without any further management. All these actions harm public health and the environment. Controlled waste disposal can help improve and protect the health of local populations and preserve valuable environmental resources, such as groundwater and drinking water.

Refuse is often dumped on open land and can present problems through associated vermin and disease. The uncontrolled burning of domestic wastes is common practice as a form of disposal. The market report on Global Waste Management, published by Key Note in 2007 stated that "...in much of Africa, waste management is in a poor state due to a lack of government policies, legislation, funding, implementation and, for the population as a whole, a lack of education regarding the importance of a proper approach to waste collection, treatment and disposal. Where legislation exists, a lack of administration may prevent its implementation" (Uganda Wildlife Society, 2010).

Most uncontrolled dumps are many years old, having grown over time from small dumps to large, unmanaged waste sites. Uncontrolled dumps have significant environmental impacts. As the waste decomposes, it creates leachate which may get into local water supplies and contaminate the drinking water. Uncontrolled dumps also release gases that are explosive and flammable. In some instances, waste is burned at these dumps, which poses a direct safety threat because of the danger of explosion. The air pollution created by burning harms local communities. Improper waste disposal also produces greenhouse gases (GHGs), which contribute to climate change (United States Environmental Protection Agency, 2002).

Furthermore, when solid waste (SW) is disposed in waste dumps and landfills, most of the organic material will be degraded over a longer or shorter period, ranging in a wide span from less than one year to 100 years or more. The majority of this process will be bio-degradation. Strongly depending on conditions in the site where the SW is disposed, this biodegradation will be aerobic or anaerobic (Frøiland-Jensen and Pipatti, 2000).

According to Newman (2013), waste produces two types of greenhouse emissions. The first is methane, created by the fermentation of biodegradable waste, mainly food waste and paper products. When in a controlled environment, such as within an anaerobic digestion plant, methane is captured and put to use providing energy. But in most of the world, methane exists in uncontrolled environments, including landfills without methane capture and open dumps, where it is released into the atmosphere.

Treatment and disposal of municipal, industrial and other solid waste produces significant amounts of methane ( $\text{CH}_4$ ). In addition to  $\text{CH}_4$ , solid waste disposal sites (SWDS) also produce biogenic carbon dioxide ( $\text{CO}_2$ ) and non-methane volatile organic compounds (NMVOCs) as well as smaller amounts of nitrous oxide ( $\text{N}_2\text{O}$ ), nitrogen oxides (NOx) and carbon monoxide (CO).  $\text{CH}_4$  produced at SWDS contributes approximately 3 to 4 percent to the annual global anthropogenic greenhouse gas emissions (IPCC, 2001).

Also, waste deposited in landfills or in refuse dumps immediately becomes part of the prevailing hydrological

system. Fluids derived from rainfall, snowmelt and groundwater, together with liquids generated by the waste itself through processes of hydrolysis and solubilisation, brought about by a whole series of complex biochemical reactions during degradation of organic wastes, percolate through the deposit and mobilise other components within the waste. The resulting leachate, subsequently migrates from the landfill or dump and has the potential to contaminate local groundwater either through direct infiltration on site or by infiltration of leachate-laden runoff offsite (Taylor and Allen, 2002).

According to Obirih-Opareh (2002), in more recent times, efficient collection and disposal of municipal solid waste is recognized not just as critical for maintaining a healthy environment but also as an important indicator of the level of development of a nation. Accordingly, cities in the developed world have devised complex procedures for handling waste and have established a variety of institutional mechanisms to ensure that these procedures are adhered to. Doan (1997) also points out that in the United States of America for example, many cities have adopted stringent regulations to govern their waste management. These include the kinds of materials that can be thrown away by a household or business, the type of storage containers and the kind of equipment to use to pick up waste. It also indicates the exact procedure for disposing waste in a sanitary landfill, the specifications for liners, covers, and aeration procedures for those landfills, and the proportion of the cost of this service to be paid by the consumer. This is hardly the case in many developing countries.

In many industrialized countries, waste management has changed much over the last decade. Waste minimisation and recycling/reuse policies have been introduced to reduce the amount of waste generated, and increasingly, alternative waste management practices to solid waste disposal on land have been implemented to reduce the environmental impacts of waste management. Also, landfill gas recovery has become more common as a measure to reduce  $CH_4$  emissions from solid waste disposal sites (Pipatti and Svardal, 2006).

### 3. Materials and Methods

Extensive literature search, administering of questionnaire, interview and personal observation were employed in this study. Questionnaires were administered in six residential areas: Kambale and Dondoli; Airport Residential and Dobile Residential; and SSNIT and Jdzedayiri - Tampalepani residential areas. These residential areas represent two each of low, middle and high income residential areas respectively in the Wa municipality. One hundred and twenty (120) questionnaires were administered. Key informants and focus groups in the study area were also involved in this study through interviews. After cleaning up the data from the questionnaire surveys and correcting the few mistakes that were detected in the filling of the questionnaires, the data were coded and fed into SPSS 17.0 for Windows. Simple correlation analysis was employed to determine among others the combined effect of age, sex and educational level on the solid waste disposal methods of residents in the study area. Statistical tests of significance were performed to determine the models reliability at predicting future outcomes. Graphs, percentages and tables were also used for analysis of the findings. The analysis was undertaken to generate a descriptive picture of the data gathered on such themes as household waste generation and handling practices, services available to households for waste disposal and householders' satisfaction with the quality of service.

### 4. Results and Discussion

Simple percentages were used to analyse the quantitative data obtained from the household questionnaire administration. The qualitative data from interviews conducted with all other categories of respondents were analysed manually by making summaries of the views of the respondents and supporting these with relevant quotations that captured these views, supported with data from documentary sources and my own field observations of the waste situations in the municipality.

#### 4.1 Sex Distribution of Respondents

Majority of the respondents were female (65%) and the remaining percentage of 35% were male. From the researcher's field survey, it was realised that in low and middle income residential areas domestic solid waste management was perceived to be the responsibility of women while in the high income residential areas domestic solid waste management was not assigned to any particular sex; it was seen as collective responsibility.

The correlation between solid waste disposal and sex as indicted in table 1 below revealed that both male and female have resorted to improper disposal of waste. However, in some cases one sex is more culpable than the other; whereas 16.7% of male dispose their waste by throwing the waste into the bush, 10.3% female dispose their waste into the bush. In terms of respondents who burn their waste, 14.3% male as against 17.9% of woman burn their waste. However, in terms of proper waste disposal practices, men are slightly ahead of women; 45.2% of men dispose their solid waste into communal containers, while 44.9% of female dump their waste in the communal containers. Similarly, 23.8% of men have subscribed to Zoomlion Company Limited's door to door collection as opposed to 23.1% of female. It can be deduced that improper/proper disposal of waste in the Wa

municipality cannot be ascribed to any particular sex. This is illustrated in table 1 below

Furthermore, the study revealed that sex has no significance on the waste disposal method of respondents to the study; sex had a low significance level of 0.853 which is far above the 5% significance level. This is indicated in table 2.

Table 1: Cross tabulation of Solid Waste Disposal Method and Sex of Respondents

Waste disposal Method		Sex		
		Male	Female	Total
Bush	Count	7	8	15
	% within Sex	16.7%	10.3%	12.5%
Burn	Count	6	14	20
	% within Sex	14.3%	17.9%	16.7%
Communal Container	Count	19	35	54
	% within Sex	45.2%	44.9%	45.0%
Door to Door Collection	Count	10	18	28
	% within Sex	23.8%	23.1%	23.3%
Others	Count	0	3	3
	% within Sex	.0%	3.8%	2.5%
<b>Total</b>	Count	42	78	120
	% within Sex	100.0%	100.0%	100.0%

Source: Authors' Construct

Table 2: Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.251 <sup>a</sup>	16	.853
Likelihood Ratio	11.325	16	.789
Linear-by-linear Association	.210	1	.647
N of valid Cases	120		

a. 2 cells (20%) have expected count less than 5. The minimum expected count is 1.05

Source: Authors' Construct

#### 4.2 Age Distribution of Household Respondents

Most of the household respondents were between the 21 – 30 age group (36.7%) while the lowest number of household respondents was between 51 and above age group (12.5%). During the study it was realised that those between age groups of 10 – 20 and 20 – 30 were mostly responsible for domestic solid waste management, especially solid waste disposal. This is illustrated in figure 1.

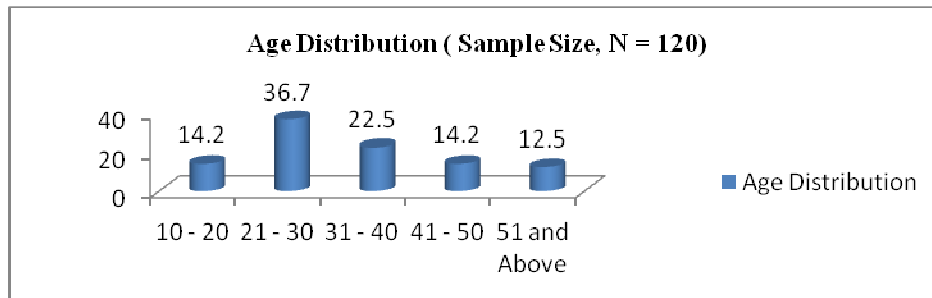


Figure 1: Age distribution of the household respondents  
 Source: Author’s construct

Furthermore, analysis of the correlation between age and waste disposal method had a low and negative correlation of 27% with waste disposal method. The correlation coefficient between age and waste disposal is 0.769 which is also far above the significance level of 5%. This is shown in table 3 below.

Table 3: Spearman’s correlation coefficient of Age and solid waste disposal method

	Age	Waste disposal method	Sig. (2-tailed)
Age	1.000	-0.27	0.769
Waste disposal method	-0.27	1.000	0.769

Source: Authors’ Construct

#### 4.3 Level of Education of Respondents

The importance of education to socio-economic development cannot be over emphasised. Education helps to shape the attitude of people. Figure 2 below shows the educational level of the respondents to the study.

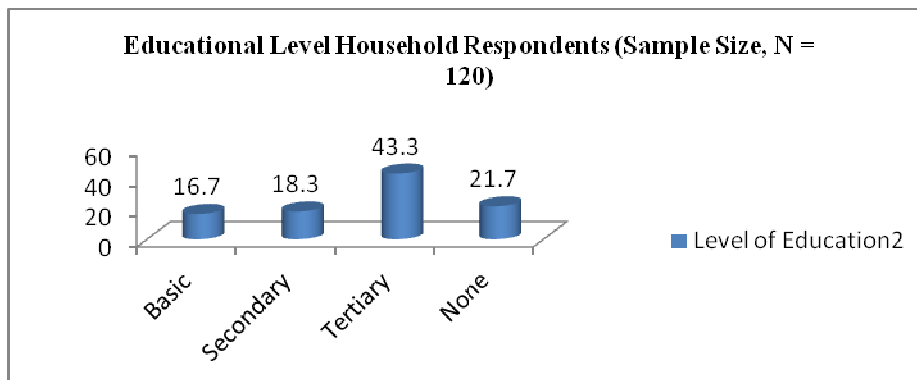


Figure 2: Educational levels of the household respondents  
 Source: Author’s construct

The highest educational level of most of the household respondents was tertiary (43.35%) and the lowest education level being 16.7 percent. During the researcher’s field studies, it was recognized that a lot of the household respondents were exposed to solid waste management issues and understand the risk that improperly managed waste pose to human health and the environment. Thus, with proper education of residents on waste disposal regulations coupled with an effective solid waste management system, the Municipal Authorities could change the residents’ attitude of improper disposal of waste.

Also, analysis of the regression of age, sex and educational with solid waste disposal method revealed that age had a negative coefficient of -0.054 and significance of 0.858 which is far above the 5% significance level. However, sex had a positive coefficient of 0.176; this coefficient is significant at the 5% significant level. The coefficient shows how the sex of respondent influences their solid waste disposal method. Similarly, educational level had a more positive coefficient of 0.060 which is more significant at the 5% significant level. This indicates that a person’s level of education has an impact on his solid waste disposal method. This is shown in table 4.

Table 4: summary of regression of results

Dependent Variable: Solid waste disposal Method	Coefficient	t-statistics	sig
Constant	2.564 (0.441)	5.818	0.000
AGE	-0.054 (0.081)	-0.674	0.858
SEX	0.176 (0.193)	0.910	0.072
EDUCATIONAL LEVEL	0.060 (0.101)	0.596	0.082

Figure in ( ) indicates standard error

Source: Author's construct

#### 4.4 Solid waste disposal in the Wa Municipality

Majority of the residents in the Wa Municipality depend on communal method of solid waste collection as indicated by the solid waste disposal methods by the respondents to the study. All the solid waste generated in the Wa Municipality is usually transported by roll on/off trucks owned by the Wa Municipal Assembly and Zoomlion Ghana Limited to an open dumping site owned by the Municipal Assembly and situated at Siritiyir in the Wa West District for final disposal, untreated. This is similar to solid waste disposal practices in other parts of Ghana; In Ghana, 58% of the solid waste generated is dumped by households in designated dumping sites, 25% is dumped elsewhere in non-designated sites and only 15% is uncollected. The quantity of waste collected varies from place to place and could be as high as 20% as in Accra and Kumasi (GSS, 2000). However, in the upper west region about 65-70% of the solid waste generated is collected and dumped in non-designated dumping sites while about 35-40% is uncollected (Wa Municipal Assembly, 2010).

Furthermore, many cities in Ghana have no controlled system for waste disposal. Waste is burned in pits, dumped in random locations, or disposed of in open dumps without any further management. All these actions harm public health and the environment. Controlled waste disposal can help improve and protect the health of local populations and preserve valuable environmental resources, such as groundwater and drinking water. However, the data analysed showed that there are three options for solid waste disposal available to the Wa Municipal Authorities: to operate a properly designed, constructed, and managed landfill; burn the waste in a controlled facility that converts waste to energy; or/and compost the waste into manure for agricultural purposes; the main occupation of the indigenes of the municipality is agriculture. Therefore, composting waste will go a long to improve agricultural production in the municipality; manure will readily be available to farmers to fertilize their farms and not over depend on foreign fertilizers which sometimes have adverse effects on the environment.

## 5. Conclusion

The study revealed that sex, age and educational level negatively correlated with the solid waste disposal methods in the Wa Municipality. This means that the Municipal Authorities must brace up to fight the solid waste menace in the municipality as the bad attitude to solid waste is not limited to any sex, age or the educational level of residents. The approach to managing waste in most parts of Ghana has mainly focused on getting rid of the trash, with very little or no attention paid to waste minimization or recovery efforts. The waste is usually disposed in open dumping site without treatment. Most open dumps are many years old, having grown over time from small dumps to large, unmanaged waste sites. Open dumps have significant environmental impacts. As the waste decomposes, it creates leachate which may get into local water supplies and contaminate the drinking water. Open dumps also release gases that are explosive and flammable. In some instances, waste is burned at the dumping site, which poses a direct safety threat because of the danger of explosion. The air pollution created by burning harms local communities. Improper waste disposal also produces greenhouse gases (GHGs), which contribute to climate change. To protect human health and the environment, the study thus recommends that, the Wa Municipal Authorities should stop the use of the open dumping site and construct an engineered landfill for solid waste disposal in the Wa Municipality.

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