GLOBAL JOURNAL OF BIOLOGY, AGRICULTURE & HEALTH SCIENCES
(Published By: Global Institute for Research & Education)
www.gifre.org

Household Perspective of Plastic Waste Management in Urban Ghana: A Case Study of the Bolgatanga Municipality

Bright Buzong Yintii[1*], Maxwell Anim-Gyampo[2]& Maurice M. Braimah[3]

[1]Lecturer, School of Applied Science and Arts, Department of Ecological Agriculture, Bolgatanga Polytechnic, Ghana
[2]Senior lecturer, Faculty of Applied Sciences, Department of Earth and Environmental Science, University for Development Studies, Navrongo, Ghana
[3]Lecturer, School of Engineering, Department of Agricultural Engineering, Bolgatanga Polytechnic, Ghana
*Corresponding Author

Abstract

Many urban areas in Ghana are heavily polluted with plastic waste and the Bolgatanga Municipality is not an exception. The inability of the Bolgatanga Municipal Assembly and Zoomlion Ghana limited (a private waste management firm) to tackle the problem calls for the participation of the general public. Households as a subset of the public consume more plastic products and subsequently generates enormous amount of waste. In addition, their waste management practices affect the environment. In view of this, the study was carried out to ascertain the plastic waste situation, identify household plastic waste management practices and challenges, and to find out from the household's perspective the way forward to reducing plastic waste. This questionnaire-based study was carried out in twelve (12) randomly selected electoral areas, and the analysis of the results showed that about 81.67% of households believed that the plastic waste situation was bad. Household waste management practices identified included temporal storage of waste in dustbins, boxes, buckets and large polythene bags. At the household level, plastic waste was generally collected together with other household waste and temporary stored in waste storage bins. In terms of final disposal from the household, about 54.77% of households disposed their waste at approved dumping sites whil34.77% burned their waste, 8.92% disposed their waste at any available open space whilst 1.54% buried their waste. Challenges of household waste management identified were distance to dumpsites, lack of sufficient dumpsite and dustbins as well as irregular collection of waste by waste management firms. Households however believed that dealing with the problem required a change of attitude towards waste disposal, discontinuation of plastic use, recycling, and all stakeholder participation in waste management. Recommendations made included the establishment of a recycling plant, creation of awareness and carrying out educational campaigns, the use of environment R's (Reduce, Reuse and Recycle) and support for the Municipal Assemblyin its waste management efforts.

Keywords: **"**waste, plastics, household, management, Bolgatanga, Ghana".

Introduction

Plastics are man-made organic materials that are produced from oil and natural gas as raw materials. They are relatively cheap, durable and versatile material. Products made from plastics have brought benefits to society in terms of economic activity, jobs and quality of life. Plastics can even help reduce energy consumption and greenhouse gas emissions in many circumstances, even in some packaging applications when compared to the alternatives (European commission DG ENV, 2011). The benefits driven from plastics compel manufacturers to increase production. According to Spokas (2007) and Geographical (2005) around 500 billion of plastics bags are used worldwide. A United Kingdom group *Wasteonline* also puts annual global production of plastic around 100 million tonnes per year. In a study conducted in Switzerland in 2010, approximately 1000,000 tonnes or 125 kg of plastic material was used or consumed per head. According to the same report, the world produces 20 times more plastic today than 50 years ago(FOEN 2003).

As plastic consumption is increasing, more and more plastic waste is being generated (World Bank, 1996; Yankson, 1998). FOEN (2003) indicates that, plastics form around 15% of household refuse and according to a report published in December 2010, the U.S. Environmental Protection Agency (USEPA) determined that, the United States alone generated 30 million tonnes of plastic waste in 2009. It is believed after their entry into the environment, plastics can persist up to 100 years without being decomposed by sunlight and/or microorganisms (Stevens, 2001 and UNEP, 2005a).

The issue of plastic waste management is therefore a major global phenomenon that has crept up over the decades, and really requires a global and comprehensive solution that includes systemic rethinks about usage and production (Wassener, 2011). It is a crucial problem not only for developing countries but for the developed countries as well.

As enormous amount of plastic waste is generated throughout the world, the most crucially posed question is how to manage it effectively and efficiently to save the environment and the continuous existence of mankind (Wienaah, 2007). Many municipalities, cities and towns the world over continue to grapple with the problem because it imposes negative environmental externalities. It is usually non-biodegradable and therefore can remain as waste in the environment for a very long time (EC, DG ENV, 2011), it may pose risks to human health as well as the environment; and it can be difficult to reuse and/or recycle in practice. An issue of particular concern is that, giant masses of plastic waste have been discovered in the North Atlantic and Pacific Ocean; the full environmental impacts of which are not yet fully understood but which cause severe damage to seabirds, marine mammals and fish (EC DG ENV, 2011).In Ghana, most of the concern for plastic waste management is with the urban areas than the rural areas. Urban areas in Ghana produce a variety of these plastic wastes because of the adoption of a more hygienic mode of packaging food, beverages, "iced

water" and other products. This has brought plastic packaging to replace the existing cultural packaging methods (leaf wrappers, brown paper and metal cup uses) in cities and towns (Adarkwa and Edmundsen, 1993; KMA, 1995; World Bank, 1995; Schweizer and Annoh, 1996). This widespread replacement of the modes of packaging with plastics is an indication of the uniqueness of plastic properties such as versatility, inertness and flexibility, especially in the application areas of packaging. As a result of their unique properties, plastics have become the most favoured packaging materials in commerce with firms making windfall profits and transferring the environmental cost associated with cleaning plastic waste on the general public.

The shift to this new form of plastic packaging in Ghana has equally created or generated huge quantities of waste and created pressing sanitation problem as many towns and cities are overwhelmed with management of wastes. According to a study conducted in Accra, Ghana by GOPA Consultants in 1983, Plastic Waste accounted for 1-5% (of net weight) of the total amount of waste generated (Lardinois and Van de Klundert, 1995). The majority of these wastes are sachet water bags. This is so because, the public have developed a strong taste for such sachet water since it is portable and can easily be carried from one place to another. There is also a perception that such sachet water is cleaner and more mineralized than tap water. After gulping down the liquid content, these bags are discarded indiscriminately thereby littering the whole environment. These bags now constitute a major proportion of the plastic waste generated throughout the urban areas in Ghana (Wienaah, 2007). Statistics released by the Accra Metropolitan Assembly (AMA) Waste Management Department and other waste management bodies indicated that about 9000 tonnes of waste is generated daily, out of which 315 tonnes are plastic related (Amankwah, 2005). In addition to the plastic sachet that poses problems, other forms of plastics include plastic bottles, polythene bags and wrappers. It is estimated that, there are over 40 plastic producing industries in the country producing over 30,000 metric tons per annum of assorted plastic products. In addition, about 12,000 metric tons of finished plastic products are imported annually into the country. These add to compound the plastic waste problem in the country. At least about 20-30% of these end up as waste in the streets. With very few recycling facilities in the country, the issue of post-consumer plastic waste has become a major issue of concern. However, there have been serious attempts to address the problem. Plastic wastes are sent to dumpsites, but majority end up in drains, streams and open places. Some plastic wastes are disposed of by open dumping, open burning, controlled burning and tipping at dumpsites. These methods employed in the management of plastics over the years have only proved unsuccessful.

The current state of plastic waste management leaves much to be desired. Less than 40% of urban residents are served with waste collection services. The traditionally applied methods of dealing with wastes including burning, burying and open space dumping have been unsuccessful, and the resulting contamination of water and land has led to growing concern over the absence of an integrated approach to waste management in the country. This therefore implies that, there is no single solution to the challenge of plastic waste management. Generally, waste management process is usually framed in terms of generation, storage, treatment and disposal, with transportation inserted between stages required. Hence, George, (2008) indicated that a combination of source reduction, recycling, incineration and burying in landfills and conversion is currently the optimal way to manage domestic waste which includes plastic waste. However in order to achieve this optimal way of managing waste in general, participation by all stakeholders including households is key.

Materials and Methods

Study site

Geographically, the study area covered twelve Electoral (EA) areas within the Bolgatanga municipal Assembly (B M A) in the upper East Region of Ghana. Bolgatanga municipality was chosen because it is the largest municipality in the Upper East Region of Ghana and has a larger number of households and commercial centers than any other district in the region, and also because it faces major problems of efficient waste management. Apart from that, the study also focused on domestic waste management; this is because most plastics and solid wastes generated in these areas come from domestic sources. Despite the seriousness of these problems in this Municipality, very little research on plastic waste management had been carried out in these Electoral areas (EA) in the Municipality.

Description of the Study Area

The study was conducted in Bolgatanga, the Upper East regional capital of Ghana located between latitude 10° 47' 50" N and Longitude 0° 52' 40" W. (DMTDP, 2010). It covers an area of about 4,220km^2 which constitutes about 35.1% of the total land area of the Upper East Region. It is bounded to the north by Kassena Nankana district, on the west by Sisala district, on the south by West Mamprusi district and on the east by the Nabdam district as shown in Figure 1.0. It has a total population of about seventy four thousand, five hundred and seventy six (74.576) of which 48.2% are male and 51.8% are female (PHC, 2001).

The area falls under the Tropical Continental Climatic region which is influenced by two main air masses, namely the Southwest Monsoon and the Northeast Trade Winds. It is characterized by a single rainy season within a year, usually from May to October followed by prolonged dry season. The rainfall ranges from 110mm/year to 800mm/year with average evapotranspiration estimated to be about 890mm/year but may reach 1000 -1300 mm/year in wet years and 650mm/year in dry years. Between 1989 and 2005 rainfall has decreased from 1673.2mm to 769.5mm/year. Mean monthly temperatures range from 42°C in March to about 26°C in August with the average daily temperature ranging from 28°C in July to 32°C in April (MOFA, 2006 or BAS, 2006). Within this climatic zone relative humidities are high during the rainy season (about 70 to 90%) which may fall to about 20% during the dry season. The vegetation is mainly of the Sahel Savannah type consisting of open Savannah with fire swept grassland separating deciduous trees (Dickson & Benneh, 1988)

The vegetation of the Bolga municipal is characterized by savannah woodland and consists of deciduous widely fire and drought resistant trees of varying density with dispensed cover of perennial grasses and associated herbs. Through the activities of man, the woodland savannah has been reduced to an open pack land where only trees of economic value such as kapok, baobab, acacia,shea nut and 'dawadawa' have been retained with time. These trees satisfy domestic requirement such as fuel wood. Timber for local housing construction, Cattle kraal, vegetable garden fence and material for handcart, in the dry season. Annual bushfires decimate the grasses and shrubs and as a result pasture for the livestock is largely destroyed. These bushfires also ravage the forest reserve in the district and render them distinguishable from the surrounding vegetation (DoF, 2001).

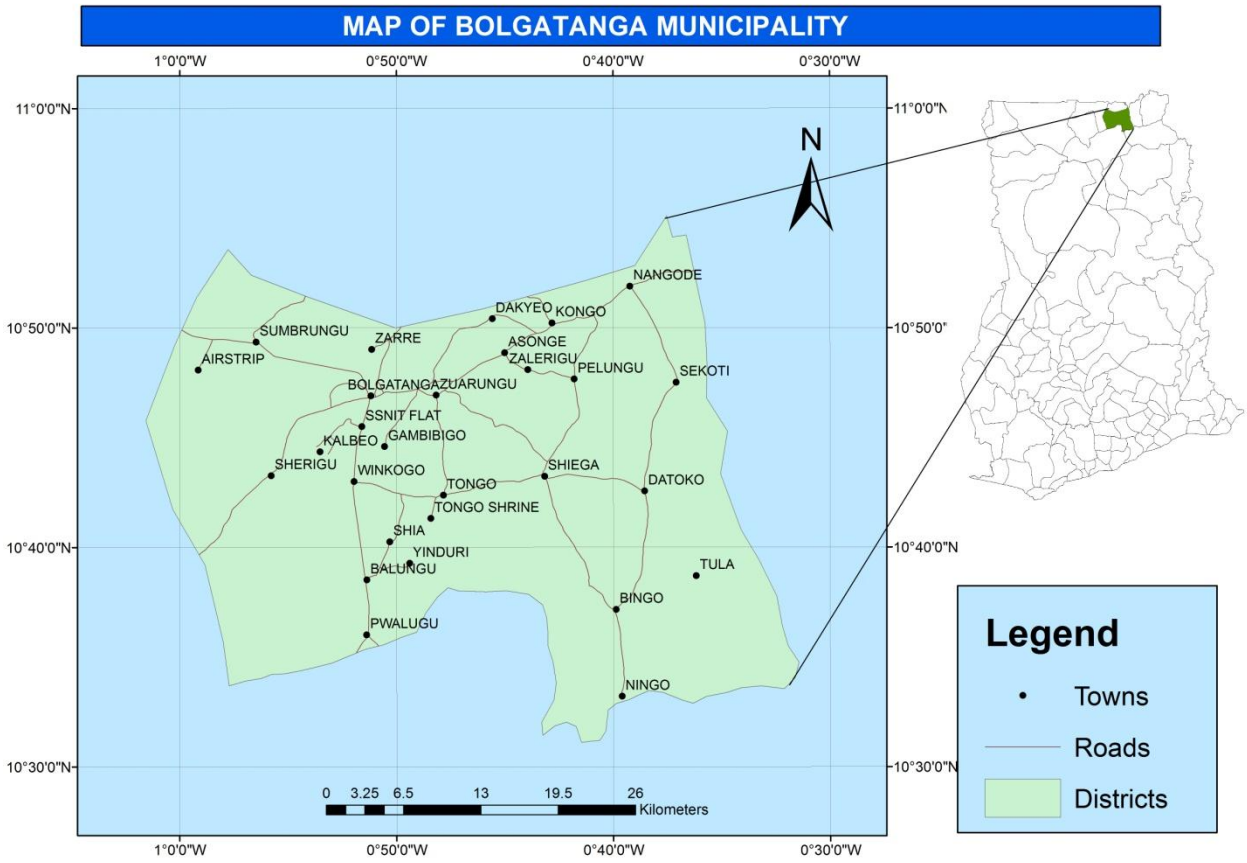

Figure: 1.0

Research Design and Methodology

Descriptive survey design (Knupfer and McLellan, 2001) was adopted in this study applying both qualitative and quantitative research methodologies. The study used structured close-ended questionnaires as the main instrument to collect data alongside with focused group discussions, key informant interviews and observation. These methods sought to provide an opportunity to have an in-depth knowledge of the research which hitherto was not clear. Empirical verification was done via observation on attitudes and behaviors of respondents (Anderson, 1971) to test the truth or otherwise of empirical statements. In all, three (3) focus group discussions were held with the various groups. It involved opinion leaders within schools, households, students from the study areas etc. Others included in this interview were the Bolgatanga Municipal Assembly, staff of Zoomlion Ltd anNGOs into waste management and staff from environmental protection agency. This method sought to help these groups to freely express themselves concerning the subject. The researcher conducted a series of in-depth interviews with members of each of household during data collection.The interview with the participants focused on ten structured questions designed by the researcher. This was to ascertain and verify the other sources already employed to collect the information. Interpretation of the questionnaires to those who could not understand was done by the researcher and the appropriate responses ticked. A total of six thousand and twenty five (6,025) male and female households' heads and other stakeholders aged 18 and above was obtained as the sample frame of the assessment survey. The sample size for the study was three hundred and sixty (360). To find out the haulage of waste to the dumpsite, the time of loading the waste and the time of discharge at the dumping site was determined. The kilometric reading was taken from the waste vehicles to determine the distance of each Electoral area (EA) to the dumping site.

Data Analysis

Data obtained was analyzed using Statistical Package for Social Scientist (SPSS) 16.0 and Microsoft Excel.

Results and Discussion

Table 1: Relationship between gender and reason for choosing to use plastic products

	Reason for choosing plastic products				
Gender	**Cheap**	**Common**	**Light in weight**	**Lack alternatives**	**Total**
Female	26 (7.26)	44 (12.29)	76 (21.23)	69 (19.27)	215 (60.06)
Male	8 (2.23)	38 (10.61)	49 (13.69)	48 (13.41)	143 (39.94)
Total	34 (9.50)	82 (22.91)	125 (34.92)	117 (32.68)	358 (100.00)

likelihood-ratiox^2(3) = 5.5613 Pr = 0.135

The number in each cell of the table represents the count or frequency, whilst the number in parenthesis indicates the cell percentage. For instance, out of the 215 female respondents, 26 of them indicated that they preferred plastic products because they are cheap. This constituted 7.26% of the total respondents. The chi square test performs a hypothesis test to determine whether or not to reject the idea that the row and column classifications are independent. Since the p-value 0.135 is greater than 5% level of significance, there is a failure to reject the null hypothesis of independence of gender and reason for choosing to use plastic products. However, the observed value for gender for a particular case may bear no relation to its corresponding value of reason for chosen to use plastic products.

Table 2 depicts relationship between marital status and reason for choosing to use plastic products.

Table 2: Relationship between educational status and reason for choosing to use plastic products

	Reason for chosen plastic products				
Educational Status	**Cheap**	**Common**	**Light in weight**	**Lack alternatives**	**Total**
No education	5 (1.40)	10 (2.79)	9 (2.51)	3 (0.84)	27 (7.54)
Primary	4 (1.12)	5 (1.40)	2 (0.56)	6 (1.68)	17 (4.75)
Secondary	11 (3.07)	38 (10.61)	47 (13.13)	37 (10.34)	133 (37.15)
Tertiary	11 (3.07)	23 (6.42)	65 (18.16)	69 (19.27)	168 (46.93)
Vocational	3 (0.84)	6 (1.68)	2 (0.56)	2 (0.56)	13 (3.63)
Total	6 (1.68)	9 (2.51)	9 (2.51)	8 (2.23)	32 (8.94)

likelihood-ratiox^2(12) = 38.7418Pr = 0.000

The likelihood ratio test on the relationship between level of education of the respondent and the reason why they chose to use plastic products indicated at the 5% level of significance that the reason for the choice of plastic products was largely dependent on the educational status of the respondent with a p-value of 0.000.

Persons responsible for management of household waste

Figure 1 below shows that within households in the Bolgatanga Municipality, 45.71% of mothers; 45.18% of children and 9.11% of fathers are responsible for managing waste. It can then be concluded that waste management at the household level is virtually the work of mothers and children. In majority of the households, the mothers clean the homes and collect the rubbish and the children carry out the final disposal from the homes. Some households had children completely in charge of cleaning, collecting and disposing of waste from the home.

In most home, fathers did not play any role in waste management. In household that males managed waste, they were either single or married with their partners elsewhere. Generally fathers were not very much involved in household waste management.

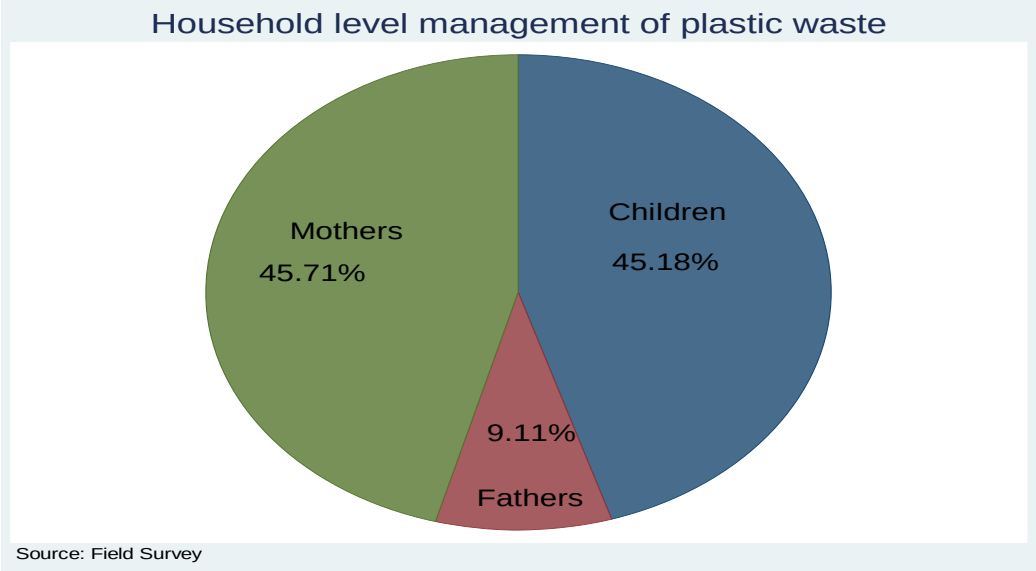

Figure 1: Responsibility for waste management at household level

In a similar research on waste in Ijebu Ode, South Nigeria, Banjo et al, (2009) share similar view. His studies revealed that 4.3%nof fathers; 43.3% of mothers; 30% of children and 15.4% domestic help were responsible for waste management. When the situation in the Bolgatanga Municipality is compared with that of Ijebu Ode in Nigeria, it is very obvious that few fathers (Males) handle waste while mothers (Females) forms the majority of those handling waste. This pattern was also evident in Tsibo and Marbell, (2004). However they indicated that, in the institution of marriage, it is the duty of the woman to cook, fetch water and clean, dispose of waste and keep the house in order. In addition, since it is the woman who produces waste as a result of her domestic activities, it beholds on her to find the means to dispose her waste. They argued that since men are normally out of the house most of the time and as such produces less refuse as compared to the other members of the household they are not bothered and should not be bothered. This is possibly the reason why they were few men involved in plastic waste management at the household level in the Bolgatanga Municipality.

Temporal Storage of household waste

The manner in which households store temporally store waste at the household level can positively or negatively affect the environment especially the household immediate environment. When households have good temporal storage systems, the environment is enhanced and vice versa. Figure 2 below indicates that, 48.74% of households handled waste in trash bins with lid; 30.25% in buckets, 14.29% in trash bins without lid, 3.64% in large polythene bags whilst 3.08% handled their waste in other objects.

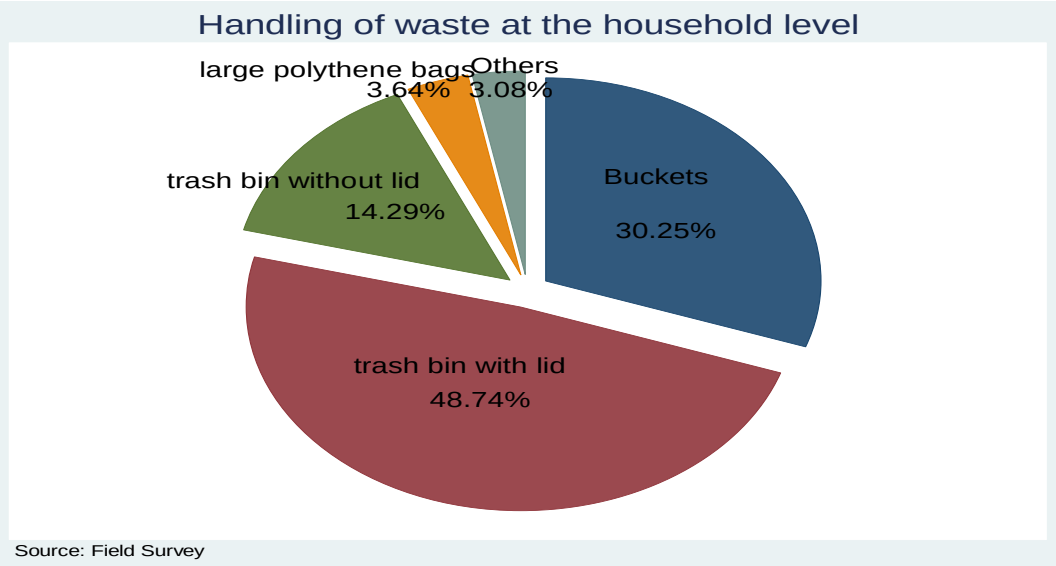

Figure 2: Handling of waste at the household level

The used of wide variety of containments systems like dustbins, baskets, boxes, cement bags, concrete vats, metal bins, buckets, sacks and polythene bags was observed. Similar observations were made by Puopiel (2010) and George (2008) in Ghana; Banjo et al., (2009) in Nigeria and Dobbs, (1991) in Kolkata, India.

Methods of Disposal of Household Waste and Time spent

According to Puopiel (2010), the method of disposal of household solid waste which generally includes plastic waste is one of the functional elements in the management of waste. From figure 3 below, the commonest place of plastic waste disposal is the dumpsite with 54.77% of respondents disposing their waste there. Most respondents within these EAs; Atulbabisi, Soe, Bukere and Dapoore-Tindongo virtually depended on dumpsites some of which were self-

designated. Out of 178 respondents the following percentages 76.97%; 12.36%; 5.62% and 2.81% are between 5-10, 11-15, 16-20, 21-25 and 26-30 minutes walking distance from the household. This is depicted on Table 3 below. Some respondents however were not comfortable spending more time to disposing their waste and indicated that they often resorted to disposing it at any bushy or undeveloped space around the household environment.

Table 3: Distance of dumping site from household

Distance (minutes)	Number of responses	Percentage (%)
5 – 10	137	76.97
11 – 15	22	12.36
16 – 20	10	5.62
21 – 25	5	2.81
26 – 30	4	2.25
Total	178	100.00

This observation is consistent with Puopiel, (2010) findings in Tamale. He observed that respondents at different location of his study area spent different minutes in disposing of their waste. 79.2% spent above 10 minutes in disposing their waste and out of the 79.2%, 63.3% of the respondents said it inconvenienced them to spend such time to dispose their waste in the nearest skip. This presupposes that household's waste disposal practices can improved if dump sites are located somehow closed them.

With regards to how households finally disposed their waste, a wide diversity of methodswere identified. From figure 3, 34.77% of household disposed their plastic waste by burning. Households within EAs like Kumbosgo, Yarigabisi and Yekene disposed plastics by burning in the open place. Some, households within these same EA's who did not have approved dumping sites or skips disposed their waste on any available open space. They accounted for the 8.92%. A small percentage of households disposed their plastic waste by burying representing 1.54% as shown on Figure 3 below. Generally, almost all respondents admitted having to burn plastic waste some time.

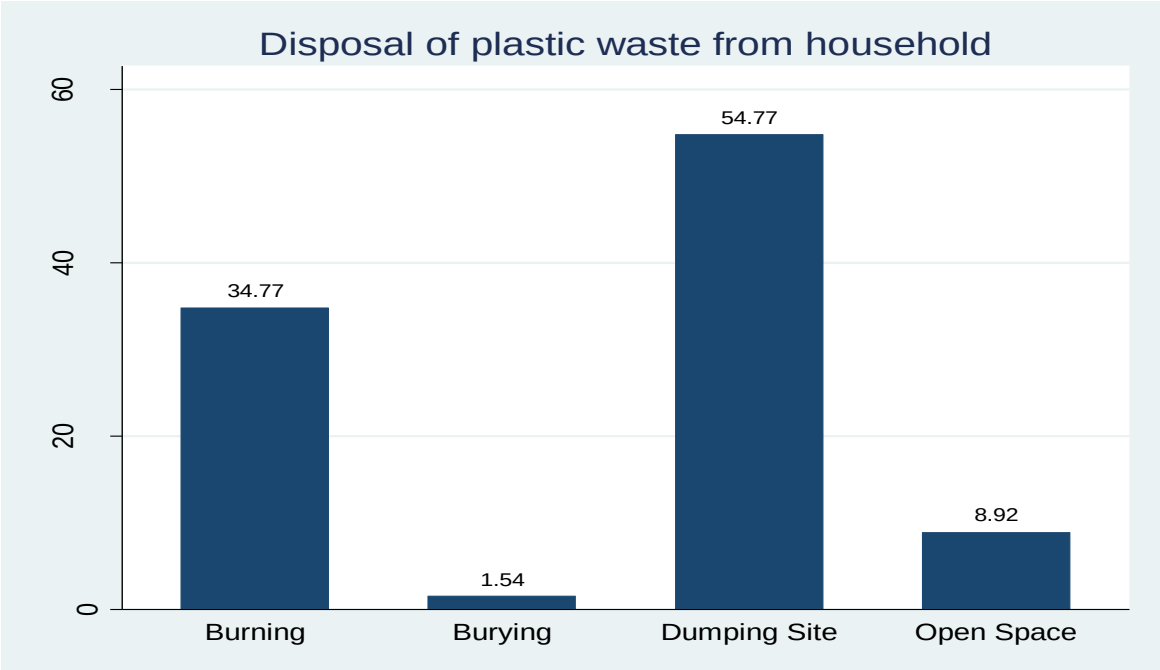

Figure 3: Disposal of plastic waste from household

Observed ways through which households final disposed of their plastic waste

These methods of doing away with household waste have been reported by a number of researchers. Among some of the methods of household final disposal of waste observed are; dumping in open space, gutters, undeveloped lands, roadsides, skip and approved dumpsite for collection by waste management firms (Anomanyo, 2004; Banjo et al., 2009; Puopiel, 2010; Adane and Muleta, 2012). Banjo et al. (2009) observed in Ije Ode, that inhabitants waste management practices as burning (65, 21.7%), burying (22, 7.3%), depositing into gutter (45, 15%), putting on road side for waste managers (150, 50%) and dumping on undeveloped land (18, 6%). Adane and Muleta, (2011) on the other hand observed that 137 (59.56%), 94 (40.86%) and 43 (18.69) disposed their waste through open dumping, burning and burying respectively.

Mode of disposing plastic waste

Knowledge of how household dispose plastic waste is an important function in the effective management of plastic waste. According to a staff of Zoomlion (Bolgatanaga), the manner in which plastic waste is found in the environment can make the work of waste management firms easier or difficult, hence the need to ascertain how household disposed of their plastic waste. Table 4 below indicates that, out of the 360 households examined, 74 (20.56%) separated plastics

from household waste before final disposal whilst a total of 282 (78.33%) disposed their household waste together with other household waste. This is to say that household waste is thrown together with its plastic components without the necessity to sort. One reason giving for not sorting was the fact that they were not going to be paid for that. Another had to do with the absence of a recycling firm in the Municipality. Those few respondents (74, 20.56) who did some form of separation or sorting did that so that they could burn the plastics components of the waste and in some cases to sell some component such as plastic bottles and broken plastic buckets and chairs.

Table 4: Mode of disposing plastic waste

Mode of plastic waste disposal	Number of responses	Percentage (%)
Separated from household waste	74	20.56
Thrown together with household waste	282	78.33
Missing	4	1.11
Total	360	100.00

Similar observation was made in Ije Ode in Nigeria but in this case there was no sorting of waste at all. Banjo et al., (2009) observed that all the 300 respondents of Ije Ode state did not undertake any form of sorting of waste before disposal. In a study on sustainable plastics waste management in Accra, Wiennah (2007) observation revealed the importance of plastic waste separation if recycling efforts were to be effective.

Challenges of household waste disposal

Households within the Municipality faced numerous challenges in disposing of their waste. The most common challenge was the problem of irregular collection of waste as depicted on figure 4 below. This problem was common to those households dumping waste at approved dumpsite with waste containers and a section of those who received door to door services. According to the Municipal Assembly's boss, their waste collection vehicle had been down for almost three (3) years and for that matter they had to rely on Zoomlion Ghana Limited to do the collection of waste for them. Considering the fact that, the private waste management has its own client it would have to deal with first before attending to the areas covered by the Municipal Assembly, the issue of irregular collection often arises and for that matter is the most common problem encountered by households.

The second largest challenge encountered by household is the lack of dumpsites with 35.28 of households confirming this as indicated on figure 4 below. Other challenges that household encounter in their disposal of waste were the lack of dustbins and the fact that the distance of some dumping sites were far as indicated figure 16 as 22.5% and 20.56% respectively.

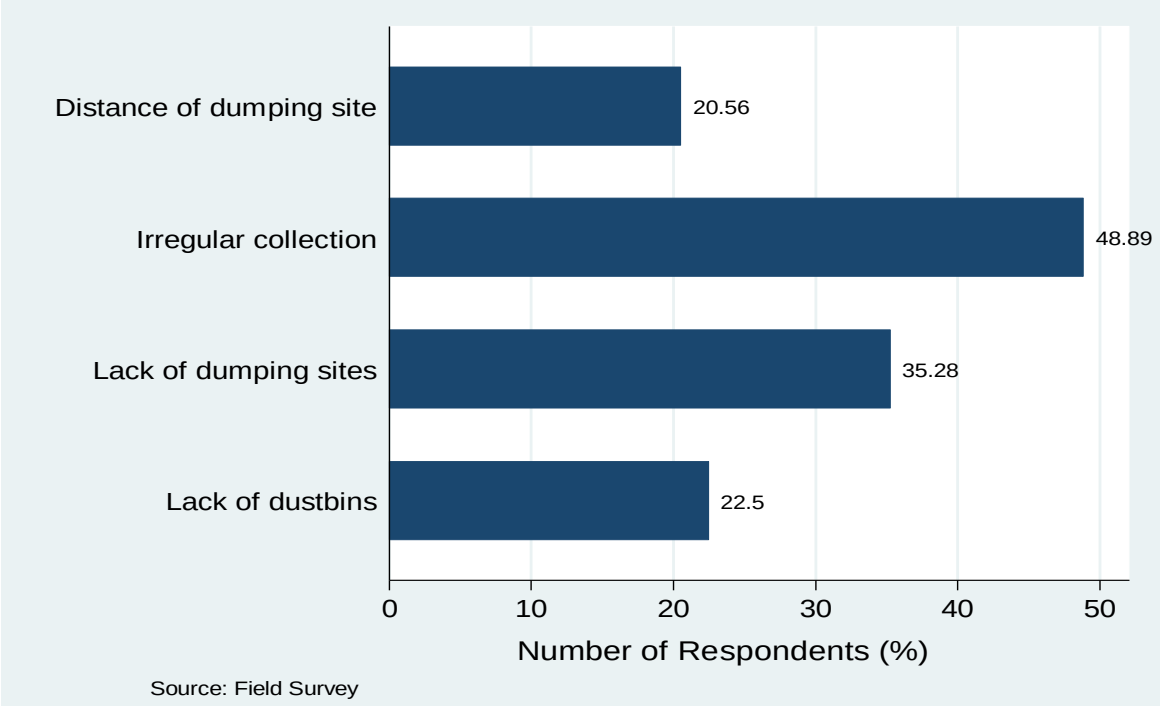

Figure 4: Challenges in disposing waste materials

Similar observations were made by observations were made by Puopiel, (2010) where inhabitants identified some of the above problems as major challenges militating against the effective disposal of waste in the Tamale Metropolitan Area. Other challenges confronting household waste disposal included, lack of dustbins and the long distance of dumping sites (Tsiboe and Marbell, 2004) and higher charges from waste management firms providing door to door services (Edmunson,1991; Adelaide, 1995). Such challenges when continuously are not address leads to the use of in appropriate dumping strategies by households such as dumping in gutters, roadsides, behind houses, in water bodies and any available open spaces. This could possibly be the reason why the Bolgatanga Municipality has an increased plastic waste (polyethen bags and pure water sachets) in its environment and for that matter a total of 294 (81.67) respondents

felt that, the environment situation was bad. While 57, (15.83%) said the situation was fair, that is not too good and not too bad, 4 (1.11%) said the environmental situation was good. 5 (1.39%) of respondents were not sure about the environmental situation.

Conclusion

Plastic waste was generally thrown together with other waste out of the household. 54.77% of households finally disposed their waste at approved dumping site while 34.77% burned their waste. A percentage of 8.92% disposed their waste at any available open space whilst 1.54% buried their waste. Household waste management challenges identified were distance of dumpsites, lack of dumpsite and dustbins as well as irregular collection of waste by waste management firms. From the household perspective, the solutions to the problems of the plastic menace includesd; change of attitude towards waste disposal, discontinuation of plastic use with the introduction of alternatives, recycling, and all stakeholder participation in waste management. The study did reveal that at the household level waste was basically managed by mothers and children while most fathers or grown up men did not play any active role in waste management. With regards to temporal storage of waste at the household, plastic waste was generally stored with other waste in dustbins with and without lids, buckets, paper boxes and large polyethene bags. Some households did not have any medium for temporal storage of waste and therefore disposed waste immediately after generation in any available open space around the home. Final disposal of waste from households was at approved dumping sites, any available space, burying and burning.

Recommendations

The researcher sees it necessary for authorities to take action now to address the problem. The following recommendations are therefore made.

1. Public awareness and education campaigns

The creation of awareness among households and all in society regarding indiscriminate use and disposal of plastic bags will be a good option to overcome the problem in future. Even though household are already aware of the impacts of plastics such awareness and educational campaigns must still be carried to remind people continuously. This could be done through anti-littering campaigns and promotions where residents are educated on the dangers posed by plastic bags. Awareness campaigns should be used to encourage behavioural change on plastic bag use. It is important to educate the public on the ills of plastic bags and ensure that information on the possible safe alternatives is available. There already are numerous alternatives to plastic shopping bags which include paper bags, green bags and degradable bags. Such education campaigns should encourage men to be much involved in household waste management since they have a greater common and influence at that level.

2. Use of environmental R's

Even though the government of Ghana is taking measures to regulate the use of plastic bags, this seems not to achieve the intended objectives. Instead, the application of the environmental R's could curtail the use of plastic bags. The government, environmental Non-Governmental Organizations and concerned stakeholders should utilize the three environmental R's (reduce, recycle and reuse) to mitigate the use of plastics. Producers and users should be encouraged to reduce the use of plastics. A reduction in the use of plastics means that alternatives such as paper and other biodegradable bags should replace the plastic ones; and new strategies of packaging should be practiced. Customers should have a mind-set that accepting plastic bags at the point of sale such as supermarket is unfashionable. In addition, households should be encouraged to (re)use plastic bags and bottles as many times as possible thus curtailing their production. With sound campaigns people should be educated to carry old plastic bags when going for shopping. They could be reused to carry books by school going pupils. They could also be utilised as carrier bags in various sectors. Plastic bottles could be used as water bottles and milk containers. In some communities they are reused as paraffin containers. This will prevent unnecessary discarding of these bottles.

References

Adane, L. and Muleta, D. (2011). Survey on the usage of plastic bags, their disposal and adverse impacts on environment: A case study in Jimma City, Southwestern Ethiopia.Journal of Toxicology and Environmental Health Sciences Vol. 3(8) pp. 234-248.

Adarkwa, K. K. and Edmundsen A. R. (1993).Urban Waste Management in Ghana, a Study of Eleven Urban Centers.University of Science and Technology, Kumasi.

Adelaide, A. (1995). Waste Management and Sanitation at James Town and Accra Central. A dissertation submitted to the Department of Sociology, University of Ghana, Legon.

Amankwah, A. (2005). Plastic Waste Wahala.[Access on 08 June, 2006 from http:www.ghanaweb.com/publicagenda/arcticle]

Anomanyo, D.E. (2004). Integration of Municipal Solid Waste Management in Accra,

Ghana: Biofactor treatment technology as an integral part of the management process.

Banjo,A. D., Adebambo, A.A.R. and Dairo, O.S. (2009). Inhabitants' Perception on Domestic Waste Disposal in Ijebu Ode, Southwest Nigeria**.**African Journal of Basic & Applied Sciences 1 (3-4): 62-66.

Dickson, K. B. and Benneh G. (1988). A New Geography of Ghana, Longman, London.

Dobbs, I. M. (1991). "Litter and waste management: Disposal taxes versus user charges." Canadian Journal of Economics 24: 221-27.

Draft 2010-2013 District Medium Term Development. (2010)

Edmunson, R. (1981). Refuse Management in Kumasi. Land administration research Centre Kwame Nkrumah University of Science and technology, Kumasi.

Federal Office for the Environment FOEN, (2003).Plastics.Retrieved July 21, 2012 from http://www.bafu.admin.ch/abfall/01472/01483/index.html?lang=en

George, F. (2008).Problem of Solid Waste in Accra. A dissertation Submitted to the

Department of Environmental Science University of Ghana.

Lardinois, I. &Klundert van de, (1995). *Plastic waste.Options for small scale resource recovery*.Urban Solid Waste Series 2.Waste consultant.

MLGRD (2009). National Report for Ghana Waste Management 2009, 18th Section of United Nations Commission on Sustainable Development. www.un.org/National Reports/ghana). [Accessed on 22nd July 2011]

MLGRD(2004).SanitationCountryProfileGhana(2004).(www.un.org/esta/agenda21./ghana/sanitationGHANA04.pdf). Accessed on 12th October, 2009

Puopiel, F. (2010). Solid waste management in Ghana: The case study of Tamale Metropolitan Area. A master's thesis submitted to the department of planning, Kwame Nkrumah University of Sceince and Technology.

Spokas, K.A. (2007). Plastics: still young, but having a mature impact. Waste Manage., 28(3): 473-474.

Tsiboe, I.A. and Marbell, E. (2004).A Look at Urban Waste Disposal Problems in Accra. Roskilde University, Denmark.

UNEP (2006).Ecosystems and Biodiversity in Deep Waters and High Seas.*UNEP Regional Seas Reports and Studies No. 178*.UNEP/ IUCN, Switzerland 2006. ISBN: 92-807-2734-6.

Wassener, B. (2011). Raising Awareness of plastic waste.

[Available on: http://bagitmovie.wordpress.com/2011/08/19/raising-awareness-of-plastic-waste-by-bettina-wassener-of-the-new-york-times]

Wienaah, M. (2007).Sustainable plastic waste management – A case of Accra, Ghana.

http://www2.lwr.kth.se/Publikationer/PDF_Files/LWR_EX_07_10.PDF

[Accessed 2nd July 2012].

World Bank(1995).*Ghana, Growth, Private Sector, and Poverty Reduction, a Country Economic Memorandum*. Washington D.C.

World Bank (1996).Urban Environmental Sanitation Project, Staff Appraisal Report, Republic of Ghana, Africa Regional Office.Washington.

Yankson, P. W. K. (1988). The Urban Informal Economy Accommodation, Growth, Linkages, Health and Environmental Impact.The Case of Greater Accra Metropolitan Area (GAMA). Ghana University Press, Accra.