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# Alternative way of managing plastic waste on campuses

A.B. Nyavor-Akporyo \*, F. Kutsanedzie, S. Achio, V. Nyame-Tawiah, L. Appiah Gyekye, E. Mensah

Accra Polytechnic, P. O. Box GP 561, Accra – Ghana

## Abstract

Plastic waste in developing countries has become problematic. Plastic waste has already become a serious environmental dilemma in Ghana in general and Accra in particular. Concerns have been expressed by many stakeholders including the past and present presidents of Ghana, organizations, environmental NGOs and public at large. This study is aimed at finding out how plastic waste can be recycled into reusable articles. Data for the study was collected using well-structured questionnaire. A sample size of hundred students from the University of Ghana Legon, University of Professional Studies, Accra Polytechnic, and University of Ghana - Accra City Campus were selected using simple random sampling technique for study. The results from the data collected revealed the possibility of using plastic waste to make useful products for reuse. Waste items-sachets of Milo, yoghurt and sachet water were collected from the campuses of the academic tertiary institutions involved in the study and subsequently used in designing and developing items such student bags, dresses, shopping bags, and umbrellas as a creative and innovative antidote for waste management on campuses.

**Keywords:** Sachets; waste; plastic; environment; campuses

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\* Corresponding author. E-mail address: [fkutsanedzie@apoly.edu.gh](mailto:fkutsanedzie@apoly.edu.gh)

## 1. Introduction

Sustainable solid waste management is a crucial problem not only for developing countries but for the developed countries as well. Enormous amount of waste is generated throughout the world and the most crucially posed question is how to manage these wastes effectively and efficiently to save the environment for the continuous existence of mankind. Many municipalities, cities, and towns continue to grapple with the problem of solid waste management, and the Municipality of Accra is no exception (Amankwah, 2012).

The organic component of solid waste may not be too much of a problem since that is biodegradable. However, the plastic waste component of the solid waste is quite problematic because this is non-biodegradable and therefore can stay in the environment for a considerable length of time causing all sorts of health and environmental problems. The management of plastic waste through combustion (incineration) is not environmentally friendly and sustainable since this may release carbon dioxide, (NO<sub>x</sub> and Dioxins) a major contributor to global warming (greenhouse effect). Land filling with plastic waste is not also desirable since plastic is non-degradable and no economic value would have been derived from the waste in that case. The best option for sustainable plastic waste management is through recycling (ZiadatAnfm and Mott, 2005). This is because the benefits of recycling of plastic waste are numerous and also environmentally friendly compared to the other methods of waste disposal.

Through recycling, waste can be use as materials for other product instead of regarding it as garbage or trash. According to a study conducted in Accra by GOPA Consultants in 1983, plastic waste accounts for 1-5% (of net weight) of the total amount of waste generated (Lardinois and Klundert, 1995). Since then, there has been a tremendous increase in plastic waste particularly sachet water bags due to increase urbanization and consumption pattern.

Most people in Ghana drink water that is bagged or bottled in plastics – either in plastic bottles or bags. However, plastic sachet water is most patronized because they are most affordable. Moreover sachet water is seen to more portable. According to Boadi and Kuitunen (2003), there is also a perception that such sachet water is cleaner and more mineralized than tap water, and after gulping down the water, satchets are discarded indiscriminately thereby littering the whole environment.

Over the years, plastics have replaced leaves, glass and metals as a cheaper and more efficient means of packaging (IRIN, 2012). Soon after usage, these are randomly discarded. Recent rapid expansion in the human communities on campuses in Ghana has resulted in increased plastic waste generation.

The Government of Ghana has partnered with various recycling companies such as Zoomlion Ghana Limited, Blowplast and Jospong Group of Companies to collect, sort, process and recycle solid and liquid waste. This is to be used in the production of organic manure, rubber sandals and polythene bags. The Accra Compost and Recycling Plant have also been established to address the problem of plastic and solid waste.

It is therefore an important step to analyze the types of plastic waste produced by students on campuses in Ghana and how some of these plastic waste can be recycled into reusable articles in order to help decrease the quantity of plastic waste on campuses and to apply the results toward further recycling opportunities.

### 1.1. Purpose of the study

The study was conducted in two phases. Phase one (1) was a survey of to find out students' opinion on the types and ways of handling the plastic waste produced on campuses of academic tertiary institutions. Phase two (2) was recycling of plastic waste into usable articles. The purpose was to make useful products by using some of the plastic waste identified in phase one (1) of the study.

### 1.2. Research questions

The phase one (1) of the study was aimed at investigating the opinion of the students about plastic waste produced on campuses with an emphasis on the following research questions:

- *RQ1*. What are the students' opinions about the types of plastic waste produced on campuses of academic tertiary institutions?
- *RQ2*. What are the students' opinions about ways of handling the plastic waste produced on campuses of academic tertiary institutions?

## 2. Methodology

### 2.1. Sample of the study

The study was conducted at four tertiary academic institutions in Accra. These include the University of Ghana Legon, Institute of Professional Studies, Accra Polytechnic, and University of Ghana - Accra City Campus. The population of the study consisted of the students from the Department of Linguistics at the University of Ghana, Department of Business Administration at the University of Professional Studies and the students from the Department of Fashion and Textiles at Accra Polytechnic. Cluster sampling was employed by grouping the academic institutions into four main clusters. A proportionate sample of 30 students allocated to each cluster, were selected for the study using simple random sampling technique. In total, a sample of 120 students was selected for the study.

### 2.2. Questionnaire

A questionnaire was used to collect data for this study. The method was used because of the advantages it has; it provides more responses than interviews and requires fewer skills to administer (Ndagi, 1999). The use of questionnaires also enables researchers to collect data on people's knowledge, values, etc. (Obasi, 1999). A total of 120 questionnaires were administered among the students in the campuses of the four tertiary academic institutions in Accra. A total of 100 (83.3 percent) questionnaires were returned and used for the analysis.

The questionnaire was pilot-tested using ten students who were not included in the actual survey. The questionnaire had the following four sections:

- *Personal information*: this includes questions concerning gender, age, academic institution and level of course
- *Types of plastic waste produced on campuses*. The types of questions are: “What are the kinds of plastic waste students normally produce on campus?” and “Where are these plastic waste normally found on campus?”
- *Ways of handling the plastic waste produced on campuses*: this includes questions concerning knowledge on how the plastic wastes produced are disposed. The question includes: “How are the plastic wastes produced on campus disposed” and “What do you think would be the best way(s) of handling the plastic wastes produced on campus?”

### 2.3. Data collection procedure

The researcher with the help of research assistants from the Research and Innovation Centre, Accra Polytechnic, administered the questionnaire at the four tertiary academic institutions. The administration and collection of the questionnaire took a period of two weeks. The purpose of the study, potential risks and discomforts, confidentiality and anonymity, and the rights of the participants were explained to the sampled students.

### 2.4. Data analysis

The data collected was analyzed using both descriptive statistics. The descriptive statistics included frequencies in tables. The SPSS program (SPSS® 17.0, 2008; SPSS Inc., Wacker Drive, Chicago, USA) was used for data the analyses.

## 3. Results

### 3.1. Participants

Of the 100 respondents, 25 percent were from University of Ghana city campus, 25 percent were from the Institute of Professional Studies, 30 percent were from Accra Polytechnic, and 20 percent were from the University of Ghana Legon. It was noted that majority of the students (54.0) percent were female as shown in table 1. Seventy percent of the students were aged 20-25 years, 25.0 percent were aged 26.30 years, while 5.0 percent were aged 31-35 years as seen in table 2. The study showed that 19.0 percent out of the total population of 100 students used for this study are level 100 students; similarly, 26.0 percent are level 200 students, 20.0 percent are level 300 students, while majority (35.0 percent) are level 400 students.

**Table 1.** Gender of the students

<b>Gender</b>	<b>Frequency</b>	<b>Percent</b>
Male	46	46.0
Female	54	54.0
Total	100	100.0

Source: Author's field data

**Table 2.** Age distribution of students

<b>Age (Years)</b>	<b>Frequency</b>	<b>Percent</b>
20-25	70	70.0
26-30	25	25.0
31-35	5	5.0
Total	100	100.0

Source: Author's field data

### 3.2. Types of plastic waste produced on campuses

The students were asked to indicate the kinds of plastic waste usually produced by students on campus. The findings indicate that 10.0 percent of the plastic wastes produced on campus are empty plastic water bottles, 25.0 percent are empty polythene bags, 35.0 percent are empty water sachets, while 30.0 percent are empty fan yogo, fan choco, fan milk and milo bags as indicated in table 3.

**Table 3.** Kinds of plastic waste on campus

<b>Plastic waste</b>	<b>Frequency</b>	<b>Percent</b>
Empty plastic water bottles	10	10.0
Empty polythene bags	25	25.0
Empty water sachet	35	35.0
Empty fan yogo, fan choco, fan milk and milo bags	30	30.0
Total	100	100.0

Source: Author's field data

With regard to the places on campus where plastic wastes are usually found, as is evident in table 4, 35.0 percent of the students indicated that they are found on campus surroundings, 30.0 percent indicated that they are found on campus cafeteria, 20.0 percent said they are found in lecture halls, while 15.0 percent said they are found in washrooms.

**Table 4.** Places where plastic waste are found on campus

Place	Frequency	Percent
Lecture Halls	20	20.0
Cafeteria	30	30.0
Washrooms	15	15.0
Campus surrounding	35	35.0
Total	100	100.0

### 3.3. Ways of handling the plastic waste produced on campuses

The students were asked to indicate the ways in which the plastic wastes produced on their campuses are disposed. Table 5 presents the findings the frequency and percentage of their responses. The analysis showed that collection and dumping the plastic wastes at the refuse dump is the custom practiced on campuses.

**Table 5.** Ways of disposing plastic waste on campus

Ways of disposal	Frequency	Percent
Dumping	75	75.0
Burning	15	15.0
No idea	10	10.0
Total	100	100.0

Source: Author's field data

The students were also asked to indicate the best approach to handling the plastic waste produced on campus. Majority (80.0 percent) of the students indicated the option of recycling the plastic waste. However, 15.0 percent of the students consider the collection and dumping of the plastic waste at the refuse, while 5.0 percent think of burning plastic waste all the time.

## 4. Discussion

### 4.1. Discussion of students' survey

From the data collected it is evident that water sachets form the highest waste produced, followed by empty fan milk, fan yoghurt and milo bag.

These plastic wastes are found on campus surroundings, cafeteria, lecture halls, and washrooms. This confirms findings of Boadi and Kuitunen (2003), that after gulping down the liquid content from these bags; they are discarded indiscriminately thereby littering the whole environment.

The findings reveal that dumping is the commonest way of disposing plastics academic tertiary institutions in Accra.

**Table 6.** Best way of handling plastic waste on campus

<b>Ways of handling</b>	<b>Frequency</b>	<b>Percent</b>
Dumping	15	15.0
Burning	5	5.0
Recycling	80	80.0
Total	100	100.0

Source: Author's field data

Contrary to the findings of Ziadat and Mott (2005), that recycling is, perhaps, the best and the most environmentally-sound method used in solid waste management for reducing quantities of solid waste disposed of in landfills, majority of the students indicated that the best approach to handling the plastic waste produced on campus should be recycling of the plastic waste for reuse.

#### 4.2. Discussion of recycling of plastic waste

Phase two (2) of the research was recycling of plastic waste into reusable articles. The purpose was to make useful products for reuse by using some of the plastic waste identified in phase one (1) of the study. The recycling of the plastic waste was guided by the following leading questions:

- Which of the plastic wastes identified in Phase one (1) can readily be recycled?
- What products can these plastic wastes be recycled into?
- What are the processes of recycling the plastic waste into reusable products?

##### 4.2.1. Which of the plastic wastes identified in Phase one (1) can readily be recycled?

Based on the findings of the Phase one (1) of the study which dwelled on the kinds of plastic waste usually produced by students on campuses, the researcher identified the possibility of recycling empty sachet water bags, empty fan yogo, fan choco, fan milk and milo bags, into useful products at a relatively lower cost.

##### 4.2.2. What products can these plastic wastes be recycled into?

The researcher identified the use of the plastic waste in designing and developing products such as bags – student, dressing, shopping bags, dresses, and umbrellas.



### 4.3. Acceptability of the product

The product was exhibited at the Sixth Ghana Higher Education Fair, Southern Ghana at Ola Girls and over 300 people commended and commented that the product is good and nice.

#### 4.3.1. What are the processes of recycling the plastic waste into reusable products?

The researcher first collected, fan yogo, fan choco, fan milk and milo, from the academic institutions involved in the study. The next processes are shown in the Figure 1.



**Figure 1 (a).** Shows the washing of the empty water sachets, fan yogo, fan choco, fan milk and milo, collected on the campuses of the academic tertiary institutions of the study



**Figure 1 (b).** Shows the drying of the empty sachet water, fan yogo, fan choco, fan milk and milo





**Figure 1 (c).** Shows the sorting of the empty sachets into various kinds



**Figure 1 (d).** Shows the laying-out and cutting of the empty sachets into different articles.



**Figure 1 (e).** Shows the joining of the empty sachets



**Figure 1 (f).** Shows the finished product of milo shopping bag



**Figure 1 (g).** Shows the finished product of fan yogo and chocolate garment



**Figure 1 (h).** Shows the finished product of water sachet umbrella.

## 5. Conclusion

The benefits of recycling plastic waste are numerous aside being more environmentally friendly compared to the other methods of waste management. As reported in table 6, one of the best ways to tackle the menace of indiscriminate disposal of plastic wastes in lecture halls, washrooms, cafeteria and on campus surroundings is to recycle into less costly products for reuse, instead of collecting and dumping them at the refuse dump or burning them which are not environmentally friendly.

In recognition of the importance of recycling of plastic waste in waste management in the metropolis as well as in the academic tertiary institutions, the study recommends the following:

- That more technical staff should be trained on how to recycle plastic waste into useful products.
- The academic tertiary institutions can incorporate a short course training programme at low cost, teaching students and the general public how to recycle plastic waste – empty sachets, into useful products.
- The government could adopt recycling of plastic waste into useful products as part of its poverty reduction and youth employment strategy.

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