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Plastic Wastes Disposal in the Wawasua Community in the Sunyani Municipality, Bono Region

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Abstract

Plastic waste management has been a major challenge globally owing to its far-reaching effects on public health and the environment. The study was aimed at assessing plastic waste management and plastic waste use behaviour in the Wawasua Community in the Sunyani Municipality. A total of 30 households were randomly selected for the study. The study revealed that, 70% of the respondents had formal education whilst 30% did not. It further revealed that, all of the respondents use plastics and 60% of them have heard about solid waste management whilst the remaining 40% have not. Schools (23.3%) and Mass media (20%) were the major source of information about waste management. Only 36.7% of the respondents reuse plastic waste with about 83.3% of the respondents disposing of plastics through open dumping or burning. In contrast, about 76.7% of the respondents' own waste bins. In terms of proximity of disposal sites, 80% of the respondents travel a distance between 301m – 1km to dispose of waste. All the respondents alluded that communal waste bins in the community were rusted/perforated (30%) and too small (70%). Low-Density Polyethylene (PE) and Polyethylene terephthalate (PET) each represented 30% of the plastic waste composition in the study area. In terms of knowledge and perceptions about plastic waste, majority of the respondents demonstrated awareness of the effects of improper plastic waste management. It is therefore recommended that public education on plastic waste disposal should be intensified to increase household awareness and implementation of sustainable waste management systems.

Keywords: plastic waste, open dumping, reuse, knowledge, solid waste management

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INTRODUCTION

Waste is considered a by-product of urbanization, economic development, and population growth. Around the world, about 2.01 billion tones of municipal solid waste is produced annually and this is expected to increase to 3.40 billion tones by 2050 under a business-as-usual scenario. Plastics make up about 12% of the global municipal solid waste composition (Kaza et al., 2018; Hornweg and Bhada-Tata, 2012).

According to a report by the UNICEF and World Health Organization, about 2 billion people still lack access to basic sanitation facilities with 7 out of 10 living in rural areas (WHO, 2019). In Sub-Saharan Africa about 70% of the waste generated is openly dumped including plastics. Thus, choking gutters and drainage channels posing significant health risks to both plants and animals, resulting in flooding and serving as breeding spots for disease causing organisms (Kaza et al., 2018).

Plastics are essentially synthetic and semi-synthetic polymers or molecules made up of repeating units of carbon (monomers) usually produced from petroleum. They can easily be moulded into different shapes, durable, light-weight, corrosion-resistant, hydrophobic and relatively cheap. They are characterized by high molecular stability and cannot easily be broken hence its notoriety of been nonbiodegradable. These properties amongst others makes them best suited for a wide range of applications. The benefits notwithstanding, plastics have become a major environmental and public health concern engendering widespread consensus on the need for sustainable and eco-friendly alternatives to plastics (Erni-Cassola et al., 2019; Geyer et al., 2017).

Globally, it is estimated that about 407 million metric tons of plastics are produced annually. In a business-as-usual scenario, it is expected that the rate of plastic production would double by 2030 and quadruple by 2050. The packaging industry

remains a major consumer of plastic resins globally (Geyer et al., 2017; Jambeck *et al.*, 2015).

It is estimated that, Ghana generates about 1 million tons of plastic waste annually of this, only 2-5% (22,000-55,000) is recycled. The rest ends up on landfill (38%), land (28%), in the sea (23%), or burned (11%) (United Nations Development Programme, 2019). Plastic pollution is becoming pervasive in our environment especially in our oceans. Land based plastics remains a major source of plastic pollution in our oceans and water bodies (Lebreton and Andrady, 2019). This results in significant losses in terms of ecosystem services lost, reduction in environmental ambience and beauty. Thus, negatively affecting important sectors of the economy such as tourism and fisheries. This research therefore seeks to ascertain the composition and plastic waste disposal behaviour in Wawasua. It also seeks to assess the knowledge and perceptions of the people towards plastic waste.

METHODOLOGY

Study Area

The study was carried out in Wawasua Community in the Sunyani Municipality, Ahafo Region. The community lies between latitudes 7.35° N and 7.05° N and longitudes 2.30° W and 2.10° W in the wet semi-equatorial climatic zone of Ghana. The monthly temperatures vary between 23°C and 33°C with the lowest around August and the highest around March and April. Farming is the major occupation and source of income in the community (Afrifa et al., 2019; GSS, 2014).

Sampling size and technique

The research employed the mixed research design approach thus employing both qualitative and quantitative methods and techniques. A total of 30 households were randomly selected, interviewed and administered questionnaires. A waste

characterization study was also conducted in the sampled households. According to researches by Owarma et al. (2015), Sharma and Mcbean (2007), McCauley-Bell et al. (1997), a sample size of 30 sorts at a confidence interval of 90% is ideal for researches involving solid waste characterization. The researchers showed that convergence was reached especially for plastic waste after 23 sorts beyond which little or no additional information is gained. The simple random sampling technique was used in order to eliminate researcher bias in the household sampling process.

Data Collection and Analysis

Questionnaires, personal observation and interviews were employed to obtain data on domestic plastics waste disposal and its effect on the environment. Semi-structured questionnaire was administered to the respondents selected from each household. This was to find out their plastic waste management practices and user behavior.

Plastic waste characterization was also conducted in each household in the study area for a period of 7 days. Direct or manual sorting was done periodically and weighed using weighing scale. Statistical Package for Social Scientists (SPSS) was used to analyze the results obtained from the data collected.

RESULTS AND DISCUSSIONS

Socio-Demographic Characteristics of the Respondents

The study revealed that 70% of the respondents were females and 30% males (Table 1). Thirty percent (30%) of the were between the ages of 25-35 years and 36-45 years. The survey further revealed that 30% of the respondents had no formal education whilst 70% had (Table 1). Majority of the respondents (46.7%) too were married, 30% single, and 13.3%, divorced (Table 1).

Table 1: Socio-demographic characteristics of the respondents

Gender of respondents	Frequency	Percent (%)
Male	9	30
Female	21	70
Total	60	100
Age of respondent	Frequency	Percent
> 25 years	5	16.6
26-35 years	9	30
36-45 years	9	30
46 years and above	7	23.3
Total	30	100
Level of education	Frequency	Percent
No formal education	9	30
Primary	12	40
JHS/SHS	8	26.6
Tertiary	1	3.4
Total	30	100
Marital status	Frequency	Percent
Married	14	46.7
Single	9	30
Divorced	4	13.3
Separated	2	6.6
Widow/Widow	1	3.4
Total	30	100

Plastic Waste Use Behaviour

The study revealed that all (100%) of the respondents use plastics (Table 2). This confirms the relative ubiquity of plastics which can be attributed to its durability, lightweight, corrosion-resistance and its ability to be molded into different shapes and forms without fracturing (*Plasticity*) (UNEP, 2018).

Burning was the major plastic waste disposal method in the study area representing (53.3%), open dumping (30%) whilst the remaining 16.7% use waste bins (Table 2). This

finding is corroborated by Yintii *et al.* (2014) who in a similar study on household perspectives of plastic waste management in Bolgatanga Municipality revealed that a significant number of the respondents 34.77% disposed of plastic waste through burning. Similarly, a World Bank report by Kaza *et al.* (2018) asserts that about 69% of waste in the Sub-Saharan Africa region is openly dumped. In contrast, though majority of the respondents owned waste bins, burning and open dumping were prevalent in the study area (Table 2). This can be attributed to poor waste collection services in the area, thus, compelling residents to resort to burning and open dumping as convenient waste disposal methods. Similarly, proximity to communal waste disposal bins / sites may be a major factor accounting for the indiscriminate plastic waste disposal methods in the community. Residents walk between 301 m - 1 km to dispose of their waste (Table 2). A research by González-Torre and Adenso-Díaz (2005) has shown that there is a strong relationship between proximity to disposal sites/bins and the waste management practice adopted by respondents. They found out that recycling rates increase as the distance to recycling bins decreases.

Table 2: Plastic waste use behaviour

Do you use plastics	Frequency	Percent (%)
Yes	30	100
How do you dispose of plastic waste	Frequency	Percent (%)
Waste bin	5	16.7
Open dumping	9	30
Burning	16	53.3
Do you re-use the plastic bags	Frequency	Percent (%)
Yes	11	36.7
No	19	63.3
Total	30	100
Do you own a waste bin for the collection of waste	Frequency	Percent (%)

Yes	23	76.7
No	7	23.3
Total	30	100
If yes how often is it emptied	Frequency	Percent (%)
Once in a month	7	30.4
Once per week	11	47.8
Twice per week	4	17.4
Everyday	1	4.3
Total	23	100
State of communal / public bins in your vicinity	Frequency	Percent (%)
Not in a good condition (Rusted / perforated)	9	30
Too small	21	70
Total	30	100
Proximity of communal waste bin to your place of residence	Frequency	Percent (%)
>100 m	1	3.3
100 - 300 m	5	16.7
301 - 500 m	14	46.6
500 - 800 m	5	16.7
1 km and above	5	16.7
Total	30	100

Plastic Waste Composition

Waste characterization studies in the study area revealed that, the total plastic waste generated for the period of 7 days in the sampled households was about 32.9kg. Low-Density Polyethylene (LDPE) and Polyethylene terephthalate (PET) were significantly higher (30% each) than other types of plastic waste. Closely following was high density polyethylene (HDPE) with 23% and others including polystyrene, polyethylene, polyvinyl chloride (PVC) and uncoded plastics accounted for 17% of the total plastics sorted out in the study area (Figure 1). The observed finding corroborates research by Gwada et al. (2019) who found out that Low-Density Polyethylene (LDPE) and Polyethylene terephthalate (PET) accounted for about 90% of the total plastic waste

composition. Similar findings were reported by Areprasert et al. (2017). Compared to HDPE and PET, LDPE has a lesser value and is likely to be left out when plastics are being sought for re-use or recycling. However, the low plastic waste recycling and reuse behaviour accounts for the high disposal rates for PET and HDPE (Table 2) (Banerjee et al., 2014).

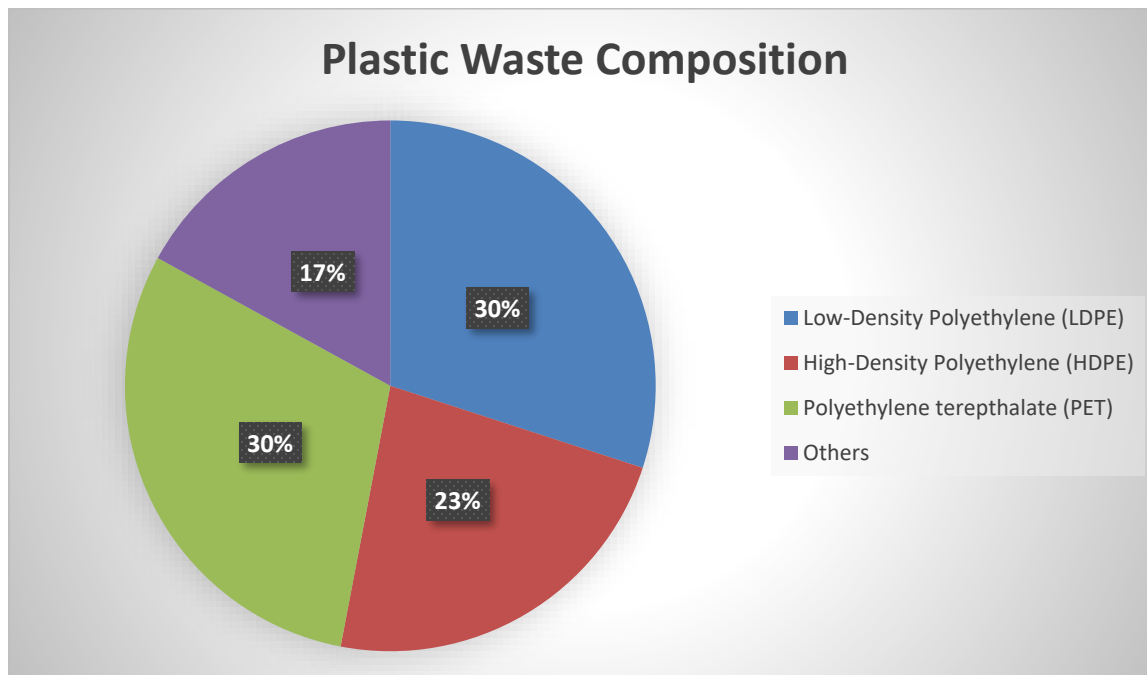


Figure 1: Plastic waste composition

Knowledge and Perception on Plastic Waste

The study revealed that about 60% of the respondents had some knowledge or information about plastic waste management (Table 3). Their sources of information about solid waste management varied as follows; 38.9% of them appreciated the importance of formal education / schools, 33.3% was through mass media, family and friends 11.1% whiles 16.7% admitted that they heard it during public meetings (Table 3). A research conducted by Noufal et al. (2020) found out that social media was a major

source of information for households in the study area with 71% of the households indicating that social media is the prime source of information on solid waste management, compared with other sources (brochures, advertisements, TV, and radio). A total of 76.7% of the respondents alluded that waste can be recycled whereas the remaining 23.3% did not have any idea or knowledge that plastic waste can be recycled (Table 3). However, all the respondents agreed that plastic waste disposal was a major environmental problem in the neighborhood (Table 3). Some of the effects of plastic waste in the community as mentioned were the resultant deluge of slowly degradable materials entering their environment and their food chain. The result also indicated that 90% of the respondents were aware of the dangerous effect of using plastic waste on the environment and were ready to support a ban on plastic bags. The ban on single use or lightweight plastic bags has been touted as a strategic solution towards reducing plastics pollution globally. Kenya, Canada, Zimbabwe, Ethiopia, United Kingdom, United States amongst countries taking steps in reducing plastics waste generation by banning the use of certain single use plastics (Masterson, 2020). The observed awareness of the negative effects of plastic waste mismanagement amongst the respondents in Wawasua community corroborates their support for the ban on single use plastic bags (Chow et al., 2017).

Table 3: Knowledge and perception on plastic waste

Have you heard about plastic waste management	Frequency	Percent (%)
Yes	18	60
No	12	40
Total	30	100
If yes, through what medium	Frequency	Percent (%)
Mass media	6	33.3
In a public meeting	3	16.7
Through family and fiends	2	11.1

In school	7	38.9
Total	18	100
Do you think waste material can be recycled	Frequency	Percent (%)
Yes	23	76.7
No	7	23.3
Total	30	100
Do you think Plastic waste disposal is a problem in your neighbourhood	Frequency	Percent (%)
Yes	30	100
Total	30	100
Are you aware of the dangerous effect of using plastic waste on the environment	Frequency	Percent (%)
Yes	27	90
No	3	10
Total	30	100
Do you think the people in the society have enough knowledge about the dangers of plastic to our environment	Frequency	Percent (%)
Yes	9	30
No	21	70
Total	30	100
Are you ready to support of the ban use of plastic	Frequency	Percent (%)
Yes	30	100
Total		

CONCLUSIONS

The study assessed the disposal of plastic wastes and its effect on the environment in Wawasua Community in the Sunyani Municipality. Low-Density Polyethylene (LDPE) and Polyethylene terephthalate (PET) were significantly higher than other types of plastic waste. Majority of the people in the study area disposed their waste in the form of open dumping and burning. The respondents demonstrated satisfactory knowledge

about waste plastic waste management and the effects of plastic waste mismanagement. However, sustainable plastic waste use behaviour such as reuse and recycling were relatively low in the study area. This can be attributed to the lack of recycling centers and incentives in the area. The observed plastic waste composition has a very high revenue potential in terms of recycling. Based on these, it is recommended that: public education on plastic waste disposal should be intensified to increase household awareness for better waste management in the study area. The Government and other NGOs should establish plastic waste recycling centers in the community and provide incentives for plastic waste reuse and recycling. Environmental health officers should also intensify their supervision in the area to prompt households to keep their homes and surrounding clean; and Government should provide adequate and quality communal waste bins for the collection of plastic waste.

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Conflict of interest

We have no competing interest regard the publication of this research article.

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