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Solid Waste Management Plan at Ibiminapolo Community, Port Harcourt Nigeria

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Abstract

Solid waste characterization study is fundamental to any proper planning of solid waste management in an area. The study investigated the generation rate and characterization of solid waste in a slum - Ibiminapolo community, in Nembe waterside, Port Harcourt Nigeria with an estimated population of 200 persons. A total of ten households were sampled, each having an average of four dwellers. The quantity of total waste generated from these homes was measured for ten days to estimate the solid waste generated and its components before any pretreatment. The results obtained revealed that the total solid waste generated during the period of study in Ibiminapolo community had the following components 41.8% plastics, 15.6% paper, 12.8% dirt, 11.5% organics, 7.6% textile, 7.2% wood and 3.4% aluminium with a generation rate of 0.22kg/capita/day. Because plastics have the highest percentage, the recommended option for management of plastics in Ibiminapolo community is a waste management program incorporating reuse and recycling rather than disposal. Although energy recovery is another option however, the Nigerian economy is not yet ripe for such technology.

Keywords: *Plastics, Waste management, Characterization, recycling, reuse.*

1. Introduction

Until the advent of technology, followed by increased anthropogenic activities, the waste stream was mostly organic. Microorganisms found naturally occurring in the environment decomposed such organic wastes in a process known as bioremediation. With global population explosion, there is an increasing trend in the amount of both organic and synthetic solid waste generated due to change in consumption patterns (Marshall and Farahbakhsh, 2013). The challenge with management of solid waste comes largely from the synthetic wastes, which are highly non-biodegradable. When plastics are discharged into surface water, there is the risk of fishes consuming smaller particles. In emerging economies such as Nigeria, the government still finds it difficult to invest in the management of what is already termed 'waste'. As a result, management of municipal solid waste is left for non-experts in the informal sector (Nwankwo et al; 2014). One of the reasons for solid waste management is to safeguard public health and conservation of natural resources such as land use.

There are different sources of municipal solid waste namely; residential homes, commercial establishments, institutions and municipal services such as street sweepings and roadside litter (Kuleape et al; 2014). In most developed countries, municipal solid wastes are segregated to avoid co-mingling with other types of waste before further processing (Chang and Wang, 1996). Knowledge about the composition and

generation rate of municipal solid waste is pertinent to policy formulation and effective management of waste such as frequency of collection, treatment and disposal options based on appropriate technology.

For characterization of solid wastes, factors such as degree of urbanization and industrialization, social customs, season, population, economic status, geography and climate influence the waste stream (Kuleape et al; 2014). The effects of economic status have largely been investigated (Abur et al; 2014; World Bank 1999). It is accepted that low-income earners generate more organic waste arising from cooking than high-income earners due to consumption of ready-made meals. The analysis of the composition of the waste stream, by material types or by product types is referred to as waste characterization. Most studies involving solid waste characterization in Port Harcourt metropolis have been done on the waste dumpsites (Igoni et al; 2007). Such studies do not give accurate estimation of the total waste generated. This is largely because at the dumpsites, the wastes are subjected to other forms of pre-treatment such as sorting by waste scavengers around. Thus, this study is aimed at bridging such gap by characterizing the solid waste generated at Ibiminapolo community, Port Harcourt and estimating the generation rate before final disposal to dumpsite. Such information will help the government in planning especially as Ibiminapolo community is densely populated.

2. Materials and methods

2.1 Study area

The study area is the Ibiminapolo community, which is part of the island of the Bille town in Rivers State with longitude of 4˚45' 25.8″N and latitude of 7˚01' 31.6″E. Bille town, like other coastal towns, is a low-lying land in the vast mangrove forest region of the Niger Delta and is only a few feet above the sea level. It is situated in the southeastern part of the present Degema Local Government Area of the Rivers State. This area is a slum, characterized by substandard housing and absence of social amenities. The inhabitants of this area are mostly fishermen and jetty transport workers. The map of this area is shown as Figure 1.

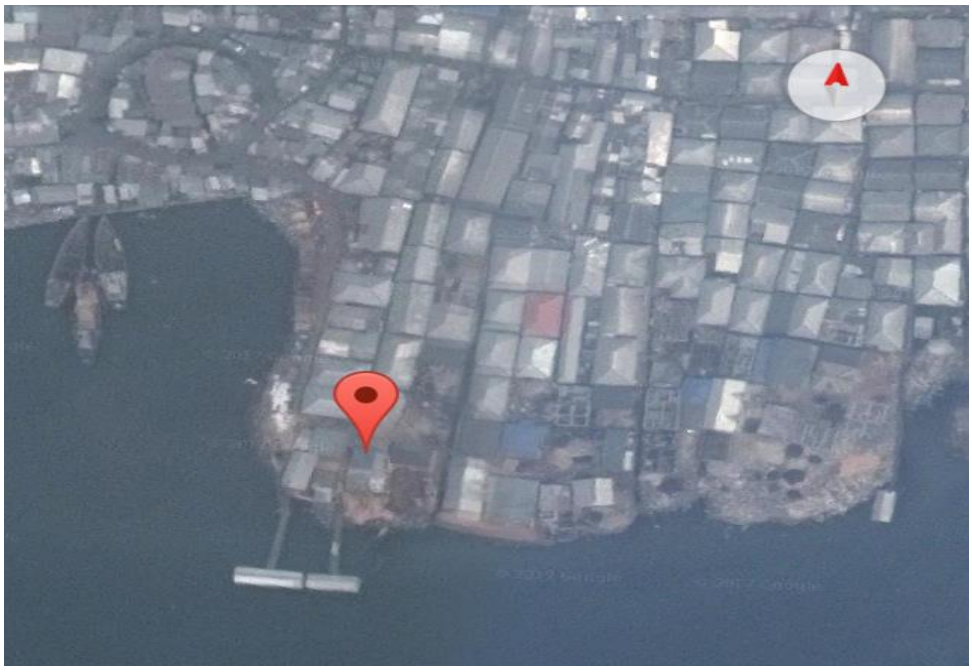

Figure 1: map of the study area

2.2 Sampling method

The study period was for ten days. Waste bags, each measuring about five liters by volume was given to ten homes with an average of four people per home. Each household was asked to fill the bag daily with whatever waste generated. The aim was to determine the amount of waste generated at source before any form of pre-treatment. Other materials used included weighing scale, containers, bench and hand gloves. The collected wastes were sorted out and the different components weighed using the weighing scale. The waste collected from the homes were sorted out into different components and weighed in kilogram.

3. Results and discussion

The daily measurements recorded from the various components are recorded in Table 1. The percentage average weights of the different components of the waste are shown in Figure 2.

Table 1: Daily measurements from municipal solid waste generated at Ibiminapolo community

Days	Total waste collected per day(kg)	Plastics (kg)	Textile (kg)	Dirt (kg)	Paper (kg)	Organics (kg)	Wood (kg)	Aluminium (kg)
1	8.3	3	0.2	1.4	1.9	1.5	0.2	0.1
2	7.2	1.8	0.5	1	1.2	1.2	1.4	0.1
3	7.7	4	1	0.7	1.1	0.6	0.1	0.2
4	8.1	3.3	0.1	0.5	1.7	1	1.2	0.3
5	10.4	4.6	0.8	1.5	1.8	0.4	0.7	0.6
6	8.9	3.5	1.1	0.8	1.5	1.2	0.6	0.2
7	8.8	2.9	0.8	1.5	1	1.4	0.5	0.7
8	9.7	5.2	0.1	1.2	1.3	1.3	0.2	0.4
9	9.2	4.4	0.9	1.1	1.1	0.6	0.8	0.3
10	8.7	3.7	1.1	1.4	1	0.8	0.6	0.1

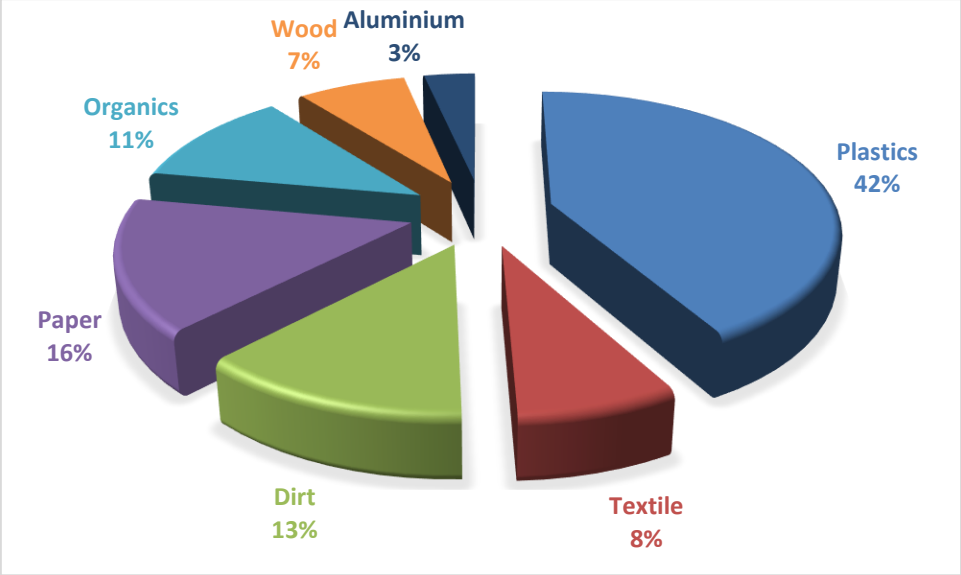

Figure 2: The different components of wastes generated at Ibiminapolo community

The solid waste composition of the Ibiminapolocommunity shows that plastics has the highest waste composition with an average of 42% with paper, aluminium, wood, dirt, textile and organics having an average of 16%, 8%, 7%, 11%, 13%, and 8% respectively.The generation rate of the solid waste from the community shows 0.22 kg/person/day. This is similar to previous studies within Port Harcourt metropolis (Igoni et al; 2007)

It was observed that the residents of Ibiminapolocommunity use more of plastic products because of the markets and jetty activities which make use of plastic and paper products like sachet water, bottled water, plastic fizzy drinks and food packs. An approach developed for the management of the plastics is shown in Figure 3.

From the field study, it was discovered that the residents of Ibiminapolocommunity use end of pipe approach for the management of their waste that is, they generate, collect and dispose by the riverbank adding to the pollution of the water body.

However, a waste management approach will entail generation of the waste, collection and resource recovery. This is a proactive way of managing the plastic waste. For resource recovery of the plastics, the drivers to a successful implementation will involve public campaign and reward system.

Public campaign will entail educating the residents on the consequences of improper disposal of plastics and the gains of proper waste management scheme which includes a sustainable environment. Reward system is an old tradition whereby plastics are traded for money and gift items however, this practice is almost gone. Given the economic status of the study area, once people are aware that they will receive a token by exchanging their waste in this case plastic bottles, they will comply.

The first step in waste management is to gain an understanding of the waste types being generated in order to design appropriate collection, recovery and disposal strategies. The relevant stakeholders are local manufacturers, local traders and waste scavengers. The study has shown that 42% of the solid waste generated from Ibiminapolocommunity is plastics. The large generation of plastics can be reused by the local traders for the selling of kerosene and local drinks like zobo and local gins. In addition, it can be sent to bottling companies for sterilization and reuse. The plastic can also be recycled into more useful products

like plastic picnic tables, lawn furniture, playground equipment and waste bins by local manufacturers. Because, the bulk of the sorting at Ibiminapolo community is done by the waste scavengers, there is need for control pricing as way of motivation to them. Therefore, they could come under a cooperative to ensure such control pricing. This process of recycling and reuse will reduce the quantity of waste, which is disposed by Ibiminapolocommunity into the river. This in turn reduces the pollution and aesthetics of the river, and ensures a sustainable environment. Efforts should be made by the Stakeholders to ensure a proper disposal of waste by creating awareness on the dangers of waste disposal on the water body, indiscriminate disposal of waste and the benefits of proper waste management in this case recycling and reuse. There should be a legal framework either by the council or community heads to support the program in which case offenders will be fined and reward system for those that are compliant.

4. Conclusions

The current state of solid waste management in Port Harcourt, Nigeria has been on a decline over the years as a result of urbanization, population and industrialization and poor funding from the government. The study has shown there is a steady supply of plastic waste from Ibiminapolo community. There should be a synergy between the Federal Ministry of Industry, Trade and Investment and Federal Ministry of Environment to promote awareness among the local manufacturers. Therefore, the local manufacturers can source for raw materials from the collection centers located in and around the community. The waste management plan developed will help improve the management of solid waste generated in Ibiminapolocommunity.

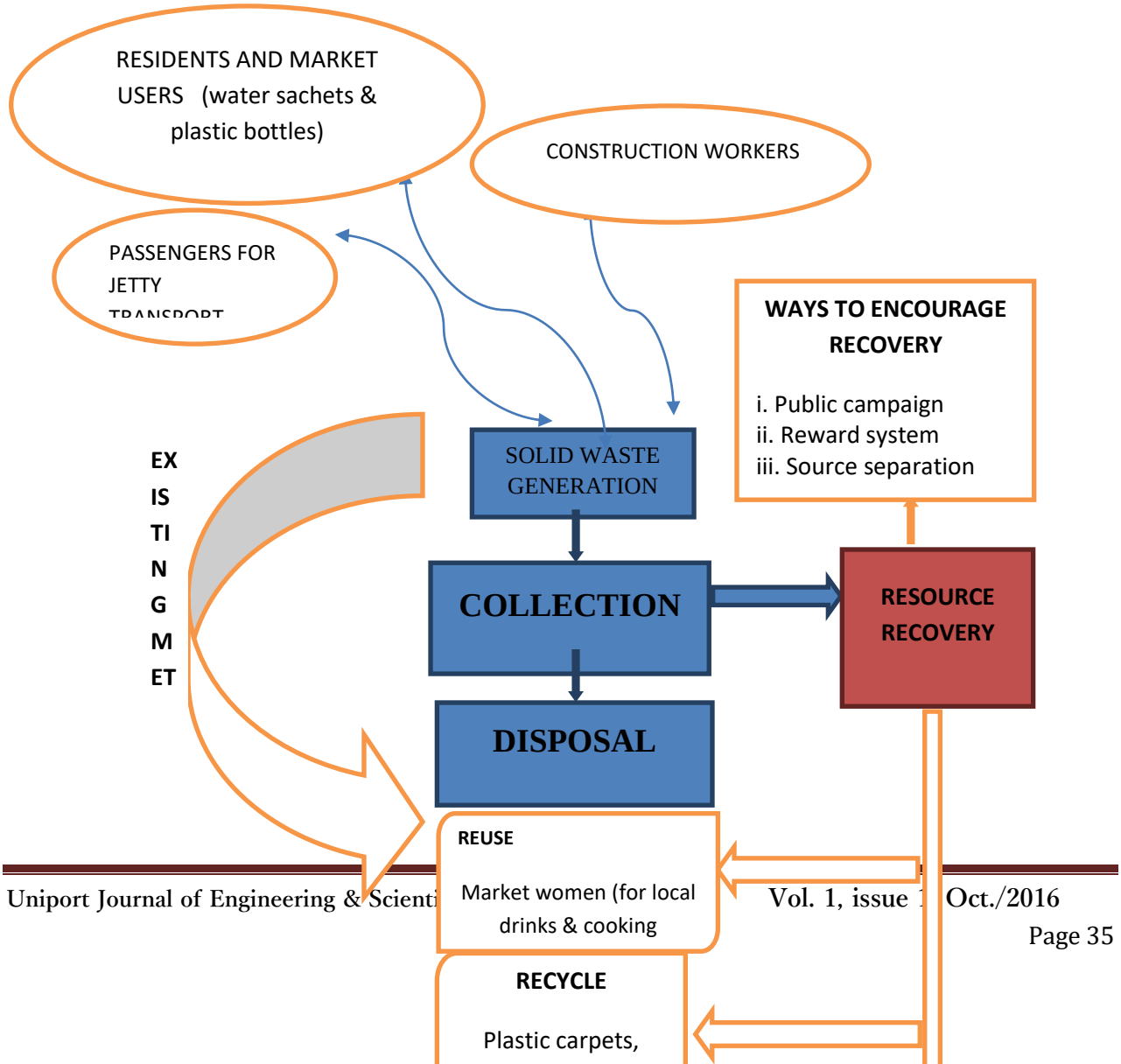

Figure 3:A waste management approach for plastic waste management

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