# CHARACTERISATION OF MUNICIPAL SOLID WASTE IN SIX LOCAL GOVERNMENTS IN IBADAN, OYO STATE

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***Abstract***

*The state of municipal solid waste (MSW) management in Nigeria is poor, and it points to the continued low level of national development; MSW as a concern is yet to receive optimum attention in developing countries. The general challenge of municipal solid waste management in Nigeria is marked by the primary problem of indiscriminate disposal of common household refuse, and it has prompted this investigation of the constituent characters of municipal solid waste in the six peripheral local governments in Ibadan, Oyo State. The study involved random sampling of packaged heterogeneous wastes that were disposed-off by residents in at least two different communities, in each of the six local governments. Materials in the samples were sorted into groups and volume determined. Result from the investigation indicates that plastics constitute as the largest group at 47.53%. Also, organics and others that can be recycled or used as input materials for valuable and economic products are in excess of 75% of total volume of municipal waste. This study indicates the need for an effective waste collection system as a crucial pathway to establish a very efficient and sustainable waste management system.*

***Keywords***: *municipal solid waste, plastics, organics, waste collection.*

## Introduction

The attempt by developing countries to improve their economy is multi-dimensional, involving several issues and details across different sectors of the economy. In the process of achieving this development, there are changes, improvements and adoption of new and supposedly better technologies, strategies, and ways of life. However, many of these newness and changes bring about undesirables that tag along the positive developments. These parallel, inadvertent occurrences are usually unpleasant consequences of industrialisation, urbanisation, and increasing population, and they have potentials to interrupt or reverse the gains of development made. One of these adverse occurrences is the development and poor management of the common household refuse.

Refuse or garbage from residences in towns and cities is more technically referred to as municipal solid waste (MSW). Abila and Kantola (2013), describes this waste management problem in Nigeria and developing Africa as a primordial and present issue, especially with the entrant and significance of new and modern waste specimens. According to Ojolowo and Wahab (2011), rapid urbanisation coupled with rapidly increasing population such asin Nigeria, has led to soaring amount of MSW and subsequent greater challenges for disposal and management.

In many developing countries, MSW management is often regarded as minor and of little or no priority, there is little foresight compared to many developed countries. Many of the Sustainable Development Goals (SDGs) are directly linked to improved MSW management. Goal 11 of the SDGs directly concerns MSW; it is to make cities and human settlements inclusive, safe, resilient and sustainable by reducing adverse per capita environmental impact of cities, including by paying special attention to air

quality and municipal and other waste management (UN, 2015).

In many states in Nigeria, there is no solid MSW management plan or infrastructure, while the waste is generated at a rate beyond the capacity that city authorities can handle. Studies including Ogboi and Okosun (2003), Nwachukwu (2010), Abila and Kantola (2013), and Karshima (2016), have acknowledge poor solid waste management in various cities in Nigeria including Lagos, Ibadan, Kano, Enugu, Onitsha, Aba Port-Harcourt and Abuja. These reports further highlighted scanty documentation and data on collection and treatment rates, except for some estimated rates of MSW generation. Karshima (2016) describes waste management in developing countries as loose and as a result of negligence from stakeholders, poor funding and lack of organisation.

Challenges of MSW management in developing countries include low collection and coverage, inconsistent collection process, indiscriminate dumping, indiscriminate waste picking and scavenging, scavenging by domestic animals and disease vector perspectives. Lagos, the commercial nerve centre of the country with the best waste management structure and facilities has only 43% collection rate (LAWMA, 2015).WHO (2002), reports that 33 (66%) of the generated municipal waste in developing countries are not collected.

Consequences of poor waste management are enormous. The first effect is the indiscriminate dumping of refuse in open spaces, streets, and drainage channels. Ogboi and Okosun (2003), reports the unsightly mountains of refuse that have become common feature of the urban landscape of many top cities in Nigeria. At 0.44 - 0.66kg daily per capital with continuous increased production from households, schools, and commercial institutions, quality and composition of waste varies and directly proportional to population, socio-economic status and level of industrial and commerce (Arora, Chaturvedi & Dasgupta, 2010), (Ogbonna, Chindah, & Ubani, 2012), (Adediran, Kolapo & Uwalaka, 2014).

Indiscriminately disposed refuse end up mostly in drainages and water channels and the primary consequence of this is flooding and damage of roads. Ojolowo and Wahab (2017), reports that the pair of improper dumping of refuse and floods has become an intractable challenge in many prime cities in Nigeria and even beyond the country. It has become an inevitable phenomenon within natural cycles. In Nkwunonwo, Malcom and Brian (2015), floods in 1985 - 2014 affected over 11 million people with about 1,100 deaths and direct losses in excess of US$17billion. In 2012 alone, 28 states were devastated by flooding and this affected over 3.8 million lives including 363 deaths and over 380,000 people totally displaced (FGN, 2013). The report puts physical and durable assets losses at over US$9.5billion while combined losses across all sectors of the economy was in excess of US$16.9 billion.

Though urban flooding can be due to natural ecological factors and others such as urbanisation, little or no pro-active strategies, and poor responses and logistics, the duo of poor environmental management and indiscriminate refuse disposal have been implicated as a major contributor to flooding and related problems (Lamond, Bhatlacharya & Bloch, 2012) and (Adeloye & Rustum, 2017).

Improper disposal such as indiscriminate open dumping of refuse and burning are sources of air pollution, even in controlled landfills. They release different undesirable gases into the atmosphere including the greenhouse gases that are of major deleterious effect to the atmosphere. According to Global Polio Eradication Initiative, GPEI (2015), 49% of methane emission in England in the year 2007 was from landfills only; likewise in Germany. When MSW found its way to water bodies

there is a high chance of inorganic and heavy metal pollution. Inherent organic contents of MSW are also released into water, resulting in eutrophication and magnified cycle of other deleterious consequences on aquatic life.

While plastic has many "valuable" uses, single-use or disposable plastic are with severe environmental consequences. UN Environment (2019), indicates that one million plastic drinking bottles are purchased every minute, while up to 5 trillion single-use plastic bags are used worldwide annually; half of all plastics are designed to be used only once then thrown away. This global watchdog posits that if current trends continue, our oceans could contain more plastic than fish by 2050. Health issues from improper MSW disposal include contamination and infections. Heavy metals such as Pb, Cd, Hg, and As are found in paint containers, Cd and Pb-acid batteries and containers, cigarette stumps, broken thermometers, pesticides and wood preservatives containers. They are largely xenobiotic and indicted in several congenital abnormalities, tumours and cancers; they can also contaminate the aquifer system and leach into the underground water.

Public health implications of indiscriminate MSW disposal include the risk of food and water borne diseases. Common sanitary food and water borne endemic diseases documented in Nigeria include taeniasis/cysticercosis, hydatidosis, echincoccosis, colibacillosis, and salmonellosis (Rabiu and Jegede, 2010); (Raji, Adekeye, Kwaga, Bale and Henton, 2007); Salihu, Junaidu, Magaji and Rabiu, 2010); Saulawa, Magaji, Faleke, Mohammed, Junaidu, *et al*. (2011). Yellow fever and the Dengue virus have mosquitoes as their vectors just like the common malaria fever, while rodents are responsible for Lassa haemorrhagic fever. Outbreaks of these diseases have direct links with indiscriminate and improper MSW disposal. According to GPEI (2015), the poliomyelitis virus is associated with poor sanitation and this is reported to be not unconnected with re-emergence of the virus despite the massive vaccination efforts.

**Statement of the Problem**

In many states in Nigeria, especially those with high level urbanisation, MSW management is very poor. In many of these circumstances, management is more or less an ad-hoc, with little or no infrastructure and personnel, while MSW is obviously generated at a faster rate compared to evacuation and management speed. The result is the direct and indirect consequences, which are multi-sectoral as highlighted earlier, and of significant economic cost to the country.

Proper MSW management demands efficiency at all the six stages involved. However, studies including Abila and Kantola (2013), have identified poor collection of waste from residences and municipal buildings as the primary challenge of MSW management in Nigeria and the reason for the indiscriminate and improper disposal. Though imperfection exists in the other stages, the collection stage remains a critical point in effective MSW structure and management. Collection is only preceded by the joint generation-storage stage, while several strategies such as free, subsidized, and premium payment collections have been adopted but the problem persists; thus, the need for this study. The study aims to ascertain the constituent characters of MSW with a view of having better and holistic collection and sustainable management strategy.

**Method**

The study adopted a survey design. The study areas consisted of the six peripheral local governments of Ibadan, Oyo State. These local governments are commonly referred to as Ibadan "less city" and they are the urban growth and expansion areas of the city, compared to the other core or interior local governments. Study samples were obtained from at least two areas in each of the local governments by purposive random sampling method. Packed and heterogeneous MSW

samples that were indiscriminately disposed-off by residents were obtained in various places such as roadsides, water channels, bushes, and undeveloped plots of land. Samples obtained were later sorted out into the different constituent characters, and volume estimated using makeshift but standardised materials. Data obtained were analysed using percentage descriptive statistics.

**Result**

**Table 1:** Constituent characters of MSW in the study area ($x10^{-4}$ $m^3$)

| Places and Characters | 1 | 2 | 3 | 4 | 5 | 6 | Total | % |
|---|---|---|---|---|---|---|---|---|
| **Kitchen waste** | 63 | 89 | 100 | 52 | 78 | 52 | 434 | 13.59 |
| **Paper** | 86 | 107 | 92 | 63 | 120 | 90 | 558 | 17.47 |
| **Plastic** | 242 | 264 | 306 | 226 | 242 | 234 | 1518 | 47.53 |
| **Textile** | 65 | 78 | ** | ** | 58 | ** | 201 | 6.29 |
| **Metal** | 94 | ** | 52 | 70 | ** | 35 | 251 | 7.86 |
| **Glass** | ** | ** | ** | 24 | 16 | ** | 40 | 1.25 |
| **Styrofoam** | ** | 26 | ** | 60 | ** | ** | 86 | 2.69 |
| **Other Inorganics & e-waste** | ** | 18 | 26 | ** | 34 | 28 | 106 | 3.32 |

**** Not sighted or amount too low**

Data in Table 1 above shows eight groups of MSW items. Except in the last group i.e. other inorganics and e-wastes, all others are homogenous groups. It could also be observed that some items were either not sighted or of insignificant amounts.

**Table 2:** MSW groups (Organics, Plastics, and other Inorganic chemicals) ($x10^{-4}$ $m^3$).

| Group | Constituent Characters | Volume | % |
|---|---|---|---|
| **Organics** | Kitchen waste & Paper | 992 | 31.06 |
| **Plastics** | Plastic | 1518 | 47.53 |
| **Other Inorganics** | Textile, Metals, Glass, Styrofoam, e-waste & others | 684 | 21.41 |

Table 2 shows a compressed version of all the characters by their chemical nature. The only exception is plastics which stand alone because of its larger proportion compared to the rest inorganics.

**Table 3:** MSW characters by ease and convenience of pre-collection storage ($x10^{-4}$ $m^3$).

| Ease of Storage | Constituent Characters | Volume | % |
|---|---|---|---|
| **Putrefactory** | Kitchen waste and Styrofoam | 520 | 16.28 |
| **Clean, Easy Storage** | Paper, Plastic, Textile, Metals | 2528 | 79.15 |
| **Possibly Toxic or Dangerous** | Glass, e-waste & others | 146 | 4.57 |

Table 3 shows the proportion of waste items according to the ease of domestic storage.

## Discussion

From the results in this study, the largest MSW items i.e. plastics, paper and organic wastes follows the trend observed in previous studies in various parts of the country (Agunwanba et al, 1998), (Ogwueleka, 2003) and (Nwachuckwu, 2010). These three items appears as top-three, though the position of each varies. Values of organic materials however show contrast with the previous studies where they constitute the largest proportions; 40% on the average. This may be due to different units of measurement i.e. weight or density, and most probably because many studies usually characterize MSW contents at landfills and/or designated dumpsites.

Data from this study also points to a poor and inefficient recycling system, otherwise recyclable materials which could be easily and safely stored for a necessary period of time, will not be disposed-off as observed. This situation is as observed in Ogwueleka (2003), which reported a poor sorting and recycling system. The rather large proportion of plastics in this study also corroborate UN-HABITAT (2002), that annual flooding in East and West Africa and some cities in India are partly due to plastics that block drains.

Data on plastics in this study also incline along some recent surveys by UN Environment (2019) that plastic waste is now so ubiquitous in the natural environment to serve as a probable geological indicator of the Anthropocene era. The report further stated that plastics- drink bottles, food wrappers, grocery bags, straws and stirrers were the next most common plastic items after plastic fibres of cigarette butts and that 79% of all plastics ever produced have accumulated in landfills, dumps or the natural environment.

Observed volume of recyclables equally corroborate the findings of Agunwamba (1998) and Ogwueleka (2009), that attempts at recycling MSW constituent are exclusively informal, and at the mercy of young scavengers. The report stated that up to 48% of raw materials of artisan and small industries in certain parts of the country are supplied by scavengers, who remove up to 30% of total generated urban waste.

## Conclusion

This study has shown that plastics, paper, and kitchen wastes constitute the larger percentage of municipal solid waste in the study area with plastics being responsible for nearly half of total waste. It could also be concluded that a larger percentage of MSW constituent are either recyclable or compost ingredients; both of which are environmental friendly and sustainable.

Equally, if the right system is created and properly managed, there can be substantial reduction in the ultimate municipal waste, up to 90% in volume, compared to the present volume. This means that such effect of improper waste management, such as urban flooding and its attendant losses including road damages, and fatalities and biota loss can reduce and/or be prevented.

The implication of this is that if properly managed, MSW will be plausible and be of positive effect on our agricultural system and products, forest, and the aquatic ecosystem. If properly planned and managed, the MSW system will not only be self-funding, it will be an additional and substantial pathway of employment, national productivity and sustainable development.

**Recommendation**

The present situation/content of MSW as shown by this study reveals a wasting wealth. There is need to change the narrative of MSW in the country from the negative and beyond achieving the sustainable development goals, to a positive, resource and productivity potential. In making this a reality, this study recommends the following:

- Government and other stakeholders should re-awaken MSW concerns to a level comparable to the Koko toxic waste dump in former Bendel State, and pre-FEPA days;
- There is need for a Reduce, Re-use and Recycle policy that is effectively integrated into the national economic policy, especially on the top three MSW constituents;
- There is need for advocacy and involvement of the population in the MSW management line especially in economic and financial terms.

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