

Classification of Municipal Solid Waste in Geidam, Yobe State

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Abstract

The importance of classifying municipal solid waste in the process of managing the waste cannot be overemphasized. This is because of the powerful insights it provides regarding the composition of the waste. This study classifies municipal solid waste (MSW) in Geidam into different component. The result of the study indicated that the waste contains 39% food waste, 31% plastic, 10.5% paper, 4.5% fabric, 3.5% metal, 1.5% glass and the other components constituted about 10% of the waste. The findings of the study revealed that most of the municipal solid wastes (MSW) in Geidam are organic wastes are organic in nature which signifies great opportunities for generation of bioenergy from the waste. The results also revealed that plastics represented a significant portion of the waste which informs the urgent demand to solve the problem of uncontrolled dumping of the material. The study recommends that government and other relevant stakeholders at all levels should engage in public awareness campaign on the health and environmental hazards posed by municipal solid wastes (MSW) disposal and the possibilities of converting them into useful products such bioenergy and fertilizers.

Keywords: *Municipal solid waste (MSW), Bioenergy, Disposal, Environmental hazards, Briquette.*

Introduction

Population growth in urban settlements is resulting to a corresponding increase in generation of municipal solid waste (MSW). This is often associated with many environmental and health problems because the waste generated are often managed poorly. Humans have suffered in no small way from diseases associated with solid wastes and the contamination of the subsurface water by the leachate from solid wastes heavily laden with toxic chemicals and pathogenic organisms which contaminate the water and make it unfit for human consumption (Adedibu, 2008).

Municipal solid waste consists of unwanted solid remains retrieved from household & office residents, and retail and commercial business establishments in a municipality. MSW poses a great challenge with regards to its management and has been identified as one of the major challenges to reaching sustainability targets (Bassey et al., 2024)

Therefore, there is an urgent need to address this environmental and health concerns caused by municipal solid waste disposal. This can only be achieved through effective municipal waste management.

Municipal solid waste management (MSWM) refers to the collection, transfer, treatment, recycling, resources recovery and disposal of solid waste in urban areas. The goals of municipal solid waste management are to promote the quality of the urban environment, generate employment and income, and protect environmental health and support the efficiency and productivity of the economy (Ogwueleka, 2009).

However, to effectively manage municipal solid waste (MSW), there is need for waste classification in order to know the composition of the waste. According to Abur et al., 2014, characterization of municipal solid waste helps in determining the quantity of waste generated in a particular location at a particular time of the

year. This help in identifying the trend of generation as well as the influencing factors. It makes proper planning of solid waste management, determining the size and number of functional units and equipment required for managing the waste, the needed resources for the protection of environment and public health. Characterization is also important to determine its possible environmental impacts on nature as well as on society (Alamgir et al, 2005).

Therefore, this research aims to characterize municipal solid waste in Geidam into different types such as plastics, fabrics, rubber, food, metal, glass and so on.

Studying and understanding the waste composition will provide important insights into the pattern of waste generation. It will also identify potential recycling opportunities and highlights the overall challenges that Geidam encounters in managing waste.

Materials and Methods

Sampling Method

Random sampling was used adopted in the sampling process. This was achieved by randomly selecting a dump site in Geidam. Large dump site in an area with different social activities was chosen.

Sample Collection Process

Samples of freshly disposed municipal solid wastes from the selected points were manually and randomly collected.

Sorting Process

The collected wastes were taken to a specific sorting location and were manually sorted into different categories, such as plastics, fabrics, rubber, food, metal, glass and so on. Each category's weight was recorded and its proportion in the sample was determined.

Data Processing

Statistical analysis was conducted on the data obtained to summarize them, showing the

average proportions of the various waste materials.

Results and Discussions

Results

The result of classification of the municipal solid waste (MSW) in Geidam is shown in table 1.

Table 1: Classification of municipal solid waste (MSW) in Geidam.

Waste Type	Mass (kg)	Composition (%)
Fabric	2	4.5
Food waste	17.5	39
Glass	0.7	1.5
Metal	1.6	3.5
Paper	4.7	10.5
Plastic	14	31
Others	4.5	10
Total	45	100

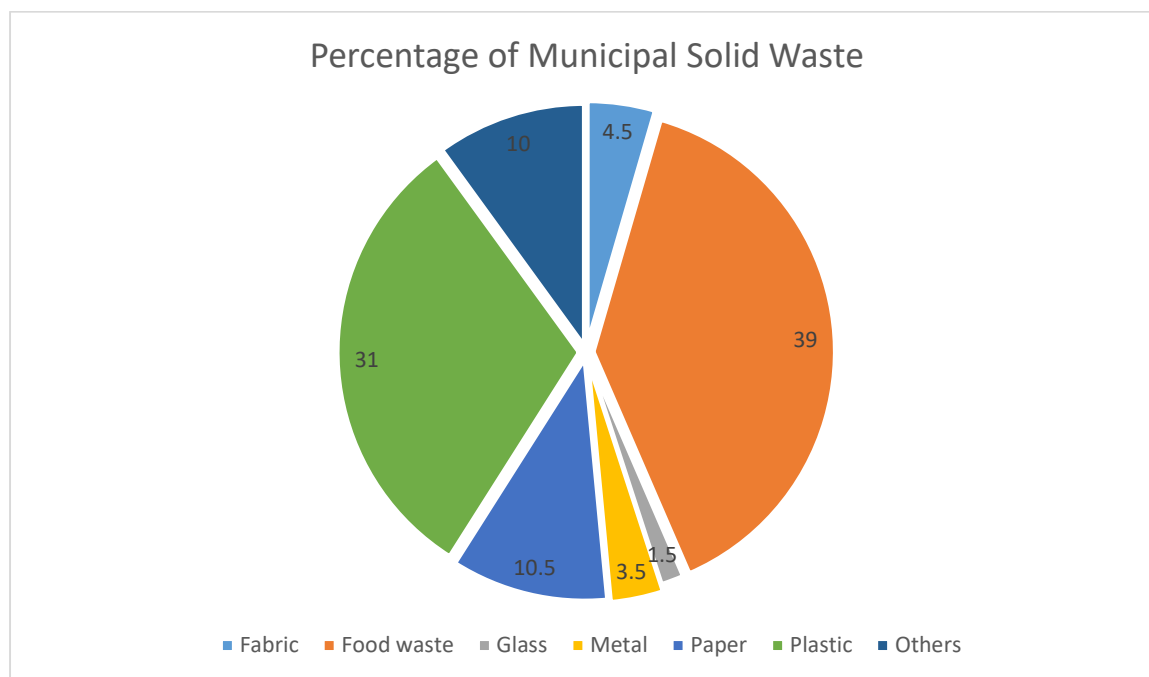


Fig. 1: Percentage of Municipal Solid Waste

Discussion of Result

The result of the study indicated that municipal solid waste (MSW) with highest percentage by weight is food wastes, averaging 39%. This result is in agreement with the result of Yildiz et al, (2012), stating that 54.45% of municipal solid waste composition for European region transfer stations are organic in nature. Plastic is another major component that constituted a large percent of about 31%. This result

indicated the high rate of plastic consumption in Geidam, hence the need for effective plastic management in the city. Another component with a reasonable percentage is paper. This can be collected and used for the generation of heat in households either by direct burning or by converting them into biofuels like briquette. Fabric, glass and metal represent 4.5, 1.5 and 3.5% of the total municipal solid waste (MSW). Although their percentage is less compared to

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the others, they also offer a significant recycling opportunity. Other components of the waste like electrical equipment, sandy materials and so on constituted the remaining 10%.

Conclusion

This research examines the nature and composition of municipal solid waste (MSW) in Geidam. These wastes are generated at an alarming rate in the city with very poor management practices. The wastes are constantly littering residential and commercial areas, posing serious health and environmental challenges.

Findings of the study indicated that most of the municipal solid wastes (MSW) in Geidam are organic wastes (about 39%), which means that significant portion of the present opportunities for generation of bioenergy from waste. The results also indicated that significant portion of the waste is plastic and other non-biodegradable materials which signifies the urgent need to address or contain their uncontrolled dumping.

Actually, there are many steps involved in the analysis, collection, characterization and subsequent utilization of municipal solid wastes (MSW) that needs thorough research and consideration, but this study on classification of municipal solid wastes has provided hints about the composition of municipal solid wastes in Geidam, which can be used as a base or foundation to develop further research.

Recommendations

1. Government and other relevant stakeholders at all levels should engage in public awareness campaign on the health and environmental hazards posed by municipal solid wastes (MSW) disposal and the possibilities of converting them into useful products such bioenergy and fertilizers.
2. Complete characterization of the municipal solid wastes (MSW) should be conducted in

order to determine the various physio-chemical characteristics of the waste.

3. Necessary equipment and facilities for waste management and recycling should provided in the city in order to facilitate effective waste recycling and management processes.
4. Governments at all levels should formulate policies and regulations that will discourage uncontrolled dumping of refuse.

References

- Abur, B.T., Oguche, E.E. & Duvuna, G.A. (2014). Characterization of Municipal Solid Waste in the Federal Capital Abuja, Nigeria. *Global Journal of Science Frontier Research*. 14(2).
- Adedibu, A. A. (2008). Environmental Problems Associated with Urbanization of Rural Areas in Nigeria. *Environmental Issues* 15:229–235.
- Alamgir M., Mc Donald C., Roehi K. E. & Ahsan A. (2005). Integrated management and safe disposal of MSW in least developed Asian countries-A feasibility study, *Waste Safe*. Khulna University of Engineering and Technology, Asia Pro Eco Programme of the European Commission. *Global Journal of Science Frontier Research*. 14(2).
- Bassey, U., Tom, A., Okono, U., John, M., Sinn, M., Bassey, A., Luke, U. & Narra, S. (2024). Characteristics and management of municipal solid waste in Uyo, Akwa Ibom state, Nigeria. *Scientific Reports*. 14:10971. <https://doi.org/10.1038/s41598-024-61108-0>
- Ogwueleka, T.C. (2009). Municipal Solid Waste Characteristics and Management in Nigeria. *Iran. J.*

Environ. Health. Sci. Eng., 6(3). 173-180.

Yildiz, S., Yaman, C., Demir, G., Ozcan, H.K., Coban, A., Okten, H.E., Sezer, K. & Gorene, S. (2012). Characterization

of Municipal Solid Waste in Istanbul, Turkey. Environmental Progress & Sustainable Energy. DOI 10.1002/ep