

MERITS AND DEMERITS OF WASTE DISPOSAL METHODS IN FEDERAL POLYTECHNIC, ILARO, OGUN STATE, NIGERIA

¹JOSEPH, OLAKUNLE OLALEYE AND ²IBRAHIM, GBENGA WASIU
MECHANICAL ENGINEERING DEPARTMENT,
THE FEDERAL POLYTECHNIC ILARO, OGUN STATE, NIGERIA

¹olakunle.joseph@federalpolyilaro.edu.ng, +2348154433866
²gbengawasiu20@yahoo.com, +2348034591098

ABSTRACT

Municipal solid waste (MSW) contributed to about 70% of the wastes generated in The Federal Polytechnic, Ilaro. These wastes were generated from the departmental offices, other offices (academics and non-academic), shopping malls, shops, business centres and residential areas (Staff Quarters). A table of composition (% by weight) of solid waste generated gave the categories of waste generated. The methods used for wastes collection, disposal and management came with their attendant advantages and disadvantages. The assessments of the waste management were also obtained from the campus cleaners. This research work assessed the merits and demerits of the municipal solid wastes (MSW) collection, disposal and management methods used within the polytechnic campus community. Single-point waste collection, open wastes dumping and wastes burning management methods had a merit of 26% and demerit of 74%. This research work enlightened the campus community on the safety and economic status of wastes collection, disposal and management method adopted. The institution was adequately informed that multi-point waste collection method, standardized temporary waste dumping site and discouragement of wastes burning will ensure safer and green environment and generate unimagined revenue for the institution making it a trailblazer in wastes management.

Keywords: Wastes, Landfill, Merits and Demerits, Municipal, Incineration, Environment

1.0 INTRODUCTION

Wastes are mostly referred to as material that has been used up and has no value in whatever capacity. Municipal solid waste (MSW) generation is an issue of worldwide concern (Sehker & Beukering 1998) Wastes generally may be solid, liquid or gas resulting from human activities leading to products

generation or mere resource lifecycle following the basic characteristics of input and output (mass balance) (Kumar et al, 2016). Environmental waste management covers the three states of matters – solids, liquids and gases. However, for every material resource, process focus is on products and the by-products waste (solid, liquid or gas). Considering the fact that whatever we give to the environment is what the environment gives to us.

Waste management system in any community tells a lot about the care for the environment (Joseph and Ibrahim, 2018). Municipal solid wastes (MSW) generation in The Federal Polytechnic, Ilaro comes from the staff and students in the five schools which are Schools of Engineering, Applied and Pure Science, Management Studies, Information and Communication Technology and Environmental Studies and from shopping malls, shops, business centres, hostel, residential and official areas (Joseph and Ibrahim, 2018). Cities around the world are facing great challenges due to increasing urbanization, and one of the major challenges is the rising amount of generated waste and littering due to high demand for food products and other essentials (Oyedele, 2009). Public waste bins are filling up faster than ever and inevitably many of the bins end up overflowing before they are collected, causing not only cluttered streets and bad odors but also negative health and environmental impacts. One of the outcomes of overflowing garbage is air pollution, which causes various respiratory diseases and other adverse health effects as contaminants are absorbed from lungs into other parts of the body. The toxic substances in air contaminated by waste include carbon dioxide, nitrous oxide and methane. In everyday life we identify the polluted air especially through bad odors, which are usually caused by decomposing and liquid waste items (The Environment, 2016)

Environmental impact assessment (EIA) is an effective method which evaluates the effects of different sectors and activities of a project on environmental components and finally according to results of this assessment offers solutions to reduce negative effects (Mohammed et al, 2014).

Olagoke (2013) reported that in the environment there are always the physiological and psychological effects of pollution from mismanaged solid waste which include air pollution, destruction of valued environment, depression, health hazards poor waste management system

2.0 LITERATURE REVIEW

Waste management focus is on waste minimization or reduction especially the industrial ones that may be hazardous or toxic. The hierarchy of priorities in hazardous waste management and treatment options is shown in the pyramid order in figure 1.

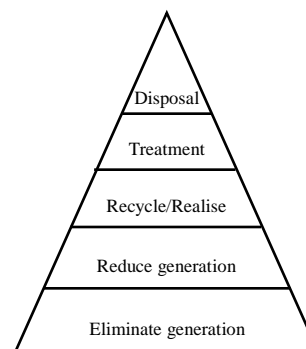


Figure 1: Effective Option for Waste Management and Treatment (Olagoke, 2013)

The three waste disposal and management methods that are operational in the campus community are single-point waste collection, waste burning and landfill methods. Burning of Municipal Solid Wastes as a method of waste management causes serious environmental pollution. It is of paramount importance to assess the chosen wastes disposal option in any community for effective service delivery, this is the focus of this research work. An adequate knowledge and understanding of the option

will be a guide and a determining factor to the success of the waste management.

In developing countries municipal solid wastes contain much more of what is suitable for reclamation or reuse. Recovery is aided when materials are separated at source. Once they are mixed, separation and upgrading by manual and mechanical means is more difficult and the quality of the product is lower. Source separation has been successfully used in many industrialized countries. For example in Britain:

- i. Britain is now limited mainly to paper with smaller contributions from match, glass and textiles.
- ii. The decline in the returnable glass bottle and the introduction of strongest hygiene regulations governing the use of food waste as pig fodder have increased the quantity of these materials in waste.

The prospects for separation of plastics at source are currently poor owing to the difficulties of separating the various types, although experiments in Japan and West Germany have had some success.

Wastes collection is an essential part of waste management (Daily and Huang, 2001). In The Federal Polytechnic, Ilaro 60-75% of waste generated on campus is obtained from classrooms and offices (Joseph and Ibrahim, 2018). The wastes

generated in percentage by weight can be obtained in Table 1. The method of managing waste by open burning can cause serious environmental pollution and it is also unethical considering the campus community that is made up of professionals and learned personalities.

Table 1: Composition (% by weight) of Solid Waste Generated in the Institution

Waste Categories	Weight of waste (kg)	% by weight
Paper	998.2	35
Plastics & nylon	342.24	12
Textile	142.6	5
leather	57.04	2
Metals(tins & cans)	285.2	10
Glass	85.56	3
Organic (biodegradables)	827.08	29
Others	114.08	4
Total	2852	100

Source: (Joseph and Ibrahim, 2018)

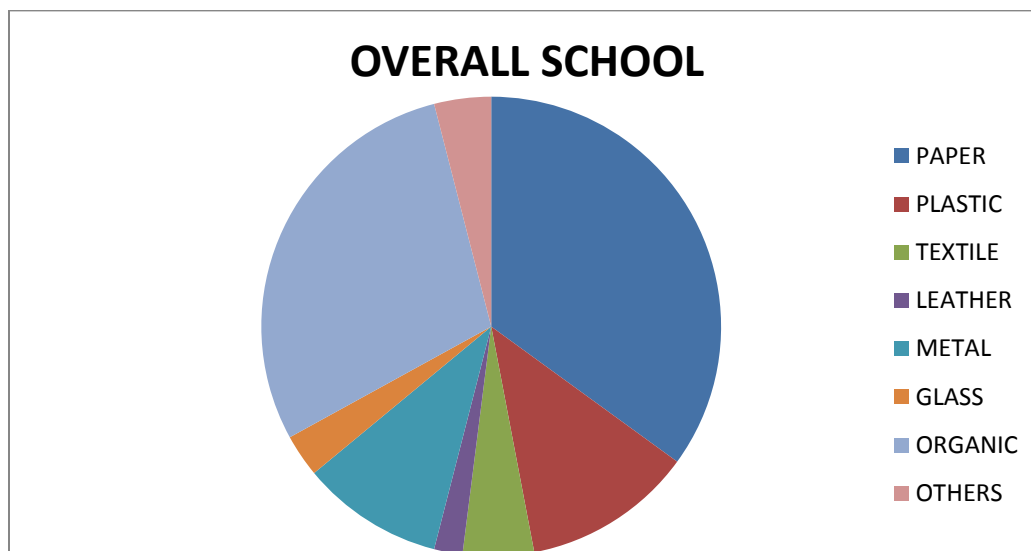


Figure 2: Solid Waste Generated in the Overall Institution (Joseph and Ibrahim, 2018)

3.0 MATERIALS AND METHODS

The population of the Polytechnic campus community is about 10,500 (City Voice, 2019). The number of staff of the campus environmental cleaning services is about 40 as obtained from the staff record department. Opinions of the cleaning services workers on the methods of waste disposal and management were sampled. Environmental Impact Assessment (EIA) of the waste disposal and management methods were carried out to discover its merits and demerits.

The methods of waste collection and disposal at sources were identified and assessed. All the points and places of waste generation in the campus were adequately identified and the various methods of waste collection were equally assessed for environmental impact. The attitude of staff and students at the points of waste collection were carefully observed as it affects the waste collection

and the cleanliness of environment. The opinion of staff and students were sought on wastes sorting, recycling and management.

Normally, after waste collection, the waste are often disposed at the temporary dump site. The dump sites are located in areas close to the points of waste collection for easy disposal. Environmental Impact and Assessment (EIA) of the dump sites were critically carried out. Within the campus community the waste management methods were identified, critically assessed and their merits and demerits were noted with the effects on the environment.

4.0 RESULTS AND DISCUSSIONS

4.1 Waste Collection Method Assessment

Waste collection is the curbside collection of recyclable materials that are technically not waste, for effective waste management program. However,

it was observed that 94% of the wastes collected at the points of generation use single-point waste collection method shown in Plate 1. The wastes were not sorted or separated into their various categories such as food waste, bottles, paper and disposable, plastic etc. There was no effective waste management through waste sorting, recycling and reuse. Joseph and Ibrahim (2018) reported that there may not be an effective waste management without appropriate and effective waste collection methods at the points of waste generation. Unsorted wastes can result to about 76% of energy lose due to lack of waste reusing. It can cause air, water and land pollutions. Unsorted wastes are not pre-processed before disposal to dump site hence leachate from the wastes affects the surface waters and underground aquifers making it unsafe for drinking. Also, unpleasant odour is released into the environment and resident microbes in wastes have negative impacts on public health.

i. Merit of Single Point Waste Collection Method

- It was easy to operate by 27%
- It was easy to dispose to the central waste point

ii. Demerits of Single Point Waste Collection Method

- It made waste sorting practically difficult 81%
- Unsorted wastes resulted into air, water and land pollution from the central waste point
- Unsorted wastes made recycling very tasking and difficulty to the tune of 81%
- Unsorted waste led to loss of energy by 73%
- It caused loss of revenue that could have been made from sales of recyclable and reusable items up to about ₦60,000 monthly.



Plate 1: Single-point Waste Collection Method



Plate 2: Multi-point Waste Collection Method for Effective Waste Sorting

4.2 Wastes Disposal Methods Assessment

(i) Open Waste Dumping

The dumping sites serve as places where wastes from classrooms, offices, shopping malls and other sources are dumped directly from the collection points. The waste dumping sites in the campus are located at places close to the classrooms, multipurpose hall, shopping malls and other places. These dumping sites are in open places and defaced the academic environment. This method is only

partially preferred for wastes that are not biodegradable.

(ii) Merits of Central Open Waste Dumping Method

- The site is easily accessible by the campus cleaners for easy disposal of waste with a difference of about 500 metres from main dumping site
- It is a central disposal point for a number of classrooms and offices as affirmed by 32% of the campus cleaners
- It is walled to about 1 metre high thereby preventing flying of waste around the dumping site and rated at 20%

- The wastes are removed regularly, most cases weekly or less

(iii) Demerits of Central Open Waste Dumping Method

- It causes environmental pollution by 71%
- It affected the beauty of the academic environment up to 68%
- It affected the environmental aesthetic negatively
- Due to its openness when it rained transferring the waste into loading vehicle became difficult and risky health wise by 70%
- The waste burning site had no covering or roof to prevent rain from falling on it



Plate 3: Dump Site Located Close to Classrooms and Offices

4.3 Waste Management Method Assessment

(i) Waste Burning Method

Burning of wastes was sometimes used to reduce the volume of waste to about 25% at the dump site. Occasions of wastes burning were observed and the effects were equally noted and highlighted as follows:

(ii) Merit of Waste Burning Method

- It reduced the volume of the waste to about 25%
- It prevented bad odours when the wastes are completely burnt
- It was not expensive to operate

(iii) Demerits of Waste Burning

- It produced various toxic compounds to the environment such as smoke
- When wastes were burnt it caused air pollution

- It produced volatile organic compound (VOC) which usually undergo photochemical reactions (i.e. react with sunlight) when released into the atmosphere
- It produced carbon monoxide (CO) which chemically reacted with sunlight to create harmful ozone layer in the atmosphere
- It caused particle pollution, also known as particulate matter (fine particles) that produced visible smoke, reduced visibility and created haze.



Plate 4: Dump Site Used for Burning Waste Causing Air Pollution



Plate 5: Dump Site Used for Burning Waste Which Resulted in Air Pollution and Smoky Environment

5.0 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The wastes collection, disposal and management methods in the campus community came with their attendance advantages and disadvantages. The methods in use were single-point waste collection, open waste dumping for disposal and waste burning methods. The single-point collection method had negative effects on the possibility of recycling and reusing wastes, since wastes not sorted will obviously affect waste management methods negatively. Revenue generation were lost to the tune of more than N100,000 monthly. Undoubtedly, open dumping caused air pollution, defaced the beauty of the environment and affected the surface and underground water due to leachate from wastes. Foul odours and microbial agents present in wastes also impacted negatively on the public health. Also economically, there was no income generation from the presently adopted wastes disposal and management methods because recycling of wastes were practically difficult and impossible. Figure 3 shows the % merits and demerits of adopted waste management method. In conclusion, the merits of the waste collection, disposal and management methods were 26% while the demerits were 74%.

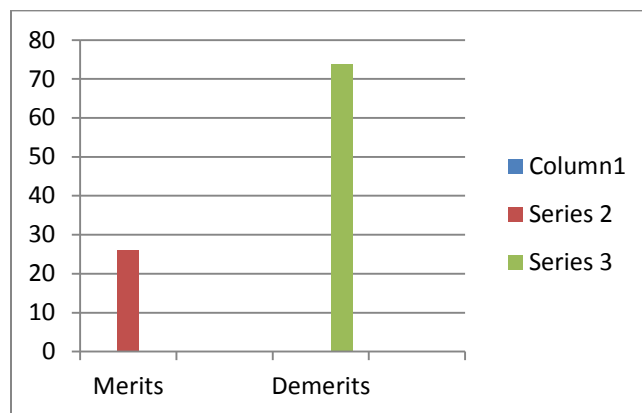


Figure 3: % Merits and Demerits of Adopted Waste Management Methods

5.2 RECOMMENDATIONS

Considering the holistic assessment of the waste disposal and management methods adopted seems not to be the best, by considering the resulting demerits attached to it. In view of this, to arrest all these demerits and make the polytechnic community maximize the usefulness of the wastes generated as it is obtained in other places around the world, the following recommendations should be adopted.

- (i) Proper education and orientation about wastes recycling and management should be given to the campus community for change of attitude in respect of recycling
- (ii) Waste sorting and processing should be encouraged at the source of waste generation by using multi-point waste collection method as shown in Plate 6
- (iii) Recycle the wastes that are recyclable to generate revenue and create wealth
- (iv) Avoid waste burning at the dump site to prevent air pollution and eye irritation

- (v) Timely evacuation of waste from dump sites, if possible daily
- (vi) Construct shed or roof for the temporary dump sites and increase the height of the dump site walls to prevent flying of wastes
- (vii) Relocate the dumping sites to better and hidden places away from the present locations



Plate 6: Multi-point Waste Bins for Effective Waste Disposal, Sorting and Management

REFERENCES

- Daily B. F., & Huang S. (2001). Achieving Sustainability Through Attention to Human Resources Factors in Environmental Management. *International Journal of Operation and Production Management* 21 (12), 1539 – 1552.
- Joseph O. O., & Ibrahim, G. W. (2018). Evaluation of Wastes Generation in The Federal Polytechnic, Ilaro, Efficient and Effective Methods of Disposal to Convert the Wastes to Wealth. A paper presented at the 1st International Conference and Exhibition on Technology, Innovation and Global Competitiveness”, Knowledge and Technological Innovation for Global Competitiveness, International Conference Centre, The Federal Polytechnic, Ilaro, Nigeria, November 5 – 8, 2018.
- Kumar, S., Dhar, H., Nair, V. V., Bhattacharyya, J. K., Vaidya, A. N., & Akolkar, A. B. (2016). Characterization of municipal solid waste in high-altitude sub-tropical regions. *Environmental Technology* 37 (20): 2627–2637. doi:10.1080/09593330.2016.1158322. PMID 26915419.
- The Environment (2016): <https://www.ecubelabs.com/overflowing-garbage-bins-5-impacts-on-health-and-environment-and-how-to-prevent/>
- Masters, M. G. (1998). Introduction to Environmental Environmentry and Science; Prentice-Hall, Inc. Simon & Schuster 1/A Viacom Company, Upper Saddle River, New Jersey 67458
- Mohammad T., Mehdi Gholamalifard, Mahdi Jalili G., & Shahin, R. (2014). Environmental impact assessment of municipal solid waste disposal site in Tabriz, Iran using rapid

- impact assessment matrix; *Journal of Impact Assessment and Project Appraisal*, 32(2), <https://doi.org/10.1080/14615517.2014.896082> 162-169.
- Olagoke, S. A. (2013). *Environmental Engineering*. Ibadan: SAO Multiventures.
- Oyedele, O. (2009). Solid Waste Management as Engine for Industrial Development in Nigeria; Sci Topics Retrieved September 13 2010 from <http://www.scltopics.com/SolidWasteManagementasEngineforIndustrialDevelopmentinOyo.htm/>
- Sehker, M., & Beukering, P. V. (1998). Integrated solid waste management: a perspective on Bangalore (India). CREED working paper series No. 24 . p. 277–295. [[Google Scholar](#)], p. 278)
- City Voice (2019): Federal Poly Ilaro’s best graduating student gets Ogun automatic employment; <https://cityvoiceng.com/federal-poly-ilaros-best-graduating-student-gets-ogun-automatic-employment/> Retrieved 10 – 03 - 2020