

## SOLID WASTES MANAGEMENT IN ABA METROPOLIS

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### ABSTRACT

*With the tonnage of solid wastes generated in Aba metropolis on a weekly basis, the government should take advantage of the tremendous opportunities associated with solid wastes such as obtaining new products through recycling and deriving cleaner form of energy through waste to energy conversion. The aim of this research is to propose effective solid waste management practice and to evaluate the possibility of generating clean energy from solid wastes. The method adopted includes administration of questionnaires to traders, non-traders and Abia State Environmental Protection Agency (ASEPA) workers. Solid waste samples were collected from three disposal sites (Landfills, market and dustbins) in Aba metropolis and the organic matter from the waste was mixed thoroughly. Proximate and ultimate analyses were performed on the samples before Dulong modified formula was used to obtain the heating value. Section A of the questionnaire revealed low awareness on the reuse, recycling and energy recovery from solid wastes among the respondents, Section B revealed that the three categories agreed that behavioral pattern help to improve good solid waste management practice, Section C showed that traders and non-trader were in agreement to the factors limiting good solid waste management while the ASEPA workers were not in total agreement with all the factors that limit good solid waste management, Section D revealed high agreement among the Non-Traders and the ASEPA workers on the effect of poor solid waste management on the environment and on one's health. Results obtained from the proximate analysis test gave an average moisture content, volatile matter content and Ash residue of 54%, 68.7% and 3.2% respectively. The heating value obtained ranged from 22871-24457KJ/Kg which was far above the standard required of about 6000KJ/Kg for waste to energy generation. Therefore solid wastes generated in Aba metropolis can be used to generate energy. It was recommended that an enlightenment program be done by the government. It was further recommended that Government should create the enabling environment to enable Private investors key into the initiative of building thermo-chemical plants that can effectively convert these solid wastes to electricity.*

**Keywords:** Solid wastes, Solid wastes management, Proximate and ultimate analyses.

### 1.0 Background

The two main points of the 'Zero waste' strategy from the European Union waste legislation are to:

1. Promote good behavior amongst producers and households on how solid wastes should be handled.
2. Promote new technologies that can totally transform these solid wastes to other useful products.

Most European countries have already keyed into this legislation and have significantly reduced the amount of solid wastes that are being deposited at landfill sites. Majority of these wastes are now utilized to generate electricity or recycled into other products.

The waste management hierarchy as shown in Figure 1 emphasizes on the importance of waste prevention first, but due to the difficulties associated with waste prevention, other levels such as minimization of waste, reuse, recycling and energy recovery should be considered in that order before considering waste disposal at landfill as the last resort. When waste is not properly treated before disposal, it has significant effect on health and environment; as it leads to air pollution, underground water contamination, soil contamination, land degradation, habitat deterioration e.t.c. Ackerman (2002) reported that generation of wastes reflects a loss of material and energy, and also impose economic and social costs on the society for its management.



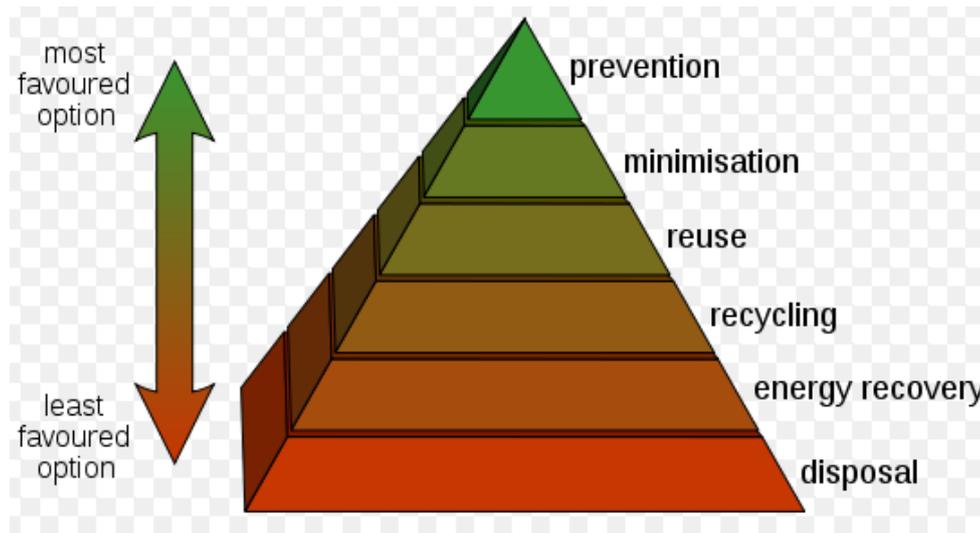
Figure 1: Waste Management Hierarchy (Source: [https://en.wikipedia.org/wiki/waste\\_hierarchy](https://en.wikipedia.org/wiki/waste_hierarchy))

The solid wastes generated are influenced by some certain factors such as economic development, the level of industrialization, the habit of the people and local climate. There is a direct relationship between the economic development and the generation of solid wastes in the country. Solid waste management is now a global issue.

On the other hand, due to weak legislation and enforcement in terms of waste generation and management in Africa, most countries in the continent still dispose over 70% of the total solid waste generated in landfill sites, thereby not optimizing the use of these solid wastes in the generation of energy and creation of new products from these wastes.

### 1.1 Statement of Problem

The indiscriminate dumping of solid wastes along major roads in the city of Aba is a source of concern to every well-meaning citizen. This appalling situation would not have risen if there was effective implementation of already existing legislation on the management and disposal of solid wastes generated within the Aba metropolis. Aba is one of the dirtiest cities in Nigeria due to a poor waste management system and poor attitude of the residents. The impact of indiscriminate dumping of solid wastes can lead to outbreak of diseases and other related health issues. With the failure of the federal government to provide the citizens with adequate power supply despite the billions already sunk into the power sector, there is no better time than now in Nigeria to study waste generation and conversion of same to energy. Figure 2 shows the type of waste practice evident in Aba.



**Figure 2:** Waste Management Hierarchy evident in Aba

Aba which is located in Abia State is one city in Nigeria that generates solid wastes on a daily basis due to the heavy industrial and commercial activities in the city. Solid wastes are generated in their tonnages weekly in the city and these wastes are either deposited in landfills or are left to litter the city. Majority of the solid wastes generated in developing countries are largely organic materials, and research conducted by Tatarniuk (2007) revealed that when organic materials degrade, they yield energy in a form which can be utilized effectively in the right condition. The heat of combustion and the heating value are the components used to determine the energy content of solid waste. This paper seeks to propose ways of managing solid waste effectively and efficiently. Mention was also made of the infinite opportunities that are accruable from managing wastes properly, waste to energy concept through the use of Bio-chemical and thermo-chemical plants.

## 1.2 Research Objectives

1. To find out whether inhabitants of Aba metropolis are aware of the implications of indiscriminate waste disposal in their environment.
2. To evaluate the level of efficiency in the control and management of urban wastes in Aba metropolis.
3. To investigate whether the techniques/methods used or proffered by government are adequately creating awareness about the health implications of indiscriminate waste disposal in Aba metropolis.

## 2.0 Study Area

Aba is a city that is located inside Abia State in Nigeria. The city is geographically located on 5°07'N 7°22'E and it is at an elevation of 205m above sea level. The city is a major trading zone in the South east region of Nigeria, and it is divided into three local government areas namely; Aba South, Aba North and Osisioma. Aba south is considered to be the commercial hub of the city as most of the commercial activities take place in that part of the city. Some of the villages located inside Aba are Umuokpoji, Aba Ukwu, Eziukwu-Aba, and Obuda-Aba. The population of the city is about 2,277,300 people as at 2016, with majority of the people adopting Christianity as their religion. Figure 3.1 show the map of Aba which was extracted from Google earth.

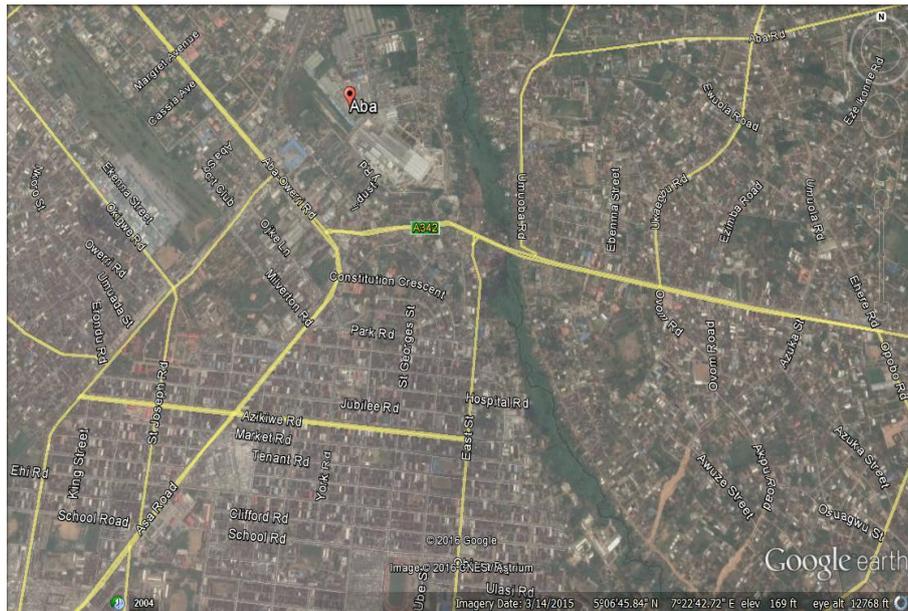
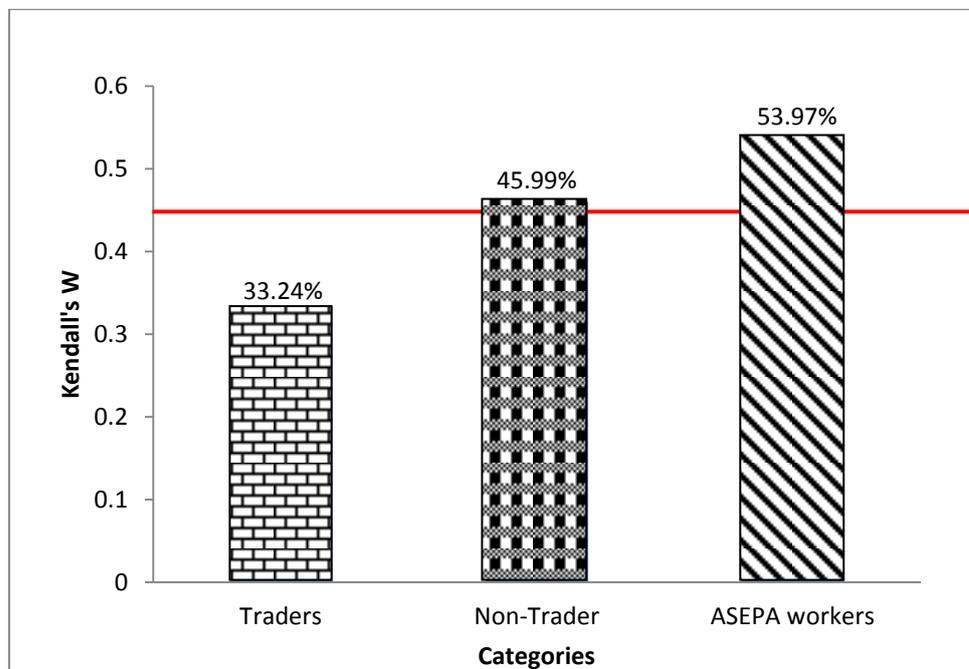


Figure 3: Map of Aba city

### 2.1 Sample and Sampling Techniques

The research employed different samples and sampling techniques. Extensive data analysis was carried out including proximate and ultimate analysis test to obtain various elemental composition of solid waste that was then used in Dulong formula to obtain the heat of combustion and the heating value from the 15kg of solid wastes collected from each disposal site (contact corresponding author for more detail).

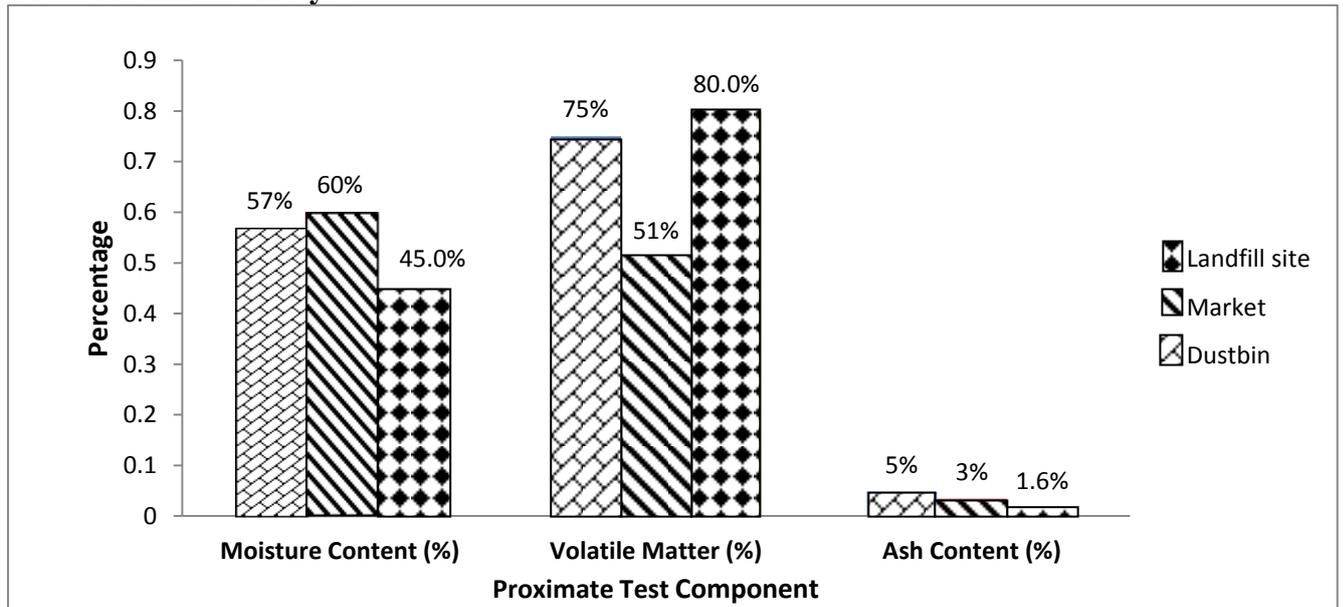
### 3.0 Results



If Kendall's  $W > 50\%$  it means there is agreement among respondents.  
 If Kendall's  $W < 50\%$  it means low agreement among respondent.

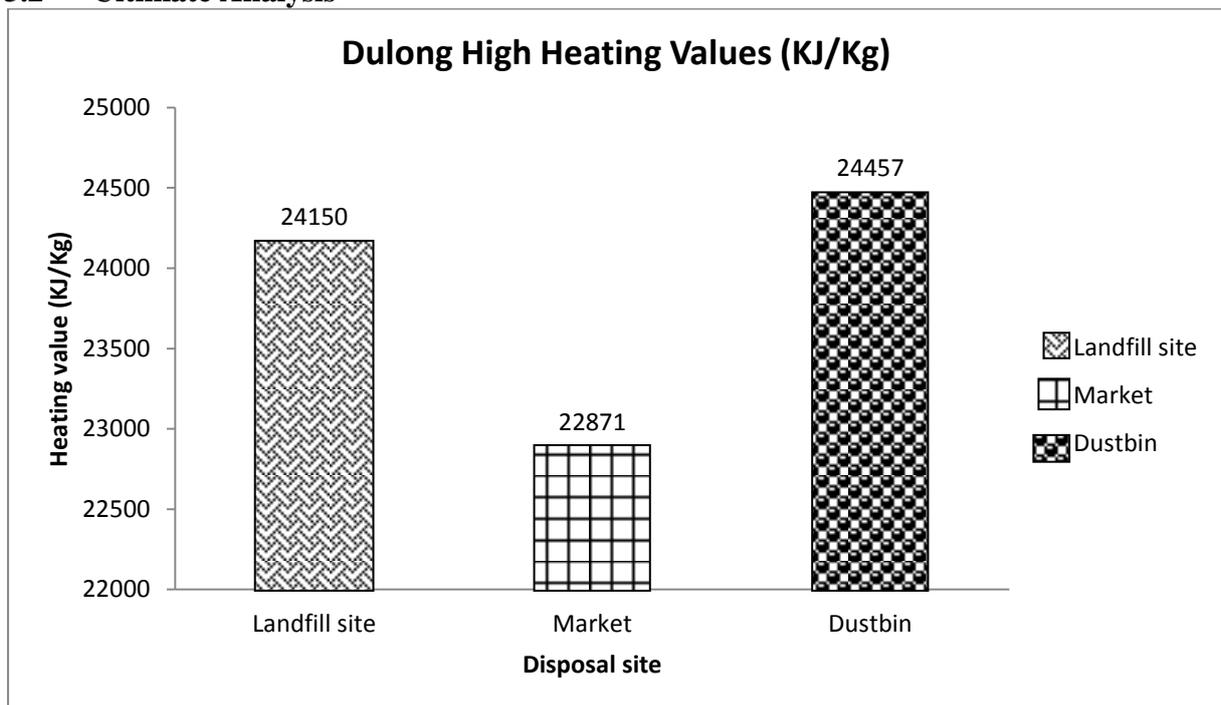
Figure 4: Awareness on the reuse, recycling and energy recovery from solid waste

### 3.1 Proximate Analysis



**Figure 5:** Result of percentage moisture content, volatile matter and ash residue of solid waste

### 3.2 Ultimate Analysis



**Figure 6:** Result showing the heating value from various disposal sites.

### 4.0 Conclusion

The purpose of this research is to apply the engineering principles of the functional elements of solid waste management to manage the waste generated and to generate energy from the waste in Aba metropolis. The analysis done in this thesis can be utilized to help decision-makers, particularly at the local level, in the process of formulation and implementation of sustainable waste management practices. It could also help the argument that waste is a source of wealth when considered as an alternative source to generate electricity. Therefore,

the thesis data can be used as a base for preparation of further project proposals in Aba metropolis waste sector for donor organizations and private investors.

#### **4.1 Recommendations**

##### **Government**

1. The Abia State Government should add new legislation to the already existing ones that will help improve solid waste management and have a team that will effectively ensure that these laws are implemented.
2. Due to the low level of awareness among traders and non-traders in the metropolis on reuse, recycling and energy recovery from solid wastes, it is recommended that the Government of Abia State should device enlightenment programme using media like bill boards, posters and fliers so that the citizens will be duly informed on how solid wastes can be reused or recycled and places where they can be recycled. The enlightenment should also cover the effects of solid wastes on the environment and on the public health.

##### **Individual**

1. Citizens of the state should engage in good behavioral practices like bagging of solid wastes before disposal in waste collection points.
2. Every household should have solid waste facilities such as garbage bin and dustbin for easy disposal.

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