SOLID WASTE ANALYSIS AND CONTROL IN FEDERAL POLYTECHNIC, ADO EKITI

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ABSTRACT:

Solid wastes are unwanted materials released to the surroundings in different forms. The more the population in a particular area, the more waste that is likely to be generated. Various studies revealed that most of the solid wastes are carelessly littered in the environment. It was noticed that the generation of wastes amongst human is higher than population of man. The study is concluded with a few fruitful suggestions, which may be a very useful tool if considered to control the uses and the disposal of solid wastes in Federal Polytechnic, Ado Ekiti, Ekiti State, Nigeria. Areas considered in this citadel of higher learning are, Abuja hostel which has 16.3% of wastes generated, Lagos hostel has 16.0%, Annex hostel with 9.3%, Administrative block with 2.3%, School of Engineering(SOE)with 4.7%, School of Science and Technology (SOT)with 5.8% and Aba with 44.3%. These areas were assessed with the use of printed questionnaires and later collated with the use of statistical software known as Microsoft Excel and also analyzed for visible results.

Keywords: Solid wastes, Analysis, The Federal Polytechnic, Ado-Ekiti, Environment, Population and Control.

• INTRODUCTION

Waste is an unwanted or unusable materials or it can also be known as any substance which is discarded after primary use, or is worthless, defective and of no use. Examples include municipal solid waste (household trash/refuse), hazardous waste, and waste water (such as sewage, which contains bodily wastes (fesses and urine) and surface runoff, radioactive waste, and others[Mantel,1975]and [Wikipedia, 2016]. Solid waste is generated from households, offices, shops, markets, restaurants, public institutions, industrial installations, water works and sewage facilities, construction and demolition sites, agricultural activities etc. [Pipatti et al., 2006]We cannot overlook the unpleasant effect that inadequate disposal of solid waste can cause to our immediate environment. As days pass-by man has to perform their daily activities and this involves using items thereby in most cases making the best use of it that renders the materials useless for its purpose, known as the waste we call it, and to be able to live in a healthy and hygienic environment there must be a good provision for waste disposal [EPA, 2010]. As we presume it would help to maintain good health and of course a good looking surroundings. It should be noticed that in the institution premises, hostel of where more than one individual shares a room and there is liability of excessive disposal of waste product even when it involves youths. In this work, solid waste analysis in the Federal Polytechnic, Ado-Ekiti and its possible control method was carried out, to discover, analysis, highlight the types of solid wastes in federal Polytechnic, Ado-Ekiti and recommend possible

and realistic control measures in making the environment clean. It also entails methods of disposal and the presumed adverse effect on the people in the institution and its environs.

• **METHOD OF STUDY**

The data collated is based on opinions of the students, staffs and non-staffs of the federal polytechnic of Ado-Ekiti. This was achieved with the use of questionnaires distributed to Abuja hostel, Annex hostel, Lagos hostel, Aba quarters, departments in the institution and the administrative building. In the process of investigation, opinions of the people interviewed would have great influences to the environs, so it is expected that this research work would be important in helping the institution in curbing the menace of excessive waste products as a result of various human activities within the campus.

• **QUESTIONNAIRE ADMINISTRATION**

The questionnaire was administered to students and staff to obtain information on the following:

- ❖ The storage methods of individuals
- ❖ The mode of collection of solid waste
- ❖ The mode of disposal and
- ❖ Reaction of people towards environments

• **METHOD OF DATA ANALYSIS**

The questionnaires collected were analyzed, tabulated and also tested using the statistical technique of bar chart, pie charts and simple percentages.

• **PREAMBLE**

One of the goals of this research work is the proper coordination of waste collection, disposal and recovery systems within The Federal Polytechnic, Ado-Ekiti

This section examines the socio-economics of respondents while focusing on the present conditions or rather state-of-art of Waste Management vis-à-vis the roles played by the people who generate the waste and government agencies that have the constitutional and legal rights to generally protect every environment. The data was first classified into three that involves the refuse storage, refuse collection, refuse disposal, methods of waste disposal and the location of buildings.

• **REFUSE STORAGE**

From the table of analysis it was discovered that the highest percentage of 60.5% of the respondent questioned uses plastic/refuse paper bin as their primary refuse disposal facility, 18.6% of them uses concrete constructions for their refuse storage, 4.7% uses receptacle, 14% uses steel drum and steel dustbin while the lowest is use of skips which is 2.3%.

Some of the respondent claimed to use good facilities for neither refuse disposal such as latrine and water closet which is approximately 54.5%, but 4.5% and 38.6% uses bucket and nearby bush respectively nor the disposal of their refuse. The distance of material for dumping the the correspondent is mostly stated as 25 – 50 meters, which is 38.6% of the respondent and 47.7% claimed that the distance is below 2.5 meters and 50 – 100 meters.

Just as the research went on it was discovered that 22.7% made it known that the sewage in the environment are made up of concrete slab cover, 18.2% of the respondent sewage was made up of covered pipe drainage, 47.7% is opened to the surroundings, 6.8% uses pit as they sewage disposal and the approximate value of the ones that has none are just 2.3% and this might be due to the under-developed area it seem to be located.

The use of waste was randomly analysis to know the common waste product used by the occupant in the Federal Polytechnic, Ado-Ekiti and the percentage of people that make use of paper is the highest with 79.5% that of Nylon is 27.2% that of fabrics is 9% of wood is 6.8% that of metal dust is 4.5% and finally the ones that uses others are approximately 13.6%.

During the analysis carried out it was discovered that some of the respondent uses nearby bush as their fesses disposal and their percentage sum up to be 38.6% while some uses the bucket with 4.5% and then the rest uses latrine and water closet. The details on waste storage forms is presented in Table 1 Below

Table 1: Storage of Waste in Different Locations

S/N	Location of buildings	Plastic/refuse paper bag (%)	Concrete construction (%)	Receptacle (%)	Steel drums and dustbin (%)	Skips (%)	Total (%)
1.	Abuja Hostel	16.3	-	-	-	-	16.3
2.	Lagos Hostel	7	2.3	2.3	2.3	2.3	16.3
3.	Annex Hostel	7			2.3		9.3
4.	Quarter Aba	21	14	2.3	7	-	44.3
5.	Admin. Block	2.3	2.3	-	0.1	-	4.7
6.	Minimart	10.0	-	3.0	2.3	--	15.3
7.	SOE	4.7	-	-	-	-	4.7
8	SOT	3.0	-	1.4	1.4	-	5.8

Fig. 1 Storage of Waste Disposal (%)

• REFUSE COLLECTION

The collection of waste after that respondent responded to the questionnaire and analyzed it was a general opinion that the waste are been collected daily but just a few percentage of people made it known that waste are not collected at all which sum up to that 4.7% of people and some claimed that waste are been collected weekly which are just 2.3%. The response means that The Federal Government is doing its best in collection of waste in the environs of the institution.

• REFUSE DISPOSAL

The Table 2 below shows the percentage rate of refuse disposal. The disposal of the waste is nothing to write home about due to the fact the correspondent mostly burn there waste to ash while some dispose it to the bush, they are 23.3% and 20.5% respectively. The percentage of people that uses open air disposal is 29.5% and the ones with opened dump site are 25%.

Table 2: Refuse Disposal Methods

S/N	Method of waste disposal	Abuja Hostel (%)	Annex Hostel (%)	Lagos Hostel (%)	Quarter in Aba (%)	Admin. Block (%)	SOT (%)	SOE (%)
1.	Burn to ash	2.3	-	-	11.6	4.7	-	4.7
2.	Disposal in bush	4.7	-	4.7	9.3	-	2.3	-
3.	Open-air disposal	4.7	7	7	11.6	-	-	-
4.	Opened dump site	4.7	-	4.7	11.6	-	-	-

• METHOD OF FESSES DISPOSAL

According to the data collated from different correspondent in different location it was noticed that 20.5% of the correspondent dispose their waste in nearby bushes located in the premises of the school and its environs.

Precisely 22.7% of the correspondent interviewed burns their refuse in open air, and the rest disposes their waste either in open air (on road, water channels, sites etc.). Tables 3 below shows methods of fesses disposal

Tables 3: The Method of Fesses Disposal

S/N	Method of fesses disposal	Abuja hostel (%)	Annex hostel (%)	Lagos hostel (%)	Aba quarter (%)	Admin. Block (%)	SOT	SOE
1.	Water closet	7	-	-	23.2	4.7	4.7	4.7
2.	Latrine	-	-	-	-	-	-	-
3.	Nearby bush	7	7	16.3	-	-	-	-
4.	Bucket	2.3	-	-	-	-	-	2.3

In the cases of analysis of collation of data, it was noticed that the presence of Transfer Loading Station (TLS) is so minimal having just 7% in the total answered questions. All over the world, TLS has been proven to be a key factor in solving waste management problems [Vanguard News Paper, 2006] Although disposal in TLS and dump site appears to be the most favorable way of disposing refuse. In view of the very few number of response obtained in different location around Federal Polytechnic, Ado-Ekiti. It is difficult to draw generalized conclusion on how this citadel of learning dumps their wastes.

• TREATMENT AND UTILIZATION

Waste can be utilized in different purposes [Sha' Ato et al, 2007], but it was noticed that the wastes disposed in the area are not recycled, rather they are burnt off. Burning of wastes serves as the major problem we are facing now due to the fact that it emits dangerous gases

not only for inhaling but the depletion of the Ozone layer [Afuye, 2006]. Different Organization if enquiring is made might need this waste and renew them for usage again.

• ANALYSIS OF SOLID WASTES

There are different methods involved in analyzing solid wastes such as calculating the energy contents, chemical contents, moisture contents, percentages, and the use of data collection known as the statistical methods [Bandara et al, 2007] and [Oladebeye, 2001]. In this work, the analysis is based on percentages and statistical methods due to the fact that questionnaire was administered.

Table 4: The Classification of the Municipal Solid Waste into Combustible and Non-Combustible Solid Wastes

S/N	Component	Consequent
1.	Paper	Tough sheets, rough sheets and used cartoons
2.	Nylon	Consumed products, roughages
3.	Fabrics	Waste clothes
4.	Wood	Wood shavings and log of wood
5.	Food waste	Egg shell, banana pile and yam pile
6.	Metal dust	Chips and metal filing
7.	Others	Fesses

Table 5: Percentage Composition of Municipal Solid Waste (MSW) In Federal Polytechnic, Ado-Ekiti State

S/N	Component	Keys	Usage (%)
1.	Paper wastes	PW	44.9
2.	Nylon wastes	NW	15.4
3.	Fabrics wastes	F	5.1
4.	Wood wastes	WW	3.8
5.	Food wastes	FW	26.9
6.	Metal dust	MD	2.6
7.	Others	OW	1.3
	Total		100

Fig. 2: Usage of Different Wastes (%)

From the above bar chart, it is visible to discover the waste mostly used in Federal Polytechnic Ado-Ekiti as the paper waste. This assumed to be the fact that it is an academic area and more of paper would be used. The percentage of paper waste is known as 44.9% followed by food waste which is 26.9% to nylon waste which is 15.4% next as the fabric waste which is 5.1% next to wood waste which is 3.8% and the waste that is not mostly used is the Metal duct of 2.6%

The total numbers of people that are presumed to live together are 143 people living. Breaking them statistically to percentage. The percentage of people that one person lives in a room or occupies an office/shop are 6.3, next are the one that two people lived are 7%, then the ones of three in a room are 2.1%, going to the 4 people which is 6.3%, next is 6 people 2.8% and lastly the 8 people which is 4.2%.

Table 6: Percentage Density of People Occupying A Place in Kilogram

S/N	Number of people	Percentage of people in places (kg)
1.	One	6.3
2.	Two	7
3.	Three	2.1
4.	Four	6.3
5.	Six	2.8
6.	Eight	4.2
7.	Other	73.2

Fig.3: Percentage of People in Places (%)

Table 7: The Density of Wastes in Kilogram

S/N	Types of waste	Density of wastes (kg)
1.	Paper wastes	35
2.	Nylon wastes	12
3.	Fabric wastes	4
4.	Wood wastes	3
5.	Food wastes	21
6.	Metal wastes	2
7.	Other wastes	1
	Total	78

From Tables 8 the density of people is 28.7kg. The total waste generated by the correspondent that answered the question is 78kg analysis. If 28.7kg of people uses 35kg then 1kg would use:

Mathematically;

$$\begin{array}{l} 28.7\text{kg} \longrightarrow 78\text{kg} \\ 1\text{kg} \longrightarrow X\text{kg} \\ 28.7\text{kg} \times X\text{kg} = 78\text{kg} \\ X = \frac{78}{28.7} \quad X = 2.72\text{kg} \end{array}$$

From the calculation it was derived that 1kg of people occupying a place disposes at approximately 2.72kg of waste in different forms.

REFUSE RECOVERY AND UTILIZATION

Most of the respondent claims that the bulks of household refuse generated are neither recovered nor utilized. This low degree of recovery is however done in large recycling industries, ambulant recovery which is far from the citadel of higher learning. Therefore transportation of waste can be a little more demanding.

Calculation required obtaining the angle for each material

For paper: 35kg

$$\text{Therefore } \frac{35}{78} \times 360^\circ = 161.5^\circ$$

$$\text{For nylon } \frac{12}{78} \times 360^\circ = 55.3^\circ$$

$$\text{For fabric } \frac{4}{78} \times 360^\circ = 18.5^\circ$$

$$\text{For wood } \frac{3}{78} \times 360^\circ = 13.8^\circ$$

$$\text{For food waste } \frac{21}{78} \times 360^\circ = 97^\circ$$

$$\text{For metal dust } \frac{2}{78} \times 360^\circ = 9.2^\circ$$

$$\text{For other waste } \frac{1}{78} \times 360^\circ = 4.6^\circ$$

Fig. 4: Pie-Chart Analysis of Waste

RESULTS AND DISCUSSION

This study is designed to evaluate content of the municipal solid waste of the inhabitants of Federal Polytechnic Ado-Ekiti, Ekiti state. The research study revealed that amount of waste is 78kg, and the total amount of people in kg is 28.7. Therefore the calculated waste

generated per-head is 2.72kg. The analysis is just a fraction of the whole people in The Federal Polytechnic Ado-Ekiti and it might not be exact.

The true position of household and industrial refuse storage, collection and disposal in Federal Polytechnic Ado-Ekiti. Ekiti State has been revealed in this study.

Due to some logistic problems the study was not done in the entire metropolis Federal Polytechnic Ado-Ekiti, but results of refuse analysis from the selected areas of concentration makes it clear that almost, one third of the respondents admit the fact that they dump their refuse carelessly.

CONCLUSION AND RECOMMENDATION

The research of solid waste generated in Federal Polytechnic, Ado-Ekiti was carried out and analyzed. It was derived from the result that paper waste has the highest usage in the environs of 44.9% followed by food wastes with 26.9%, next is Nylon waste with 15.4%, with fabric waste of 5.1%, coming down to metal dust which is being used but in small quantity and it is recorded as 2.6%. Lastly the waste with the lowest usage according to the correspondent that filled the administered questions, other waste like fesses, cattle dumps is 1.3%.

During the analysis it was noticed that most of the correspondent does not have a specific place for disposal of refuse and a large percentage of them dump their refuse in open air which are around 29.5%

The generation of this wastes is quite irregular but the increase of the waste is day by day and this waste litter not only the places been dumped but called in disease that are air-borne around this area. The places where the dump sites were located are not that far from the places where people live or pass through or even eat.

The following recommendation are expected to be considered in controlling pollution caused by solid waste in the institution.

- i. Every hostel, room, offices and shops must have an average size dustbin, and in case where they are quite populated, each must have at least waste bin (dust bin) of about 200L to 300L.
- ii. There must be specific central location for the dumping of the wastes as soon as the bin gets filled up, this location must be in interval within the institution and must have a giant waste bin which the dump truck can easily come and pick up for final disposal.
- iii. The route where dump site should be located should be easily accessible.
- iv. Transfer loading stations should be sponsored by the government to enhance the collection of waste in the surroundings for recycles rather than burning.
- v. The collection of the waste bin should be on daily or weekly.
- vi. The schedule for the movement of the dumping trucks should be done carefully to cover all the sites of dump or refuse disposal.

APPENDIX

The questionnaire administered

1. Status: Student ; Staff
2. Level: ND ; HND ; Teaching ; Non-teaching
3. Sex: Male ; Female
4. Age: Under 25yrs ; 25 -35yrs ; 36 – 45yrs ; 46 – 50yrs ; 51 – 55yrs ; 56 – 60yrs ; 60 and above
5. Marital status: Single ; Married ; Divorced/Separated ; Widowed
6. Type of building: Abuja; Annex ; Lagos ; Aba ; Admin Block ; SOE ; SBS ; SOT
7. Purpose of Building: Commercial; Industrial; Public; Others
8. If residential, state type of accommodation: Hostel; Flat; Duplex; Bungalow; Others
9. Scope for Expansion: Available; Not available

10. How many people make up the room/office?
11. What is the type of waste commonly disposed? Paper; Nylon; Fabric; Wood; Food wastes; Metal dust; others
12. What is the sewage like in the environment? Opened; Covered pipe Drains; Concrete slab cover; Pit
13. What is the method of disposal? Open dump sites; Open air disposal within the premises; Disposal into bush nearby ; Burn to ash ; Streams ; Water canals
14. What is the distance of dump? Below 25meters; 25 – 50meters; 50 – 100meters; None
15. What is the method of fesses matter disposal in your building? Bucket; Latrine; Nearby Bush ; Water closet ; Nearby Dumpsite
16. Distance of refuse storage from Home/Hostel/Office: Below 25meters; 25 – 50meters ; 50 – 100meters ; None
17. What type of equipment do you use for refuse storage? Receptacle; Plastic/Refuse Paper Bags; 200L or 40gall; Steel drums; Concrete constructions; Steel Dustbins; Skips
18. When you look at the frequency of use of the various equipment/materials used for refuse storage how would you evaluate the frequency of use of the following equipments: The equipment is not in use at all ; The equipment is used daily ; The equipment is used weekly ; The equipment is used fortnightly ; The equipment is used monthly ; The equipment is used others.
19. Do you have any transfer loading station around you? Yes No
20. What type of TLS do you have? Skips ; Fixed ; Wheeled containers
21. Do you treat your wastes? Yes No
22. If yes what kind of treatment do you apply? Burning of wastes; Burying of wastes ; Land filling ; Others.

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