Quest Journals
Journal of Research in Environmental and Earth Science
Volume 5~ Issue 1 (2019) pp: 65-70
ISSN(Online) : 2348-2532
www.questjournals.org

Research Paper

Spatial Distribution of Dump Sites in the Federal Polytechnic

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ABSTRACT: *Solid waste dump sites are a global environmental issue that constitutes significant problem in today's world. This study identified and mapped the legal and illegal dumpsites in the area and also analyzed the proximity of the dump sites to residential areas. Coordinates of dump sites were obtained using Handheld GNSS receivers. The data collected from the field was analyzed using the QGIS 2.14 software. The results showed that most of the wastes generated from these dump sites are in the form of polythene bags and plastic bottles. The work shows the legal dumpsites in the area are located within the residential land use. Based on the foregoing, it was recommended that the general public should be well sensitized on the dangers associated with indiscriminate refuse disposal.*
Keywords: *Solid waste, Dumpsite, Environmental issues.*

Received 28 July, 2019; Accepted 10 Aug , 2019
Published with open access at www.questjournals.org

I. INTRODUCTION

Waste Management is a global environmental issue affecting most urban areas. It is one of the major problems facing city planners all over the world. The problem is particularly severe in developing countries that are characterized with increased urbanization, poor planning and lack of adequate resources (Mwanthl, Nyabola and Tenambergen, 1997; Mato, 1999; Obirih and Post,2002). The management of solid waste is a major public health issue and an important factor affecting the quality of the environment. The problem of solid waste disposal, especially in our cities, has become one of the most difficult environmental problems facing the world today (NEST, 1991).

Among all the wastes (solid, liquid and gas), solid waste is the most popular and most difficult to manage locally because it does not flow, evaporate, diffuse, dissolve or be absorbed into the surrounding unlike liquid and gaseous wastes (Ogunbiyi, 2001 in Victor and Choji, 2006). The problem of waste management is even becoming more complex with the increasing rate of urbanization. The solid waste management issue in Nigerian cities is even more alarming. The volume and range of solid wastes generated daily in Nigeria have been increasing within the last few years and this is mainly due to the high population growth, urbanization, industrialization and general economic growth. About 20 kg of solid waste is generated per capita per annum in Nigeria that is 2.2 million tones yearly based on the 1989 estimated population of 110 million; the estimated volume of solid waste generated in selected urban centres in Nigeria was projected to double by the year 2000 (NEST, 1991) this means increasing the problem of management. Dumpsites have been the most organized common methods of waste disposal and remain so in many places in the world (El-Fadel 1995). In developing countries like the Federal Republic of Nigeria, the prevailing practice of municipal solid waste disposal is to dispose of the solid waste in dumpsites (Weiss 1974; Lee and Krieger 1986; El-Fadel et.al 1995; Asian Institute of Technology (AIT) 2004).

Study Area

The Federal Polytechnic Ado-Ekiti is located between latitudes 7.594 and longitude 5.2955. The school was created in 1979 in Akure, Ondo state. It was later moved in 1982 to Ado - Ekiti by the Federal Government which is now the capital of Ekiti state. It currently has over 15,000 students and a total staff strength of about 2,000.

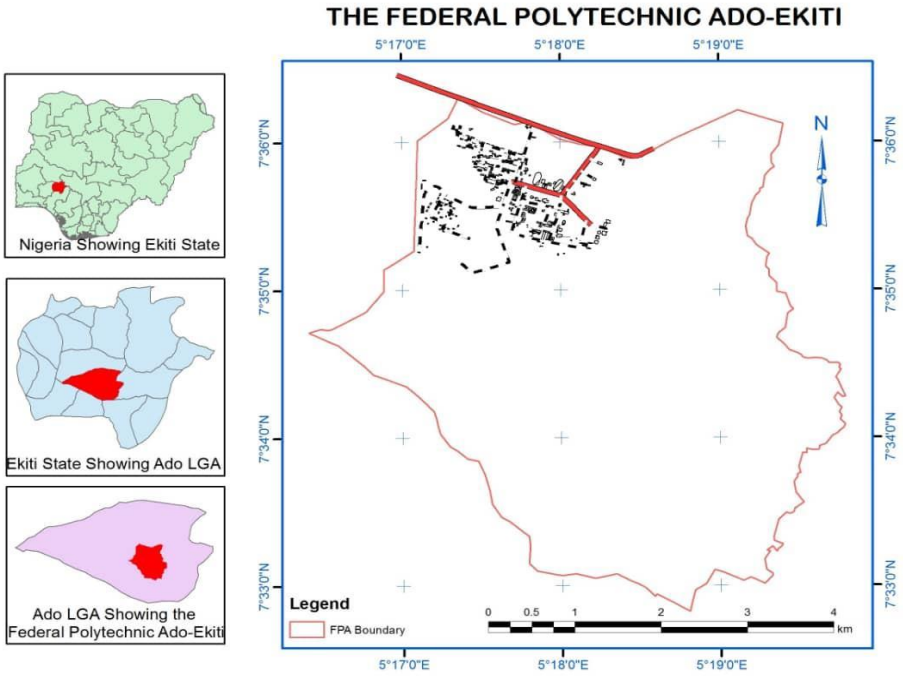

Figure 1: Showing the study area.

II. THEORETICAL FRAMEWORK

Wastes

Wastes according to Basel convention are substances or objects which are disposed or are intended to be disposed or required to be disposed of by provision of natural laws. The United Nation Statistics Division (2011) see wastes as materials that are of prime product for which the generator has no further use in term of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose of.

Waste is defined as any unwanted material that is due for discarding. But technically, waste is considered as a resource in the wrong place (Abdullahi 2011). Mabogunje (1988) stated that waste is any unavailable material arising from an individual, domestic, occupational, industrial or any human activity (which has no economic value) for disposal. Waste can also be defined as any substances which require being disposed of.

Classification of Wastes

Wastes can be classified into three major groups based on their sources and composition namely; solid, liquid and Gaseous. Solid waste occupies a geographical space. It does not decompose easily, and also does not evaporate like the gaseous waste. This work is concerned with solid waste. Solid waste can be classified based on composition, source, as well as physio-chemical properties. The classes of solid waste based on the source are: municipal (domestic, institutional and commercial), agricultural, mining and mineral, radioactive and industrial wastes. Among these sources, industrial and municipal wastes contribute largely to the volume of solid wastes.

For the purpose of this study, municipal solid waste is considered. Frequently, the material composition of the waste stream is also used to classify wastes into such types as organic waste, paper and cardboard, plastic, glass, ceramics, textiles, metal and inert waste. Surrey waste.info (2008) identified nine main types of materials on the basis of material composition namely: paper/card, plastic film, dense plastic, textiles, miscellaneous combustibles, glass, ferrous metal, garden waste and food waste. Therefore, components and amounts of waste generated vary for different towns and cities. In addition, a number of determinants account for the type of waste generated, these include; levels of economic development, seasons of the year, and public attitudes (consumption patterns, as well as lifestyles) (Sanyanga andMasundire, 1999). Meanwhile, the methods for handling and disposing of waste differ considerably.

Types of solid waste

The solid wastes are subdivided into the following:

(a) Garbage: Garbage is the solid or semi-solid waste incidental to preparing, cooking, and serving food, and cleaning of food service items. It does not include rubbish. Garbage is classified as edible or non-edible. Edible garbage is that part of the garbage which is suitable for animal food such as scrap meat and vegetables. Non-

edible garbage is that garbage that cannot be used for animal food, such as tea leaves, bones, and egg shells.
(b) Rubbish. Rubbish consists of wastes which originate in food service facilities, barracks, wards, quarters, and offices. It includes items such as wastepaper, plastics, wood, metal, glass, ashes, and broken or damaged crockery. Rubbish may be classified as combustible or non-combustible depending upon whether or not it can be burned. etc.

III. METHODOLOGY

Research tools
Global Navigation Satellite System (Garmin 76csx GNSS model), Phone Camera, Google Earth Pro, and QGIS 2.14.17 software were used.

Method of data collection and Analysis

Global Navigation Satellite System (GNSS) was used to take the coordinates of the solid waste collection points within the study area, after which a database was created and used to record the coordinates, formal or informal status, locations and addresses of the collection points. A Phone camera was also used to take pictures of some selected solid wastes collection points.

The Federal Polytechnic Ado-Ekiti was zoomed and digitized directly from satellite imageries on Google Earth imagery. Points of interest, buildings and roads within the study area were digitized into points, lines and polygons. The digitized file was saved into KML format, and the data was import into the QGIS 2.14 for editing, structuring, analysis and cartographic symbolization to produce digital maps.

IV. RESULTS AND DISCUSSION

Locations of dumpsites

The coordinates of the authorize and illegal dumpsites determined using the Garmin handheld GNSS receiver and the status of the dumpsites are shown in the table shown below. The table also shows the description of the location of each of the dumpsite.

Table 1: Coordinates of Dumpsites

Dumpsite	Eastings	Northings	Status of Site	Location Description
1	752533	840992	Illegal	Annex hostel Block B
2	752412	840986	Illegal	Annex hostel Block A
3	752611	840964	Illegal	Beside CACSA
4	752495	840826	Illegal	Annex Hostel Block E
5	752767	840721	Illegal	Close to Favour food
6	752660	840584	Illegal	Lagos Hostel Block E
7	752769	840364	Illegal	Lagos Hostel Block D
8	752800	840341	Illegal	Lagos Hostel Block D
9	752887	840718	Illegal	Lagos Hostel Block C
10	752858	840242	Illegal	Lagos Hostel Block C
11	752811	840568	Illegal	Behind Staff quarters
12	752991	839962	Legal	Along Rector village
13	753260	839777	Illegal	Behind Com.sci

14	752999	839895	Illegal	Front of DUDAP building
15	753746	839722	Illegal	Behind New SBS
16	753791	840063	Legal	Along Abuja Hostel Rd
17	753216	839548	Legal	Beside old eed centre
18	753890	839488	Illegal	Beside Abuja Gen. House
19	753389	839576	Illegal	Engineering

Below are photographs of some of the dumpsites.

Plates 1: A Plate showing examples of dumpsites

Solid Waste Distribution

The result reveals the spatial distribution of solid waste dumpsite in The Federal Polytechnic Ado- Ekiti, irrespective of whether legal (authorized) or illegal (unauthorized) have been located.

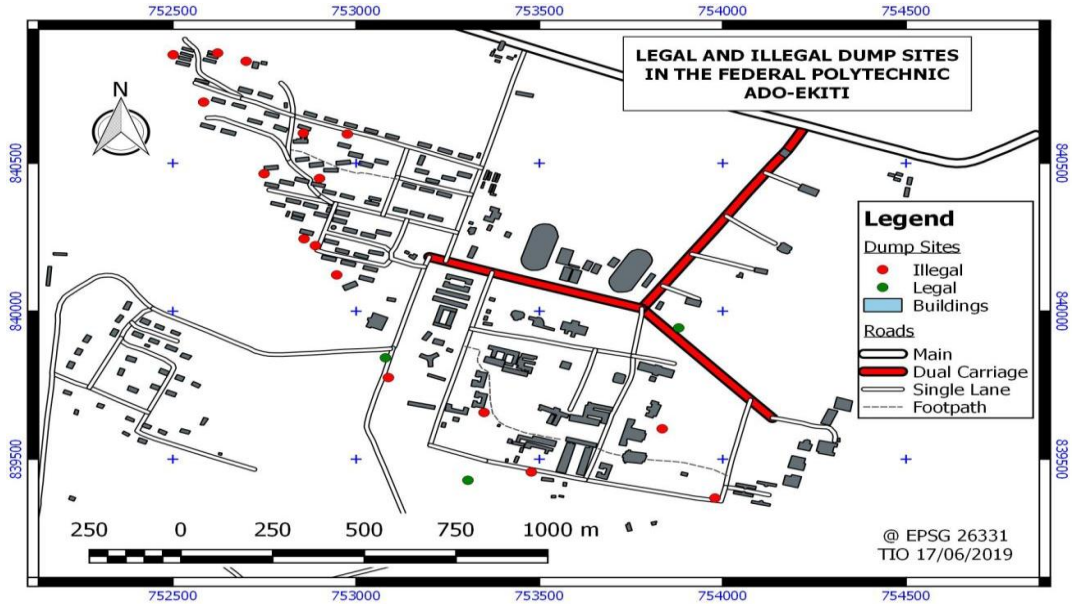

Figure 2: Showing the location of legal and illegal dumpsite within the study area.

Risk Posed by Dumpsite to the Surrounding

The Spatial Distribution of the legal and the illegal collection points is shown above in figure 2, the illegal collection points are more concentrated in the low-medium density populated part of The Federal Polytechnic Ado-Ekiti. The illegal (unauthorized) solid waste collection points can also be found along water channels. From the analysis in the study area, there is more illegal dumpsite than legal dumpsite. The illegal

dumpsite cluster around hostels, offices and some classrooms.

The locations of the dumpsite show serious negative implications on infrastructural facilities in the area. Some dumpsite were on drainages thereby obstructing the free flow of water and this could eventually lead to flooding and erosion during the rainy seasons. A good number of the dumps were very close to buildings where they not only destroy the aesthetic value of the areas but also constitute breeding grounds for vectors like mosquitoes and flies which transmit diseases like malaria, typhoid fever and cholera which are part of the highest killer diseases in Nigeria. In some cases, they pollute surface and ground water, hence, exposing inhabitants area to the consumption of contaminated water and food which is inimical to their health. The hostels in these areas were also exposed to offensive odour and polluted air.

Solutions to Avoid Illegal Dumpsite

Based on the outcome of this work, to situate legal dumpsite within the area the steps below should be followed:

• If dumpsite must be used, they should be properly planned, monitored and sited away from residential buildings, schools and other infrastructural facilities using Remote sensing and Geographic Information Systems (GIS). They should also be properly protected and constantly evacuated to prevent the breeding of pests and rodents as well as pollution of air and water.

• Our waste management strategies should shift from simply moving the waste from one site to another and not really managing it. The Integrated Waste Management (IWM) concept should be adopted.

This concept is outlined as a group of management alternatives that embrace, reuse, source reduction, recycling, composting, landfill and incineration.

The ultimate aim of Reduce, Reuse, and Recycle (3R's of IWM) is to reduce the amount of urban waste that would eventually end up in landfills, incinerators or other waste management facilities.

V. SUMMARY AND CONCLUSION

The rate growth in the population of the Federal Polytechnic Ado-Ekiti has resulted in overwhelming growth of solid waste which poses great management problem in the study area. Some of these dumpsites are situated on drainages networks where they constitute a barrier to the free movement of water.

Others are within and around residential structures, hence, creating breeding grounds for pests and rodents that transmit diseases, polluting the air, surface and groundwater and claiming lives.

Conclusively, the analysis of the spatial distribution of dumpsites within The Federal Polytechnic Ado-Ekiti has been carried out in this work. Although, the distribution identified illegal dumpsite as having the highest record. Findings in the study further show that legal dumpsite is situated in the study area as well. The categories of waste identified from these dumpsites are in form of polythene bag, plastic bottles, plastic food pack and polystyrene food pack are altogether generated at an average rate. Furthermore, it is discovered that there is no properly designed final solid waste disposal facility within the study area. To improve existing strategy, a comprehensive assessment approach is essential to the established performance of the present strategy, to provide information to management for discourse that's why Geographic Information system is employed in showing the spatial distribution of both legal and illegal dumpsites within the study area.

RECOMMENDATIONS

Based on this work, the following are recommended:

- Education and Enlightenment or sensitization programs should be intensified and brought down to the grass root.
- Adequate sensitization of members of the community should be carried out.
- Where possible, it should be incorporated into the school curriculum. The media publicity is not enough since not everyone has access to the media.
- The establishment of a sanitation monitoring team to inspect the environment on a regular basis and prosecute defaulters accordingly.

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Sesan P. Oyinkolade" Spatial Distribution of Dump Sites in the Federal Polytechnic" Quest Journals Journal of Research in Environmental and Earth Science, vol. 05, no. 01, 2019, pp. 65-70