



## ASSESSMENT OF SOLID WASTE MANAGEMENT IN DAURA TOWNSHIP, KATSINA STATE

Suleiman Iguda Ladan

Department of Basic and Applied Sciences, College of Science and Technology, Hassan Usman Katsina Polytechnic, Katsina

Corresponding Author's Email: [suleiguda@gmail.com](mailto:suleiguda@gmail.com)

---

### ABSTRACT

Solid waste management in urban centers of developing countries has been a major challenge as a result of increasing population, migration and rising standard of living. This study focuses on Daura Township, Katsina State northern Nigeria. The methodology deployed to achieve the aim is through direct observational technique during two field visits to the town. There is also the administration of questionnaire on respondents that were purposively sampled for the study and interview with the Zonal Officer of the waste management agency in charge of Daura town. The results obtained have shown that the State Government provides 78.12% of the waste disposal facilities while 12.88% of the facilities comprise the use of open spaces and uncompleted buildings. The efficiency of waste collection for disposal by the waste management agency is 55% of the wastes generated with the remaining 45% not collected for proper disposal. The major findings are that 22.82% of the respondents disposed wastes in authorized sites, waste materials are allowed to accumulate before vehicles and equipment are sent to collect the wastes for disposal and some of the residents are not cooperating with the Agency to ensure proper waste management. The challenges associated with waste management include blockage of drainages, air and land pollution, littering of streets and road sides. It is therefore recommended that adequate facilities, machineries and equipment should be provided by the State Government and public enlightenment campaign should be carried out to overcome the challenges of solid waste management in the township.

**Keywords:** Assessment, Solid waste, Solid waste management, Daura township

### INTRODUCTION

Waste is any solid, liquid substance or gaseous emission that are discarded or released into the environment as a result of human activity of which no use can be done by the organism or the system that produces it (Bellamy, 2007). Any materials, solid, liquid or gas that is no longer required by the organism or system that has produces it is termed waste (Maton, *et al*, 2016). Wastes are quite often pollutants of the environment but when suitably treated they may be reclaimed and recycled for productive uses. Among all the wastes, solid waste is the most ubiquitous and most difficult to manage locally. This is because solid waste does not flow, evaporate, diffuse, dissolve or be absorbed into the environment unlike liquid and gaseous waste (Arigbede and Yusuf, 2010). Consequently an improperly managed solid waste constitutes real and potential hazards to the populace. Waste management is the precise term for the collection, transportation, disposal or recycling and monitoring of wastes in order to prevent or avoid its adverse effects on human health and the environment (Wrfound, 2009). The primary objectives of waste management today are to protect the public and the environment from potentially harmful effects of wastes. Some wastes materials are normally safe but can become hazardous if not managed properly.

The term solid waste includes all those solid and semi-solid materials that are discarded by a community as a result of various human activities (Garget *al.*, 2006). The solid wastes generated through domestic and commercial activities are classified as municipal solid wastes and also called refuse. The solid waste generated by industries is known as industrial solid wastes. Solid wastes may also be generated by agricultural activities, a large portion of which may become part of municipal solid waste. A part of biomedical waste from hospitals and clinics, similarly finds entry into municipal solid wastes, though is supposed to be disposed off separately as hazardous biomedical waste (Garget *al.*, 2006).

However, solid waste management (SWM) involves managing activities associated with generation, collection, transport and disposal of solid waste in an environmentally compatible manner, adopting principles of economy, aesthetics, energy and conservation (Anjaneyulu, 2005).

The generation of solid wastes and its management in urban areas of developing countries has been a major challenge (Olukanni and Mnenga, 2015). With increasing population, migration and the rising standard of living, the challenges of solid wastes are attaining larger and complex dimensions, requiring integrated and sophisticated interventions in terms of policies/regulations and technologies (Anjaneyulu, 2005). In

developing countries, solid waste management authorities are seriously facing the associated challenges of collection, transportation and disposal of communal solid wastes (Ejaz and Janjua, 2012).

According to Ogwueleka (2009), solid waste management has emerged as one of the greatest challenges facing State and Local Government environmental protection agencies in Nigeria. The volume of solid wastes being generated continues to increase at a rate faster than the ability of the agencies to improve on the financial and technical resources needed to parallel this growth (Ogwueleka, 2009). A Task Force on Environmental Protection of Kano State in 1993 reported that Kano city with a population of 1.5 million generated 500 tonnes of waste materials daily, but less than 30% is evacuated for disposal due to lack of machinery and equipment leading to rapid accumulation of waste in different parts of the city which had negative consequences on the environment and health of the residents (Ayuba, 2005).

Most of the studies on waste management in Nigeria focus on large cities or towns with little or no studies conducted on medium size towns such as Daura. Daura town has recently gained political and economic prominence in the country with the coming to power of a native of the town Major General (Rtd) Muhammad Buhari as the President of the Federal Republic of Nigeria since 2015. The town has experienced some development and rehabilitation of the infrastructural facilities and social amenities that have expanded the population and also increased movement into the town which will increase the rate of solid waste generation. Hence, the objectives of this paper are:

- identify the facilities used for disposal of solid wastes in the town.
- describe the efficiency of managing solid wastes by the Agency.
- highlight the challenges of solid waste management in the town and
- offer suggestions towards overcoming the challenges of waste management.

## MATERIALS AND METHODS

### The Study Area

Daura is the name of a town and headquarter of a local government area situated in the extreme northern part of Katsina State. The town is located on latitude 13°01' North of the equator and longitude 8°19' East of GMT. The town lies at the intersection of roads from Katsina, the State capital (79km), Kano (73km), Zango (18km) and Zinder in Niger Republic (Encyclopedia Britannica, 2018). Daura as a local government has a total population of 224,884 comprising 115,576 males and 109,308 females according to the 2006 final census released by the National Population Commission (Bawa, 2012). The 2006 population projection stood at 303,600 in the local government which indicates a rising population. The occupation of the inhabitants is farming of food and cash crops while other people engage in trading activities with other traders from Katsina, Kano and Zinder in the neighboring Niger Republic.

In terms of physical setting, the relief of the town lies on the great Hausa plains of Northern Nigeria composed of basement complex rocks and the topography is gently undulating with an elevation of 475m (Alo *et al*, 1998). The drainage consists mainly of ponds created by excavation of laterite that contains and retain rain water such as the Tafkin Kwargam (Kwargampond) at Unguwar Kwargam. Underground water is available in form of well such as the Kusugu well. The climate is hot and dry for most of the year, maximum day temperature of about 38°C in the months of March, April and May are common and the minimum temperature is about 22°C in the month of December and January and annual average rainfall of 780mm (Dauda *et al* 2011). The vegetation is Sudan savanna type with short scattered trees and grasses. One of the main tree species is the neem tree (*Azadirachta indica*) planted to provide shade and reduce the effects of wind erosion prevalent around the area.

Daura hosts Katsina State office of National Great Green Wall Project, a United Nations project that aimed at planting trees across the Savannah – Sahara desert fringes to halt the advancement of the desert. The map of the study area can be seen on the figure 1 below:

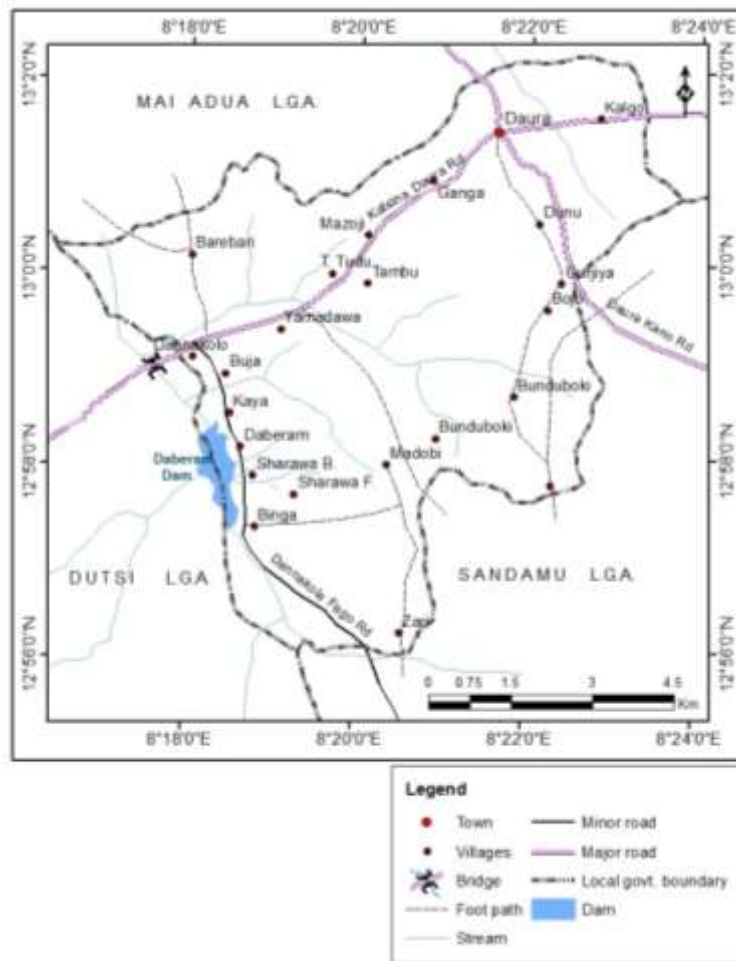


Fig. 1: Map showing study area

## RESEARCH METHODS

Data for the study were collected through field visits to the study area on two occasions on 15<sup>th</sup> April and 29<sup>th</sup> October, 2018. The field visits involved direct observation and survey of waste dump sites in different residential areas of the town. During the visits pictures of some waste dump sites were snapped and included in the research study. A total of forty seven (47) waste dump sites that comprise both legal and illegal dump sites were visited for the study out of the estimated sixty (60) dump sites in the study area. A structured questionnaire was used to generate data for the study. The questions contained in the questionnaire focused on the facilities used for waste disposal, ownership of the facilities, efficiency of managing wastes, challenges posed by the waste management practice and suggestions towards overcoming the challenges. The respondents include adult males and females whose residents are located close to the waste dump sites. The respondents reside in the main areas of Daura township such as Bakin Mayanka, Fegi, Low Cost Housing estate, Majema, Makangara, Nasarawa, Sabon Gari, Tudun Wada, Tsohuwar Kasuwa, Unguwar Mayanka, Unguwar Kwargam, Unguwar Kwari and Adare.

The questionnaires were administered with the help of two research assistants who are natives of the town on both occasions of the field visits, who were former students of the Author. Also, direct observations were made on the waste management practice adopted, the facilities used and their ownership, the challenges encountered and what should be done to overcome the challenges. The data collected from the above highlighted primary sources of data were complemented with data from secondary sources which include published articles, textbooks, conference papers, environmental action plans, historical sketches and internet sourced materials. The data collected were analyzed using descriptive statistics in form of averages and percentages.

## RESULTS AND DISCUSSION

### Demographic Characteristics of Respondents

The demographic characteristics of the respondents showed that majority (68.00%) are males while the others (32.00%) are females. This is based on the culture of the people in the study area where males are found mostly outdoors and have more information about their environment than the females. The age

ranges of those involved in the study are from 20 – 24 year up to the range of 55 – 60 years. The highest percentage is 18.00% for those on the range of 20 – 25 years followed by 14.00% for those on the age ranges of 30 – 34 years and 45 – 50 years which indicate a youthful segment of the population responding to the questionnaires.

In terms of marital status, 60.00% of the respondents are married while 28.00% are single and 12.00% are widowed. Among those that are married, 50.00% of them have 1 – 5 children. In terms of educational qualification, respondents that have attained tertiary level education constitute 44.00% which are the largest among the respondents. This means that they are likely to be more knowledgeable on the issues of solid waste management in the study area.

As per the occupational status, those engage in farming activities among the respondents constitute the majority which is 44.00% of the total. Some of these farmers rely on the decomposed solid waste generated from waste dumps to serve as manure for the farmlands.

#### Facilities Used for Waste Disposal in Daura Township

The agency in charge of waste management of Daura township is the Katsina State Environmental Protection Agency (KATSEPA) whose headquarters is at Katsina, the State capital. But there are zonal offices in the main towns of the State such as Daura, Dutsinma and Funtua. Each zonal office is allocated a certain number of staff, facilities and equipment for the purpose of managing wastes in the township. Find below the staff, facilities and equipment for the Daura zone.

**Table 2: Staff and Facilities used for waste management in Daura Township**

S/No.	Staff and Facilities	Number	Duty/Functions in waste management
1.	Permanent staff	04	Administrative duties and supervision of the other staff
2	Casual labourers	68	Manual work to load waste materials and sweep streets.
3	Waste collection vans	03	Vans meant to collect and disposed wastes from RCCs.
4	Refuse Collection Centers (RCCs)	14	Waste collection centers for waste disposal.
5	Roll on-roll off (Roro) waste collection containers	16	Waste collection containers kept for waste disposal
6	Roro van	01	A van for loading and transportation of Roro containers for disposal
7	Skid bin waste containers	14	Waste collection containers distributed in offices, schools, hospitals etc.
8	Waste dumpsites	02	Waste dump sites for waste disposal located outside the township

Source: KATSEPA (2018)

From the table above which show the staff and facilities used for waste management in Daura town. The Zonal Officer is in charge of the staff that carries out administrative duties and the casual labourers. The casual laborers sweep major streets of the town and carries out the manual work of collecting waste materials from the RCCs to load it on the waste collection vans. The RCCs presently are fourteen (14) in number as they have been gradually replaced by Roll-on-Roll Off (Roro) waste collection containers since the beginning of the year 2016. The Roro van collects the waste collection containers for disposal at two locations along Zango and Maiadua roads. The skid bin containers that are distributed to offices, schools and hospitals are collected by waste collection vans. The agency collect and disposed waste materials two to three times daily but recently due to problem of maintenance of vehicles, the waste materials are allowed to accumulate, then vehicles and equipments will be sent from the agency's headquarters at Katsina to come and collect the wastes for proper disposal.

Respondents to the questionnaires were asked what facility they are using for the disposal of waste materials outside their houses or shops. The results have shown that 46.87% of the respondents are using the Roro waste collection containers. The respondents that use RCCs constitute 18.75% while those that

are using the skid bin containers constitute 12.50% of the total. Respondents that are using open spaces to dump their waste materials constitute 15.62% while 6.20% of the respondents are using uncompleted buildings as sites for waste disposal. This showed clearly that the last two sets of respondents that constitute 21.82% are disposing their waste materials in unauthorized sites which have negative impacts on the environment and human health.

Respondents to the questionnaires were asked who provide the facility for waste disposal in their areas. Majority of the respondents that constitute 78.12% indicate that the State Government provided the facilities which include Roro waste collection containers, RCCs and skid bin containers. Some of the respondents that constituted 21.88% indicate that the community, committee of residents, some wealthy private individuals and Royal fathers provided the facilities which include RCCs, waste collection drums and undeveloped plots of land. This clearly indicated that the State Government has not been able to fully provide the facilities for waste disposal to the sampled residential areas in the town. For example one of the traditional rulers of the town Magajin Garin Daura constructed a RCC close to a cemetery at Mankara Huta quarters (See figure 2). In some areas, such as Tsohuwar Kasuwar Daura some

individuals provide space for waste disposal and when the waste accumulates, it is sorted out and the composts are transported to the farm as manure.

#### The Efficiency of Managing Wastes by the Agency

Respondents to the questionnaires were asked to describe by rating, the efficiency of managing wastes by KATSEPA in their respective residential areas. The average rating of the efficiency of the waste management agency in managing the waste generated is 55% with the remaining 45% not collected for proper disposal. This percentage is close to the figures given in a study by Ogwueleka (2009) who observed that solid waste collection efficiency in Nigeria range from 5% in some semi urban areas to 50% in urban areas. In Daura town, the respondents advanced various reasons for the rating of the efficiency of the agency to manage wastes, this is mainly due to:

(i) The facilities for waste disposal are not enough to adequately cover Daura township and hence some residents dispose waste materials along the road or street corners.

(ii) The staffs of the agency do not come on time to collect the Roro waste collection containers when it is full for proper disposal. This implies the collection for disposal is not regular even in the authorized waste collection centres.

(iii) Waste materials are found littering certain areas for the town and even blocking the road that people and vehicles pass. Example at Fegi quarters near MTN mast and near Nigerian Prison Service Daura.

(iv) There is no waste collection for proper disposal in some areas that are not along the road. These include areas that are not easily accessible to motor vehicles and areas that are in the interior of the residential areas such as TafkinKwargam.

The two figures below shows the condition of solid waste management of the town as at the time of field survey which further support the rating given by the respondents.



Fig. 2: Heaps of solid waste materials outside Roro waste collection containers near Nigeria Prison Service, Daura



Fig. 3: Uncollected waste materials scattered near a cemetery at Mankara Huta Quarters, Daura

However, according to the Daura Zonal Officer, there are certain reasons that account for the rating given to them by the respondents. These are because of the following:

- (i) Some residents send children to dump waste materials inside the Roro waste collection containers and the children due to their height do not dump the waste inside the container but outside which increase the work of the agency.
- (ii) Some residents of the town do not dump waste materials in the designated authorized centres but dump the waste at any corner or obscure location thereby creating too many waste dump sites which the agency could not collect easily for proper disposal.
- (iii) There is some level of indiscipline among the people which leads to the people dumping the waste materials outside the containers. At one time, the agency complained to the Emir of Daura who urged the people to dump waste materials inside the containers but the situation did not change.
- (iv) There are problems concerning the repairs and maintenance of the vehicles that are used for waste collection and disposal. This has resulted that when the vehicles break down they are not promptly repaired and vehicles have to be requested or drafted from Katsina to come and work for the people of Daura.

- (v) Some people use to set fire to burn the waste at the RCCs and the Roro waste collection containers in order to make manure. This burning weakens the RCCs and the Roro containers and as such could not perform the functions they were meant to perform in collecting wastes.

#### **Challenges of Solid Waste Management in Daura Township**

Respondents to the questionnaires were asked what challenges the waste management poses to their residential areas. These challenges are summed up based on the responses and highlighted below:

- (i) Air pollution which arises as a result of decomposition of waste materials especially when the waste materials are not collected for many days. The air pollution also results when waste materials are burnt to reduce its volume as a means of disposal or to generate manure from the waste. Land pollution also occurs when
- (ii) Blockage of drainages that arises when waste materials spill out of the RCCs or the Roro containers. Also the indiscriminate disposal of waste materials leads to the flow of waste materials into drainages. The blockage of drainages obstructs the flow of sewage and rain water during the rainy season. The blockage of drainages has contributed to a flood event in the year 2015.

(iii) Health hazard to the people particularly children when they are assigned to dispose waste materials they do stay back at the dump site to pick some items they could play with at home. In one incident at UnguwarKwargam two young boys accidentally drowned at a pond (TafkinKwargam) after dumping waste materials at the edge of the pond.

(iv) Children from poor families and beggars called *Almajirai* in Hausa language do visit the waste dump sites or jump into the Roro containers to scavenge for some items such as metal, iron, rubber, plastics, and pieces of wood or glass that they can sell to earn some money. Several studies carried out by scholars from different parts of Nigeria and other developing countries have shown that scavengers are exposed to serious health hazards and the scavenger could serve as routes for the transmission of certain pathogens associated with waste to the larger society (Aboagye-Larbi, *et al.*, 2014).

(v) Littering of streets with waste materials particularly polythene bags, sachet water bags and other waste items and materials that could easily be blown away by wind from the dump sites or any area where waste materials are dumped. This littering of the streets with waste materials makes the streets dirty and untidy.

(vi) Health hazards to domestic animals such as goats, sheep and chickens which are seen eating any form of food remnants at the dump sites. At a waste dump site at Fegi quarters a total of 28 goats and sheep were counted grazing on the dump sites. Some of these animals can be seen on figures 1 and 2. These animals could eat polythene or cellophane bags or an acidic substance that could affect their health conditions.

## CONCLUSION

Solid waste management had become a major problem in developing countries due to increasing population that generates large volume of waste and the inadequate facilities, machineries and technological knowhow to effectively manage the waste (Ali, *et al.*, 2014). Many developing countries are seriously struggling to design useful and economical solid waste management systems (Ejaz and Janjua, 2012). In Nigeria, the situation is serious as the Agencies responsible for the waste management are struggling to cope with the increasing volumes of wastes in both large cities and medium size towns. Significant findings of this study on Daura township include waste materials are allowed to accumulate before vehicles and equipment are sent to collect the wastes for disposal, 22.82% of the respondents disposed wastes in authorized sites, some of the residents are not cooperating with the Agency to ensure proper waste management and large quantities of wastes are left uncollected for disposal which has given rise to the challenges of solid waste management in the township. It is therefore

recommended that adequate facilities, machineries and equipments should be provided by the government and increasing public enlightenment on proper waste disposal to overcome the challenges of solid waste management in the township.

## RECOMMENDATIONS

The following recommendations are made in order to improve the situation concerning solid waste management in Dauratownship. These are:

(i) KATSEPA should provide adequate vehicles, machineries and equipments to efficiently manage the solid wastes generated from the township. Also enough funds should be allocated for the service, repairs and maintenance of the facilities, machineries and equipments.

(ii) KATSEPA Zonal Office at Daura should carry out their assigned duties on daily basis to ensure that the wastes generated are collected for effective disposal. A situation should not arise where the waste materials are allowed to accumulate for weeks before the wastes are collected and disposed.

(iii) KATSEPA should evolve new and innovative methods of collecting waste materials that are dumped in the interior locations within residential areas. Wheel barrows for example can be used to collect wastes from such location and then transported to the road side where the vehicles are waiting for the waste materials to be loaded for disposal. In some areas that the wheel barrow may not be appropriate, domestic animals such as donkey and cows can be used to transport the wastes to the road side.

(iv) KATSEPA in conjunction with Daura Emirate Council should embark on rigorous public enlightenment using print and electronic media with the objectives of creating awareness among the people to dump waste materials inside the designated containers and not to burnt waste materials either as means of disposal or to generate manure as it causes air pollution.

(v) The State Government should provide land and other incentives to private investors to establish factories that will collect cellophane, polythene and other pieces of metal for reprocessing and recycling. The youths that make compost from the waste dumps should be encouraged by the State Government through the provision of working materials and safety equipment.

## REFERENCES

Aboagye-Larbi, H. Acheampong, M.A.Kyei, S.K. and Carboo, A.S.(2014)-The Potential Health Risk Associated with Waste Scavenging in Ghana : A Case Study of Three Selected Dump

- Sites in Tema Metropolis *International Journal of Environmental Science and Technology* 2 (10) : 199-209.
- Ali, F. Sharif, F. Ahmad, F. and Ali, A. S. (2014)-Assessment and Planning of Solid Waste Management Practices in Selected Areas of Lahore, Pakistan *Journal of Environmental Science, Computer Science and Engineering and Technology JECET* 3 (3) : 1264-1271
- Alo, B. T., Oluwakudejo, J. D., Fakiyesi, T. Omojola, D. Soneye, A. S., Osho, Y. B. and Ayoola, B. (1998). Katsina State Environmental Action Plan. Final Report. Federal Environmental Protection Agency Under World Bank Assisted Programme, Ikeja, Lagos.
- Anjaneyulu Y. (2005)-*Introduction to Environmental Science* BS Publications Hyderabad India.
- Arigbede, Y. A. and Yusuf, O. R. (2010)-Waste Disposal Among the Underage and the Location of Waste Disposal Infrastructures in Samaru Zaria In : Ogidiolu, A., Musa, S. D. and Ifatimehin, O. O. (eds) Contemporary Issues in Infrastructural Development and Management in Nigeria Proceedings of the 51<sup>st</sup> Annual Conference of Association of Nigerian Geographers.
- Ayuba, H. K. (2005) – *Environmental Science: An Introductory Text*. Apani Publications, Kaduna.
- Bawa, G. M. (2012). *Katsina State: Pictorial and Historical Sketches. The first Twenty Five Years (1987 – 2012)*. Government Printing Press Katsina
- Bellamy, P. (2007)-*Academic's Dictionary of Geography*. Academic (India) Publishers New Delhi.
- Dauda, U. Gulumbe, S. U., Yakubu, M. and Ibrahim, L. K. (2011) – Monitoring of Infectious Diseases in Katsina and Daura Zones of Katsina State : A Clustering Analysis *Nigerian Journal of Basic and Applied Sciences* 19 (1): 31– 42.
- Ejas, N. and Janjua, N. S. (2012)-Solid Waste Management Issues in Small Towns of Developing Countries: A Case Study of Taxila City *International Journal of Environmental Science and Development* 3 (2) : 167-171.
- Garg, R. K., Garg, R. and Garg, R. (2007) – *Environmental Science and Ecological Studies*. Khanna Publishers, New Delhi India
- Maton, S. M., Dabi, D. D., Dobo, J. D. and Nesla, R. A. (2016) – Environmental Hazards Of Continued Solid Waste Generation and Poor Disposal in Municipal Areas of Nigeria. *Journal of Geography, Environmental and Earth Science International* 6(3): 1-10.
- Ogwueleka, T. C. (2009) – Municipal Solid Waste Characteristics and Management in Nigeria. *Iran Journal of Environmental Science and Engineering* 6(3):173 – 180.
- Olukanni, D. O. and Mnenga, M. U. (2015) – Municipal Solid Waste Generation and Characterization: A Case Study of Ota, Nigeria. *International Journal of Environmental Science and Toxicology Research* 3(1):1-8.
- Wrfound (2009) –Waste Management Resources. Retrieved from [www.wrfound.org.uk](http://www.wrfound.org.uk)