

Integrated Sustainable Waste Management (ISWM) in Developing Countries “Myths or Reality” (The Nigerian Perspective)

Haruna Abdu. Usman¹ and Abubakar Sakile Kawuwa²

^{1,2}Architecture Department, Abubakar Tafawa Balewa University Bauchi, Nigeria
E-mail: ¹arkiplan.usman8@gmail.com, ²abusarkile@gmail.com

Abstract—Municipal solid waste management refers to the collection, transfer, treatment, recycling, resource recovery and disposal of solid waste in urban areas and is essential components of environmental infrastructure in human settlement. This paper present the characteristics and problem of municipals solid waste management in Bauchi, capital of Bauchi state Nigeria and assessed the current waste management practices employed by the municipal agency with integrated sustainable waste management (ISWM) with the view of examining the feasibility of implementing ISWM. The study discusses the impending challenges x-rayed from the assessment.

Keywords: Solid waste management, integrated sustainable waste management, Bauchi metropolis Nigeria.

1. INTRODUCTION

Municipal solid waste (MSW) is a term usually applied to heterogeneous collection of wastes produced in urban areas, the nature of which varies from region to region. The characteristics and quantity of the solid waste generated in a region is not only a function of the living standard and lifestyle of the regions inhabitants, but also of the abundance and type of the regions natural resources. In developing countries, Nigeria inclusive, municipal solid waste management has emerged as of the greatest challenges facing environmental protection agencies. In Nigeria, solid waste management is characterized by inefficient collection system, inadequate coverage of the collection methods and improper disposal alternatives. [1]

Most urban centers do not have access to proper solid waste collection. There are no data at all levels from households, district up to municipal level.

Several attempts made by the municipal agencies in various urban centers to curtail the problems received impendance from wide range of problems ranging from lack of funds, technical knowhow, bureaucracy, lack of policy implementation, uneven urbanization, equipment failure and so on.

Upon these, urban managers are therefore encouraged to pursue the paths of integrated solid waste management which

place highest priority on waste prevention, waste reduction, and waste recycling instead of just trying to cope with ever increasing amounts of waste through treatment and disposal [2]. The path of integrated solid waste management has been widely acknowledged and agreed to be sustainable. Because we lived in a world of increasing scarcity raw materials from natural resources are limited, financial resources are often insufficient and scarcity of land for final disposal is getting more difficult.

2. THE CONCEPT OF INTEGRATED SUSTAINABLE WASTE MANAGEMENT

Integrated sustainable waste management refers to a waste management system that best suites the society economy and environment in a given location, a city in most cases. [3]. The concept as described by Van De Kluendert, not only takes technical or financial economic, sustainability into account as in conventionally done, but it also includes socio cultural environmental institutional and political aspects that influence overall sustainability of waste management. ISWM also stands for a strategic and long term approach.

In ISWM approach, waste management is seen as an equity and public health issue, which means that everybody has a right to a regular waste collection and proper sanitation.

The concept of ISWM was established by the US environmental protection agency (EPA) in the early 1990s to expand existing solid waste management initiatives. The concept as described by both Van De Klundert and Anschutz, recognize three important dimensions in waste management:[5]

1. Stakeholder involved in waste management
2. (Practical and technical) element of the waste systems and
3. Sustainability aspects of the local context that should be taken into account when assessing and planning waste management systems. The important principle of ISWM is that a waste management system should be appropriate

to local conditions and feasible from a technical environmental, socio-economic; financial, institutional and political perspective [6]. It differs from conventional approaches towards waste management by seeking stakeholder participation, covering waste prevention and resource recovery and promoting and integration of different habitat scales (city, neighborhood, household).

3. METHODOLOGY

The study was carried out in Bauchi metropolis, capital of Bauchi state Nigeria. The choice of this urban center stem from the fact that the state environmental protection agency (BASEPA), emerged among the nations sister states environmental protection agencies that overcome environmental challenges, in terms of sanitation and solid waste management, through its programme termed the "Bauchi example" in year 2011 and 2013.

Although studies on the documents and publications of other major cities like Lagos and Kano on municipal solid waste management programme and problems were made to get the full urbanistic representation of Nigeria's biggest cities, Lagos in the south and Kano in the northern part of Nigeria

In developing countries, the largest stream of municipal solid waste flows from households [9] reported that about 80% of the solid wastes generated in capital cities of Africa come from domestic's sources.

Bauchi metropolis is the capital of Bauchi state located between latitude 9°00' and 9°30' north of the equator and longitude 10° 25 and 11°20' east of the green which meridian. It occupies a total land area of 3,604, 0 hectares. Bauchi state is one of the towns in northern Nigeria with Sudan savannah vegetation zone.

The population of the metropolis stands at 421,187 (National Population Commission 2014). It has about 33,339 residential households distributed among the three categories of high density (city proper), medium density (urban agglomeration) and low density (metropolitan transition areas). The city is divided into 8 districts 40 wards and 105 sub wards in which over 90 of these sub wards were located within the metropolis.

The climate of Bauchi is divided into two main seasons; the cold dry season last from October to April while the hot wet season is from May to September. The town lies over 2000ft above sea level and has an altitude of 795.2m

The aim of this study is to;

- Document the solid waste management problems and strategies in urban centers of Nigeria
- Study the characteristics and composition of solid waste generated in Nigerian urban centers
- Assess the current municipal solid waste management scenario with integrated sustainable waste management.

The study was carried out in 3 stages

1. Records, document and academic literatures on municipal solid waste management in Bauchi, Nigeria and developing countries were studied. Waste characterization study undertaken in Bauchi metropolis. 366 households were selected using purposive sampling.
2. Interviews with municipal authorities; the BASEPA

National Environmental Standards Regulation Enforcement Agency (NESREA), waste contractors operating in Bauchi metropolis, informal waste pickers, the households, and community heads.

4. THE RESULTS

The federal government of Nigeria established the federal environmental protection agency (FEPA) through decree 58 of 1988 and 59 (amended) of 1992. FEPA was charge with the responsibility for environmental management and protection. By the establishment of FEPA, Nigeria became the first African country to establish a national institutional mechanism for environmental protection. Later, FEPA and other relevant department in other ministries were merged to form the federal ministry of environment in 1999, but without an appropriate enabling law on enforcement issues. The situation however, created a vacuum in the effective enforcement of environmental laws, standards and regulations in the country.

This led to the creation of national environmental standards and regulations enforcement agency (NESREA) in line with section 20 of the 1999 constitution. NESREA has the responsibility for the protection and development of the environment biodiversity conservation and sustainable development of Nigeria's natural resources in general and environmental technology. Pursuant to the FEPA act, each state formed up its own environmental protection body for the protection and improvement of the environment within its jurisdiction.

Municipal solid waste collection and disposal in Bauchi metropolis is a function of BASEPA. However, private waste contractors exist and operate independently in Bauchi town. The current scenario is the state agency BASEPA, undertakes streets sweepings collection and disposal in major roads daily in the heart of the city.

The operation requires the households and commercial outfits to dump their waste daily, by the road sides. These collections are sporadic, irregular and unorganized. Cosmopolitan cleaners are the major contractors rendering these services. They use compactor trucks and open pick-up vans and sometimes use pay loaders and tippers, causing traffic jams and inconveniences to passersby. During rainy days the unattended waste before collection is washed-away into city drains causing blockages and flooding. There are no collection points or transfer stations in this part of the city.

In the urban agglomeration and urban metropolitan transition areas, the system of collection is usually fortnightly. No street sweepings and very few or inadequate collation facilities. Wastes are littered and discard on undesignated plots of land, drains, uncompleted building sites and public areas. Parallel to the state agency and its contractor, private or formal waste services exists in these areas. Observation and findings of this study reveals that these waste contractors are not all registered and regulated by the state agency. They operate for a fee and collect wastes usually weekly and operate using door to door services. They used an open metal drum, painted green with their names and telephone number on it. Both cosmopolitan, BASEPA and other waste contractors disposed the waste collected in open dumps along the major highways linking the city with neighboring states. Although a burrow pits off Bauchi-Gombe road is being used partially by BASEPA and Cosmopolitan cleaners to dump the municipal waste. Interviews with the officials of the state agency indicate that no regulation or enforcement is in place regarding collection and disposal of municipal solid waste in the burrow pit or landfills. Other newly developed sub-urban areas, which are characterized by overcrowding, lack of access roads, unplanned neighborhoods and uneven urbanization received no services from both the state agency and the waste contractors. They are generally low income populations which are generally marginalized.

This situation is typical in most urban centers of Nigeria. Waste management services by the municipality are only rendered at mostly the city centers only.

Waste transportation in Nigeria, Bauchi inclusive, is carried out using compactors trucks, side loaders, rear loaders, mini trucks, tippers, skip trucks and open back trucks [9]. Most of these vehicles are in a state of disrepair, and are ill-maintained and grossly inadequate and inappropriate. For example the compactor trucks used are inefficient because the waste is dense and mostly organic which is not suitable for compactor trucks. The solid waste generation in Nigeria exceeds collection capacity. According to BASEPA, Bauchi state generates 492,750 metric tons of solid waste annually.

Table (1) presents the current equipment, vehicles available in both BASEPA and cosmopolitan cleaners.

Table 1: Available Equipment/machinery in state agency and the waste contractors

S/N	EQUIPMENT	BASEPA	COSMOPOLITAN	TIPPER UNION
1.	Compactor Trucks	2	4	-
2.	Tippers Trucks	5	2	10-15
3.	Tractors	2	-	-
4.	Pay loader	1	1	-
5.	Others (Vehicle)	2	1	-

5. WASTE GENERATION COMPOSITION AND CHARACTERISTICS

Based on the findings of this study, average per capita household waste generation varied from 0.22 to 0.48kg per person per day. The average per capita for Bauchi stands at 0.30kg/capita/day. In some major Nigeria urban centers, like Lagos and Kano, municipal solid waste generation was estimated as 9000 tons/day in Lagos and 3,849 tons/day in Kano. [10], according to [9] 25 million tonnes of municipal solid waste are generated annually. The Nigerian minister of environment on March 2nd, 2013 admits that about 3m tons of waste littered the streets of Nigerian urban centers uncollected.

Table II. Shows the waste generation of other Nigerian cities and the breakdown densities as compiled by all sites engineering ltd, obtained from [9].

The densities and moisture content are higher in developing countries. These require different technology and management. The densities ranged from 250kg/m³ to 370kg/m³.

The waste characterization study carried out in Bauchi metropolis reveals the following waste composition. Garbage 61%, polythene 13%,Residues 14%, glass 2.2%, plastics 2.8%, textiles 2.2%

Table 2: Composition of waste stream characteristics

Nsukka	Lagos	Makurdi	Kano	Onisha	Ibadan	Maiduri
Putrescible	56	56	52.2	43.0	30.7	76
Plastics	84.	4	8.2	4.0	9.2	4.0
Paper	13.8	14.0	12.3	17.0	23.1	6.6
Textile	3.1	-	2.5	7.0	6.2	1.4
Metal	6.8	4.0	7.1	5.0	6.2	2.5
Glass	2.5	3.0	3.6	2.0	9.2	0.6
Others	9.4	19.0	14.0	22.0	15.4	8.9

Source (9)

6. RESOURCE RECOVERY FROM WASTE, RECYCLING AND TREATMENT

The result of this study indicates that less than 10% of the respondents undertake either segregation at source or source separation or resource recovery in Bauchi metropolis. This is a typical situation in most Nigerian urban centers.

Resource recovery programme are not common and no policy on composting. Observations revealed that most city dwellers do not know the principle of composting.

Although, urban farmers, pay the municipal agency to dispose the municipal waste collected and to their farms.

Recycling is a method of solid waste management like controlling or incineration, but is environmentally more desirable Ruzi (2001) in [9], recycling can help the economy by recovering and re-using valuable materials.

The Bauchi state government established a plastic recycling plant in June, 2012. The plant was intended to recycle polythene materials and plastics cans. Although, this facility exists proper and efficient utilization is not put in place. Interview with the management of the company indicates no policy, or support is being rendered by the state government to sustain it.

7. DISCUSSION AND ASSESSMENT

As earlier mentioned, that integrated sustainable waste management (ISWWM) is a comprehensive waste prevention, recycling, composting and disposal programs.

There are not adequate and efficient waste collection and transportation. The city is fast growing, with uneven urbanization and decay of infrastructures, but no provision is made or plans to cater for the ever increasing waste generation.

To assess the municipal solid waste management in Bauchi metropolis with the three dimensions of sustainability of ISWM; viz stakeholders, system elements, and aspects as shown in the diagram, the results indicates;

8. STAKEHOLDERS

In Bauchi metropolis, the major stakeholders are the municipal agency or government, private formal sectors, informal sector and service users. There are no OBOs, or NGOs operating in waste management. Based on the social life and culture of the communities, solid waste activities are regarded as jobs of the poor and households does not form any community based organizations. Based on the findings of this research, no NGOs or any international or national donor agency exists or are present in Bauchi. Private waste contractors are not regulated. The municipal agency is saddle with lack of financial support. No budget is being, made specifically for the purpose. As shown earlier, no adequate equipment and personnel, no maintenance and protection facilities, scavengers operates on their own. They are not incorporated into the system.

9. ASPECTS

In municipal agency and the waste contractors (formal and informal), this study found that technical expertise are grossly inadequate.

Financial and economic aspects with regard to municipal solid waste management in Bauchi is the major constrain facing the municipal agency. No plan for cost recovery and according to the interview with the municipal officials, no funds allocation is made to waste collection. These are lack of institutional supports and capacity development does not exist in the agency. Although, the officials indicated that the government is considering the introduction of waste fee.

10. SYSTEM ELEMENT

Waste minimization, waste re-use and recycling are not recognized, motivated or imposed in Bauchi metropolis. They were only practiced at individual level and no policy or any public enlightenment. The recycling plant established by the state government is more of solving political campaign problems.

In conclusion, the study found that, the situation in Bauchi is typical of most cities of Nigeria. Therefore for sustainability of our cities, and conservation of our natural and man-made environment, there is the need for a drastic shift from the current state of managing municipal solid waste management to a more sustainable solid waste management obtained elsewhere in developing and developed countries. This means solving health associated problems unemployment, and cleaner cities.

REFERENCES

- [1] Peter Schubeler (1996), [1] conceptual framework for municipal solid waste management in low income countries UNDP/UNCHS (habitat)/world bank/SDC collaborative programme on municipal solid waste management in low income countries.
- [2] Haruan et al (2014) [2], municipal solid waste management characteristics and management challenges in Bauchi metropolitan area, Nigeria, journal of tourism and hospitality management USA.
- [3] Van De klundert; [3] "the sustainability of alliances between and stakeholders in waste management. Anschitz (2000) working paper for UWEP/CWG
- [4] Wilson et al, (2013) [4] integrated sustainable waste management in developing countries. Ice proceedings (2013)
- [5] Solomon (2011), [5] "the role of household in solid waste management in east Africa capital citres. Wageningen academic publishers, the Netherlands, 2011.
- [6] Simon (2008), [6] "analysis of activities of community based organizations involved in solid waste management, investigating modernized mixtures approach to Dar Es Salam, Tanzania. MSc thesis environmental studies <http://www.enp.wur.nl/uk>Haruna et al. (2016) [7], the economic potential of solid waste characteristics in Bauchi metropolis. Proceeding ICSW 2016 solid waste conference.
- [7] Ogwueleka (2009), [9] "Municipal solid waste characteristics and management in Nigeria".Iran J. Environ. Health Sci, Eng, 2009, Vol 6 no 3 pp 173-180.
- [8] Napoleon et al, (2011) [10]. Mitigating the impact of solid wastes in urban centers in Nigeria