

## **Management of Disposed Solid Wastes for Environmental Sustainability in Kakamega Municipality**

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**Abstract:** Kakamega Municipality like any other municipality in Kenya faces absolute challenges in disposal and control of solid waste. The getting rid of and control of solid waste in less economically developed countries is a growing challenge of our time. With the growing population and the increasing size of the middle class, solid waste disposal is becoming a menace that local authorities have to contend with. Kakamega Municipality is not exempted from this problem. The quality of the environment has kept degrading due to increasing quantities of solid waste coming from households, industrial and commercial areas also addition to the changing nature of the collected waste over time. Environmentally sound solid waste management and organic waste treatment is yet to be realized. Rapid population growth, urbanization and inadequate refuse collection vehicles have contributed to high generation and accumulation of wastes in Kakamega Municipality. Waste segregation is not carried out in Kakamega Municipality. The study sought to find possible ways to manage the solid wastes in Kakamega Municipality for environmental sustainability through reduction, reuse and recycling to manage the negative impacts due to solid waste disposal in a cheaper efficient and better ways of management practices for solid waste. The study was based on three main objectives namely: identification of the solid waste types in Kakamega Municipality; to evaluate the major effects of doing away with solid waste and consequent pollution in Kakamega municipality; and to establish how management through reduction, reuse and recycling can help attain environmental sustainability. A descriptive survey design which embraced approaches for qualitative and quantitative collection of data on how solid waste is managed within the Municipality was conducted. Kakamega Municipality has a total population of 99,987 according to population census of 2009. A sample size of 382 respondents (based on Krejcie and Morgan) was obtained and sampled through random and purposive sampling. Interviews, questionnaires and focused group discussions were carried out on various stake holders like the Municipal council staffs who are in charge of collecting solid wastes, residents who live besides the dumpsites and private firms that collect solid wastes. Data was analyzed by SPSS and presented in form of graphs, tables and charts. Findings indicated 50.4% of the sampled population admitted that public awareness of solid waste management was low. Most of the household wastes were plastic bags according to 60% of the respondents. 63% of the respondents indicated that they burn plastic bags, 16% of the respondents reuse plastic bags while respondents view on methods of disposal was 39.5% recycle and 17% felt that there was need for reuse and reduction of wastes. 15% compost the wastes and 5% throw in garbage tracks. 18.6% felt that there was need for creation awareness. From the findings, the research recommends community participation in waste management; need to improve viability of composting as a method of waste disposal and lastly enhancement of awareness creation. This research can be replicated in other areas of municipality in Kenya.

**Key Words:** Solid Waste, Solid Waste Management, Municipal Waste, Pollution

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### **I. INTRODUCTION**

Wastes result from human activities, they can be harmful to the surrounding environment and humans depending on the way it is processed, collected, kept and gotten rid of (Logue and fox, 1986). According to Swedish International Agency for Development (SIDA 2012), improved sanitation affects the wellbeing of the people, human dignity, their health and security whereas Prasad (2013) indicates that sanitation being poor is a precise indicator of health related problems.

Cities and towns globally are at a higher risk of an environmental threat due to increased production of wastes and in the complexity of the wastes. An approximated to of about 1.7 -1.9 billion metric tons Municipal Solid Wastes(MSW) are produced worldwide (Firdaus, 2010). Production of Municipal Solid Wastes for Africa is estimated to be 0.3-1.4 kg per capita daily, that is an average of 0.78 kg as unlike the usual level in developed countries of 1.22 kg per capita(Mohan.*et. al.*, 2000

The effects of ineffective waste collection and poor waste management are countless. Insufficient collection and poor disposal practices generate serious health related problems to humans and the environment (Eawag, 2008). In Sub-Saharan Africa for instance, poor disposal practices have aggravated health related problems (Zhu *et al.*, 2008).

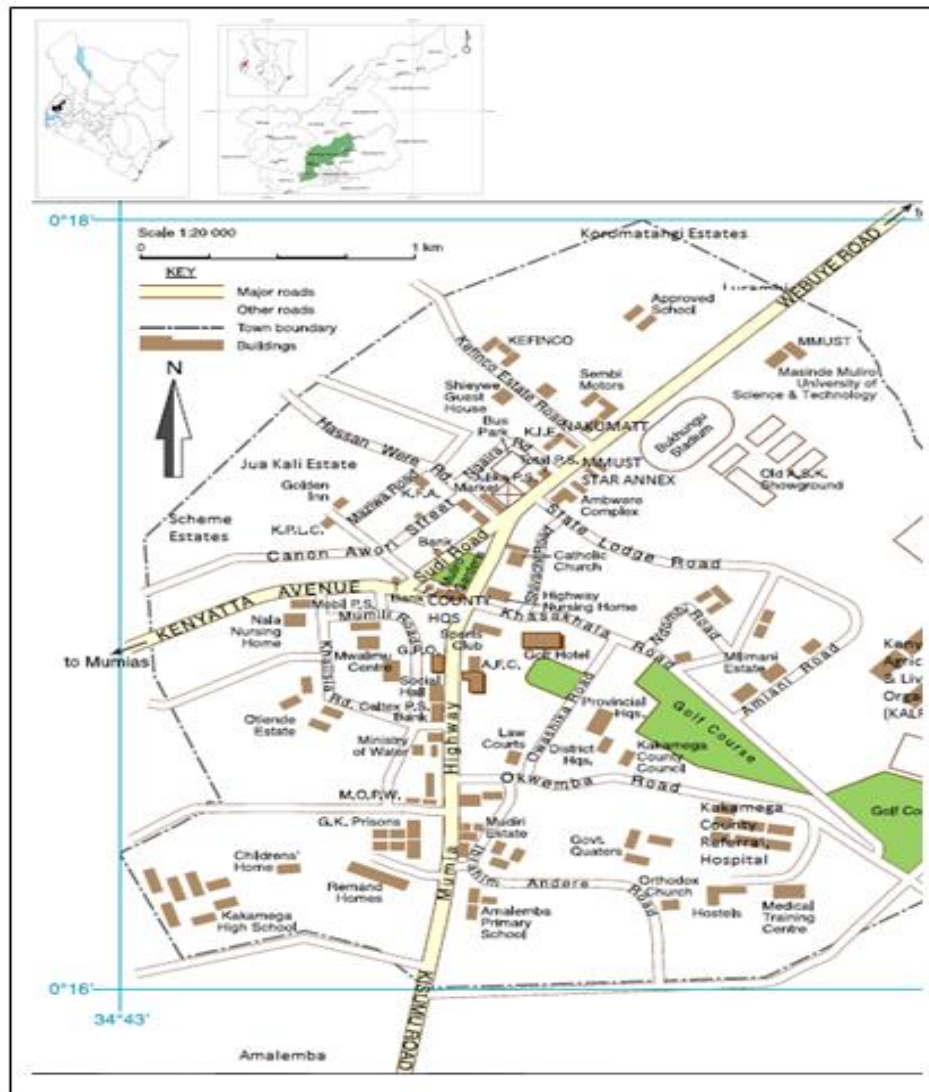
Findings by Zhu *et al.* (2008) confirm that poor waste collection practices and improper solid waste disposal contribute to local episodes of disease, regional water resource pollution and global greenhouse gases. Boadi and Markku, (2005), also revealed that high incidence of diarrhea in children under six is interrelated to food contamination by flies which had fed on wastes. Hygiene related diarrhea alone is thought to cause 30,300 deaths per year and is considered one of the commonest outpatient cases (Busvine, 2003).

## II. METHODOLOGY

The study adopted both qualitative and quantitative research approach, using a descriptive survey.

### 2.1 Study Area

Kakamega Municipality lies in Kakamega County and in former Western Kenya about 52km north of Kisumu, a port city on Lake Victoria and Kenya's the third largest city. Being an administrative center of Kakamega County with an estimated population of about 99,987 (2009, Census). Local inhabitants of Kakamega County are mostly the Luhya who mainly fish and farm. The town is also a head quarter of Mumias sugar, a large sugar producing firm located in Mumias village. In early 1930, reports of gold from a geologist Albert Ernest Kitson fueled the growth of the town.



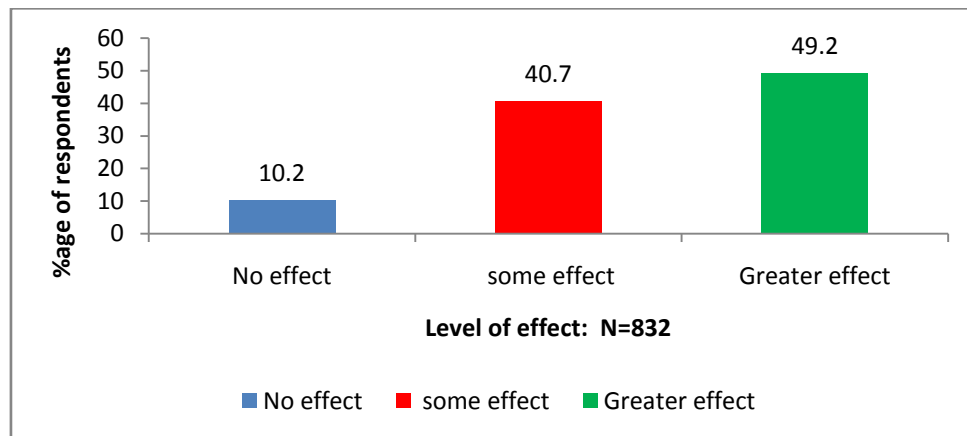
### Sampling Procedure

Given the average population of Kakamega town is 99,987, According to the population census 2009. This study adopted Fischer's Formulae for determining sample size and therefore out of a population of 99,987 a sample size of 382 was derived. Each of the 6 estates gave a random sample of 60 respondents, 12 members of staff from the county government, 5 members from NEMA and 5 from health facilities giving a total of 382 respondents.

### III. RESULTS AND DISCUSSION

#### 4.3 Effects of Solid Waste in Kakamega Municipality

The study's second objective was to assess the major impacts of the getting rid of solid waste and consequent pollution in Kakamega Municipality. The respondents indicated the levels of the effects they think solid waste has on the natural surrounding environment. From the respondents interviewed, 49% (182) of them admitted that indeed the wastes have a greater effect on the environment. Another 40.7% (156) alluded that the wastes have slight effect while only 10.2% (40) admitted that indeed the wastes have no effect of on the environment (figure 4.1).



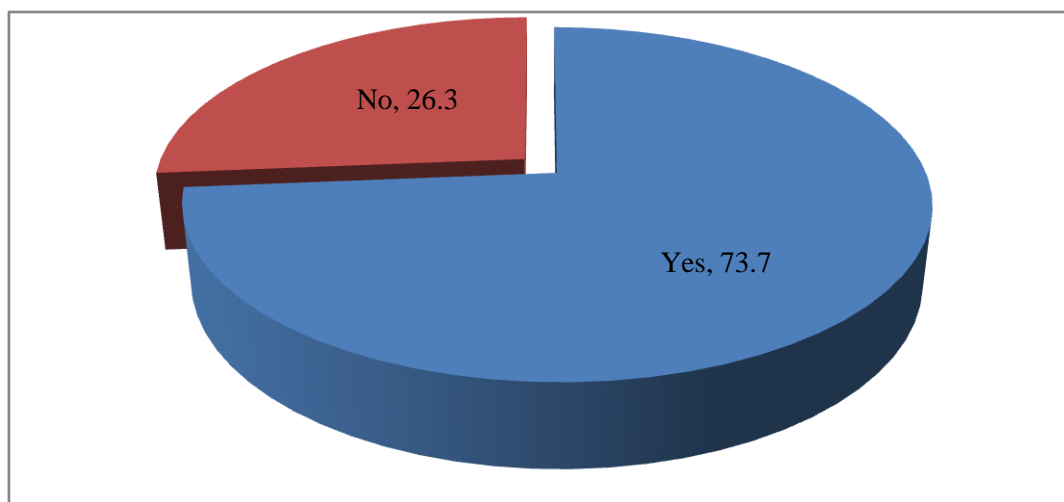
**Figure 4.3:** Effects of Solid Waste in Kakamega Municipality according to the respondents

Source: Researcher, 2017

In Kakamega Municipality according to the county government report, poor methods discarding solid waste is among the leading contributor in degradation of the environment due to lack of modern waste management and handling systems.

#### 4.3.1 Knowledge about Composting

The respondents questioned if they had knowledge of composting. The results are shown in Figure 4.13 below. Most of the respondents knew about composting as shown by 73.7% of the respondents while 26.3% knew nothing about composting.

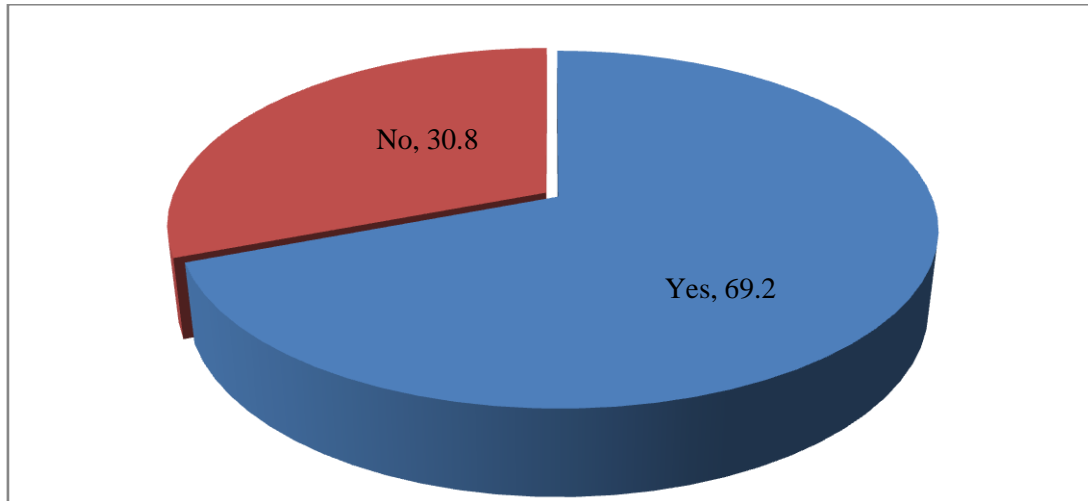


**Figure 4.4:** Knowledge of respondents on waste composting in Kakamega Municipality

Source: Researcher, 2017

#### 4.3.2 Proportion of respondents who did actual composting of solid waste material

The study was to establish the proportion of respondents who knew about composting and did actual composting their household sold waste. It was found that majority of the respondents who knew about composting did compost as indicated by 69.2% of the respondents while 30.8% did not do compost. The results are as show in Figure 4.14 below.

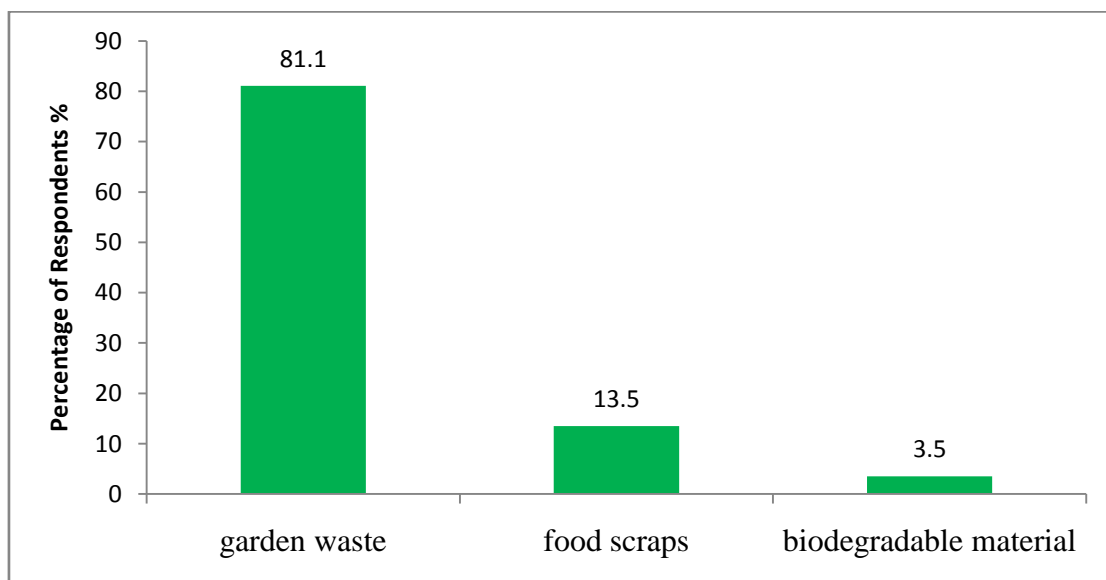


**Figure 4.5:** Proportion of respondents who did actual composting of solid waste material in KakamegaMunicipality

Source: Researcher, 2017

#### 4.3.4 Solid waste material composted by respondents

The respondents who practiced compost were asked to state what they compost. It was revealed that majority of the respondents (81.1%) compost garden waste while 13.5% compost food scraps. 2.7% of the sampled respondents compost others biodegradable materials such as paper and cardboard chips.



**Figure 4.6:** Nature of Composting Solid Waste at Household Level

#### Figure 4.7: Reasons for low uptake of composting as a waste management practice in KakamegaMunicipality

Source: Researcher, 2017

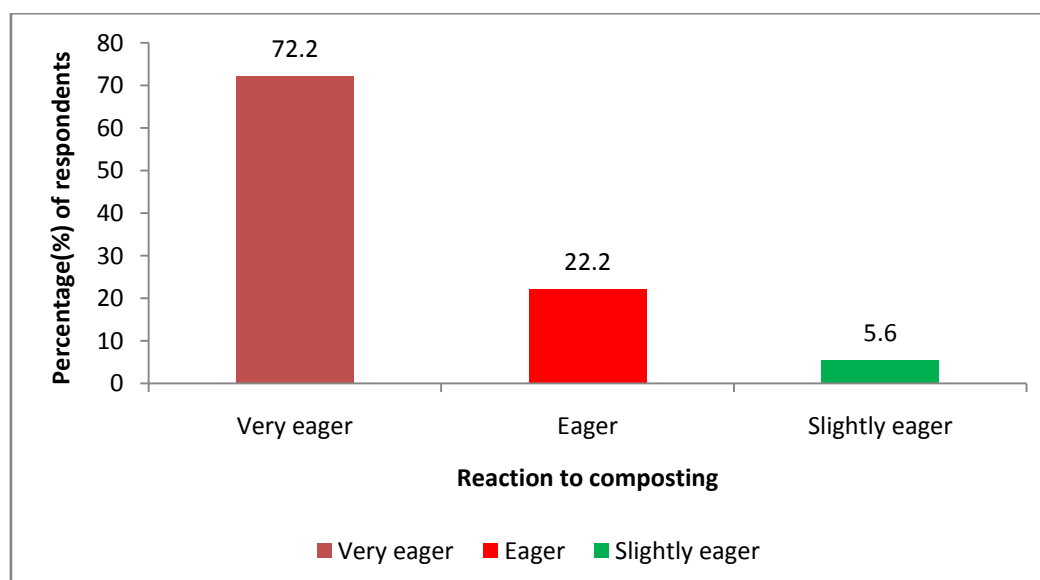
**Table 4.4:** Responses on selected environmental concerns in Kakamega town

Environmental issue of concern	Agree	Disagree	No Opinion
I play an important role in the management of garbage in my community	83.33%	11.67%	5%
Environmental education should be taught in schools	100%		
The purchase decision that I make can increase or decrease the amount of garbage my household must get rid of (dispose)	63.33%	15%	18.33%
I don't care that burning garbage can be bad for my health and the health of others	8.33%	83.33%	8.33%
People throw garbage on the street and in drains and gullies because they have no other means of getting rid of (disposing of) their garbage problem	36.67%	51.67%	10%
The county government of Kakamega is not doing enough to fix the garbage problem	48.33%	30%	21.67%
Correct garbage management should not be taught in school	16.67%	78.33%	3.33%
Other personal issues (like crime, unemployment and cost of living) are more important to me than a garbage free community	11.67%	78.33%	8.33%
Regular collection of garbage is the only solution to garbage problem	55%	41.67%	3.33%
Picking up garbage around my community in my responsibility as a resident	83.33%	15%	1.67%
Public education about proper garbage management is one way to fix the garbage crisis	86.67%	5%	6.67%
It is very important that the county government of Kakamega put recycling laws and programs in place	91.67%	5%	3.33%
NEMA is not doing enough to curb this menace	30%	28.33%	35%

Source: Researcher, 2017

#### 4.3.5 Proportion of respondents eager to undertake composting as a waste management

The respondents were questioned whether they were ready to be educated on proper ways of composting. The results revealed that 72.2% of the respondents were very eager to undertake composting while 22.2% were eager, while another 5.7% were slightly eager. The results are as shown in Figure 4.17.



**Figure 4.8:** Proportion of respondents eager to undertake composting in Kakamega municipality

Source: Researcher, 2017

#### **4.3.6 Composition of Municipal waste in Kakamega Municipality**

The waste composition in urban centers depends on public consumption patterns, the existing sectors, lifestyles, cultural traditions and income. A study done recently in East African urban centers indicates that the waste mainly consists of decomposable organic materials ranging between (65–70%), plastic (6–12%), paper (5–9%), glass materials (0.7–4%), metallic materials (0.3–3%) and other unwanted materials (0.4–1%) (Okot-Okumu, 2012). The research also noted the rise in the electronic waste quantities due to the increase in the use of electrical goods and electronics. Solid waste in Kakamega Municipality generally adheres to these statistics. Kakamega Municipality should give consideration to the composting option of implementing an approach that is integrated in controlling solid waste.

#### **IV. CONCLUSIONS AND RECOMMENDATIONS**

The level of adoption of 3Rs in waste management in Kakamega town is low and requires the collective responsibility and commitment by stakeholders to boost the uptake of the approach.

There is need to improve the viability of the composting through group projects and which must include building strong community support and involvement, and developing such groups' business and marketing skills. Kakamega municipality management currently under the county government needs to increase public awareness and mobilize community support for waste reduction and recycling.

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