

Original Research Article

Efficacy of County Government Authorities in Managing Municipal Solid Waste: A Case Study of Kitui Municipality, Kitui County, Kenya

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Abstract: Municipal solid waste management in Kenya has remained a challenge despite being devolved to forty-seven regional Counties in 2010 resulting in ongoing negative impacts on human health and environment. The study sought to investigate the success of Kitui County government in managing municipal solid waste with an aim of producing recommendations for its improvement. The research adopted mixed method approach and the research data was obtained through key informant interviews and issuance of survey questionnaires. Kitui municipality manager, Kitui municipality environment, recreation and social services director, municipal solid waste management supervisor, Kitui County National Environment Management Authority (NEMA) director, and Kitui County environment director were purposively selected as key informants for this study. The interview data obtained was descriptively analysed by looking at common themes arising from the interview narratives. Insights from the interview data revealed that financial constraints, and limited knowledge on sustainable municipal solid waste management practices, policies and regulations among Kitui municipality residents were some of the factors contributing to unsustainable municipal solid waste management practices in Kitui County. Randomly sampled (399) Kitui municipality residents were enrolled in a questionnaire survey on their experiences with Kitui County waste management operation. Of the 399 questionnaires issued 390 were completed and returned. Data obtained from the survey questionnaires was descriptively analysed by determining variable frequencies and presented in pie charts, bar graphs and frequency tables. The study findings revealed that, 42.8 % of the respondents were not satisfied with how Kitui County government undertakes waste collection exercise. Additionally, 23.8% of the respondents lacked waste collection services with 61% of them undertaking open burning of their generated waste. Waste from 31.2 % of the respondents was collected daily while that from 29.9 % of the respondents was not collected at all. 34.4 %, 25.1% and 21.2 % of the respondents lacked proper waste collection points, designated waste disposal site nearby, and awareness on good sanitary practices respectively. Lastly, a significant majority of 66.8 % of the respondents were not aware of waste management policies and regulations. The research findings therefore, disclosed need for regular public sensitization on sustainable municipal solid waste management practices, policies and regulations, prioritization of waste management services in budgeting, and incorporation of waste management into fundamental planning.

Keywords: Waste Management, Devolution, Kitui County, Environmental Health, Municipal Solid Waste Management (MSWM).

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1. INTRODUCTION

Municipal solid waste refers to refuse from households, non-hazardous solid waste from industrial, commercial and institutional establishment, market waste, and street sweeping collected by municipal

authority within a given area (Nnaji, 2014). Its management aspect encompasses collection, transfer, treatment, recycling, resource recovery, and disposal (Haregu *et al.*, 2016). Globally, the rate of waste

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generation is increasing in tandem with the increasing rate of urbanisation (Ziraba *et al.*, 2016).

In sub-Saharan Africa, municipal solid waste management is a growing challenge to many rapidly urbanizing areas resulting to adverse environmental and social impacts (Kadhila and Wit, 2022). Human population in cities and towns in Kenya has increased as

citizens migrated from their rural areas in search of employment and other opportunities available in cities and towns (The World Bank group, 2023). In 20 years for instance, Kenya’s rural population increased by 51.46% whereas it’s urban population increased by 137.14% (Table 1.1). This therefore, suggests that waste management systems in Kenya’s urban setting are under more pressure than in rural setting.

Table 0.1: Kenyan urban and rural population demographics from 2000 to 2020 (The World Bank group, 2023)

| S/n | Year | Rural population | Urban population |
|-----|------|------------------|------------------|
| 1 | 2000 | 24,714, 605 | 6,137,001 |
| 2 | 2002 | 26,030,130 | 6,749,693 |
| 3 | 2004 | 27,377,696 | 7,414,140 |
| 4 | 2006 | 28,785,081 | 8,140,172 |
| 5 | 2008 | 30,252,283 | 8,934,612 |
| 6 | 2010 | 31,731,712 | 9,786,183 |
| 7 | 2012 | 33,067,204 | 10,658,602 |
| 8 | 2014 | 34,272,609 | 11,559,254 |
| 9 | 2016 | 35,319,766 | 12,502,904 |
| 10 | 2018 | 36,450,926 | 13,502,904 |
| 11 | 2020 | 37,432,361 | 14,553,419 |

In many cases, due to limited provision of municipal solid waste management services to urban citizens, a portion of the generated waste is disposed of in illegal dumpsites posing adverse environmental and health impacts to the urban dwellers (Matheka *et al.*, 2022). In an attempt to mitigate illegal disposal of municipal solid waste, the government of Kenya has legislatively developed municipal solid waste management systems including, active job creation programmes in municipal solid waste collection, sorting and recycling (Mwau and Muinde, 2018).

In 2010, Kenya adopted a new constitution which created devolved system of government comprising of national government and forty-seven regional Counties such as Kitui, Mombasa, and Nairobi (Constitution of Kenya, 2010). Waste management became a regional constitutional mandate of the newly formed forty-seven Counties with national government exercising regulatory role through National Environment Management Authority (NEMA) (Kituku *et al.*, 2020). Despite National Environmental Management Authority (NEMA) developing the national solid waste management strategy in 2015 to guide County governments in achieving sustainable solid waste management by 2030 (NEMA, 2014), poor municipal solid waste management still persists in all the forty-seven Counties (Kituku *et al.*, 2020).

This therefore, has invited research attention to investigate the success of Kitui County government in managing municipal solid waste within Kitui municipality. Kitui municipality offers a case study opportunity to perform investigative research since no preceding published research on municipal solid waste management had been done within the municipality.

Therefore, the research findings will inform in recommendations for best practice solutions for municipal solid waste management improvement.

1.1 Justification for the Research

Article 42 of the 2010 Kenya’s new constitution (Constitution of Kenya, 2010) guaranteed every person the fundamental right to a clean and healthy environment. Sustainable municipal solid waste management became a key aspect of clean and healthy environment. However, more than a decade after the County governments were established under Kenya’s new constitution dispensations and assigned the responsibility of providing waste management services to Kenyan citizens, waste management has remained a challenge in Kenya’s cities and towns (Kituku *et al.*, 2020).

Deficient municipal solid waste collection and disposal system in Kenya’s cities and towns have impacted human health and environment negatively. For instance, poor municipal solid waste management has resulted to pollution of both surface and ground water through leachate percolation (Dianati *et al.*, 2021). Additionally, open burning of municipal solid waste in controlled and uncontrolled dumpsites has contributed to emission of greenhouse gas into atmosphere hence contributing to climate change which has adverse impacts to both human and environment (Dianati *et al.*, 2021). From observation, a portion of municipal solid waste generated in most parts of Kitui municipality is indiscriminately disposed of in undesignated areas such as road reserves, unoccupied plots, riversides, and town streets thereby littering market places, town streets and drainage channels.

Moreover, open access dumpsites characterised by open burning by informal waste pickers (Figure 1.1) are the final resting place for collected municipal solid waste within Kitui municipality. The informal waste pickers without considering the negative environmental impacts of greenhouse gases emission into atmosphere

believes that open burning of municipal solid waste will create more space within the dumpsites for more informal dumping (Dianati *et al.*, 2021). This therefore will provide them with an opportunity for more picking of recyclable materials such as plastics (Figure 1.2).



Figure 0.1: Municipal solid waste set on fire at a dumpsite within Kitui municipality (Mutua, 2023)



Figure 0.2: A heap of collected plastics by informal waste pickers within Kitui municipality (Mutua, 2023)

Undertaking this study will unearth existing factors inhibiting Kitui County government from achieving the minimum requirements for solid waste management systems stipulated in the national solid waste management strategy, 2015 such as having a secured and well manned municipal solid waste disposal designated sites and ensuring timely and regular collection of all municipal solid waste (NEMA, 2014).

It is envisaged that the study findings will generate information that will inform the existing body of knowledge on municipal solid waste management in Kenya. Additionally, the study findings will assist in formulating appropriate policies regarding municipal solid waste management and enlighten policy makers, local leaders and Kitui municipality residents on the identification of barriers and promote drivers to inform the improvement of sustainable municipal solid waste

management. This will bring insights on finding locally appropriate and socially strategic interventions that Kitui County government could consider to improve local residents' health and protect the wider urban environment.

1.2 Scope of the Research

The study was carried out in Kitui municipality (Figure 1.3), Kitui County, Kenya. Kitui municipality spans 580.81 square Kilometres and hosts Kitui town which is the County headquarters (Kitui municipality, 2023).

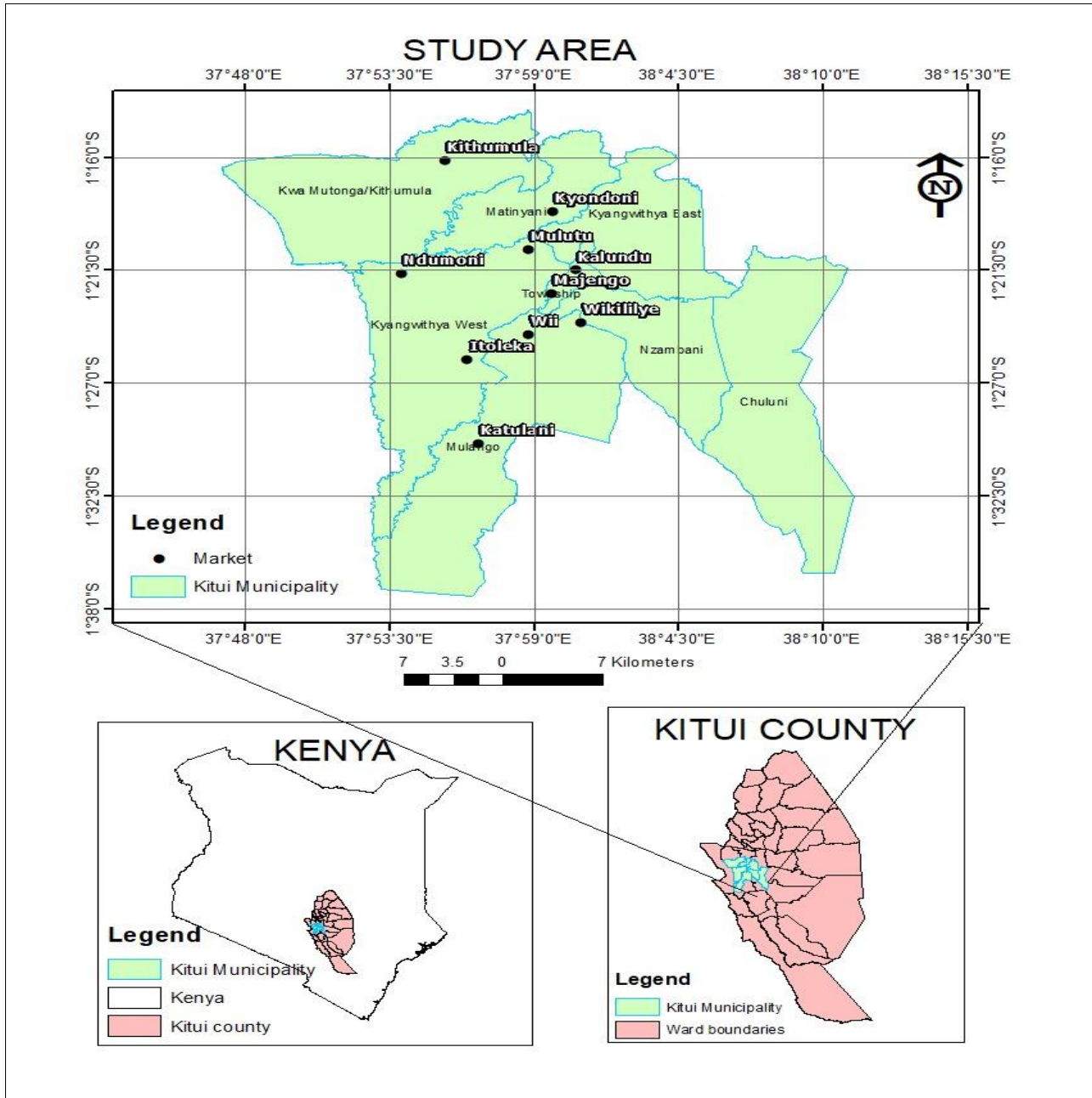


Figure 0.3: Study area (Mutua, 2023)

The research was confined to investigating existing factors inhibiting Kitui County government from effectively managing municipal solid waste in Kitui municipality as perceived by Kitui municipality residents and key informants. The research relied on both quantitative and qualitative data availed from surveying randomly sampled 399 respondents representing kitui municipality residents using survey questionnaires and interviewing five government officials in charge of

municipal solid waste management within Kitui County. These government officials included Kitui County NEMA director, Kitui County environment director, Kitui municipality manager, municipal solid waste management supervisor and Kitui municipality environment, recreation and social services director. Moreover, the researcher reviewed existing literatures on waste management in sub-Saharan African countries, Kenya, and Kitui County.

Among other aspects, the study looked into municipal solid waste management aspects such as;

- The roles played by NEMA with regards to municipal solid waste management in Kitui County.
- Levels of coordination between NEMA and Kitui County government with regards to municipal solid waste management.
- Municipal solid waste management challenges.
- Solutions to identified municipal solid waste challenges.
- Kitui County government compliance status to minimum requirements for solid waste management systems as stipulated in the national solid waste management strategy, 2015.
- Modes of creating awareness on sustainable solid waste management practices, policies and regulations among Kitui municipality residents.
- Level of involvement of Kitui municipality residents in municipal solid waste management, and,
- Frequency at which municipal solid waste generated by Kitui municipality residents is collected by the Kitui County government.

2. Aim, Objectives, Methods, Tasks and Deliverables of the Research

The research aims at producing recommendations for improvement of existing municipal solid waste management systems in Kitui municipality. The objectives of the research include;

- To evaluate if change in municipal solid waste management responsibilities from national government to forty-seven (47) regional County governments undermined efficacy of Kitui County government in discharging its mandates at local level.
- To determine drivers and barriers in coordination of the national government, National Environment Management Authority (NEMA) and the forty-seven regional Counties on servicing of municipal solid waste management using Kitui municipality as a case study.
- To evaluate if municipal solid waste management policies developed by Kitui County government are well suited to improve municipal solid waste management.
- To quantify the level of awareness on sustainable municipal solid waste management practices, policies and legislations among Kitui municipality residents.

In order to achieve the above objectives, randomly selected respondents representing Kitui municipality residents were surveyed using questionnaires. Key informants such Kitui County NEMA director, Kitui municipality manager, Kitui

municipality environment, recreation and social services director, municipal solid waste management supervisor, and Kitui County environment director were interviewed using semi-structured interview schedules.

The data obtained helped in identifying existing municipal solid waste management practices within Kitui municipality, challenges experienced in municipal solid waste management, roles of key municipal solid waste management stakeholders and level of awareness on sustainable municipal solid waste management practices, policies and regulations among Kitui municipality residents. The data obtained supplemented information obtained from literature review. Data obtained from survey questionnaires was descriptively analysed by determining variable frequencies.

Interview narratives obtained from key informant interviews were analysed manually by looking at common themes arising in the interview narratives. Pie charts, bar graphs, and frequency tables were used to present research data obtained from survey questionnaires. The output from the data analysis was interpreted based on the research objectives thereby forming the basis to propose strategic interventions to Kitui County government for improvement of the existing municipal solid waste management systems thus achieving the research aim.

3. METHODOLOGY

The research adopted mixed method approach which combined both qualitative data from semi-structured interviews and quantitative data from questionnaires. This approach was chosen because it provides a better understanding of municipal solid waste management problem than either qualitative or quantitative approach alone (Molina-Azorin, 2016). Six stakeholders were selected for the interviews and questionnaire surveys including;

1. **Kitui County Environment Director:** The director is responsible for formulating, reviewing and enforcing Kitui County specific environmental policies including those on waste management.
2. **Kitui County NEMA Director:** The director undertakes enforcement activities on environmental matters including waste management within Kitui County.
3. **Kitui Municipal Manager:** The manager oversees affairs of Kitui municipality including those on waste management.
4. **Kitui Municipality Environment, Recreation and Social Services Director:** The director coordinates waste management activities within Kitui municipality.
5. **Kitui Municipality Municipal Solid Waste Management Supervisor:** The supervisor oversees day to day waste management activities in Kitui municipality.
6. **Kitui Municipality Residents (Households and Business Premises Owners):** They are responsible

for managing the generated waste in their households and business premises.

3.1 Use of Questionnaires

Semi structured questionnaires were issued to randomly selected sample (399) representing Kitui municipality residents. The sample size was determined by the formula developed by Yamane (1967) (Muiruri, 2017) as indicated below.

$$n = \frac{N}{1 + Ne^2}$$

Where;

n=Sample size

N=Size of the target population (196,250 obtained from Kenya National Bureau of Statistics (2023) Publication);

e = acceptable sampling error (5%)

n= 196,250

$$\frac{1 + (196250 \times 0.05^2)}{196,250}$$

$$\frac{1 + (196250 \times 0.0025)}{196,250}$$

$$\frac{1 + 490.625}{196250}$$

$$\frac{491.625}{399.186};$$

therefore, the sample size for the population was 399 respondents.

Semi structured questionnaires were used to collect among other data, data on;

- Challenges in municipal solid waste management, and
- Level of awareness on sustainable municipal solid waste management practices.

Close-ended questions involving Likert scales where respondents were required to 'agree', 'disagree', or 'be neutral' by ticking on roles played by NEMA and Kitui County government in waste management options were used. Of the 399 questionnaires issued 390 were completed and returned.

3.2 Interview Schedules

Semi-structured interview schedules were used to sought views on existing municipal solid waste

management systems in Kitui municipality from Kitui County NEMA director, Kitui County environment director, Kitui municipality manager, municipal solid waste management supervisor and environment, recreation and social services director. Interview schedules were used to obtain among other data, data on;

- Roles of NEMA and Kitui County government in municipal solid waste management.
- Drivers and barriers in coordinating NEMA and Kitui County government in municipal solid waste management, and
- Municipal solid waste management challenges.

3.3 Photography

Photographs of dumpsites were captured to clarify actual practices taking place in the study area.

3.4 Reading Published and Unpublished Information Sources

Secondary data sources such as online journals, and government documents were reviewed to aid in understanding the apparent challenges in municipal solid waste management in Kitui County. Data obtained from literature review informed formulation of questions in questionnaires and interview schedules. For instance, inclusion of questions to establish level of coordination between NEMA and Kitui County in questionnaires and interview schedules was informed by Haregu *et al.*, (2017) findings that coordination mechanism among waste management stakeholders was weak. This was in an effort to establish if the same aspect is experienced in Kitui County.

4. RESULTS AND DISCUSSION

Data obtained from the survey questionnaires was analysed by determining variable frequencies. The study results were presented in frequency tables, pie charts, and bar graphs. Qualitative data obtained from key informant interviews was analysed descriptively by looking at common themes arising from the interview narratives.

4.1.1 Social- Demographic Characteristics

4.1.1.1 Age of the Respondents

Municipal solid waste generation tends to differ between age groups due to different societal lifestyles. The survey analysis revealed that majority (40%) of the respondents were aged between 26-35 years (Figure 4.2).

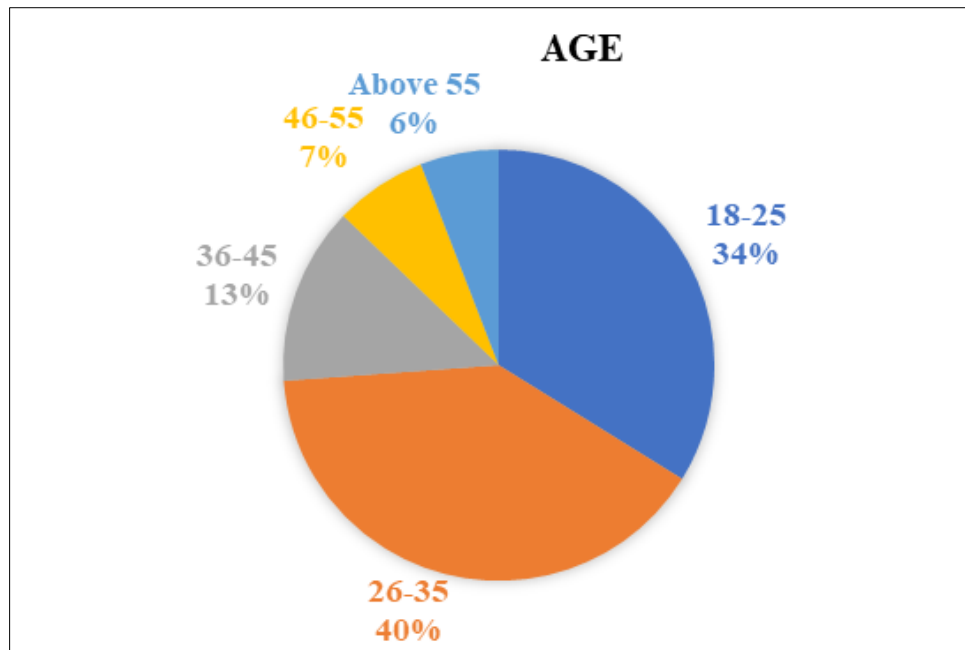


Figure 0.1: Respondent's age (Mutua, 2023)

4.1.1.2 Gender of the Respondents

The analysis revealed that majority 218 (60%) of the respondents were males (Figure 4.3).

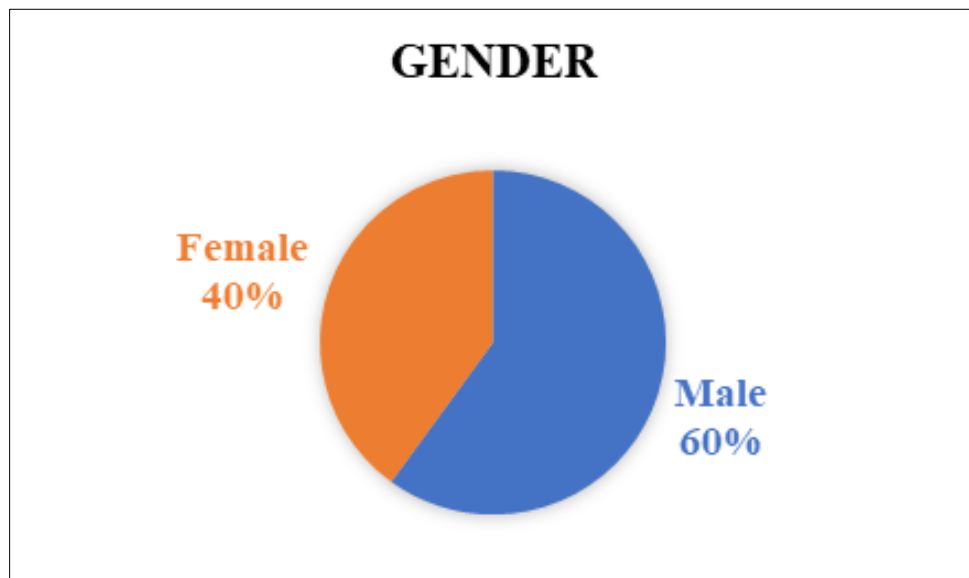


Figure 0.2: Respondent's gender (Mutua, 2023)

4.1.1.3 Education Level of the Respondents

The study established that majority (98%) of the respondents had either primary school, secondary school

or tertiary education thus able to understand the survey questions (Figure 4.4).

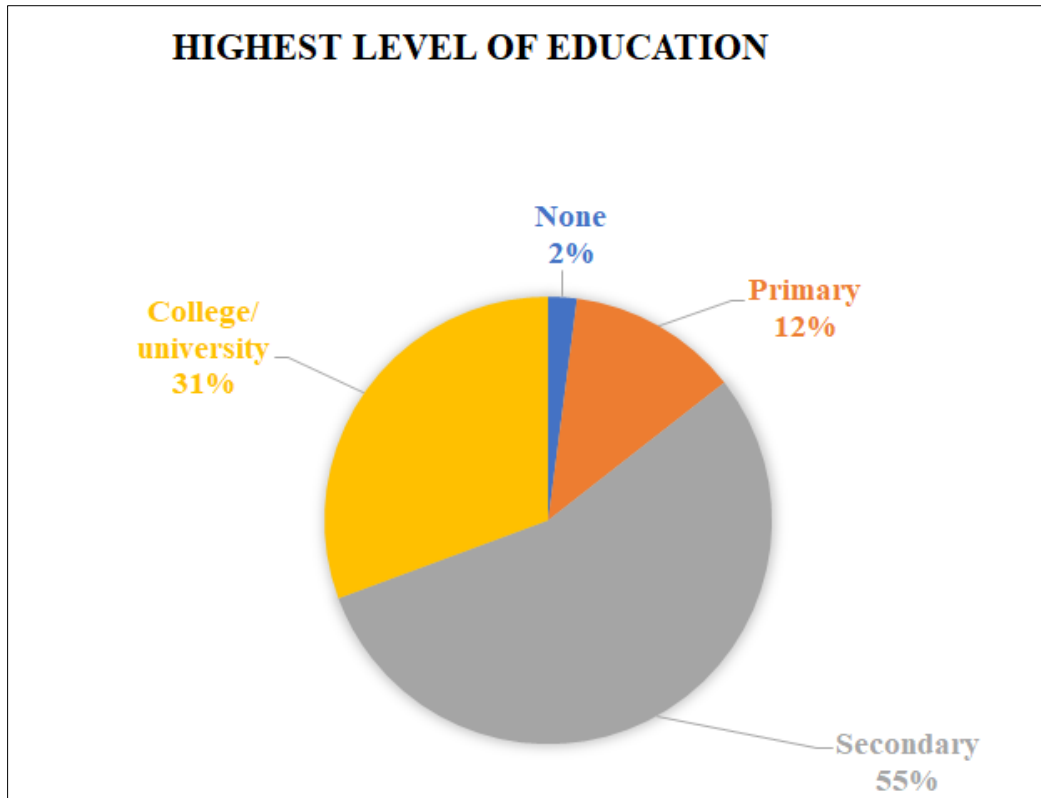


Figure 0.3: Respondent's education level (Mutua, 2023)

4.1.1.4 Respondents' Occupation

The survey analysis revealed that majority (59%) of the respondents were employed either in civil

service, private avenues or in business implying higher consumption rate and consequently more waste generation (Figure 4.5).

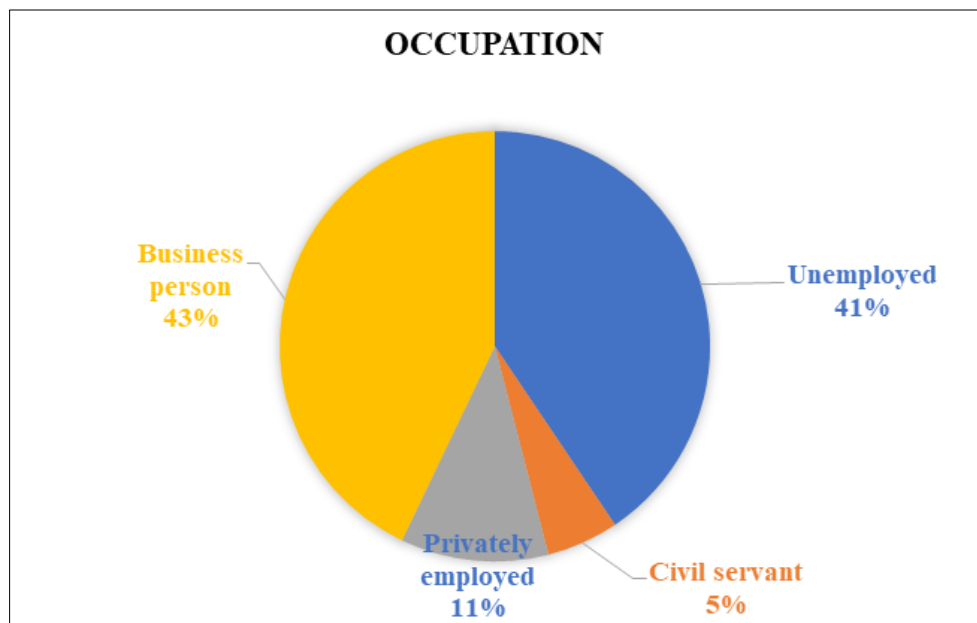


Figure 0.4: Respondents' occupation (Mutua, 2023)

4.1.1.5 Number of years lived in Kitui municipality

The survey results revealed that majority (57%) of the respondents had lived in Kitui municipality for

more than 10 years thus able to relate to waste management experiences over time (Figure 4.6).

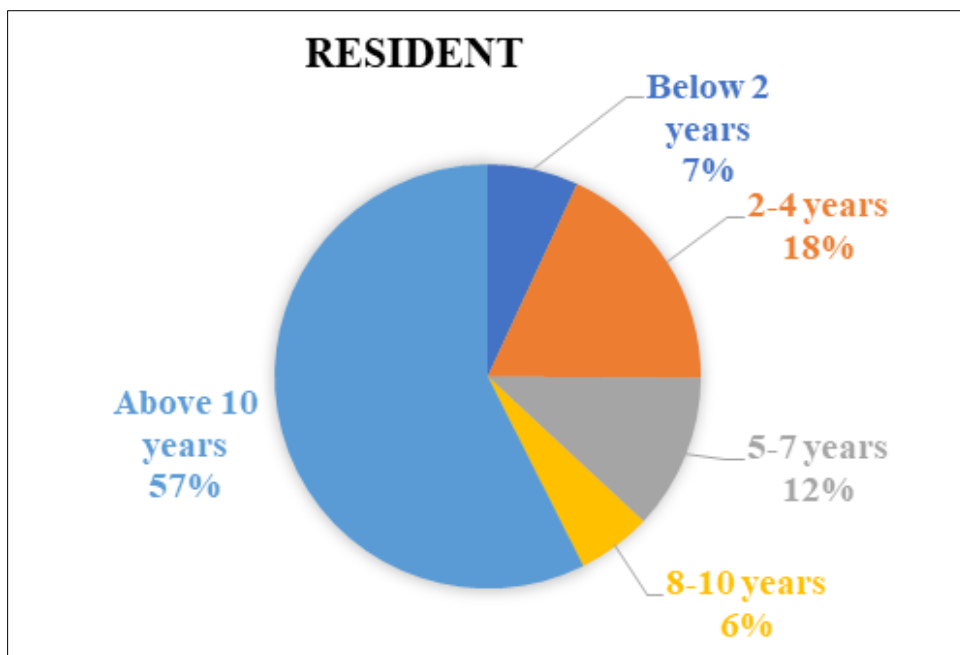


Figure 0.5: Number of years lived in Kitui municipality (Mutua, 2023)

4.1.2 Cleanness of Respondents’ Environment and Their Satisfaction on Waste Collection Services

The study revealed that despite majority (65.3%) of the respondents living in areas well served by

the garbage collectors (Table 4.1), a significant number of the respondents 37.9 % pointed out that Kitui County government was ineffective in waste management (Table 4.2).

Table 0.1: Resident’s environment cleanness (Mutua, 2023)

| Is your area clean/ well served by garbage collectors? | Frequency (n) | Percent (%) |
|--|---------------|--------------|
| Yes | 252 | 65.3 |
| No | 134 | 34.7 |
| Total | 386 | 100.0 |

Table 0.2: Effectiveness of waste management institutions and respondent’s satisfaction (Mutua, 2023)

| Elements | Category | Kitui County government (n) (%) | Private firms (n) (%) | Community based organization (n) (%) | Self-help groups (n) (%) | None (n) (%) | Total (n) (%) |
|---|--------------|---------------------------------|-----------------------|--------------------------------------|--------------------------|-----------------|-----------------|
| Are you satisfied with the garbage collection service within your area? | Yes | 197(93.4) | 1(0.5) | 7(3.3) | 0(0) | 6(2.8) | 211(100) |
| | No | 69(43.1) | 6(3.8) | 3(1.9) | 0(0) | 82(51.3) | 160 (100) |
| | Total | 266(71.7) | 7(1.9) | 10(2.7) | 0(0) | 88(23.7) | 371(100) |
| Are the institutions responsible for waste management effective in performing their duties? | Yes | 211(91.3) | 3(1.3) | 8(3.5) | 1(0.4) | 8(3.5) | 231(100) |
| | No | 55(37.9) | 5(3.4) | 3(2.1) | 0(0) | 82(56.6) | 145(100) |
| | Total | 266(70.7) | 8(2.1) | 11(2.9) | 1(0.3) | 90(23.9) | 376(100) |

4.1.3 Waste Management Institutions in Kitui Municipality

The survey results established that waste generated by (70.9%) of the respondents was collected and disposed of by Kitui County government. Other institutions (private firms, community-based

organizations, and self-help groups) collected and disposed of waste from (5.3 %) of the respondents (Figure 4.7). Waste generated from a notable number of the respondents (23.8 %) was not collected at all where majority of them 245 (61%), practiced open burning of the waste (Figure 4.8).

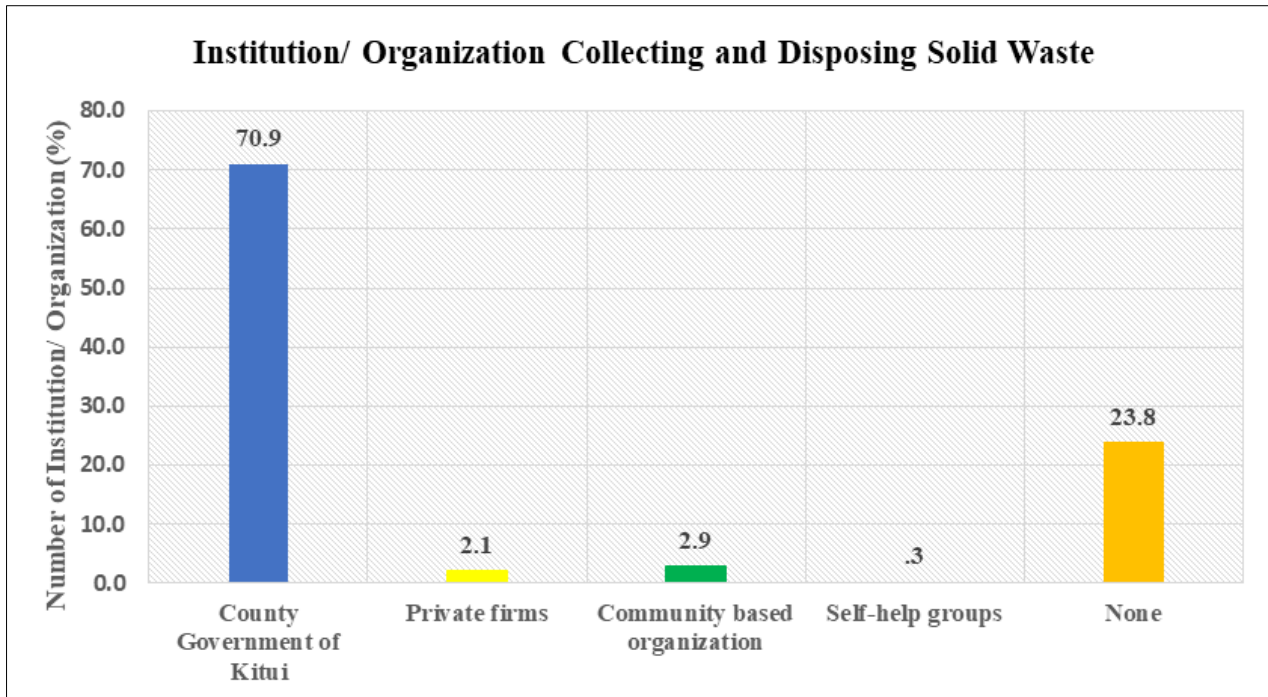


Figure 0.6: Waste management institutions within Kitui municipality (Mutua, 2023)

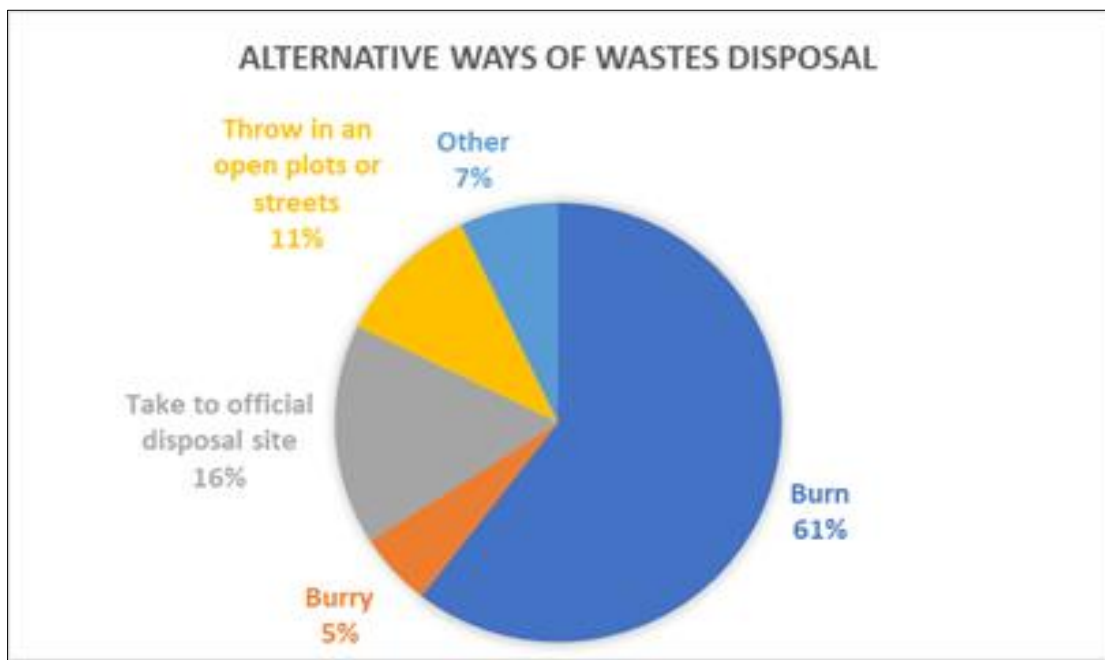


Figure 0.7: Waste disposal methods in areas not served by waste collection institutions (Mutua, 2023)

4.1.4 Municipal Solid Waste Collection Frequency

The survey revealed that waste from less than half (31.2%) of the respondents was collected daily while

that from (29.9%) of the respondents was not collected at all (Figure 4.9).

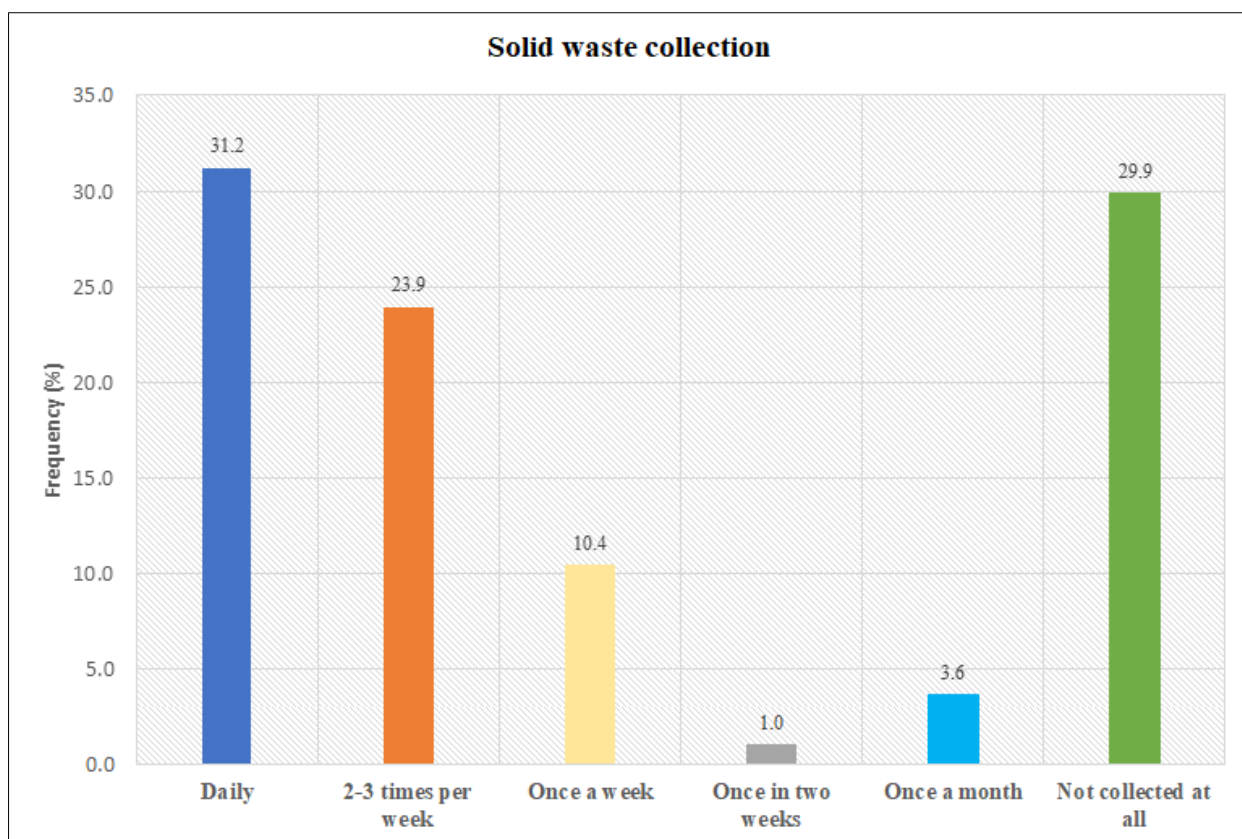


Figure 0.8: Municipal solid waste collection frequency (Mutua, 2023)

4.1.5 Municipal Solid Waste Management Challenges Faced by the Respondents

The survey established that majority of the respondents 133 (34.4%) lacked proper municipal solid waste collection points (Table 4.3). Other challenges included;

- Lack of awareness on good sanitary practices among residents (21.2%).
- Inadequate enforcement by waste management institutions (14.2%).
- Lack of regulation and policies on waste management (11.6%), and
- Lack of periodic clean-up campaigns within Kitui County (7.5%)

Table 0.3: Municipal solid waste management challenges faced by respondents (Mutua, 2023)

| Element | Category | Frequency (n) | Percentage (%) |
|--|--|---------------|----------------|
| Among the challenges listed below which one do you face with waste management? | No collection points | 133 | 34.4 |
| | Collection by private collectors is expensive | 18 | 4.7 |
| | No collection services at all | 68 | 17.6 |
| | Lack of awareness on good sanitary practices among residents | 82 | 21.2 |
| | Inadequate enforcement by waste management institutions | 55 | 14.2 |
| | Lack of regulation and policies on waste management in Kitui County | 45 | 11.6 |
| | No designated disposal site nearby | 97 | 25.1 |
| | Lack of community receptacles | 75 | 19.4 |
| | Lack of periodic clean-up campaigns and activities within Kitui County | 29 | 7.5 |
| | Other | 2 | .5 |

4.1.6 Waste Recycling Within Kitui Municipality

Majority of the respondents (77%), indicated that waste recycling is not undertaken in Kitui municipality (Figure 4.10).



Figure 0.9: Waste recycling within Kitui municipality (Mutua, 2023)

4.1.7 Roles of National Environment Management Authority (NEMA) In Waste Management

Although 279 (75.6%) of the respondents agreed that NEMA is the most important agency in protecting environment, its rating was below average in most areas in which it was assessed. 156 (42.4%) of the

respondents agreed that NEMA officers instruct their neighbourhoods to manage their waste in environmentally safe manner while 132 (36.1%) of the respondents agreed that NEMA officers routinely educate residents on sustainable waste management practices (Table 4.4).

Table 0.4: Performance rate of NEMA in waste management in Kitui municipality (Mutua, 2023)

| Roles of National Environment Management Authority (NEMA) in solid waste management | Opinion | Frequency (n) | Percent (%) |
|--|-------------------|---------------|-------------|
| NEMA is the most important government agency in protecting environment | Strongly disagree | 40 | 10.8 |
| | Disagree | 17 | 4.6 |
| | Neutral | 33 | 8.9 |
| | Agree | 65 | 17.6 |
| | Strongly agree | 214 | 58.0 |
| | Total | 369 | 100.0 |
| NEMA plays adequately its role in environmental protection in Kitui municipality | Strongly disagree | 43 | 11.7 |
| | Disagree | 41 | 11.2 |
| | Neutral | 77 | 21.0 |
| | Agree | 149 | 40.6 |
| | Strongly agree | 57 | 15.5 |
| | Total | 367 | 100.0 |
| NEMA plays a critical role in waste management in Kitui municipality | Strongly disagree | 57 | 15.6 |
| | Disagree | 60 | 16.4 |
| | Neutral | 97 | 26.5 |
| | Agree | 105 | 28.7 |
| | Strongly agree | 47 | 12.8 |
| | Total | 366 | 100.0 |
| NEMA officers instruct our neighbourhoods to ensure we collect and store our waste in an environmentally safe manner | Strongly disagree | 65 | 17.7 |
| | Disagree | 58 | 15.8 |
| | Neutral | 89 | 24.2 |
| | Agree | 109 | 29.6 |
| | Strongly agree | 47 | 12.8 |
| | Total | 368 | 100.0 |
| NEMA officers routinely arrest and prosecute those who illegally dumps or mishandle waste in my neighbourhood | Strongly disagree | 72 | 19.8 |
| | Disagree | 66 | 18.1 |
| | Neutral | 94 | 25.8 |
| | Agree | 91 | 25.0 |

| Roles of National Environment Management Authority (NEMA) in solid waste management | Opinion | Frequency (n) | Percent (%) |
|---|-------------------|----------------------|--------------------|
| | Strongly agree | 41 | 11.3 |
| | Total | 364 | 100.0 |
| NEMA officers routinely educate residents on sustainable waste management practices | Strongly disagree | 74 | 20.2 |
| | Disagree | 63 | 17.2 |
| | Neutral | 97 | 26.5 |
| | Agree | 83 | 22.7 |
| | Strongly agree | 49 | 13.4 |
| | Total | 366 | 100.0 |
| NEMA affords the members of public and private sector adequate opportunity to participate in regulation of sound waste management in Kitui County | Strongly disagree | 71 | 19.3 |
| | Disagree | 60 | 16.3 |
| | Neutral | 103 | 28.1 |
| | Agree | 91 | 24.8 |
| | Strongly agree | 42 | 11.4 |
| | Total | 367 | 100.0 |
| Under extreme scenarios NEMA shuts down establishments that do not observe sound waste management practices | Strongly disagree | 68 | 18.6 |
| | Disagree | 55 | 15.0 |
| | Neutral | 93 | 25.4 |
| | Agree | 93 | 25.4 |
| | Strongly agree | 57 | 15.6 |
| | Total | 366 | 100.0 |

4.1.8 Roles of Kitui County Government in Municipal Solid Waste Management

The survey analysis revealed that 191 (51.2%) of the respondents agreed that Kitui County government ensure timely collection of municipal solid waste. Less than half of the respondents 122 (32.8%) agreed that

Kitui County government officers routinely arrest those who dumps waste illegally, 126 (33.6%) of the respondents agreed that Kitui County government organizes campaigns on sustainable waste management practices, its policies and regulations (Table 4.5).

Table 0.5: Performance rate of Kitui County government in municipal solid waste management (Mutua, 2023)

| Roles of Kitui County government in solid waste management | Opinion | Frequency (n) | Percent (%) |
|--|-------------------|----------------------|--------------------|
| Kitui County government ensure timely collection of waste in my neighbourhood | Strongly disagree | 52 | 13.9 |
| | Disagree | 48 | 12.9 |
| | Neutral | 82 | 22.0 |
| | Agree | 103 | 27.6 |
| | Strongly agree | 88 | 23.6 |
| | Total | 373 | 100.0 |
| Kitui County government officers routinely arrest those who illegally dumps waste in my neighbourhood | Strongly disagree | 70 | 18.8 |
| | Disagree | 90 | 24.1 |
| | Neutral | 91 | 24.4 |
| | Agree | 83 | 22.3 |
| | Strongly agree | 39 | 10.5 |
| | Total | 373 | 100.0 |
| Kitui County government officers routinely inspect our neighbourhoods to ensure resident collect and store solid waste in an environmentally safe manner | Strongly disagree | 73 | 19.5 |
| | Disagree | 76 | 20.3 |
| | Neutral | 101 | 26.9 |
| | Agree | 85 | 22.7 |
| | Strongly agree | 40 | 10.7 |
| | Total | 375 | 100.0 |
| Kitui County government undertake periodic clean-up activities within the municipality | Strongly disagree | 59 | 15.9 |
| | Disagree | 42 | 11.3 |
| | Neutral | 90 | 24.3 |
| | Agree | 94 | 25.3 |
| | Strongly agree | 86 | 23.2 |
| | Total | 371 | 100.0 |
| Kitui County government has zoned waste operations area | Strongly disagree | 72 | 19.6 |

| Roles of Kitui County government in solid waste management | Opinion | Frequency (n) | Percent (%) |
|--|-------------------|----------------------|--------------------|
| | Disagree | 60 | 16.3 |
| | Neutral | 101 | 27.5 |
| | Agree | 81 | 22.1 |
| | Strongly agree | 53 | 14.4 |
| | Total | 367 | 100.0 |
| Kitui County government manages public dumpsites in an environmentally safe manner | Strongly disagree | 63 | 16.9 |
| | Disagree | 48 | 12.9 |
| | Neutral | 108 | 29.0 |
| | Agree | 100 | 26.8 |
| | Strongly agree | 54 | 14.5 |
| Total | 373 | 100.0 | |
| Kitui County government officers educate residents on how to manage waste in environmentally safe manner | Strongly disagree | 79 | 21.2 |
| | Disagree | 65 | 17.5 |
| | Neutral | 104 | 28.0 |
| | Agree | 77 | 20.7 |
| | Strongly agree | 47 | 12.6 |
| Total | 372 | 100.0 | |
| Kitui County government promotes waste recycling | Strongly disagree | 70 | 18.9 |
| | Disagree | 71 | 19.1 |
| | Neutral | 108 | 29.1 |
| | Agree | 77 | 20.8 |
| | Strongly agree | 45 | 12.1 |
| Total | 371 | 100.0 | |
| Kitui County government officers under extreme circumstances issues notice of closure to establishments that fails to observe sound waste management | Strongly disagree | 66 | 17.7 |
| | Disagree | 62 | 16.7 |
| | Neutral | 107 | 28.8 |
| | Agree | 91 | 24.5 |
| | Strongly agree | 46 | 12.4 |
| Total | 372 | 100.0 | |
| Kitui County government organizes campaigns on sustainable waste management practices, policies and regulations | Strongly disagree | 75 | 20.0 |
| | Disagree | 74 | 19.7 |
| | Neutral | 100 | 26.7 |
| | Agree | 79 | 21.1 |
| | Strongly agree | 47 | 12.5 |
| Total | 375 | 100.0 | |
| There is adequate space for disposal of waste generated within Kitui municipality. | Strongly disagree | 94 | 25.3 |
| | Disagree | 51 | 13.7 |
| | Neutral | 95 | 25.6 |
| | Agree | 75 | 20.2 |
| | Strongly agree | 56 | 15.1 |
| Total | 371 | 100.0 | |

4.1.9. Coordination between Kitui County Government and NEMA in Municipal Solid Waste Management

Less than half of the respondents, 148 (40%) agreed that Kitui County government cooperates with NEMA in environment protection and waste management matters (Table 4.6).

Table 0.6: Coordination between Kitui County government and NEMA in municipal solid waste management (Mutua, 2023)

| Coordination between Kitui County government and National Environment Management Authority (NEMA) in waste management | Opinion | Frequency (n) | Percent (%) |
|--|-------------------|----------------------|--------------------|
| Kitui County government cooperates with NEMA on environmental protection and waste management within Kitui County | Strongly disagree | 55 | 14.9 |
| | Disagree | 42 | 11.4 |
| | Neutral | 125 | 33.8 |
| | Agree | 94 | 25.4 |
| | Strongly agree | 54 | 14.6 |
| Total | 370 | 100.0 | |

| Coordination between Kitui County government and National Environment Management Authority (NEMA) in waste management | Opinion | Frequency (n) | Percent (%) |
|--|-------------------|----------------------|--------------------|
| Kitui County government cooperates with NEMA in waste management issues in Kitui County | Strongly disagree | 60 | 16.2 |
| | Disagree | 44 | 11.9 |
| | Neutral | 119 | 32.2 |
| | Agree | 93 | 25.1 |
| | Strongly agree | 54 | 14.6 |
| | Total | 370 | 100.0 |
| NEMA adequately supervises Kitui County government in matters relating to environmental protection and waste management | Strongly disagree | 66 | 17.8 |
| | Disagree | 46 | 12.4 |
| | Neutral | 118 | 31.9 |
| | Agree | 84 | 22.7 |
| | Strongly agree | 56 | 15.1 |
| | Total | 370 | 100.0 |
| The national government through NEMA gives support in policies and enforcement of waste management within Kitui County | Strongly disagree | 86 | 23.6 |
| | Disagree | 34 | 9.3 |
| | Neutral | 118 | 32.3 |
| | Agree | 77 | 21.1 |
| | Strongly agree | 50 | 13.7 |
| | Total | 365 | 100.0 |

4.1.1.0 Respondents’ Awareness on Sustainable Waste Management Practices, Policies and Regulations

The study established that a significant majority of the respondents 258 (66.8%) were unaware of

sustainable waste management practices, policies and regulations with 229 (58.9%) of the respondents objecting that Kitui County government has enhanced enough awareness on the same (Table 4.7).

Table 0.7: Awareness on sustainable waste management practices, policies and regulation among the respondents (Mutua, 2023)

| Sustainable waste management practices and waste management regulation awareness | Opinion | Frequency (n) | Percent (%) |
|---|----------------|----------------------|--------------------|
| Are you aware of sustainable waste management practice and any regulation/policy on formulated by County government of Kitui? | Yes | 128 | 33.2 |
| | No | 258 | 66.8 |
| | Total | 386 | 100.0 |
| Do you think that Kitui County government has enhanced enough awareness on sustainable waste management practices, regulations and policies in your area? | Yes | 160 | 41.1 |
| | No | 229 | 58.9 |
| | Total | 389 | 100.0 |

Radio was found to be the most effective media at (69.7%) for creating awareness on sustainable waste

management practices, policies and regulation (Table 4.8).

Table 0.8: Mass media component for creating awareness on sustainable waste management practices, policies and regulation (Mutua, 2023)

| Mass Media | Frequency (n) | Percent (%) |
|-------------------|----------------------|--------------------|
| Radio | 271 | 69.7 |
| Television | 71 | 18.3 |
| Newspapers | 23 | 5.9 |
| Social media | 68 | 17.5 |

4.1.1.1 Key Informants Interview Review

Six themes emerged from manual thematic analysis of interview responses obtained from key informant interviews. These themes included;

1. Collaboration between National Environment Management Authority (NEMA) and Kitui County Government in Waste Management

All the key informants pointed a gap in coordination between Kitui County NEMA officers and Kitui County government officers managing municipal

solid waste. For instance, Kitui County director of environment indicated that they do not have full control in waste management since they are required by law to obtain waste transportation licenses from NEMA subject to payment of license fees. “...Waste management is not fully DEVOLVED to Kitui County government ... We (KITUI COUNTY GOVERNMENT) pay licenses for our waste transportation vehicles and disposal sites to NEMA...AND when we do not comply our vehicles are IMPOUNDED... We have to rely on mercies of NEMA to manage our waste ...there is need for good working

relation...” pointed out Kitui County environment director.

Kitui County NEMA director indicated that inadequate coordination mechanisms between NEMA and Kitui County government has made it difficult to relocate Kalundu dumpsite which is located adjacent to Kalundu River to a suitable place. “...*RELOCATION of Kalundu dumpsite which is a health hazard to Kitui town residents has not been done... lack of a well framed coordination mechanisms ...we (NEMA) have shut the dumpsite twice...but County Government end up RE-OPENNING it...*” indicated the NEMA director.

2. Challenges in Municipal Solid Waste Management

The key informants highlighted different challenges which they perceived to have contributed to existing unsustainable waste management practices within Kitui County. Municipal solid waste management supervisor implied that they only have two vehicles and limited waste collectors which serves the whole Kitui municipality.

“*The entire Kitui municipality is served by TWO waste transportation vehicles...Waste collectors are few ...waste collection is done on daily basis within Kitui town... other part of the municipality the waste collection exercise is done on NEED BASIS...*” Implied the supervisor.

Kitui municipality environment, recreation and social services director pointed out that the main constraint to waste management is limited financial resources.

“...*FINANCIAL CONSTRAINTS has limited us to attain sustainable waste management practices ...for me... enough finances will solve any other issue in waste management...Waste management has been given the least priority hence being allocated the least budget...*” Pointed out the director.

Kitui County NEMA director indicated that inadequate human resources have hindered them from enforcing sustainable waste management practices within Kitui County.

“*We (NEMA officers) are two of us serving the WHOLE Kitui County ... we are unlikely to enforce on waste management particularly in areas away from Kitui town...*” indicated the director.

Kitui municipality manager pointed out that failure of Kitui County government to formulate its own waste management policy has contributed to unsustainable waste management practices.

“...*The County government lacks its own policy guidance on waste management... It is at draft*

stage...HOPPING it will be completed...” indicated the manager.

3. Plans in Place to Ensure Effective Waste Management in Kitui County

Kitui municipality environment, recreation and social services director indicated that, to improve waste management in Kitui County, the County government officers should realize the value of sustainable waste management. Further, the director indicated that she will lobby for more finance to be allocated for waste management activities.

“... *OF COURSE ...We as municipality top management will persuade for more budget allocation...With financial muscles door to door sensitization will not be a problem...in addition, County government should appreciate the benefits of sustainable waste management... the end goal is clean environment for all!*” pointed out the director.

Kitui County environment director indicated that land have been secured for relocation of Kalundu dumpsite.

“... *land is there for constructing a waste land fill and relocate all waste accumulated within KALUNDU DUMPSITE... The dumpsite will be RECLAIMED into a waiting bay ...*”

4. Municipal Solid Waste Management Policies and Regulations

Kitui County environment director, Kitui municipality manager, and Kitui County NEMA director revealed that Kitui County solid waste management policy is at draft stage. Kitui County environment director indicated that on matters relating to waste management they have been relying on national legislation such as Environmental Management and Coordination (Waste management), 2006 and the national solid waste management strategy, 2015. On creation of public awareness on sustainable waste management practices, regulations and policies, the director pointed out that creation of awareness is undertaken during periodic clean-up activities commemorated every year within Kitui County.

“... *It (Solid waste management policy) is at draft stage... We are trying to finalize it within the shortest time possible.... Currently we depend on Waste management regulations, 2006 ...Yes ... on sustainable waste management practices ... yearly during clean up days...*” Kitui County environment director pointed out.

5. Compliance to Minimum Requirements for Solid Waste Management Systems Stipulated in the National Solid Waste Management Strategy, 2015

It was noted from the key informant interviews that Kitui County government had not implemented majority of the waste management minimum

requirements stipulated in the national solid waste management strategy, 2015.

Kitui County director of environment revealed that although they had not met majority of the minimum requirements, plans were underway to comply. He confirmed that land has been acquired to develop waste land fill an aspect that will aid in relocating Kalundu dumpsite to a less environment sensitive area. He assured that before the establishment of the waste landfill NEMA approval will be sought and the disposal site will be subjected to other stipulated requirements.

*“...SLIGHTLY COMPLIANT... land has been acquired for waste landfill... Kalundu dumpsite will be **RELOCATED** ... the waste management cycle in the new disposal site will fully comply with the stipulated minimum requirements...including obtaining NEMA license before the waste landfill establishment”* pointed out Kitui County environment director.

Kitui municipality waste management supervisor indicated that Kitui municipality authority will ensure that waste collection areas are zoned and waste is timely collected.

“...WASTE COLLECTION AREAS are not zoned...in support of my seniors...this will be undertaken and by employing more waste collectors... timely waste collection will be undertaken...Yes door to door or from the demarcated collection points...” pointed out the supervisor.

6. Involvement of Community Members in Waste Management

Kitui County director of environment pointed out that community members are only involved in waste management practices during periodic clean up exercise an aspect that was supported by Kitui County NEMA director, the municipal manager, and Kitui municipality waste management supervisor.

“...They are only engaged during commemoration of periodic clean up days...we will try to fully engage them...it's a gap that's need to be filled...” implied the Kitui County environment director.

When asked if community members are involved in waste recycling, Kitui municipality environment, recreation and social services director revealed that informal waste pickers either from within or outside the community members collect recyclable materials such as plastics and scrap metals.

*“...waste recycling is undertaken by unregulated group of **INFORMAL WASTE PICKERS**... Kitui County has no recycling plants... recycled materials collected... are taken to Nairobi for recycling...”* pointed out the director.

On creation of public awareness on municipal solid waste management best practices and its policies, the municipal solid waste management supervisor indicated that this is an area that require improvement.

“...sustainable waste management practices and policy awareness is minimal...remedies should be put in place...periodic clean-up exercises should be monthly and not yearly as has been the case here...” Pointed out the supervisor.

5. CONCLUSIONS ON RESEARCH AIMS AND OBJECTIVES

The study sought to investigate efficacy of Kitui County government in municipal solid waste management within Kitui municipality with a view of suggesting applicable measures to improve existing municipal solid waste management systems within the study area. The study had four objectives: to evaluate if change in municipal solid waste management responsibilities from national government to forty-seven (47) regional County governments undermined efficacy of Kitui County government in discharging its mandates at local level, to determine drivers and barriers in coordination of the national government, NEMA and the forty-seven regional Counties on servicing of municipal solid waste management, to evaluate if municipal solid waste management policies developed by Kitui County government are well suited to improve municipal solid waste management, and to quantify the level of awareness on sustainable municipal solid waste management practices, policies and regulations among Kitui municipality residents.

It was noted from the study findings that open burning of waste in open access dumpsites was the preferred method of waste management in Kitui municipality. The study further revealed that waste collected by Kitui County government ends up being dumped in open access dumpsite located adjacent to a river stream. The waste is latter burned by informal waste pickers to create more space within the dumpsite for more informal dumping and consequently providing them with an opportunity for more picking of recyclable materials such as plastics.

The study findings revealed that poor waste collection and disposal practices experienced in Kitui municipality were attributed to inadequate income, irregular waste collection by Kitui County government due to limited number of waste collection personnel and waste transportation vehicles, lack of awareness on good sanitary practices among Kitui municipality residents, lack of Kitui County policy on sustainable waste management and inadequate coordination between government institution responsible for waste management within Kitui County.

Based on the study findings, the following recommendations were made to improve existing

municipal solid waste management systems within Kitui municipality and Kitui County at large;

1. Kitui County government in partnership with NEMA should regularly train, sensitize and educate Kitui municipality residents on sustainable municipal solid waste management practices, policies and regulations through public outreach campaigns and use of local radio stations.
2. Kitui County government should prioritize municipal solid waste management in budgeting and allocate enough money for provision of municipal solid waste management services and relocation of Kalundu dumpsite which is located adjacent to Kalundu river stream.
3. Kitui County government in collaboration with other government agencies such as NEMA should regularly conduct capacity building training programs for all staffs on teamwork mechanisms and sustainable municipal solid waste management procedures.
4. Kitui County ministry of environment should finalize formulation of Kitui County solid waste management policy in the frame of the national solid waste management strategy, 2015 to provide local policy guidance to both solid waste management authorities and Kitui County residents, and
5. Municipal solid waste management should be incorporated into fundamental Kitui County government planning so as to ensure municipal solid waste management is planned for even with increasing human population and expanding urban centres within Kitui municipality.

The recommendations listed above do not guarantee ultimate route towards better municipal solid waste management systems but will accord incredible progress in municipal solid waste management in Kitui County if implemented together with recommendations stipulated in the national solid waste management strategy, 2015.

5.1 Further Work

The findings of this study form the baseline for more research work on municipal solid waste management practices within Kitui municipality as well as other municipalities in Kenya. This study was not exhaustive and recommends further studies on:

- I. Environmental and socioeconomic impacts associated with open burning of municipal solid waste within Kitui municipality. Since this study has established that open burning of waste is practised within Kitui municipality, understanding the negative environmental and socioeconomic impacts emanating from the practice in details will help kitui municipality residents, and municipal solid waste

management authorities understand the dangers associated with this act hence proposing applicable corrective measures.

- II. Roles of informal waste pickers in achieving sustainable municipal solid waste management in Kitui municipality. This study established that there were no waste recycling plants in Kitui municipality and recyclable materials such as plastics within the open dumpsites were collected by informal waste pickers, understanding and appreciating their contributions towards achieving sustainable municipal solid waste management in Kitui municipality will inform interventions that could be put in place by Kitui County government to improve their working conditions thereby increasing waste recycling rate in Kitui municipality.

Lastly, this study should be expounded to other municipalities in Kenya to avail an inclusive survey on municipal solid waste management situation under the County government authorities.

Glossary of Terms

1. **National Environment Management Authority (NEMA)**-The principal institution responsible for the implementation of all environment related policies in Kenya (NEMA, 2023).
2. **Municipal solid waste**- Refuse from households, non-hazardous solid waste from industrial, commercial and institutional establishment, market waste, and street sweeping collected by municipal authority within a given area (Nnaji, 2014).

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