

**ASSESSMENT OF HOUSEHOLD DOMESTIC WASTE  
MANAGEMENT PRACTICES, KIAMBU  
COUNTY- KENYA**

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**A Thesis submitted in partial fulfillment of the requirement for the Degree  
of Masters of Science in Environmental Management of South Eastern  
Kenya University**

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## DECLARATION

I understand that plagiarism is an offence and I therefore declare that this thesis project is my original work and has not been submitted to any other institution for any other award.

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## **DEDICATION**

I dedicate this thesis to my family members whose prayers, words of encouragement and push for tenacity that rang in my ears continually as I worked on this thesis.

## TABLE OF CONTENT

DECLARATION .....	ii
ACKNOWLEDGMENT.....	iii
DEDICATION .....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	ix
LIST OF FIGURES .....	x
ABBREVIATIONS AND ACRONYMS.....	xi
DEFINITION OF TERMS .....	xii
ABSTRACT.....	xiii
<b>CHAPTER ONE.....</b>	<b>1</b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
1.1 Background of the study .....	1
1.2 Statement of the problem .....	4
1.3 Objectives of the study.....	5
1.3.1 General objective.....	5
1.3.2 Specific objectives.....	5
1.4 Research questions.....	5
<b>1.5 Justification of the Study.....</b>	<b>6</b>
1.6 Scope of the study.....	6
1.7 Significance of the study.....	7
1.8 Organization of the Thesis .....	7
<b>CHAPTER TWO.....</b>	<b>9</b>
<b>2.0 LITERATURE REVIEW .....</b>	<b>9</b>
2.1 Global perspective of household waste management .....	9

2.2. Local perspective of household waste management.....	12
2.3 Household waste management practices .....	14
2.3.1 Public health.....	14
2.3.2 Environmental protection (waste treatment and disposal).....	15
2.3.3 Resource management (valorization of recyclables and organic materials).....	16
2.4 Perceptions and attitudes on household waste management.....	17
2.5 Factors determining household waste management.....	18
2.6 Challenges of household waste management in developing countries.....	20
2.6.1 Technical constraints.....	20
2.6.2 Financial constraints.....	21
2.6.3 Institutional constraints.....	21
2.6.4 Economic constraints.....	22
2.6.5 Social constraints.....	22
2.7 Summary of literature review .....	23
2.8 Household waste management model.....	24
2.8.1 Explanation.....	24
2.9 Conceptual framework.....	25
<b>CHAPTER THREE.....</b>	<b>27</b>
<b>3.0 RESEARCH METHODOLOGY .....</b>	<b>27</b>
3.1 Introduction.....	27
3.2 Study area.....	27
3.2.1 Topography and climate .....	28
3.2.2 Population and economy.....	28
3.3 The research design.....	29
3.4 Target population.....	29

3.5 Sampling frame.....	29
3.6 Methods of data collection.....	30
3.6.1 Primary sources.....	30
3.6.2 Secondary sources.....	30
3.7 Data processing, analysis and presentation.....	31
3.7.1 Data processing.....	31
3.7.2 Data analysis.....	31
3.7.3 Data presentation .....	31
3.8 Ethical considerations and contingency plan.....	31
<b>CHAPTER FOUR.....</b>	<b>32</b>
<b>4.0 RESULTS .....</b>	<b>32</b>
4.1 Socio-Economic characteristics of respondents in rural Gachororo and peri- Urban Juja.....	32
4.1.1 Gender of the respondents in the study area .....	32
4.1.2 Education levels of the respondents in the study areas.....	32
4.1.3 Age distribution (%) of the respondents in the study area.....	33
4.1.4 Occupation of respondents (%) in the study area .....	33
4.1.5 Distribution of respondents' monthly income(%) .....	34
4.1.6 Household size (%) of the respondents in rural Gachororo and peri-urban Juja.....	35
4.2 Household waste management practices in the study area.....	35
4.2.1 Type of waste generated by households (%) in rural Gachororo and peri- urban Juja.....	36
4.2.2 Disposal of household waste (%) in the study area.....	36
4.2.3 Waste management practices (%) in rural Gachororo and peri-urban Juja .....	36
4.2.4 Challenges faced in household waste management (%) in the study area.....	37
4.3 Factors influencing household waste management practices .....	39

4.4 Respondents' perceptions and attitudes on household waste management in rural Gachororo and peri-urban Juja.....	39
4.4.1 Respondent's satisfaction with waste disposal and their support for the idea of waste segregation in the study area .....	40
4.4.2 Responsibility share of household waste management (%) among stakeholders in rural Gachororo and peri-urban Juja.....	40
4.4.3 Respondents' rating (%) of household waste management .....	41
4.4.4 Willingness of respondents to sue reckless dumpers .....	41
4.5 Households general awareness of household waste management in the study area.....	42
4.5.1 Respondents' awareness (%) of household waste management in rural Gachororo and peri-urban Juja.....	42
4.5.2 Sources of information on household waste management (%) in rural Gachororo and peri-urban Juja.....	42
4.6 Implications of poor household waste management in rural Gachororo and peri-urban Juja.....	43
4.6.1 Respondents' awareness (%) of implications of poor household waste management in the study area .....	43
4.6.2 Respondents' perceptions on effects of poor household waste management practices on the environment in rural Gachororo and peri-urban Juja.....	44
<b>CHAPTER FIVE.....</b>	<b>46</b>
<b>5.0 DISCUSSION.....</b>	<b>46</b>
5.1 Waste disposal methods in the study .....	46
5.2 Waste segregation .....	46
5.3 Provision of waste collection services .....	47
5.4 Payment for household waste collection in the study area .....	47
5.5 Factors influencing waste management practices.....	48
5.5.1 Age of respondents .....	49
5.5.2 Location of household in waste management practices.....	49



5.5.3 Household size .....	49
5.5.4 Education level of respondents .....	50
5.5.5 Monthly income level of the respondents .....	51
5.5.6 Type of waste generated by households .....	51
5.6 Residents satisfaction with waste disposal methods and support for the idea of waste segregation in the area.....	51
5.7 Resident rating on HWM .....	52
5.8 Willingness to sue reckless dumpers .....	53
5.9 Residents awareness of impacts of poor HWM.....	53
5.10 Sources of information on HWM in the study area .....	53
5.11 Residents awareness of implications of poor HWM.....	54
5.12 Intensity of environmental implications of poor HWM in the study area .....	54
<b>CHAPTER SIX.....</b>	<b>57</b>
<b>6.0 CONCLUSION AND RECOMMENDATIONS.....</b>	<b>57</b>
6.1 Conclusion.....	57
6.2 Recommendations.....	57
6.3 Area of further research .....	58
<b>REFERENCES.....</b>	<b>60</b>
<b>APPENDICES .....</b>	<b>66</b>
Appendix 1:Research questionnaire .....	66

## LIST OF TABLES

<b>Table 4.1:</b> Age distribution (%) of the respondents in the study area.....	33
<b>Table 4.2:</b> Type of waste generated by households (%) in rural Gachororo and peri-urban Juja.....	36
<b>Table 4.3:</b> Disposal of household waste (%) in the study area .....	36
<b>Table 4.4:</b> Waste management practices (%) in rural Gachororo and peri-urban Juja.....	36
<b>Table 4.5:</b> Challenges faced in household waste management (%) in the study area.....	37
<b>Table 4.6:</b> Factors Influencing HWM Practices.....	39
<b>Table 4.7:</b> Respondent’s satisfaction with waste disposal and their support for the idea of waste segregation in the study area .....	40
<b>Table 4.8:</b> Responsibility share of household waste management (%) among stakeholders in rural Gachororo and peri-urban Juja.....	40
<b>Table 4.9:</b> Respondents’ rating (%) of household waste management.....	48
<b>Table 4.10:</b> Willingness of respondents in the study area to sue reckless dumpers .....	41
<b>Table 4.11:</b> Respondents’ awareness (%) of household waste management in rural Gachororo and peri-urban Juja.....	42
<b>Table 4.12:</b> Sources of information on household waste management (%) in rural Gachororo and peri-urban Juja.....	43
<b>Table 4.13:</b> Respondents’ awareness (%) of implications of poor household waste management in the study area.....	43
<b>Table 4.14:</b> Respondents’ perceptions (%) on effects of poor household waste management practices on the environment in rural Gachororo and peri-urban Juja.....	45

## LIST OF FIGURES

Figure 2.1: Household waste management model .....	24
Figure 2.2: Conceptual framework .....	26
Figure 3.1: Map of the study area showing the location of Juja Sub-County in Kiambu County. (Source: Google Earth 2016) .....	27
Figure 4.1: Gender distribution of respondents in the study area .....	32
Figure 4.2: Education level of respondents in the study area .....	33
Figure 4.3: Occupation of respondents (%) in the study area .....	33
Figure 4.4: Distribution of respondents' monthly income (%) .....	34
Figure 4.5: Household size (%) of the respondents .....	35

## **ABBREVIATIONS AND ACRONYMS**

**CBD** - Central Business District

**CBO** - Community Based Organizations

**C/N** - Carbon/Nitrogen

**EU** - European Union

**DoE** - Department of Environment

**EMCA** - Environmental Management and Coordination Authority

**HW** - Household Waste

**HWM** - Household Waste Management

**JKUAT** - Jomo Kenyatta University of Agriculture and Technology

**NCC** - Nairobi City County

**NEMA** - National Environment Management Authority **MLFD** - Ministry of Livestock and Fisheries Development

**PSP** - Private Sectors 'Participation

**SPSS** - Statistical Packages for Social Sciences

**SWM** - Solid Waste Management

**UN** - United Nations

**WM** - Waste Management

## DEFINITION OF TERMS

**Assessment** - The determination or approximation of the nature, quality, or capability of something. (Fielder HMP, Poon-King C, Palmer SR, ColemanG)

**Attitude** - Feeling about something and this is manifested through an individual's behavior. (Udomporn T. Resident)

**Awareness** - Knowledge or perception of a situation of fact. (William Roban Estates Directorate Dublin Mid-Leinster (2011))

**Household** - A house and its occupants regarded as a unit. (Omambia Bernard\* & Ogonya A. Mildred)

**Household Waste** - Waste produced because of the normal day-to-day use of domestic activities. (Omambia Bernard\* & Ogonya A. Mildred)

**Household Waste Management** - Involves all the actions and plans needed to handle in the right way domestic waste (Omambia Bernard\* & Ogonya A. Mildred)

**Management** - The process of dealing with or controlling something. (Omambia Bernard\* & Ogonya A. Mildred)

**Peri-Urban** - The structure resulting from peri-urbanization, the landscape interface between rural-urban transitions. (Pan, Lingyang)

**Perception** - The way one thinks about, or understands something. (Udomporn T. Resident)

**Waste** - Any material which is rejected after its primary use. (William Roban Estates Directorate Dublin Mid-Leinster (2011))

## ABSTRACT

This study was carried out to assess household domestic waste management practices, perceptions and attitudes, Kiambu County. Household waste is one of the basic services that are currently receiving wide attention in the urban agenda of developing Countries. Lack of effective Household domestic Waste Management has resulted in environmental health hazards and negative impacts on the environment. The study specific objectives were : To document household waste management practices , to assess factors determining household waste management , to assess people's perceptions and attitudes on households' waste management , to establish the Household general familiarity with various aspects of waste handling and the impacts of waste mismanagement and to establish implication of poor Household Waste Management practices and make recommendations.

The target population was divided into two divisions of Juja Sub-County namely Gachororo and Juja so as to compare waste management practices between the two. A sample size of 202 households was randomly selected from the target population and questionnaires administered to the household heads. Data was coded and analyzed using Statistical Package for Social Sciences. Both descriptive and inferential statistics were used during the analysis. The study revealed that Juja Sub-County faces challenges in household domestic waste management practices. The study showed that 46% of the challenges in Household domestic waste management were as a result of inadequate waste management facilities, 24% as a result of lack of waste collections services and 11% as a result of lack of finances to conduct effective household waste management. The results further indicated that 94% of the residents had not received public education on household domestic waste management, implying that, the residents were unaware of different aspects of household domestic waste management practices. The results of logistic regression analysis indicated that location, age, household size, income, waste type and the amount of waste generated were not significant in influencing the practice of household domestic waste management. However, the location of the household head (coefficient=0.262;  $p=0.59$ , odds ratio=1.17) significantly increased the probability of practicing household waste do by a factor of 1.17. The study revealed that poor household domestic waste management has led to outbreaks of environmental diseases such as cholera and malaria among others. The study concluded that to achieve sustainable development in respect to Vision 2030, peri-urban areas and more so Juja Sub-County need to employ sustainable waste management strategies. The study recommended provision of waste management infrastructure, public education on household domestic waste management, Implementation of reduction, recycle, reuse and recover concept, introduction of Community Based Organizations for waste collection and enforcement. The study will be of great significance to various stakeholders such as the Government and Community members.

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background of the study

Waste generation and its treatment is one of the main worldwide environmental issues together with the loss of ozone layer, biodiversity, climate change and additionally soil and water contamination (Konteh, 2009). Improper and non-sustainable transfer of generated wastes can impose dangers to human and environmental wellbeing (G.o.K, 2011). The need for minerals and crude materials, improved assembling and utilization of items (JICA, 1998) is expanding the measure of waste generated worldwide (Kibwage, 1996). Managing waste has dependably been an ordinary assignment, with humans regularly experiencing unhygienic conditions. A connection has been built between absence of cleanliness and demise and waste management (Chakrabrati *et al.*, 2009).

Household waste management is one of the fundamental tasks that are currently under wide consideration for upgrade in the urban agenda in many developing nations. Seik, F. (2007) detailed that absence of proper household waste management in urban regions result in environmental perils that can have negative effect to nature. Close to a half of the total population (47 %) stays in urban territories, a number which was projected to increase by 2% every year for the period 2000-2015 (United Nations Population Division, 2001). The growth of people's numbers, ways of living, travel manner, and their urban financial exercises largely affect the earth as far as asset utilization and waste discharge are concerned. Nevertheless, urban areas likewise offer opportunities to deal with a developing population reasonably.

There is a connection between economic development and waste generation, particularly waste from urban-based utilization. In the European Union, waste generation per capita from household and business exercises, which constitutes just a part of the aggregate sum of municipal waste of 300 kg for each capita every year as of

now surpasses the objective set in the European Union's fifth environmental plan of 100 kg (Allison, 2010). Most European nations have reusing plans, especially for paper and glass. Nevertheless, this advancement has been just an incomplete achievement on the grounds that the generation of waste paper and glass has additionally expanded. Sludge from urban wastewater treatment plants is evaluated to have expanded in the EU from 5.2 to 7.2 million tones dry solids amid 1992-98, a further escalation is probable (Allison, 2010).

Rushton (2003) pointed that waste generation will keep on rising particularly in peri-urban zones. Expanding population levels, blasting economy and the ascent in community expectations for everyday comforts have extraordinarily quickened waste generation rates in Kenya (Rotich *et al.*, 2006). Ngoc and Schnitzler (2009) conceded out that population growth, changing ways of living, financial improvement, evolving wage, urbanization and industrialization leads to expanded production of waste. Experts in charge of household waste management have the task to provide a powerful and proficient waste management system to the occupants. Most nations globally face problems in handling waste. The quickened increment in population, industrialization, and urbanization combined with ineffectual and underfunding by the administration in the waste management division muddle the issue in developing countries (G.O.K, 2006; Konteh, 2009). This has led to increased production of wastes, (Ali, 2009) sorting of wastes, changing of habits, gathering, conveyance, treatment, and recycling of wastes.

In numerous districts and nations, national and worldwide goals have been formed for community waste reusing, retrieval and removal from landfill (Gakungu, 2011). Expanding ecological concerns and the accentuation on material and energy recovery, are bit-by-bit changing the orientation of solid waste management and planning. The model accounts for waste generation rates, arrangement, gathering, treatment, disposal, and potential natural effects of different solid waste management strategies (Otieno, 2010). In peri-urban regions of Kenya, the task of Household Waste Management (HWM) is actual (Ali, 2009). Waste Assembly schemes are wasteful and dumping procedures are not ecologically benevolent since in the vicinity of 30% and 40% of total solid waste created in municipal zones is not collected and under 50% of the population



is attended (Gakungu, 2011; Rotich *et al.*, 2006). In fact, the study indicates that close to 80% collection and transportation is not good thus requires change. It also indicated that if the issue of not maintaining solid waste management is not viewed as urgent, every town in Kenya will be engulfed in waste.

Without a doubt, peri-urban areas in Kenya have faced heavy challenges of household waste management so far. Uncontrolled production of solid waste, its' disposal, together with reduced collection facilities, pose a pronounced risk to ecological value and public health. On this account, wastes will end up being disseminated everywhere particularly on the streets, the fields, and wetlands (Chakrabarti *et al.*, 2009). The fact that uncontrolled production of solid waste and disposal, together with reduced collection facilities, pose a great risk to ecological value and public health (Bolaane, 2006; Rotich *et al.*, 2006) stresses this point. Without a doubt, peri-urban areas in Kenya have faced heavy challenges of household waste management.

Juja town, the location of this study plays a significant role in the Kenyan economy. Its proximity to Nairobi City and Thika Town has led to a huge migration. For example, the population of Kiambu County increased from 1,204,009 inhabitants in the year 1999 to 1,623,282 inhabitants in 2010 (G.o.K Census reports 1999 and 2009). This has led to an accelerated production of domestic waste. The management of domestic waste is currently a problem since waste dumping sites are often mismanaged and prohibited dumping is common. Consistent data on household waste value and amount in addition to environmental effects triggered by waste dumping are scarce since related data have certainly not been gathered. Present-day national regulation is inadequately structured as, for instance, the Kenyan regulation does not indicate the proper way in which waste management perception is to be established. This encourages unsuitable dumping of household waste and leading to environmental challenges and dangers to public health. The presence of these waste substances in the environment has effects that are seen to be minute but can cause diseases such as cholera and typhoid (Liyala,2011).

As in other cities and towns in Kenya, household waste disposal poses greater challenges to the surroundings and public health in Juja town and its environs. The

fundamental aim of Solid Waste Management (SWM) is to guard the health of the people and the surrounding, preserve natural resources, and promote sustainable development (UNEP, 2010). However, SWM in Kenya being a developing country is very poor with waste gathering rates occasionally below 70% and the gathered waste regularly dumped via open uncontrolled dumpsites, dumping in streets, drains and rivers, and burning (JICA Study Reports, 1998). The concern of HWM has developed into more challenges as waste generation continues to escalate with increase in population around Juja town. Consequently, the inhabitants tend to dispose on open lands, by the road sides and fill potholes on gravel roads while others burn the generated waste. Changes in processing of consumer goods containing harmful synthetic materials have risks to the environment and human health hence new methods are required for these products that are harmful when exposed to the environment. These issues demonstrate the need of coming up with a workable waste management model that aims at minimizing environmental pollution, attaining a minimum consumption of natural resources, and defending human health. This research therefore was aimed at understanding the HWM in Juja Town, Kiambu County.

## **1.2 Statement of the problem**

In Kenya, and specifically in peri-urban areas, merely 25% of the household waste produced every day is collected (Scheinberg *et al.*, 2011). The inadequate collection and unsuitable dumping of household wastes leads to aquatic, land and air contamination, and exposes dangers to the public health and the surroundings. A large number of waste gathered is dumped in undesired waste disposal places, for example; the nearest open space, roadsides, drainage systems, and open drains thereby causing environmental degradation (Ikiara *et al.*, 2006).

In Kenya, Juja Sub-County is one of the peri-urban areas facing household waste management challenges. The Sub-County is experiencing rapid population growth due to the presence of Jomo Kenyatta University of Agriculture and Technology, completion of Thika Super Highway and its close proximity to major urban centers such as Nairobi and Thika. This has led to an increase in household waste generation.

Unfortunately, waste management infrastructures available have not been increased to accommodate the current household waste generated. Therefore, residents opt to dispose household waste in undesignated waste disposal sites such as the nearest open space, roadsides, drainage systems and open drains thereby causing environmental degradation. Juja Sub-County lacks waste management flow analysis policies meant to control waste disposal (Ikiara *et al.*, 2006). This leads to uncontrolled household waste disposal which sometimes result to breakage of drainage systems. The lack of long-term waste management plans in the Sub-County has led to accumulation of household waste and a significant increase of undesignated dumping sites. This has been exacerbated by failure to educate the residents on HWM to help transform their negative perception on household waste management.

Challenges have led to negative implications towards waste management with subsequent consequences like creation of unhygienic living conditions, emergence of environmental diseases and environmental degradation. The Kiambu County Government which is responsible for the administration of Juja town has done little in managing household wastes in the town and its environs. Most residences are not covered by the County's waste collection services. The County Government staff lack the capacity to conduct environmental assessment while inadequate budgets for environmental concerns and poor implementation of environmental policies and regulations pose a serious risk to Juja town environment. Hence, there is a necessity to improve on the current state of household waste management around the town and its surrounding areas. Change and enhancement must begin with knowing the present- day state.

Hence, this study provides an outline of the existing methods of household waste management practices in Juja Sub-County and measures which can be laid out to household generated waste.

### **1.3 Objectives of the study**

#### **1.3.1 General objective**

To evaluate household domestic waste management practices, perceptions and attitudes

in Juja Sub-County, Kiambu County.

### **1.3.2 Specific objectives**

1. To document household waste management practices.
2. To assess factors determining household waste management.
3. To assess people's perceptions and attitudes on households' waste management.
4. To establish the Household general familiarity with various aspects of waste handling and the impacts of waste mismanagement in Juja Sub- County.
5. To establish implication of poor HWM practices and make recommendations in Juja Sub-County

### **1.4 Research questions**

1. What are the household waste management practices?
2. What factors determines household waste management?
3. What are the people's perceptions and attitudes on households' waste management?
4. What is the Households level of awareness of various aspects of waste controlling and the impacts of mismanaging waste?
5. What are the implications of HWM practices and recommendations in Juja Sub-County?

### **1.5 Justification of the study**

Due to high cost of housing in towns, most people opt to stay in the peri-urban areas where housing is cheaper than rural. Rural-urban migration has resulted in rapid population growth in peri-urban areas mainly because most of the people migrating to urban areas migrate in search of jobs and most of them cannot afford housing in the town centers and opt to live in peri-urban areas (Lambere, 2011). This has translated to escalation in household waste generation, as a result of inadequate waste management infrastructure facilities. Due to abrupt increase in population, the capacity of the

infrastructure available fails to accommodate the increased household waste generation. Consequently, residents adopt poor methods of waste disposal options such as dumping waste on the roadside. This is because peri-urban areas lack integrated waste management plans consistent with the rapid population growth and hence easily result in unsustainable household waste management options (Munyaga, 2016). Juja Sub-County in Kiambu County offers the best case study and opportunity to establish these facts.

Juja Sub-County is an area of interest to the study because; it is a peri-urban area and has evidence of poor household waste management as residents dispose household waste outside their homesteads. Due to increasing population and waste generation, residents have transformed areas outside their homesteads to dumping sites (Konteh 2009). Because of insufficient collection of waste by the relevant authorities such as the County Government, garbage is left to accumulate thereby creating unhealthy living conditions. Juja Sub-County stands out from other peri-urban areas because it's relatively flat, covered with cotton soil thus has low rate of infiltration. Poor waste disposal has led to blockage of drainage systems resulting to flooding during heavy rains. Unfortunately, measures are not put in place to manage the generated household waste by the increasing population. All these make Juja Sub-County a great case for this type of study.

## **1.6 Scope of the study**

The research was conducted at Juja Sub-County in Kiambu County and targeted two divisions in Juja Sub-County; Gachororo and Juja town. Gachororo is in the rural parts of the Sub-County. In comparison to Juja town, Gachororo can be considered as a rural since it is less industrialized and its' development is highly factored by Juja town. This was purposely designed to enable comparison of waste management practice between the two contrasting areas. Gachororo was taken as the rural area and Juja town as the peri-urban area. The research took a period of five months.

## **1.7 Significance of the study**

The research is of great significance to waste management actors since it outlines the challenges facing household waste management and the effects these challenges propose to the residents in peri-urban areas.

### **Government**

The study is of great significance to government as it outlines challenges faced by households in dealing with waste management issues. This can be of benefit for developing policy options that will enhance their participation in house hold waste management options.

### **Researchers**

The study adds to existing knowledge and therefore is of great significance to researchers. The study recommendation proposes research gaps that need further research, and therefore provides a baseline for other future studies.

## **1.8 Organization of the Thesis**

The central point of the research was to evaluate household waste handling in Juja. Specifically, the research was to determine the household waste management practices, perception and attitudes in Juja. To communicate the findings in this study, the thesis has been sectioned into five broad chapters as described below.

### **Chapter One: Introduction**

The chapter introduces the research topic, a general background and information about Juja Sub-County. It defines and outlines the statement problem, research objectives and questions.

## **Chapter Two: Literature review**

The section concentrates more on renewing the ideas outlined by other researchers on household waste management from a global perspective to a local perspective. This chapter is important because it aims at situating the research in the field of domestic waste management, gathering, and dumping as well as families' awareness of the same.

## **Chapter Three: Methodology**

The chapter describes the research design and methodological procedures that were used in collecting data, analyzing and interpreting the data and also presenting the results. The chapter also highlights on the constraints encountered during the data collection process.

## **Chapter Four: Results**

The chapter focuses on presenting the results in form of charts, graphs, and tables giving clear and distinctive presentation of result as guided by the set objectives. It helps establish whether the set objectives were achieved.

## **Chapter Five: Discussion**

This chapter presents the researcher's reflection on the issues raised on the basis of the evidence presented in Chapter four. This discussion offers opportunities that can be followed to offer a formal household waste management process that can be translated into the formal municipal waste management planning process in order to achieve effectiveness and efficiency for waste management sustainability.

## **Chapter Six: Conclusions and Recommendations**

The chapter presents a summary of findings in form of conclusions and finally out lines suggestions.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Global perspective of household waste management

Household wastes is the major contributor of municipal solid waste (Kibwage, 2002; Kaseva and Mbuligwe, 2005; Oberlin 2011) and is directly connected to urbanization and economic growth. In Kenya, household waste refers to wastes generated from homesteads as defined in the Waste Management Regulations (2006) and their quantities and magnitudes vary according to category (Al-Khatib *et al.*, 2010). As nations urbanize, their financial wealth increases. As ways of life and disposable income rises, utilization of commodities and amenities likewise rises, which results to a similar increment in the measure of produced waste. A study by GoK (2012) indicated that just around 1.3 billion tons of household wastes are produced worldwide consistently. This translates to 1.2 kg/capita/day. The real per capita proportions also are profoundly inconsistent, as there are extensive contrasts in waste production rates over nations, amongst urban communities, and even inside urban communities.

Household waste handling is becoming a main issue in urban zones since their generation rates have a tendency to be far lower in remote locations, where, the inhabitants usually have low living standards, buy less store-bought commodities and have experienced higher cases of re-use and recycling (Okot-Okumu, 2008; Scheinberg *et al.*, 2011). Presently, over 50% of the global population inhabits cities, and cases of urbanization are rising rapidly. This will complicate issues particularly related to waste dumping. People and companies will probably be required to accept greater accountability for waste production and dumping, item design and waste partitioning. In addition, liable to raise is more noteworthy stress on 'urban mining' as the major source of items for instance metal and paper might find its way to cities (UNEP, 2010).

Wastes are generated as an end product of people's activities and ways of living that drive a significant part of the global economies. Solid waste is the greatest noticeable



and malicious end product of commodity utilization, and activities of human beings. Greenhouse gas productions, aquatic contamination, and endocrine disruptors are the same by-products coming because of urban lifestyles (GoK., 2012) Although, this thesis has no capacity to discuss long term sustainability of present-day worldwide economic structure, stakeholders in household waste management need to focus on the worldwide framework of solid waste and the relationship with economies, local and universal pollution (UNEP, 2010). A study by Urban Development Series (2012) estimated global household waste generation to be about

1.3 billion tons annually, and is projected to rise to roughly 2.2 billion tons annually in 2025. This shows a substantial rise in per capita waste production, from 1.2 kg to

1.42 kg per individual daily in the following ten years. In addition, worldwide means are wide approximations only as rates differ significantly by region, nation, city, and even within cities.

Household waste production proportions are impacted by financial advancement, the level of development, standard of living, and local environment. For the most part, the higher the financial improvement and rate of industrialization, the more prominent the measure of solid waste created. Wage level and industrialization are closely associated and as throwaway incomes and expectations for everyday comforts rise, utilization of goods and services similarly rises, and also the measure of waste created. Urban inhabitants deliver roughly double as much waste as their rural colleagues (Tacoli, 2012).

Urbanization has happened quickly in the last couple of decades; about a large portion of the global population is presently staying in urban areas. The rise in competitiveness between nations and cities in the globe to pick up their position in the worldwide market and diplomatic significance exacerbates this occurrence (Cohen, 2004; Konteh, 2009). At the beginning of the twentieth century, around one million individuals inhabited just around 16 cities globally and most of these numbers came from the developed nations. Be that as it may, toward the start of the 21st century, around 400 cities were occupied by more than 1 million individuals and around seventy five percent of these fresh urban zones were industrialized in low and average

nations (Okot-Okumu 2008; Scheinberg *et al.*, 2011). This fast growth of urban centers in the little and average economic nations is usually not appropriately designed and has led to numerous land use and other related issues that have beset household waste management practices in the evolving nations (Cohen,2004).

It is predictable that a large portion of global populace development will happen in urban zones from at present till 2050 and those poorer nations will experience the most elevated rise amid this period (Okot-Okumu 2008; Scheinberg *et al.*, 2011). Bearing in mind the poverty level of these unindustrialized nations and the absence of ability of the managements of these nations to give satisfactory community facilities and other programs to the occupants of these large urban areas, more individuals will be compelled to stay in slums and different sites where the state of hygiene are awful and waste management programs are not accessible or are deficient (Konteh, 2009; UNFP, 2010; Marshall and Farahbakhsh, 2013). The household waste management services in these profoundly inhabited low-income homesteads are commonly insufficient and not available in most cases. These are the places that most require waste management programs because they lack adequate space within the densely and poor built houses where they can discard the wastes either by burial or composting. Therefore, they dispose their wastes without any proper manner (Oberlin,2011).

Waste management programs in such unstructured settlements are generally not accessible or sufficient, because of the disordered nature of the buildings, absence of free area for waste bins and waste gathering vehicles, poor roads and non-tarmacked streets that are sloppy thus making the area inaccessible (Henry *et al.*, 2006; Coffey and Coad, 2010; Oberlin, 2011; Onu *et al.*, 2012). This insufficiency in waste gathering brings about disposal of wastes in any accessible land or into water bodies, a case that can prompt water and soil contamination and possibly a progression to ecological and public health dangers (Oberlin, 2011; Lambere, 2011; Scheinberg *et al.*, 2011).

Executing a waste management program includes coming up with policies that govern land utilization. Land usage regulation is an essential procedure in urban improvement (Medina, 2002; Rushton, 2003). Land zoning segregates land mass into a number of sections through directions that gave specifications to land utilization, for example, residential locations, industrial and business regions, forest reserves, recreational and

tourism destinations and in addition infrastructural and social comforts areas. Urban development strategies ought to include all the general public lands use requirements in a justifiable way. This includes the advancement of a land utilization strategies and the assessment of the scheduling application procedure (UNEP, 2010). The localities of waste management sites and facilities as stated by the municipal land usage strategies has been troubled with a number of administrative, ecological, financial, and socio-political matters. Waste management site citing in most cases faces resistance from nearby residents, bringing about the lack of accessibility to the waste management facility. Regardless, it is vital that waste management measures be incorporated and executed in urban development strategic programs (JICA Study Reports, 1998; UNPD, 2001). Consequently, for land-use strategies to be viewed as sufficient, it ought to give this important requirement in an inclusive way. It is essential that land utilization strategies must give satisfactory direction for the region of the facility inside the designated area. This ought to incorporate particular targets indicated in the waste management procedures for the said region with the required planning systems (JICA Study Reports, 1998; UNPD, 2001).

Land use ought to be assigned as per the projected forthcoming usage, and entire urban improvement plans inside the urban zone must be in accordance with the land usage strategies. This is imperative since, as the city state develops and grows, the land utilization strategies will be beneficial to organizers and policy creators in the development and improvement of the urban areas in a reasonable and proper way instead of a disorganized manner (UNPD, 2001). Land use strategies additionally gives designers and policy makers the space to create and grow the city centers reasonably via the incorporation of environmental, innovative, conservative and opinions given by the citizens in the strategizing and implementation procedure of developments (JICA Study Reports, 1998; UNPD, 2001).

## **2.2 Local perspective of household waste management**

Household Waste Management (HWM) is a major issue affecting public health as well as country cannot convey services successfully, regulation of the private sector is constrained, and illegal disposal of household wastes as well as industrial refuse is a

common phenomenon. County governments tasked with giving municipal services have discovered that it is difficult to assume these roles (UNEP, 2010). The state of wastes in Nairobi, which is perceived to portray Kenya's position, is to a great extent characterized by poor and insufficient methods of dealing with solid wastes, contamination from careless disposal of waste, inefficient public administration, unregulated and inept private sector and absence of proper solid waste management facilities. Solid wastes produced every day amounts to 4,016 tones (Allison, 2010). At the regional level, the County Government of Nairobi is the body that has the essential responsibilities in ensuring that the HWM services are available to the city of Nairobi. NCC conveys its HWM services through the Department of Environment (DoE) under the cleansing unit (JICA, 1998). Until the mid-1970s, the cleansing unit gathered more than 90% of the waste. As years passed by, there was a decline in the number of vehicles that gathers wastes because of absence of suitable maintenance of these vehicles (Kumar, 2008). Then again, the development of industries and businesses in the regions brought about an increased urban relocation, enhanced ways of life and improvement in technology, which thus prompted an increase in waste generation.

At around 1985, NCC gathered just 20% of the municipal solid waste, which left around 290,000 tons of solid waste at the Dandora disposal sites, situated around 7.5 km from the Central Business District (CBD), from industries, organizations, business foundations, and residential areas (Esho, 1997; GoK., 2006). In the 1998 JICA research, NCC approximated that more than 60 privately owned businesses enrolled under the Company Act were taking an interest in waste gathering.

There are business-gearred actions in open and unregulated competition giving services to whom and where they like and collecting tariffs specifically from the consumers. They stay uncontrolled and work with no institutional or legitimate control. Municipal private association in HWM in Nairobi begun in 1997 when NCC participated in massive collection and lanes, streets, fields and market clearing and transportation of the waste to Dandora disposal sites regularly in the Central Business District (CBD) to Kenya Refusal handlers (normally referred to as handlers). This enhanced the collection from 40% to 90% in the Central Business District yet delayed payments meddled with

operations (Kibwage, 2002). In 2001, the collection of waste from public places and transportation to Dandora disposal sites was contracted out in different parts of the city. In 2004, the existing districts that were responsible for waste management were reconsidered to 9 divisions as per the constituency borders separated from Central Business District that was removed out from Starehe Division. The contractors were then disseminated into these divisions. More than 13 contractors have been locked in and allotted into the different divisions by NCC. The Divisional officers were in charge of directing these temporary workers on the courses to take especially when they are in the field collecting the wastes and taking them to the dumping locales. It is the duty of the waste generators to take the waste to the collection destinations. In the low income and the slums in the city, Community Based Organizations (CBOs), funding organizations, welfare groups, rural committees, self-help groups and Residential (neighborhood) Associations (RAs) are giving helpful pay ranging from one hundred to three hundred Kenya shillings every month while at the same time providing jobs to the unemployed people. These services comprise waste treatment, collection, and conveying the wastes, storage, selling and reusing of some composition of wastes, for example, plastics and glass.

### **2.3 Household waste management practices**

Household waste management activities minimizes or eradicates adverse effects on the surroundings and public health and aids financial growth and improved standard of living (Prüss *et al.*, 1999). HWM practices can be studied from three perspectives, public health, environmental protection and resource management.

#### **2.3.1 Public health**

The proper evacuation and consequent management of wastes generated in the households and the handling of human fecal matter (sanitation) signify two of the greatest essential municipal environmental practices. Other fundamental values and amenities, for example, water availability, electricity, transport and settlements frequently get more consideration (significantly more finance). Neglecting to oversee

legitimately the 'back end' of the product cycles a straight effect on human wellbeing, life expectancy, and the people and their usual surrounding. Uncollected refuse blocks drainage, and results to flooding and dissemination of waterborne infections. This was the reason for a main flooding in Surat in India in 1994, which brought about diseases in the country, affecting 1000 individuals and causing deaths to 56 people. Yearly water overflows in East and West African, and Indian major towns are blamed due to blockages caused by the plastic bags to the drainage system. (Prüss *et al.*, 1999).

The task of cities to give solid waste management facilities goes back to the mid-nineteenth century, where the spread of illnesses was connected to poor sanitation and lack of proper methods of dealing with solid wastes. There are well known cities in the world that have had proper ways of dealing with wastes. Many studies have demonstrated that the extent of waste collection from cities in industrializing nations, ranges from 10 to 90 percent in peri-urban regions and in central business district respectively. This implies that numerous households get no waste management practices at all and that an excessive amount of wastes will finally be deposited on the land. UN-Habitat health information also demonstrate that cases of diarrhea and problems related to respiration are altogether higher for the school going children living in households that are located next to disposal sites, or burned in those sites, contrasted with households in similar location where waste collection services are provided on regular basis (Asnani, 2006). Shockingly, the same happens in Europe and North America where littering waste management authorities in Naples, Italy quit collecting the wastes since the majority of the area's landfills were full, and inhabitants protested wildly (Asnani,2006).

### **232 Environmental protection (Waste treatment and disposal)**

Before environmental movement began in 1960s, the refuse generated by households received no treatment and were disposed arbitrary: to land, open dumpsites; to air, through combustion of volatile substances; or to lakes, seas and oceans, by allowing solids and liquids wastes to land, water beneath or the sea. There was less concern for the impacts on water for consumption and wellbeing of the inhabitants around. For the

last 30 to 40 years, nations and municipalities looking to regulate the increasing amounts of waste and to attain a hygienic ecosystem have built up skills about best alternative. In the course, monitoring aquatic contamination and methane discharges from dumpsites, and air contamination from burning the wastes, gets an increasing consideration (JICA Study Reports, 1998).

Attention in developed nations is currently directed to other avenues, but many municipalities in underdeveloped nations are still looking for ways to eliminate open dumps and launching a controlled disposal. This is the required initial phase towards proper waste handling; a well-regulated landfill location is a crucial requirement of any current waste handling structure. Any knowhow's and apparatus used, they should be suitable for and modified to fit the local conditions. For instance, the small city of Ghorahi in Nepal, which is not endowed with resources just like Gachororo and Juja town, has effectively managed its waste by the process of waste sorting and reusing, proper land filling procedures, collection and treatment of liquid wastes, and forests to provide ambient ecological condition, fields and a bee farm that protects the area from the neighboring zone (UNEP, 2010).

New advancements are being piloted to treat household wastes, and the inventors aim at both industrialized and developing nation municipalities. In this author's opinion, this is acceptable, nonetheless it is significant that policy makers have the facts they require to make the right decisions. Unfortunately, advancements done in the industrialized nations for moderately waterless wastes with high energy content may not operate when compared to wastes in the developing world that have water and are purely organic with minimal energy content (UNPD, 2001).

### **233 Resource management (Valorization of recyclables and organic materials)**

Before industrialization, a number of cities were not well endowed with resources, finance was scarce, and most homes had a lot of needs than they could not meet. Wastage had to be reduced, most products had to be restored and recycled, resources were reused, and carbon-based material was reverted to the soil. Widespread informal reutilizing schemes thrived, but started to be replaced by modernized city waste collection procedures towards the end of the 19th century (Sheinberg and Ijgosse, 2004).

Reusing and resources recovery turn out to be so common, but nearly unnoticed, private industrial practices. For the period of the past 10–20 years, the developed nations have been appreciating the necessity of reusing as an essential component that can be used in management of wastes, and have set aside more finance to improve both physical resources and communication approaches to improve waste reusing rates. Their drive is not chiefly the product worth of recycled thing, that was the main objective of the past, informal or private departments, organizations. But the primary aim is that the reusing market provides a reasonable ‘sink’, as a substitute to progressively escalating expensiveness of landfill, burning of other treatment decisions (Marshall and Farahbakhsh,2013).

A number of developing and moderately developed nation cities still exhibit functional informal ways that are being used in reusing, recycle and repair arrangements, which in most cases attain reusing and recovery rates analogous to those found in the west. Furthermore, by managing those huge amounts of waste that would else be gathered and dumped of, the informal recycling division can help the cities in cutting down the budgets incurred in waste management. There is a great potential for the concerned departments to reinforce the available facilities, to improve the current reusing state, to defend and to improve residents’ standards of living, and to decrease still more the budgets of handling the waste remains. Various stakeholders are required to work in unison, if they need to obtain mutual benefit (Rushton, 2003).

The primacies of decent resource management are illustrated by the ‘**4Rs**’ reduce, reuse, recycle and recover: **Reduce** the amounts produced. This is currently applied used by developed countries to manage wastes; but it is, significant also for fast developing cities in moderate and underdeveloped nations to regulate the generation of household wastes. **Reuse** materials that can be recycled, restored, renovated, or remanufactured to attain extended usefulness in the society. **Recycle** products that can be obtained, refurbished, and reinstated to its initial state, in this case they reinforce local, regional, and international production. **Recover** by decaying or processing remains of organic matter (‘bio-solids’), that is, remains after cooking, land and agricultural produce, and



also with properly handled and treated fecal from humans. These are important nutrients that can be used in agriculture to produce crops. Their appropriate utilization is necessary for maintaining food security and sustainability.

#### **2.4 Perceptions and attitudes on household waste management**

In the present day, the most imperative issue that affects people and raised great concerns is waste management. Waste handling practices practiced particularly by the municipal for solid waste vary for industrialized nations, developing nations, urban regions, remote regions, households, commercial, and manufacturing industries. Procedures for waste gathering differ significantly among various nations and regions. Household waste collection facilities are regularly given by municipalities, or by private corporations in the city areas (Marshall and Farahbakhsh, 2013). Nations and specialists alike devote a lot of time and funds to look for appropriate solutions to the issues related to waste management and environmental destruction as a result of activities from mankind for instance the act of consumerism (Wambui and Mwangi, 2014). In the past years, most of the items utilized are disposable or ready-made, which leads to resource wastage. (Asnani, 2006).

Even though public involvement has an immediate bearing on efficient SWM, urban authorities have unsuccessfully mobilized the public and educated residents on the importance of good waste management practices (Asnani, 2006). In the lack of a basic waste collection service at the point of generation, people are likely to dispose waste on the streets, open spaces, drainage systems, and rivers and lakes that are nearby thus creating insanitary environment. They assume that household wastes disposed on various places in the city would be collected by the municipal employees when they are doing street sweeping. For the inhabitants in these areas, who are quite uninterested in waste disposal procedures, the duty of keeping the city unpolluted is completely on the County Authorities. This notion is mainly responsible for the improper schemes of waste management in Kenya. The significance of this research has a direct impact to the present-day environmental problems. (Asnani, 2006). There is a global response concerning the issue of waste management by the global leaders. In most cases, the

current efforts are inconsistent since all the participants want others to regulate the pollution. Willingness to sponsor all activities related to waste management services or facilities is very significant to the achievements of the Private Sectors' Participation (PSP) in Waste Management plans. The will to or not to offer sponsorship could have direct influence positively or negatively on the dependability and realization of every solid waste management policy (Coffery and Coad, 2010; Rahman *et al.*, 2005).

One's ability is observed to establish a threshold to what can be done and eventually what can be attained (Henry *et al.*, 2006). Perception can influence one's conduct (Merton, 2001) regarding SWM services. Personal point of view will impact the social standards, reactions, and achievements of the solid waste handling procedures. Therefore, individual's opinions on waste dumping and on waste gathering programs are significant for their willingness to pay. Their failure to pay might lead to illegal incineration and disposal. In fact, Fullerton and Thomas (1995) pointed out that domestic collection must be subsidized so as to avert external environmental costs caused by illegal disposal. Voluntary to payment for waste handling services is actually significant to the achievements of the private organizations' contribution in a SWM services. The readiness to or not to acquire these services may have direct influence on dependability and achievements of any solid waste management approaches (Rahman *et al.*, 2005). The concern therefore relates to the finances of domestic waste management particularly in a developing economy for instance Kenya.

The maximum charges for domestic waste collection equal to resource costs in addition to other external environmental charges (Gakungu, 2011), based domestic waste gathered. This is levied on weight-based valuing in Oostzaan, Holland. The pricing in this country cannot be applied especially in developing nations where the actual amounts of household waste generated cannot be quantified (Skumatz and Beckinridge, 1990). In Kenya, charges imposed for waste management services by the authorities are based on direct charges of household. The fee paid for collection of generated waste per house is not based on the quantity of the waste produced, but on the site and type of households. The cause of disagreement here is the fairness in the decision on charges made by the collectors which consequently improves the willingness to pay or not to

pay.

## **2.5 Factors determining household waste management**

Wastes have got different meanings according to different people (Moore, 2012). According to some people for instance the waste collectors and waste scavengers in Nairobi and other town centers in Kenya, –wastell is perceived as a commodity or a way to create revenue in an otherwise inadequate job market. In contrast,

various individuals perceive waste as a load and a problem that requires to be dealt with. Nevertheless, knowing waste as a major challenge does not avert scattering or additional undesirable manners regarding waste control (Gakungu, 2011). The variation in attitude/behavior occasionally occurs and can be influenced by a number of factors such as suitability, social customs, absence of public partaking, and non-existence of knowledge and responsiveness of working waste management systems (Rahman *et al.*,2005).

In between this attitude/behavior breach there is irregularity among people's ethics and activities. This exactly highlights the difference amongst people's worry on environmental damage caused by the wastes that they generate from their homes and the inadequate action by the same individuals to diminish their waste or involve in other pro-environmental actions (Wambui and Mwangi, 2014). A negative conduct is regularly linked with the mishandling of wastes in unindustrialized nations is the incidence of waste scattering. There are several of reasons that can result to an elevated case of public littering rates, for example, absence of social pressure to avert scattering, lack of truthful punishments or steady enforcement, and absence of information on the environmental impacts of littering (Al-Khatib, 2009). Another reason also is the quantity of wastes already existing at a specific location, existence of signs highlighting the waste, and the number and/or placing and the visibility of waste collection baskets at the location. Accessibility of waste collection bins has been reported by researchers as significance when disposing the waste, and if these are unavailable or absent in areas, it has been a major cause of littering (Henry *et al.*, 2006). Another major constraint is

absence of training and consciousness of efficient waste management activities. A research in Gaborone, Botswana, pointed out that despite the fact that inhabitants knew the idea of reusing and other workable waste handling methods, it does not essentially translate into contribution in pro- environmental doings, for example, reusing initiatives (Wambui and Mwangi,2014).

The absence of attention towards the environment leads to a society that is not responsible in various ways for instance policy making. That attitude boosts lack of accountability for contamination by waste. Eventually, this builds societies that bears small knowledge of, or responsibility for, their influence on the surrounding (Merton, 2001). Thus, it builds a circumstance where it becomes essential to distinguish between information and knowledge. Being provided with the information minus having previous knowledge is not effective in producing change. However, if previous understanding of waste management is achieved through new information, societies might be more eager to receive it and implement the results. Hence, to come up with workable waste management schemes it is essential to endorse environmental citizenship amongst public associates, to expand public awareness and public participation in household waste management. Individuals maybe more probable to contribute in waste management actions, when they see others in their locality participate in waste management practices, for example reusing. Unluckily, recycling plans are uncommon in developing nations, so richer people in the community depend on informal reuse (Wambui and Mwangi, 2014).

## **2.6 Challenges of household waste management in developing countries**

A representative waste treatment scheme in an evolving nation shows a collection of challenges, with minimal collection reportage and inconsistent collection, disposal of wastes anyhow, incineration and water contamination regulation, the raising of flies and other insects, and the management and regulation of waste collection or scavenging actions. These public health, ecological, and strategy challenges are as a result of several aspects that limit the achievement of efficient solid waste management schemes. These issues can be separated into technical, economic, institutional, commercial, and

societal restrictions. (Okot-Okumu and Nyenje. 2011) as discussed below.

### **2.6.1 Technical constraints**

Many developing nations are faced by absence of physical resources both at the country level and at County levels, as well as appropriate knowledge required for waste management strategies and action. The officials responsible for waste management, especially at the regional level, have slight or no appropriate knowledge or education required in waste management. Hence, the growth of human resources is crucial for the activities of waste management plans (Medina, 2002). Additional technical challenge is the absence of complete strategies for waste management at the regional and countrywide levels. Consequently, authorities choose a waste skill minus due reflection to its suitability, or foreign support is provided to a constituent of a waste treatment scheme for which the utilization of resources might not be best cost- effective, for example, an upgrade to a general dumping location in a region of minimal collection coverage but waste given off disposed at several undesignated places (for example open fields, drainage systems and streets). Thus, improving the disposal site is a good idea but it will create small influence on the whole waste management efficiency.

Studies and expansion of activities related waste management are of low significance in developing nations. This leads to choosing the unsuitable methods in relation to the regional environmental state, economic and human resource abilities, and communal or ethnic satisfactoriness. Consequently, the method of waste management chosen can never be employed, wasting the resources used and making the methods inappropriate (Medina, 2002).

### **2.6.2 Financial constraints**

Just like in any developing country, waste management activities are given less concern in Kenya. Therefore, very inadequate resources are set aside for waste management authorities by the government. Thus, the degree of attention needed for safeguarding the public health and the environment are not achieved (UNEP, 2010). In the County administrations, the tax policy scheme is inadequately structured. Thus, the economic basis for community services, with waste management, is not good. The gathering of

user service duties can enhance this inadequate financial support of local governments. Nevertheless, users' capability to acquire the services is inadequate, and their readiness to acquire these services which are irregular and unsuccessful is little (UNEP, 2010). In fact, the local governments lack good economic management and organization expertise. This exhausts the inadequate resources available for the division and leads to stoppage of waste management services as soon as possible.

### **2.6.3 Institutional constraints**

A number of authorities at the national level regularly take part at least to some extent in household waste management. Conversely, there exist no distinct responsibilities of the many national agencies distinct in relative to waste handling procedures. Similarly, there exists no single organization or commission formed to manage these developments and actions. These results to replication of efforts, mismanagement of resources and inappropriateness of general waste handling strategies (Medina, 2002).

The absence of efficient management for wastes is incomplete accountability for the responsibilities of the appropriate state authorities not being evidently stated and the absence of organization between them. Laws governing the waste handling in Kenya are commonly subdivided. Some regulations (for instance, Public Health Act of 2012, Local Government Act, Environmental Management and Co-ordination (Amendment) Act, 2015, and Health Act NO 1 of 2017) comprise sections that define how household domestic wastes should be handled. The rules are enacted by various authorities which resulting into duplication of duties among the organizations taking part in waste management procedures. There should be clear statement indicating individual role and this will ensure a sustainable protection of environment. It should be considered that law enforcement is only operative if it is provided. Thus, complete lawmaking, which does not include the replication of duties, seals in the breaches of vital governing functions, and is practical, is needed for workable improvement of waste handling procedures (Medina,2002).

In smaller cities and towns, official capacity of state agencies involved in waste

handling practices is generally weak due to the urgency given to the segment and undeveloped by-laws on waste management. These local organizations are not given clear orders and enough funds to accomplish the orders.

#### **2.6.4 Economic constraints**

Financial growth and improvement of industrialization contribute greatly towards household waste regulation because an improved economy allows more resources to be set aside for domestic waste treatment. (UNEP, 2010) Kenya, being a developing nation, has an economic background that is not strong, and therefore inadequate finance for proper expansion of waste management schemes. Lack of sufficient waste equipment and vehicles are always the reason of irregular and inadequate waste gathering and dumping facilities. This is accelerated by the deficiency of local manufacturing of the waste apparatus and spare parts and inadequate finances to import the same (UNDP, 2001). Furthermore, waste reuse undertakings are influenced by the unavailability of industries to accept and recycle products. For example, the reusing of waste paper is likely if there is a processing plant located near a place thus the conveyance of waste paper is inexpensive. This developing industry for recycling services is limiting in the development of waste management in urban and peri-urban regions where a huge amount of package waste is produced (Coffey and Coad, 2010).

#### **2.6.5 Social constraints**

Waste handlers tend to shy away from collecting wastes. This is because of the negative perception of people in regard to handling of waste materials. This results in lack of respect for the effort and eventually yields low working morals of workers and poor workmanship. Due to inadequate funds from Government sector, cooperative projects have tried to summon public resources to improve society activities, for instance, waste collection and related services. Outcomes are a combination of achievements and failures. The social incentive to participate in these activities is initiated through community awareness and school education programs, absence of which severely restricts the utilization of community-based methods in waste management (Oberlin,

2011).

Waste collecting or scavenging services are common activities at disposal sites, transfer stations, and street waste containers, in major urban centers of developing countries including Kenya (Kibwage, 2002). The waste pickers have not been trained on the information and abilities needed for the job and are motivated by lack of employment opportunities in the country. If well ordered, their actions can be efficiently combined into waste reusing schemes for sustainable development of waste management programs (Kibwage, 2002).

## **2.7 Summary of literature review**

Household waste management is inextricably connected to industrialization and economic growth. As nations industrialize, their financial status, ways of living, disposable earnings and the utilization of goods and services also changes. Each of these leads to an equivalent rise in the quantity of waste produced. About 1.3 billion tons of household wastes are produced worldwide each year, which translates to 1.2 kg/capita/day (GoK., 2006). Household waste mismanagement is a great concern to public health and the environment in urban and peri-urban areas in Kenya. This is because responsible authorities are incapable of providing services successfully, provision from private corporations is inadequate, and unlawful disposal of generated waste is usually exercised (Medina, 2002). The nation's waste state is characterized by inadequate services of waste collection, contamination from unregulated disposal of waste, ineffective community services, unregulated and uncoordinated private sector, and absence of important facilities to manage wastes (UNDP, 2001).

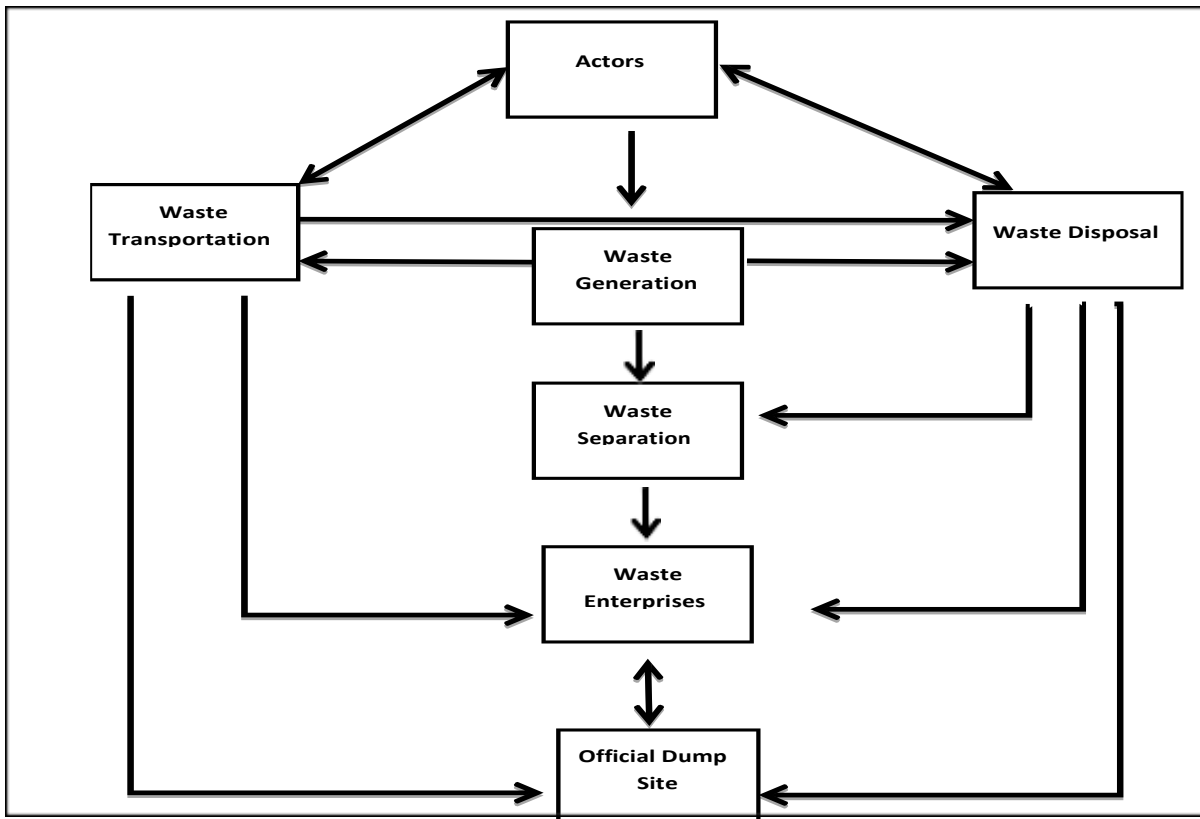
The absence of attention towards environment generates a culture of community negligence towards contribution in policymaking procedures and increases absence of responsibility for waste matters. Presenting information while lacking previous knowledge may be unproductive during waste management practices. Still, if previous information about waste handling is combined with fresh information, societies could be more enthusiastic to receive it and put into use necessary changes. It is therefore



necessary to reinforce public mindfulness, and public participation in waste handling to produce workable waste schemes and to endorse environmental citizenship amongst members of the public (Wambui and Mwangi,2014).

## 2.8

## Household waste management model



*Figure 2.1: Household Waste Management Model*

### 2.8.1 Explanation

Waste generated in households is mostly organic. However, its composition depends on the source while its volume is dependent on the population and nature of the enterprises and institution. There are two ways of waste disposal, organized and unorganized. In the unorganized way, people mainly dispose waste outside their homes, into rivers, drainage systems and on the roadsides. This is the most common in developing countries. On the other hand, the organized way is mainly done by the County Government, private garbage collectors or CBOs. (UNEP,(2010))

In developed countries the common method of waste disposal is landfills ( F.A.O., 2011). After waste is generated it is transported either to common collection points where separation of waste takes place or it's directly transported to the dump site. Due to encouragement of solid waste enterprises after separation of waste the enterprises takes the waste which they can use and the rest is transported to the dump sites (UNDP, 2014). The county authorities are accountable for household waste management in urban centers, but are not able to perform this duty simply by recommending or undertaking actions in isolation, completely by themselves. The most appropriate solid waste procedures include all the stakeholders in strategizing, applying, and ensuring change is effected (Medina, 2002). According to UNEP, (2010) a household waste management scheme contains three main clusters of participants. First, the providers, as well as the residential authorities, who really give the service; then the consumers, these are the customers; and finally, the external mediators in the sustainable environment, thus both state and county government, who establish the boundaries and make possible changes. The households are important stakeholders in waste handling procedures, and also the NGOs, self-help groups, and other cooperation that represent them in the strategy and administration processes. A variety of worthy practices in the waste management systems include: involving the stakeholders and ensuring proper communication, proper planning that is inclusive of all planners, inclusivity in placement of waste management amenities, and introducing inclusivity, in the solid waste platform' (UNEP,(2010)).

Waste management is done by the organizations in the city in collaboration with private investors. The local authorities also reinforce services by providing necessary knowledge especially of waste recycling and disposal services, and education of household members on how to handle the wastes generated. In developing nations, all the services related to waste handling are important since it has provided a form of employment to approximately 0.5 percent of the urban inhabitants particularly the unemployed. (Kumar, 2008).

## **2.9 Conceptual framework**

Independent variables in this research included domestic waste management activities, factors determining domestic waste handling activities. People's perceptions, and attitudes on households 'waste management and society's overall mindfulness of various ways of waste management while the dependent variable is household waste management.

These are shown in the Figure 2.2 below.

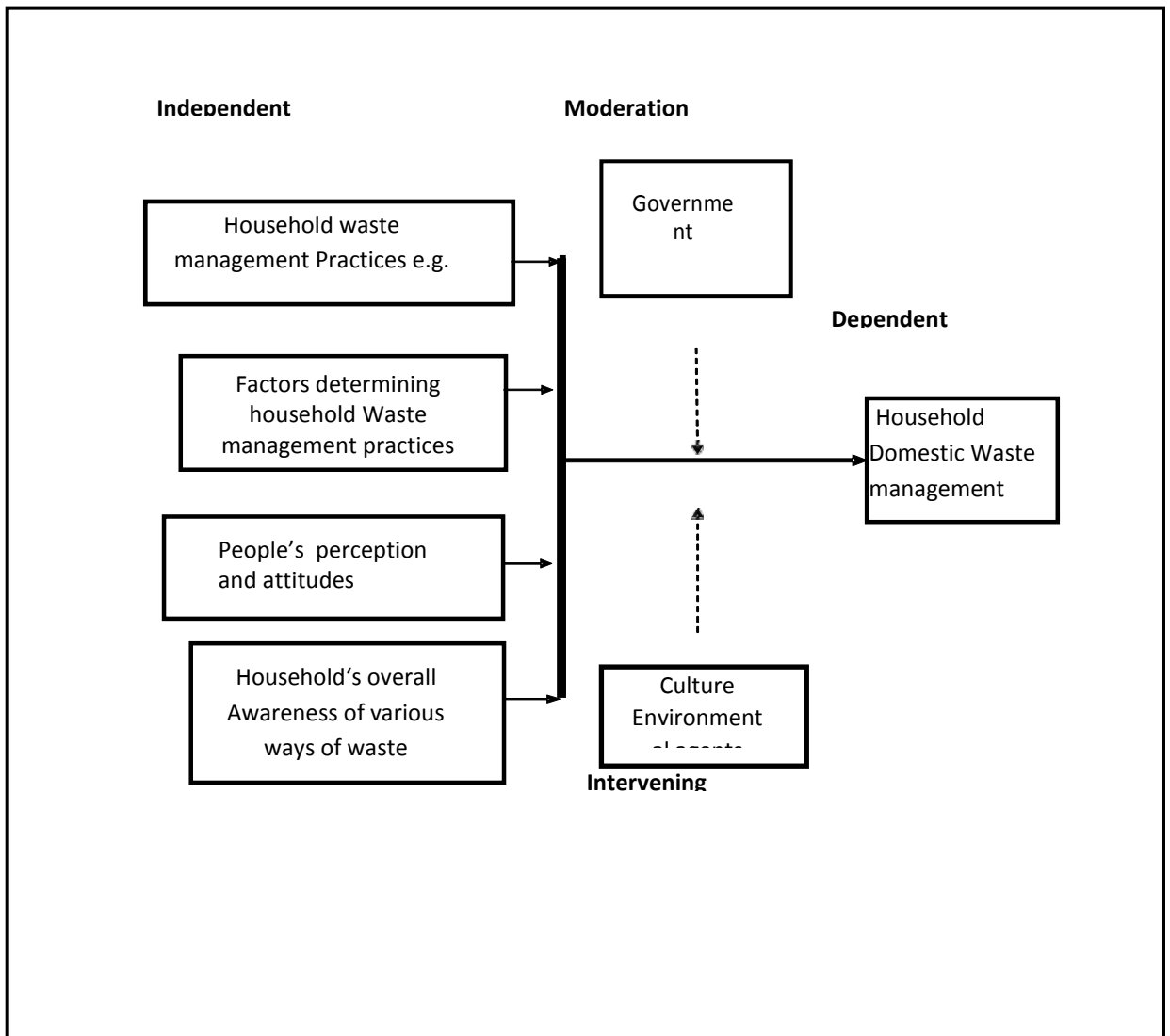


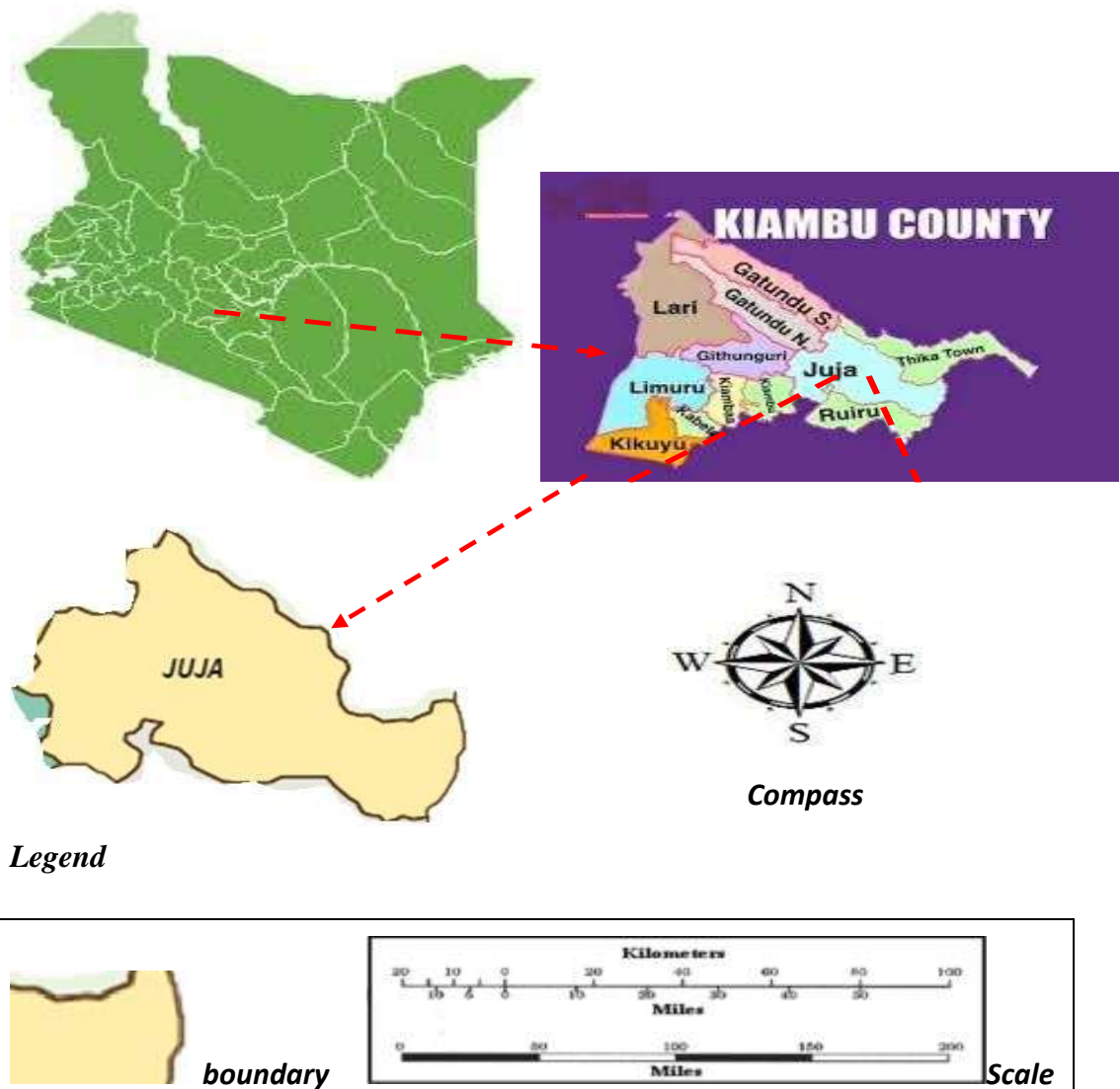
Figure 2.2: Conceptual Framework

## CHAPTER THREE

### 3.0 RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter discusses the research methods and techniques employed for data collection in the study. It describes the research design, the variables of analysis, target group of population, sample and sampling methods, data assembly procedures and tools, data treatment and analysis methods.



*Figure 3.1: Map of the study area showing the location of Juja Sub-County in Kiambu County. (Source: Google Earth, 2016)*

### **3.2 Study area**

The study was carried out, in Kiambu County. The study targeted Juja Sub-County so as to evaluate domestic household waste management practices, perceptions and attitudes in Juja Sub-County, Kiambu County. The study sites are shown in Figure 3.1 above (GoK, 2014)

#### **3.2.1 Topography and Climate**

Kiambu County is divided into four topographical regions namely; upper highland, upper midland, lower highland and lower midland. Its general altitude ranges between 1500m to 1800m above the sea level, which influences the climate. The County lies between latitudes  $0^{\circ} 75'$  and  $1^{\circ} 20'$  south of the equator and longitudes  $36^{\circ} 54'$  and  $36^{\circ} 85'$  east. The rainfall regime is bimodal and reliable. Long rains fall between April and May while short rains fall October to November. The rainfall range is 500mm to 1500mm, with Juja Sub-County receiving an average of 500mm. Water resources comprises of both surface and ground water.

The mean temperature is  $26^{\circ}$  Celsius with average temperatures ranging between  $4^{\circ}$  Celsius in Upper highlands and  $34^{\circ}$  Celsius in Lower midlands like Juja Sub-County. The lowest temperatures are experienced in July and August whereas January, February and March are the hottest months.

The County has three broad categories of soils on high uplands, volcanic footbridges and plateaus. The soil falls under plateaus and are characterized by sandy or clay loam soils which are poorly drained (Kenya Meteorological Department).

### **3.2.2 Population and Economy**

The population of Kiambu County increased from 1,204,009 inhabitants in the year 1999 to 1,623,282 inhabitants (GoK, 1999; GoK, 2009). Kiambu County is densely populated, influenced by various factors such as Rural-Urban migration, well developed infrastructure, industrialization and its proximity to Nairobi city. Juja Sub- County has a population of 118,793 persons, (GoK, 2009). Juja Sub-County residents are into dairy farming; rearing of pigs, poultry and dairy goats, cattle and sheep (MLFD, 2005). Small scale farming is also practiced. Due to peri-urban development, establishment of learning institutions and industries, there is a ready market for the small-scale farmers (MLFD, 2005).

### **3.3 The Research Design**

The study employed descriptive research. This was because of the study's interest in determining and reporting the way things are, and also the need to describe possible behavior, attitudes, values and characteristics (Mugenda and Mugenda, 2003). The descriptive method permits the outcomes to be presented by simple figures, tables, average scores, percentages and frequency distributions.

The unit of analysis was the household and the head of the household was the respondent. Purposive sampling was used to select the divisions while simple random sampling was used to select the households. One rural and one peri-urban were selected as the divisions to compare their waste management practices. Gachororo and Juja town were selected to represent rural and peri-urban respectively.

### **3.4 Target Population**

The population covered by this research was divided into two divisions of Juja Sub-County. The two contrasting locations (one rural and the other peri-urban) were selected so as to enable comparison of waste management practices between Gachororo and Juja (Figure 3.1). According to the 2009 census, Gachororo has a total of 10,000 households



while Juja has a total of 25,000 households. Thus, the target population of the study was 35,000 households.

### 3.5 Sampling Frame

Due to financial and time constraints, the study was not able to cover the entire target population and carry out profound assessment. Therefore, a sample size was determined by the use of random sampling prior to administration of household questionnaires.

The formula below recommended by Ngoc and Schineze (2009), was used to determine the sample size.

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

From equation 1 above, n = size of the sample

N =Population size = 35,000

e = margin of error = ( $\leq 0.07$ )

$$\text{Therefore } n = \frac{35,000}{1 + 35,000 \times 0.07^2} = 202 \text{ respondents}$$

The determined samples size of 202 respondents was divided into two, thus 101 respondents from Gachororo village and 101 respondents from Juja town.

### 3.6 Methods of data collection

The data presented in this study were obtained from primary and secondary sources.

#### 3.6.1 Primary Sources

##### 1. Household survey

A questionnaire structured as per the aims of the research was administered to the sample population obtained from the household and organizations in the area. A sample of the used questionnaire is appended as Appendix 1

## **2. Key informants**

Interview with officers in charge of waste management were conducted to establish the challenges in household waste management system.

## **3. Observation**

Prior to going to the field, a checklist of things to be observed in the field were prepared. This included noting down of waste phenomenon and overall condition of household waste situation in the area which was to be physically observed as the researcher collected questionnaire data and other field studies.

## **4. Photography**

Photos were taken to represent the real state of solid waste on the ground. This included solid waste disposal sites, and other element relevant to the study.

### **3.6.2 Secondary sources**

The existing literature on household waste formed secondary sources of information. This included journal article publications, books, newspapers, online sources and previous projects done on household waste management from the library.

## **3.7 Data Processing, Analysis and Presentation**

### **3.7.1 Data processing**

The data obtained from the questionnaire was processed to ensure that all responses were categorized in order to make the contemplated comparisons and analysis possible. The processing involved editing, coding, classification and tabulation. Editing helped detect errors and omissions, and the appropriateness of the data to the study objectives. Editing also helped in scrutinizing all completed questionnaires to ensure that there was accuracy; consistence, uniformity and that they were completely filled in order to facilitate coding, classification and tabulation. This also helped to put data into manageable categories that were consistent with the research problem. Further, classification of data was conducted to arrange responses into classes on the basis of

common characteristics and on the basis of the study objectives. Finally, tabulation involved arranging and displaying into matrices summaries of raw data in a concise and logical manner. This way, it became possible to supplement explanations and descriptions of the findings, facilitate comparison and summation of items, and detection of errors and omissions while providing the basis for statistical comparisons.

### **3.7.2 Data analysis**

Having coded the data collected from the questionnaires the data was analyzed using SPSS statistics and Microsoft office excel. Both descriptive and inferential statistics were used in the data analysis.

### **3.7.3 Data presentation**

The results of the analysis showed magnitudes of the occurrence of the variables from the analysis. These results were used to generate graphs, tables, pie charts, bar charts and histograms using Microsoft office Excel 2007 for easier, representation of the data.

## **3.8 Ethical considerations and contingency plan**

The study also endeavored to maintain a high degree of confidentiality as a means of respecting the privacy of study participants. The study also endeavored to maintain a high degree of confidentiality as a means of respecting the privacy of study participants.

## CHAPTER FOUR

### 4.0 RESULTS

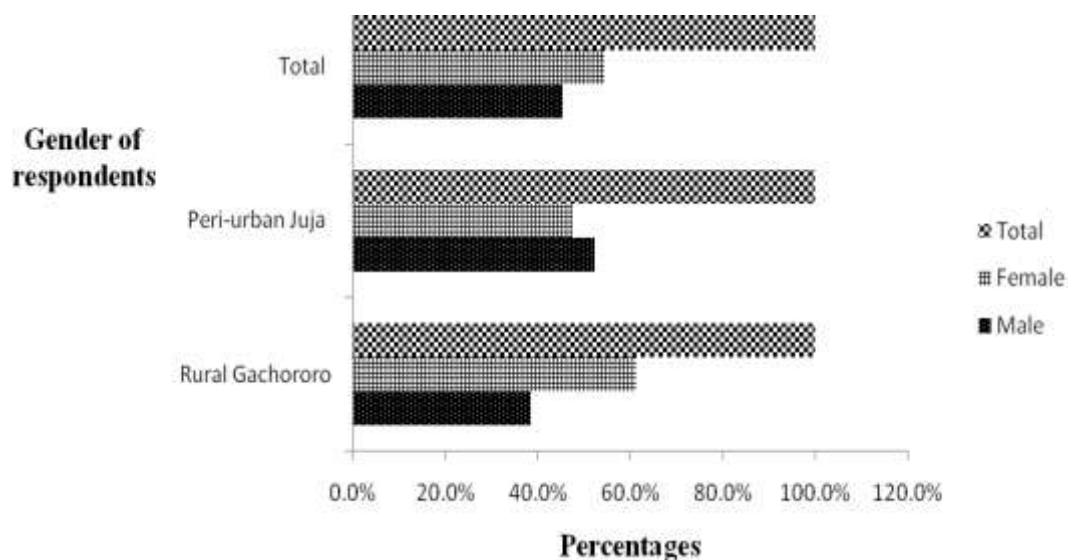
The results of the study were presented in frequency tables, percentages and graphs in relation to the study objectives.

#### *4.1 Socio-economic characteristics of respondents in rural Gachororo and peri-urban Juja*

The socio-economic characteristics of the respondents presented in this section include gender, age and education level of the respondent, household size and monthly income level.

##### **4.1.1 Gender of the respondents in the study area**

A total of 202 respondents were sampled from the two study sites with 101 respondents from Gachororo rural and another 102 respondents from Juja peri-urban. The results indicated that 38.6% and 52.5% of respondents in rural Gachororo and Juja peri-urban respectively, were male-headed while 61.4% and 47.5% of the respondents were female-headed in rural Gachororo and peri-urban Juja respectively. Figure 1 shows distribution of respondents by gender in the study areas.



*Figure 4.1: Gender distribution of respondents in the study area*

#### 4.1.2 Education levels of the respondents in the study areas

Data in Figure 2 showed that 60.4% and 20.8% of the respondents in rural Gachororo and Juja peri-urban respectively had attained high school level education accounting to 40.6% of all the respondents. 26.7% of the respondents had acquired university level education with 39.6% from Juja peri-urban and 13.9% from rural Gachororo. Further, the results show that only 9.4% of the respondent had acquired primary level with only 5.9% from Juja peri-urban and 12.9% from rural Gachororo.

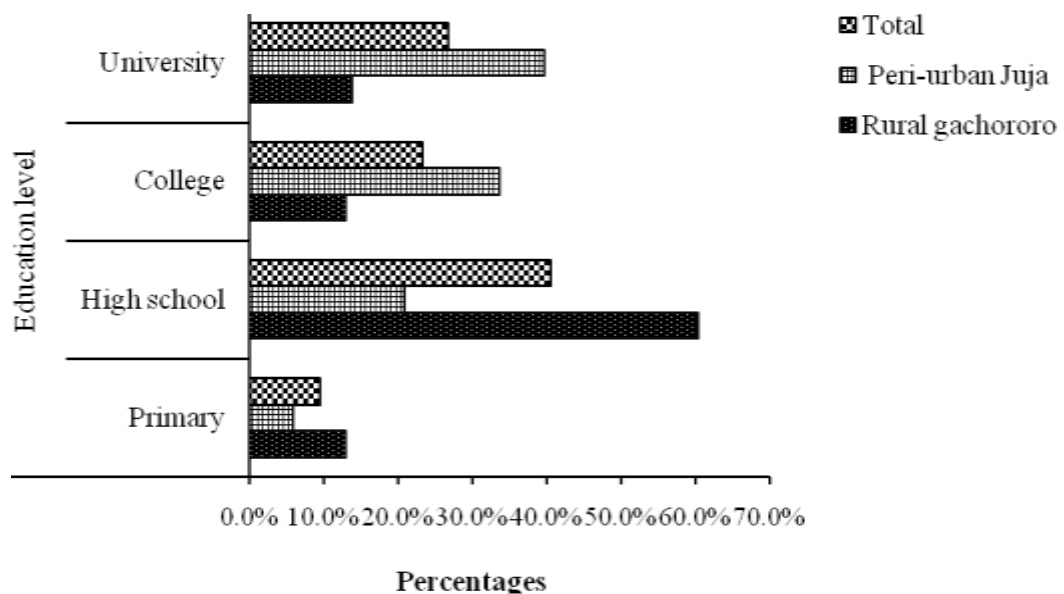


Figure 4.2: Education level of respondents in the study area

#### 4.1.3 Age distribution (%) of the respondents in the study area

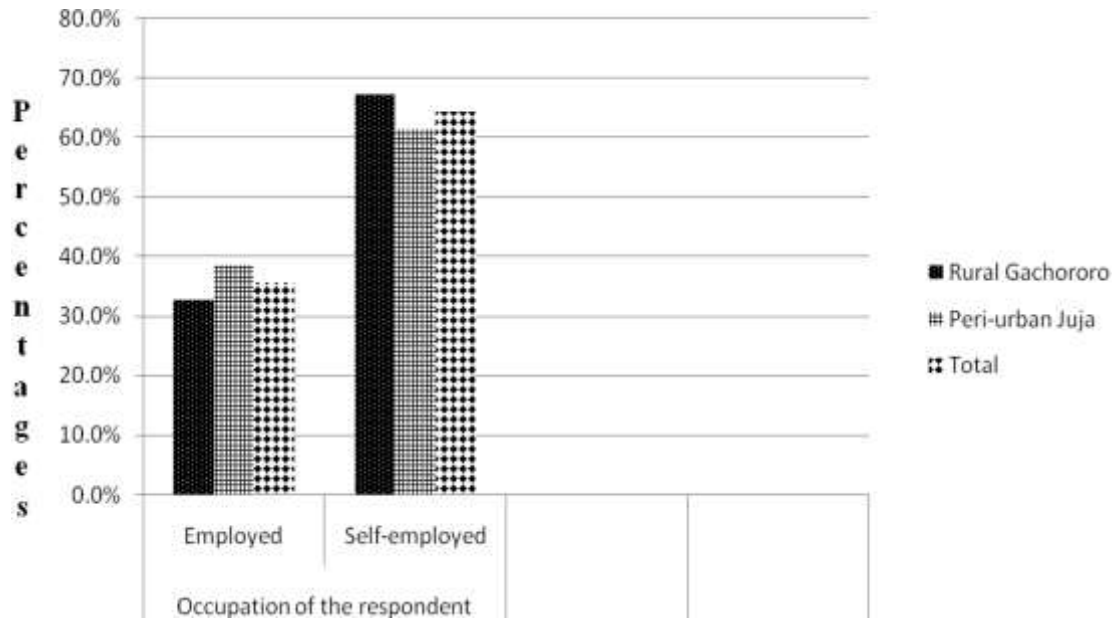
By and large, majority of the respondents in the rural Gachororo and peri-urban Juja (47.0%) were adults between 31 to 45 years with 59.4% in rural Gachororo and 34.7% in peri-urban Juja (Table 1). Further, results show that 24.3% of the respondents were between 18 to 30 years while 15.8% were between 46 to 30 years. Only 12.9% of the respondents were 61 and above years with 8.9% from rural Gachororo and 16.85 from peri-urban Juja.

**Table 4. 1: Age distribution (%) of the respondents in the study area**

Age of the respondent	Rural Gachororo (n=101)	Peri-urban Juja (n=101)	Total (n=202)
18-30	18.8%	29.7%	24.3%
31-45	59.4%	34.7%	47.0%
46-60	12.9%	18.8%	15.8%
61 and above	8.9%	16.8%	12.9%
Total	100.0%	100.0%	100.0%

**4.1.4 Occupation of respondents (%) in the study area**

The study results presented in Figure 3 revealed that 64.45% of respondents were self-employed with 67,3% in rural Gachororo and 61.4% in peri-urban Juja. On the other hand, 35.6% of the respondents had formal employment with 32.7% and 38.6% in rural Gachororo and peri-urban Juja respectively.



*Figure 4.3: Occupation of respondents (%) in the study area*

#### 4.1.5 Distribution of respondents' monthly income (%)

The study findings show that 39.1% of the respondents earned less than Ksh. 10,000 per month while only 15.8% earned Ksh. 55,001 and above per month. From Figure 4, it is clear that 18% of the respondents earned Ksh. 40,001-55,000 while 14% earned Ksh. 10,001-25,000. Only 12% of the respondents earned Ksh 25,001-40,000 with 9.9% in rural Gachororo and 14.9% in peri-urban Juja.

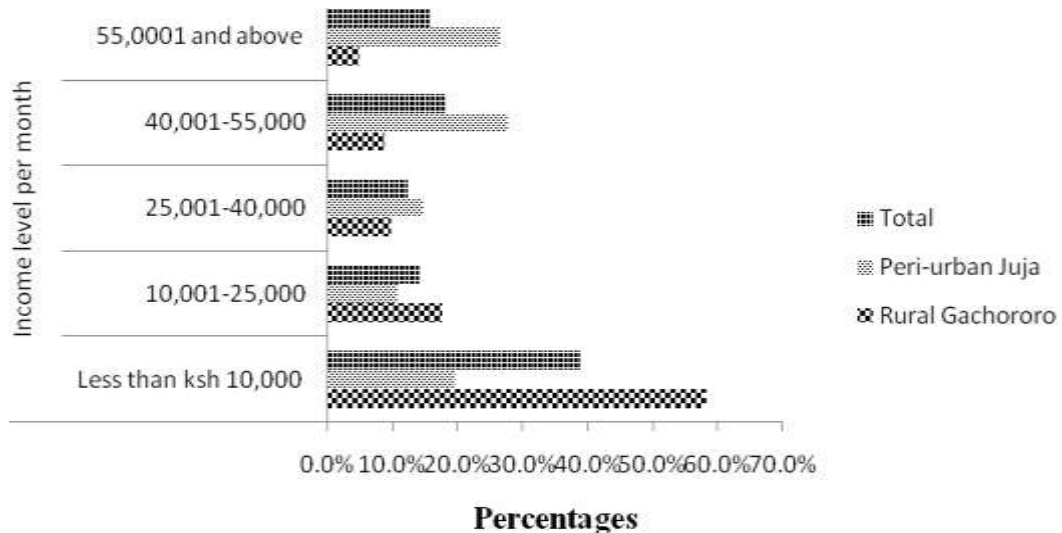


Figure 4.4: Distribution of respondents' monthly income (%)

#### 4.1.6 Household size (%) of the respondents in rural Gachororo and peri-urban Juja

Majority of the households (43.6%) had 7-10 family members while only 16.8% had 1-2 family members. The results show that 20.8% of households in the study had 3-6 family members and 18.8% had above 10 family members (Figure 5). It was observed that majority of households with high number of family members were from rural Gachororo while majority of households in peri-urban Juja had few family members.

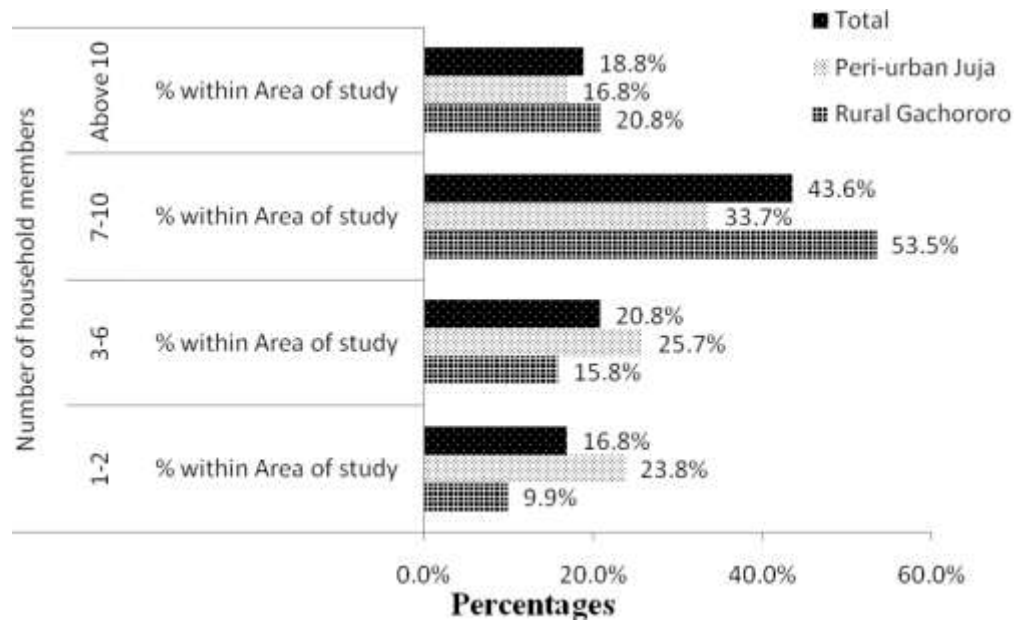


Figure 4.5: Household size (%) of the respondents

## 4.2 Household waste management practices in the study area

### 4.2.1 Type of waste generated by households (%) in rural Gachororo and peri-urban Juja

From the results presented in Table 2, 48.0% of the waste generated in rural Gachororo and peri-urban Juja was organic, 29.7% inorganic and 22.3% a mixture of organic and inorganic. Households in rural Gachororo produced the highest percentage of organic waste (60.4%) while peri-urban Juja produced the highest percentage of inorganic waste (36.6%). Chi-square test results revealed that there was a statistically significant association between the type of waste generated by households and the study areas ( $X^2=12.40$ ;  $p<0.01$ ).

Table 4. 2: Type of waste generated by households (%) in rural Gachororo and peri-urban Juja



<b>Type of waste generated by households</b>	<b>Rural Gachororo (n=101)</b>	<b>Peri-urban Juja (n=101)</b>	<b>Total (n=202)</b>
Organic waste	60.4%	35.6%	48.0%
Inorganic waste	22.8%	36.6%	29.7%
Both of the above	16.8%	27.7%	22.3%
X <sup>2</sup> value	12.40		
P- value	0.00***		

Note \*\*\* indicates significance at 1%

#### 4.2.2 Disposal of household waste (%) in the study area

<b>Disposal of household waste</b>	<b>Rural Gachororo (n=101)</b>	<b>Peri-urban Juja (n=101)</b>	<b>Total (n=202)</b>
On the road side	39.6%	25.7%	32.7%
Throwing outside the house	35.6%	44.6%	40.1%
Burning	24.8%	29.7	27.2%
Total	100%	100%	100%

From the information obtained from respondents and presented in Table 3, it is clear that rural Gachororo and peri-urban Juja lack proper HWM system as evidenced by the methods used to dispose household generated waste. Results indicated that 40.1% of the respondents dispose household waste by throwing it outside their houses. Further, 32.7% of the respondents dispose their household waste on the road side while 27.2% more dispose their waste by burning.

**Table 4. 3: Disposal of household waste (%) in the study area**

### 4.2.3 Waste management practices (%) in rural Gachororo and peri-urban Juja

The finding presented in Table 4 show that conventional waste management practices were mostly practiced in peri-urban Juja where 41.6% of the respondents segregated waste at source, 55.4% ascertained that they received waste management services and 59.4% made payments for waste collection. Further, the study revealed a statistically significant association between waste management practices used and the study areas ( $p < 0.01$ ).

**Table 4. 4: Waste management practices (%) in rural Gachororo and peri-urban**

Waste management practices used	Rural Gachororo (n=101)	Peri-urban Juja (n=101)	X <sup>2</sup> Value	P-Value
Waste segregation at source	13.9%	41.6%	19.37	0.00***
Provision of waste management services	13.9%	55.4%	38.56	0.00***
Payment for waste collection	25.7%	59.4%	23.41	0.00***

Note \*\*\* indicates significance at 1%

### 4.2.4 Challenges faced in household waste management (%) in the study area

Table 5 shows that 39.6% of respondents cited lack of waste management infrastructure as the main challenge facing HWM. Another 29.7% of the respondents identified lack of waste collection services while 11.9% cited lack of finances to conduct effective household waste management as hindrances to HWM. Results

further indicated that 9.9% and 4.0% of respondents perceived inadequate waste management facilities and lack of knowledge on different aspects of household waste management respectively as challenges experienced in household waste management. From Table 5, it is evident that the challenges faced in HWM had a statistically significant relationship with the study areas ( $X^2=94.02$ ;  $p<0.01$ ).

**Table 4.5: Challenges faced in household waste management (%) in the study area**

<b>Challenges faced in household waste management</b>	<b>Rural Gachororo (n=101)</b>	<b>Peri-urban Juja (n=101)</b>	<b>Total (n=202)</b>
Lack of waste management infrastructure	68.3%	10.9%	39.6%
Lack of waste collection services	7.9%	51.5%	29.7%
Lack of finances to conduct effective household waste management	14.9%	8.9%	11.9%
Inadequate waste management facilities	8.9%	10.9%	9.9%
Lack of knowledge on different aspects of household waste management	0.0%	7.9%	4.0%
Others	0.0%	9.9%	5.0%
X <sup>2</sup> value	94.02		
P- value	0.00***		

Note \*\*\* indicates significance at 1%

### **4.3 Factors influencing household waste management practices**

Logistic regression was run to determine the effects of education levels, age, gender, and level of income on household waste management practices. The results indicated that education level of the household head significantly influenced household waste management practices (coefficient=3.74;  $p=0.00$ , ratio=42.27) as shown in table 6. From the results, a unit increase in education level increased household's ability to practice proper waste management by a factor of 42.2.

Although the location, age, household size, income, waste type and the amount of waste generated were not significant in influencing the practice of HWM, the results indicated that the location of the household head (coefficient=0.262;  $p=0.59$ , odds ratio=1.29) increased the probability of practicing HWM by a factor of 1.17. This implies that residents in Gachororo (the rural set up) were 1.17 times more likely to practice proper HWM compared to those in Juja Town (the urban set-up).

The results also indicated that a unit increase in income (coefficient=0.00;  $p=0.49$ , odds ratio=1.00) increased the probability of practicing proper HWM by a factor of 1.00. This implies that households with higher income were likely to practice proper HWM as compared to those with low income. In the case of waste types, households producing organic wastes (coefficient=0.29;  $p=0.41$ , odds ratio=1.34) were 1.34 times more likely to practice proper HWM as compared to those producing inorganic wastes.

The results further indicated that age of the household head (coefficient= -0.01;  $p=0.67$ , odds ratio=0.99) negatively influenced the practice of proper HWM. This implies that households with younger household heads were more likely to practice proper HWM as compared to those with older heads. In the case of the amount of waste generated (coefficient= -0.04;  $p=0.79$ , odds ratio= 0.96), the results showed that a unit increase in the amount of waste generated negatively influenced the practice of proper HWM. This implies that households producing smaller amounts of waste were more likely to practice proper HWM compared to those with larger amounts.

**Table 4.6: Factors influencing HWM practices**

<b>Factor</b>	<b>Coefficient</b>	<b>P Value</b>	<b>Odds Ratio</b>
Age	-0.01	0.67	1.29
Location	0.26	0.59	1.17
Household size	-0.19	0.06	0.83
Education level	3.74	0.00*	42.27
Household income	0.00	0.69	1.00
Waste type	0.29	0.42	1.34
Amount of waste	-0.04	0.79	0.96
Constant	-1.37	0.22	0.26

Note: \* indicates significant at 5% level of significance

#### **4.4 Respondents' perceptions and attitudes on household waste management in rural Gachororo and peri-urban Juja**

##### **4.4.1 Respondent's satisfaction with waste disposal and their support for the idea of waste segregation in the study area**

Generally, the results of the study established that majority of the respondents in the study areas did not like how people disposed their household waste. This is evident as only 21.8% and 23.8% of respondents from peri-urban Juja and rural Gachororo respectively liked how people in the respective areas disposed household waste (Table 7). However, the relationship between respondents' satisfaction with waste disposal and the study areas was not significant ( $p > 0.01$ ). The table 7 shows that 63.4% of respondents in peri-urban Juja supported the idea of waste segregation while only 18.8% in rural Gachororo supported the idea. There was a statistically significant association between respondents' support for the idea of waste segregation and the study areas ( $p < 0.01$ )

**Table 4. 7: Respondent’s satisfaction with waste disposal and their support for the idea of waste segregation in the study area**

<b>Attitudes</b>	<b>Rural Gachororo (n=101)</b>	<b>Peri-urban Juja (n=101)</b>	<b>X<sup>2</sup> Value</b>	<b>P-Value</b>
Like how waste is disposed in the area	23.8%	21.8%	0.11	0.74
Support idea of waste segregation in the area	18.8%	63.4%	41.41	0.00***

Note \*\*\* indicates significance at 1%

#### **4.4.2 Responsibility share of household waste management (%) among stakeholders in rural Gachororo and peri-urban Juja**

Majority of respondents (55.4%) in rural Gachororo felt that the responsibility of HWM should be vested on the community while the majority in peri-urban Juja (46.5%) felt that it should be vested on the County government. Results further indicated that 19.8% of the respondents believed that the responsibility of HWM should be on the chief while 13.9% thought that the responsibility should be vested on the Central government.

**Table 4.8: Responsibility share of household waste management (%) among stakeholders in rural Gachororo and peri-urban Juja**

<b>Responsibility share of household waste management</b>	<b>Rural Gachororo (n=101)</b>	<b>Peri-urban Juja (n=101)</b>	<b>Total (n=202)</b>
Community	55.4%	11.9%	33.7%
Chief	15.8%	23.8%	19.8%
County government	18.8%	46.5%	32.7%
Central government	9.9%	17.8%	13.9%
Total	100%	100%	100%

#### **4.4.3 Respondents' rating (%) of household waste management in the study area**

The study revealed a greater part of respondents (45.0%) rated waste management in the respective areas as very bad (Table 9). Results indicated that 39.6% of respondents rated HWM as bad while only 8.9% and 6.4% rated it as good and very good respectively. Further, findings established that there was a statistically significant affiliation between respondents' rating of household waste management and the study areas ( $X^2=28.83$ ;  $p<0.01$ )

**Table 4.9: Respondents' rating (%) of household waste management**

<b>Rating of household waste management</b>	<b>Rural Gachororo (n=101)</b>	<b>Peri-urban Juja (n=101)</b>	<b>Total (n=202)</b>
Very good	5.0%	7.9%	6.4%
Good	9.9%	7.9%	8.9%
Bad	22.8%	56.4%	39.6%

Very bad	62.4%	27.7%	45.0%
X <sup>2</sup> value	28.83		
P- value	0.00***		

Note \*\*\* indicates significance at 1%

#### 4.4.4 Willingness of respondents to sue reckless dumpers

The study shows that 25.7% of respondents in peri-urban Juja were very willing to sue reckless dumpers, 17.8% are willing, 31.7% are slightly willing and 24.8% are unwilling (Table 10). In rural Gachororo, only 5.9% are very willing to sue, 13.9% are willing, 17.8% are slightly willing and majority (62.4%) is unwilling. Generally, a good number of total respondents (43.6%) are unwilling to sue reckless dumpers. The study revealed a statistically significant association between the respondents' willingness to sue reckless dumpers and the study areas ( $X^2=33.33$ ;  $p<0.01$ ).

**Table 4.10: Willingness of respondents in the study area to sue reckless dumpers**

Willingness to sue reckless dumpers	Rural Gachororo (n=101)	Peri-urban Juja (n=101)	Total (n=202)
Very willing	5.9%	25.7%	15.8%
Willing	13.9%	17.8%	15.8%
Slightly willing	17.8%	31.7%	24.8%
Unwilling	62.4%	24.8%	43.6%
X <sup>2</sup> value	33.33		
P- value	0.00***		

Note \*\*\* indicates significance at 1%

#### 4.5 Households' general awareness of household waste management in the study area



#### 4.5.1 Respondents' awareness (%) of household waste management in rural Gachororo and peri-urban Juja

Data presented in Table 11, revealed that only 8.4% of respondents were very aware of HWM comprising of 8.9% and 7.9% in rural Gachororo and peri-urban Juja respectively. Majority of the respondents (38.6%) were not aware of household waste management while 25.2% were slightly aware. Generally, respondents in peri-urban Juja were more aware of HWM compared to rural Gachororo. Chi square test results revealed a significant relationship between study areas and respondents' awareness of HWM ( $X^2=51.14$ ;  $p<0.00$ ).

**Table 4. 11: Respondents' awareness (%) of household waste management in rural Gachororo and peri-urban Juja**

Awareness of household waste management	Rural Gachororo(n=101)	Peri-urban Juja(n=101)	Total (n=202)
Very aware	8.9%	7.9%	8.4%
Aware	10.9%	44.6%	27.7%
Slightly aware	18.8%	31.7%	25.2%
Not aware	61.4%	15.8%	38.6%
$X^2$ value	51.14		
P- value	0.00***		

Note \*\*\* indicates significance at 1%

#### 4.5.2 Sources of information on household waste management (%) in rural Gachororo and peri-urban Juja

Results presented in Table 12 indicated that 65.3% of respondents in peri-urban Juja acquired information on HWM through television while 71.3% in rural Gachororo acquired the information through radios. Results further indicated that 16.8% of respondents from rural Gachororo and peri-urban Juja acquired information on HWM through phones.

**Table 4.12: Sources of information on household waste management (%) in rural Gachororo and peri-urban Juja**

Sources of information on household waste management	Rural Gachororo (n=101)	Peri-urban Juja (n=101)	Total (n=202)
Television	11.9%	65.3%	38.6%
Radio	71.3%	17.8%	44.6%
Phone	16.8%	16.8%	16.8%
Total	100%	100%	100%

#### **4.6 Implications of poor household waste management in rural Gachororo and peri-urban Juja**

##### **4.6.1 Respondents' awareness (%) of implications of poor household waste management in the study area**

The current study established that 37.6% of total respondents were not aware of health implications of poor HWM, 23.3% were slightly aware, 20.3% were aware and 18.8% were very aware. Further, the results showed that only 6.9% of the respondents were very aware of environmental implications of poor HWM while majority (41.6%) was not aware of such implications. In addition, 41.1% of the respondents were slightly aware of economic implications of poor HWM with 23.7% from rural Gachororo and 58.4% from peri-urban Juja. From Table 13, it is clear that the level of awareness of implications of poor HWM of health, environment and the economy was slightly lower in rural Gachororo compared to peri-urban Juja. Chi square test results established that there was a statistically significant relationship between implications of poor HWM and the study areas ( $p < 0.01$ ).

**Table 4.13: Respondents' awareness (%) of implications of poor household waste management in the study area**

<b>Implications of poor household waste management</b>	<b>Awareness</b>	<b>Rural Gachororo (n=101)</b>	<b>Peri-urban Juja (n=101)</b>	<b>Total (n=202)</b>
Health implications	Very aware	14.9%	22.8%	18.8%
	Aware	9.9%	30.7%	20.3%
	Slightly aware	21.8%	24.8%	23.3%
	Not aware	53.5%	21.8%	37.6%
	X <sup>2</sup>	26.11		
	P- value	0.00***		
Environmental implications	Very aware	5.0%	8.9%	6.9%
	Aware	12.9%	15.8%	14.4%
	Slightly aware	13.9%	60.45	37.1%
	Not aware	68.3%	14.9%	41.6%
	X <sup>2</sup>	65.62		
	P- value	0.00***		
Economic implications	Very aware	14.9%	10.9%	12.9%
	Aware	9.9%	18.8%	14.45
	Slightly aware	23.7%	58.4%	41.1%
	Not aware	51.5%	11.9%	31.7%
	X <sup>2</sup>	43.17		
	P- value	0.00***		

Note \*\*\* indicates significance at 1%

#### 4.6.2 Respondents' perceptions on effects of poor household waste management practices on the environment in rural Gachororo and peri-urban Juja

From the study results, it can be deduced that the environmental implications of poor HWM on land degradation (53.5%), air pollution (55.4%) and unhygienic environments (44.1%) were very intense in rural Gachororo and peri-urban Juja as perceived by the respondents. On the other hand, environmental implications of poor HWM on water pollution were perceived as slightly intense in peri-urban Juja (61.4%) and intense in rural Gachororo (60.4%). From the table..., 36.6% of total respondents, 11.9% in rural Gachororo and 61.4% in peri-urban Juja perceived water pollution as slightly intense while 34.7% of total respondents, 60.4% in rural Gachororo and 8.9% peri-urban Juja indicated that water pollution was intense. Additionally, result revealed that the relationship between intensity of air pollution, water pollution and unhygienic environments and the study area was statistically significant ( $p < 0.01$ ) whilst the association between intensity of land degradation and the study areas was not statistically significant.

<b>Environmental implications</b>	<b>Intensity</b>	<b>Rural Gachororo (n=101)</b>	<b>Peri-urban Juja (n=101)</b>	<b>Total (n=202)</b>
Land degradation	Very intense	52.5%	54.5%	53.5%
	Slightly intense	19.8%	17.8%	18.8%
	Intense	4.0%	10.9%	7.4%
	Not intense	23.8%	16.8%	20.3%
	X <sup>2</sup>	4.60		
	P- value	0.203		

Air pollution	Very intense	62.4%	48.5%	55.4%
	Slightly intense	7.9%	25.7%	16.8%
	Intense	7.9%	12.9%	10.4%
	Not intense	21.8%	12.9%	17.3%
	X <sup>2</sup>	14.78		
	P- value	0.00***		
Water pollution	Very intense	13.9%	15.8%	14.9%
	Slightly intense	11.9%	61.4%	36.6%
	Intense	60.4%	8.9%	34.7%
	Not intense	13.9%	44.6%	29.2
	X <sup>2</sup>	72.546		
	P- value	0.00***		
Unhygienic environment	Very intense	80.2%	7.9%	44.1%
	Slightly intense	13.9%	44.6%	29.2%
	Intense	3.0%	31.7%	17.3%
	Not intense	3.0%	15.8%	9.4%
	X <sup>2</sup>	109.09		
	P- value	0.00***		

(p=0.203).

**Table 4.14: Respondents' perceptions (%) on effects of poor household waste management practices on the environment in rural Gachoror and peri-urban Juja**

Note \*\*\* indicates significance at 1%

## CHAPTER FIVE

### RESULTS DISCUSSION

#### 5.1 Household waste management practices in rural Gachororo and peri-urban Juja

##### 5.1.1 Waste disposal methods in the study area

The current study found that residents in rural Gachororo and peri-urban Juja lacked proper HWM system as evidenced by the methods used to dispose household generated waste. From table 3, it is evident that majority of the respondents in peri-urban Juja (44.6%) disposed household waste by throwing it outside their houses, 29.7% burnt their waste and 25.7% disposed waste on the road side. The waste disposal problem in peri-urban Juja was associated with attached houses' design that had no space to dig refuse pits. On the other hand, 39.6% of respondents in rural Gachororo disposed household waste on the road side, 35.6% threw the waste in pits outside their houses and 24.8% was by burning.

These findings concur with Ng'ang'a (2012) who found out that most prevalent method of waste disposal was through the surface dumping. This is a term used to describe all forms of dumping on the ground surface that include roadside dumping, throwing in the nearest bush, throwing on the open drainages or simply dumping any form of waste anywhere outside ones house, whether the place is a designated dumping ground or not. It was followed by waste disposal through burning, a method identified by only a few of all respondents on average.

The findings also agree with Abebe and Kebede (1999) who while working on a study on assessing awareness and practice of waste management in Ethiopia found out that most people either dumped the waste in refuse piles near the house or just littered the waste all over their immediate surroundings. Such dirty environment may help to propagate the breeding of flies and rodents, which are the primary carrier and dispersal agents of diseases in many developing countries.

### **5.1.2 Waste segregation**

Based on the field survey, most of the residents were not familiar and did not practice waste segregation. In rural Gachororo only 13.9% of the surveyed residents practiced waste segregation at source while 41.6% of respondents in peri-urban Juja carried out the practice (Table 4). This situation was associated with higher education level, better sources of information and awareness on HWM in peri-urban Juja compared to rural Gachororo.

The results are in line with findings of Lounge *et al.* (2009) who indicated that the level of waste separation is very low among households while the term 'source separation' was not clear to quite a number of respondents in Lagos state.

### **5.1.3 Provision of waste collection services in the study area**

The County Government of Kiambu is mandated to offer waste management services including collection, transportation and safe disposal of all the wastes produced. From the study, only a minority of the residents covered by waste management services from the County Government of Kiambu. Majority of respondents in peri-urban Juja received waste management services (55.4%) while only 13.9% of the respondents in rural Gachororo received the services (Table 4). Just like in many other urban and peri-urban areas of unindustrialized nations, the most serious environmental problem associated with household waste management in Juja was related to waste disposal. The observed situation where waste was disposed of in uncontrolled dumps, on open spaces, streets and nearby rivers and open burning has also been reported (Kumar, 2008; Chakrabratiet *al.* 2009; Kibwage, 1994; Kibwage; 1996). These sites are determined by availability and not by sound geological, physical and economic planning.

### **5.1.4 Payment for household waste collection in the study area**

The current study found that only few households in rural areas (rural Gachororo) paid for their waste collection (25.7%) while majority of households in peri-urban Juja (59.4%) paid for household waste collection (Table 4). This could be attributed to limited space in peri-urban Juja for waste management practices such as recycling and



reusing. On the contrary, rural Gachororo was found to have adequate space for biodegradable waste which would be later used as manure.

However, surveyed inhabitants of peri-urban Juja asserted that the services offered by the county government are substandard and unreliable. They have therefore no option but to pay for collection services offered by private entities or dispose of their waste onto the road sides. In similar studies, Mihai (2017) and Bandara&Hettiaratchi (2010) found that the cost of waste collection services were supported by the local budget or by the population through annual or monthly fees that varied depending on the amount of waste produced. Some respondents argue that this is the only option because when dumping facilities are provided they are always full. Furthermore, since the county government collects tax from the residents, they have a feeling that these facilities should be offered free of charge. For instance, rental flat house landlords charge their tenants a fee of Ksh 100 to 200 per month and then pay private waste collectors to provide the waste collection services. In peri-urban Juja, there are no formal organized local groups who collect waste. Those who collect do so individually, and use carts at a fee of Ksh. 300 per trip. Unfortunately, these private collectors have no official disposal site and they only do it for money, thus, they dump the waste anywhere including on roadsides and undeveloped land. In fact, the County's Environment Department argues that the cart people have no authorization to collect waste in the County and that they do not meet the stipulated standards provided by the department for the transportation of household waste which should only be done using vehicles (G.O.K, 2014). This is in consonance with findings of Oruonye (2018) who indicated that most of the waste were transported to dumpsites manually on the head or by use of pushcarts posing health danger and risks to the handlers.

#### **5.1.5 Challenges facing HWM**

The main challenges facing HWM in the study area included lack of waste management infrastructure, lack of waste collection services, lack of finances to conduct effective HWM, inadequate HWM facilities, lack of knowledge on different aspects of HWM among others. Respondents in rural Gachororo cited lack of waste management infrastructure as the main challenge (68.3%) while lack of waste

collection services was the main challenge in HWM in peri-urban Juja (51.5%; Table 5)). Lack of waste collection services in peri-urban Juja was attributed to inadequate trucks for household waste collection, failure by the county government to prioritize household waste collection and lack of a developed waste collection and transportation schedule. Lack of waste management infrastructure in rural Gachororo was due to lack of road network and landfill for waste disposal. Residents in rural Gachororo used pits outside their houses to dispose waste thus did not depend on government for their waste management.

The results are in consonance with findings of Gakungu (2011) and Otieno (2010) who indicated that most waste collection systems in Kenya are inefficient and disposal systems are not environmentally friendly.

## **5.2 Factors influencing waste management practices**

Logistic regression was run to determine the effects of age, location, household size, education levels, level of income, type of waste generated, and amount of waste generated on household waste management practices.

### **5.2.1 Age of Respondents**

The fact that half of the respondents were of the age group 18-30 years means that they have more years to live and are able to change habits with the right information (Table 1). The logistic regression results generated on age of the respondents were not significant in influencing the practice of HWM. The results further indicated that age of the household head (coefficient= -0.1;  $p=0.67$ , odds ratio= 0.99) negatively influenced the practice of HWM (Table 6). This implies that households with younger household heads were more likely to practice proper HWM as compared to those with older heads. The results are in agreement with findings of Asnani (2006) and of Longeet *al.* (2009) who indicated that unlike older people, the youth offer higher chances of adapting to new technology and assimilating new knowledge. This is also in line with findings by Bogoroet *al.* (2013) that age influences waste disposal practices. The data showed that matured adults' perception on household waste and management was expected to be high.

### **5.2.2 Location of household in the study area**

Although the location was not significant in influencing the practice of HWM, the results analysis indicated that the location of the household head (coefficient=0.262,  $p=0.59$ , odds ratio= 1.29; Table 6)) increased the probability of practicing HWM by a factor of 1.29. This implied that residents in peri-urban Juja were 1.29 times more likely to practice HWM compared to those in rural Gachororo. Open dumping was widespread in rural Gachororo due to the lack of formal waste management services. This concurs with other research findings which have found out that waste management sector is poorly developed in rural areas and low and income regions compared to urban areas (Rushton, 2003).

### **5.2.3 Household size**

Majority of the households with higher numbers were found in rural Gachororo, where households with 7 or more persons comprised 74.3% of the respondents (Figure 5). Despite Gachororo's large household setting, their waste generation per household was low compared to peri-urban Juja waste production per household. The main factor toward this is the mode of commodity packaging for their consumption and different lifestyle. The results implies that household size did not significantly influence the practice of HWM (coefficient= -0.19,  $p=0.06$ , odds ratio=0.83; Table 6)). However, an increase in the household size negatively influenced the practice of proper HWM. The current trend of results contrasts the findings of Asnani (2006) who indicated that the higher the population the higher the amount of waste generated and thus an increase in household size corresponds to an increase in generation of wastes.

### **5.2.4 Education level of respondents**

Education level of the household head significantly influenced HWM practices (coefficient= 3.74,  $p=0.00$ , odds ratio=42.27) (Table 6). It was noted that respondents in peri-urban Juja had higher education level and were aware of HWM practices thus likely to act in an environmentally friendly manner with regard to household waste management (Figure2). Conversely, respondents in rural Gachororo had lower education level and thus did not have the knowhow on HWM. From the findings,

waste management can be dealt with through educating people and this can easily offer a remedy of waste management with stakeholder support to come up with the right curriculum on waste management. This is in line with Asnani (2006) and Henry (2006) who allude that educating the population and other stakeholders in HWM is best strategy towards proper household waste management behavior change for improved management practices. This observation calls for the provision of education to the locals to inform them on regulations governing waste handling in Kenya. The National Environment Management Authority (NEMA) and the County Government of Kiambu's Environment Department which are mandated to formulate, administer and enforce these regulations should ensure that the residents are aware of this to avoid situations where ignorance influences inaction.

In addition, the results indicated that education level played a significant role in shaping HWM practices. A study by Kibwage (1996) showed that those who had tertiary education were more aware of health and economic impacts of household wastes. This coupled with the fact that they were also more aware of household waste management practices, indicate that education can be a precursor to improved waste management (Asnani, 2006). Furthermore, those who possess good knowledge were more willing to report waste offenders for prosecution. This clearly shows that proper education (enlightening residents on the effects of HWM and other waste related information) can provide an effective way of dealing with the waste menace. Unfortunately, even those with tertiary education neither practiced waste segregation at home nor were they more willing to pay for waste collection facilities. This calls for mechanisms to engage the whole population on the importance of this waste management practices if success has to be achieved (Kaseva and Mbuligwe, 2005).

### **5.2.5 Monthly income level of the respondents**

Income was not a major factor in influencing HWM practices. However, a significant finding was that households with higher monthly incomes were more willing to sue including people who dumped waste haphazardly. The results further indicated that a unit increase in income (coefficient= 0.00,  $p=0.49$ , odds ratio=1.00) increased the probability of practicing proper HWM by a factor of 1 as compared to those with low income (Table 6). Income level is a factor that determines the amounts of wastes

generated. Results of Gakungu (2011) indicated that households with high-income levels consumes a lot and generate corresponding high amounts of wastes. The inhabitant of rural Gachororo are mainly composed of low income people and consume less, thus generates low amounts of wastes as compared to the inhabitants in peri-urban Juja. Unfortunately, the study did not establish whether this is related to particular neighborhoods. If this is so, then neighborhoods that are inhabited by affluent people may be more "cleaner" than those inhabited by low income groups due to the fact that those with higher monthly income are significantly more willing to contribute towards waste collection services than those with lower incomes emphasized this assertion (Medina, 1997).

### **5.2.6 Type of waste generated by households**

Household producing organic wastes (coefficient= 0.29,  $p=0.41$ , odds ratio=1.34; table 6) were 1.34 time more likely to practice proper HWM as compared to those producing inorganic wastes. Chi-square test results revealed that there was a statistically significant association between the type of waste generated by households and the study areas ( $X^2=12.40$ ;  $p<0.01$ ; Table 2). An enormous (60.4%) of the surveyed household in rural Gachororo generated organic waste, 22.8% inorganic and 12.40% a mixture of organic and inorganic (Table 2). Most of Gachororos' waste was organic, it was channeled into their farms as organic manure as opposed to Juja's waste which was mostly inorganic and un-segregated. In cases of inorganic waste at Gachororo, the residents would opt to burn at their homesteads. This observation is consistent with other studies which have found waste stream in rural areas to predominantly constitute a large bulk of the house hold waste generated (Kibwage, 2002). In peri-urban Juja a huge component of waste generated was inorganic (36.6%), 35.6% organic and 27.7% a mixture of organic and inorganic. In this study, organic waste was differentiated from inorganic waste as that which can easily decompose, thus that which can rot from that which cannot. Unfortunately, these two innovative methods of the management of this predominant waste stream generated are still poorly researched and deny residents information on such projects. This lack of knowledge may have hindered their implementation in the study area. This problem is compounded by rapid urban population increase that is overstretching

resources in peri-urban Juja and the surrounding. Actually, the rising population within peri-urban Juja means that large volumes of this waste stream will continue to be generated.

### **5.3 Respondents' perceptions and attitudes on household waste management in rural Gachororo and peri-urban Juja**

#### **5.3.1 Residents satisfaction with waste disposal methods and support for the idea of waste segregation in the study area**

The surveyed inhabitants were not pleased with the manner in which waste generated was managed, particularly their disposal methods and support for the idea of waste segregation at source (Table 7). Results revealed that, 76.2% and 78.2% of respondents in rural Gachororo and peri-urban Juja, respectively did not like the waste disposal methods used by residents in the study area. Majority of respondents in peri-urban Juja supported the idea of waste segregation (63.4%) since they were already practicing it while only 18.85 of respondents in rural Gachororo supported the idea and only a few of them were into the practice. The residents in peri-urban Juja lamented of lack of policy, legal and institutional mechanisms for waste management. This was based on lack of waste management infrastructure, inadequate collection services and poor implementation of HWM policies in both the study locations. This clearly means that a lot has to be done especially in peri-urban Juja to increase the residents' confidence on waste management practices otherwise; the area will not be able to realize its full potential in terms of economic and social development.

The County Government should facilitate a clean environment to the households of Juja and Gachororo, proper utilization of funds, less household waste related problems and attraction of investors. The households will benefit in that less money will be used for household treatment of solid waste related illness, peace of mind brought by clean environment and benefits of recycling and transportation of solid wastes. Thus, they will be satisfied with waste management services in their locality. The County Government of Kiambu is mandated to develop and implement these policies and legislation. However, just like it has been found elsewhere (Kumar, 2008; Chakrabratiet al. 2009; Kibwage, 2002) the regulations of waste handling are not followed as required.

### **5.3.2 Respondents rating of HWM in the study area**

The study revealed a greater part of respondents (45.0%) rated waste management in the respective areas as very bad (Table 9). There was a statistically significant association between respondents' rating of household waste management and the study areas ( $X^2=28.83$ ;  $p<0.01$ ). There is a direct relationship between public awareness on waste management and application of waste management practices. The current trend of results is in consonance with findings of Ebikapade, *et al.* (2015) and of Rahardyanet *al.* (2003) who indicated that the more the public are informed on waste management matters, the better their perception and attitude towards environmental issues. In another study, Oruonyeet *al.* (2018) found out that majority of the respondents were satisfied with HWM practices, with only a few insisting that HWM in their area was poor and environmentally harmful.

### **5.3.3 Responsibility share of household waste management (%) among stakeholders in rural Gachororo and peri-urban Juja**

Majority of respondents (55.4%) in rural Gachororo felt that the responsibility of HWM should be vested on the community while the majority in peri-urban Juja (46.5%) felt that it should be vested on the County government (Table 8). However, respondents did not seem to expect much from the authorities who they accuse of lacking the political will of improving household waste management. The development of devolution, which led to the creation of county governments, may have been done in haste thereby reluctantly inheriting the service of former local government without proper planning, hence poor relations between the central and county governments. Because of this haste, legislation on waste management can be rudimentary, ambiguous and vague. In another study, Kibwage (1996) observed that HWM in upcoming urban centres lacked comprehensive guidelines on storage, collection, conveyance and dumping of several kinds of wastes. The enforcement of this legislation is also ineffective majorly due to lack of personnel and other necessary resources.

Studies by Lounge *et al.* (2009) indicated that most respondents are in agreement that Government should be responsible for household waste collection, transportation and disposal. However, the respondents are equally in support of paying for waste

generated but there must be equity in the billing system. That is, payment should be based on quantity of waste produced.

#### **5.3.4 Willingness to sue reckless dumpers in the study areas**

Most residents in both peri-urban Juja and rural Gachororo were unwilling to sue reckless dumpers (43.6) and cited that it's the governments' responsibility to curb reckless dumping (Table 10). In addition, it was observed that most of the dumping is done by unknown persons or tracks and this makes it hard for an individual to raise an alarm. Sometimes, the trusted waste management service provided fails to collect the waste thus piling up at the roadsides. The communities are empowered by the constitution of Kenya 2010, Article 42 and Environmental Management Coordination Act through the public complaints on environmental matters to sue reckless dumpers of waste.

### **5.4 Households' general awareness of household waste management in the study area**

#### **5.4.1 Residents awareness of HWM in the study area**

Many residents in the study area (38.6%) were not aware of the household waste management concept ascribed to nonexistence of public training of HWM in the area (Table 11). In addition, there was a significant association between study areas and respondents' awareness of HWM ( $X^2=51.14$ ;  $p<0.00$ ). Consequently, awareness of HWM in peri-urban Juja was higher compared to rural Gachororo owing to the difference in literacy levels. The fact that many of those interviewed (particularly in rural Gachororo) were not conscious of household waste management may have influenced the unsustainable management of the waste generated. If the residents were informed about the economic, health and environmental effects of the generated household wastes, they would have probably acted differently. For example, if the residents were aware of the benefits of recycling the organic waste generated, they would have practiced composting activities. Alternatively, if the residents were mindful of their health effects of improper waste disposal options, they would have improved on the collection and disposal options available. This therefore calls for mechanisms to make the population aware of this through provision of education



opportunities. This can be done through media campaigns, local FM radio stations and other forums. This concurs with (Medina, 2002) research findings that absence of attention towards environment generates a culture of community negligence towards contribution in policy making procedures and increases absence of responsibility for waste matters.

#### **5.4.2 Sources of information on HWM in the study area**

The respondents in peri-urban Juja mainly acquired the information on HWM through television (65.3%) while those in rural Gachororo acquired through radio (71.3%). This is a clear indication of the wide range of potentially useful sources of information on proper household waste management methods in rural Gachororo and peri-urban Juja. However, the sources of information were different owing to different monthly incomes. Respondents in peri-urban Juja earned more than respondents in rural Gachororo thus able to purchase televisions unlike those in rural Gachororo. This explained the increased awareness and better perceptions on HWM in peri-urban Juja compared to rural Gachororo. The result is in agreement with Ebikapadeet *al.* (2015) findings that showed that the better the sources of information, the more the public are informed on waste management matters and the better their perception and attitude towards environmental issues. The finding was consistent with the findings of Rahardyan, *et al.* (2004) that publicity increases awareness, and with increased awareness; residents are better disposed to participating in waste management in their community.

### **5.5 Implications of poor household waste management in rural Gachororo and peri-urban Juja**

#### **5.5.1 Respondents awareness of implications of poor HWM on health, environment and economy in the study areas**

Many residents were not aware of the health and environmental impacts of poor household waste management. In this case, 37.6% and 41.6% (Table 13) in rural Gachororo and peri-urban Juja, respectively indicated that there was absence of public training in HWM in the areas. In addition, 41.1% of the respondents were slightly aware of economic implications of poor HWM with 23.7% from rural Gachororo and

58.4% from peri-urban Juja. It should be noted that, awareness of HWM in peri-urban Juja was higher compared to rural Gachororo on account of the difference in literacy levels (Figure 2). The fact that many of those interviewed (especially in rural Gachororo) were not conscious of poor household waste management may have influenced the unsustainable management of the waste generated. If the residents were informed about the economic, health and environmental effects of the generated household wastes, they would have probably acted differently. For example, if the residents were aware of the benefits of recycling the organic waste generated, they would have practiced composting activities. Alternatively, if the residents were mindful of their health effects of improper waste disposal options, they would have improved on the collection and disposal options available. This therefore calls for mechanisms to make the population aware of this through provision of education opportunities. This can be done through media campaigns, local FM radio stations and other forums.

The current trend of results is in consonance with findings of Medina (2002) who indicated that absence of attention and information on environmental matters generates a culture of community negligence towards contribution in policy making procedures and increases absence of responsibility for household waste matters. However, the results contradicts the findings by Oruonyeet *al.* (2018) who in a study established that a large part of the respondents were aware of the effects of poor household waste disposal and only few were not aware of the effects of poor household waste disposal.

### **5.5.2 Intensity of environmental implications of poor HWM on land degradation, air pollution, water pollution and unhygienic environment in the study area**

Poor HWM practices in the study area have adverse and unforeseen effects to both the residents and the environment. Large number of communal storage sites and unofficial dumps encourage the breeding of flies and rodents. Leachate produced as waste decomposes and burning of waste caused air pollution. Lung diseases, heart problems, skin irritation, or abnormality in breathing were cited as examples of diseases associated with improper household waste disposal. Badly-managed landfill sites were observed to attract vermin or cause litter. The methods of solid waste

collection often result in workers coming in contact with wastes that sometimes contain fecal matter.

Majority of the respondents in the study area perceived the environmental implications of poor HWM on land degradation to be very intensive (52.5% in rural Gachororo and 54.5% in peri-urban Juja; table 14). Further, the findings indicated that environmental implications of poor HWM on air pollution were also very intensive in the study area (44.6%). It was noted that, the intensity of water pollution due to poor HWM was slightly intense in peri-urban Juja (61.4%) while the impacts were intense (60.4%) in rural Gachororo. The environmental implications of poor HWM on unhygienic environment were generally very intense (44.1%).

Ejaz *et al.* (2010) found open dumping, open burning and dumping of solid household wastes to un-engineered landfill sites to be the most practiced disposal methods. However, the open dumps of household solid waste were creating serious negative impacts on environment. Strong wind and storm were spreading dust, odor and filth from the open dumps of solid waste to adjacent areas. They found that open dumps of solid waste were providing attractive habitat to rats and other vermin creating serious threat to human health and sanitation. Percolating rainwater through the open dump contaminated ground water resources in the area. The current results are also in consonance with findings of Oruonyeet *al.* (2018) that poor HWM results to intense environmental implications on land, air and water. Poor HWM was associated with offensive odor, breeding ground for insect parasites, devastated aesthetic quality of the environment, blocked drainages and health problems.

## **CHAPTER SIX**

### **6.1 CONCLUSION AND RECOMMENDATIONS**

The section provides the summary of main outcomes with respect to the research study done by the researcher about research problem. The section also provides the solutions to study questions based on the evidence collected from the study area. Conclusions and recommendations concerning the research problem are also captured.

#### **6.2 Conclusion**

One of the major challenges facing Juja Sub-county is household waste management. This is because of increase in population and subsequent rise in waste generation. The county government of Kiambu has no waste management facilities such as collection points and litter bins. Therefore, residents dispose Household Waste (HW) through unsustainable methods such as burning, disposal outside their house, disposal on drain systems, open drains and on the road. The county needs to take up their role and ensure the provision of efficient waste management services in Juja-Sub County.

The main challenge of household waste management in Juja sub-county is lack of HWM services and lack of developed HWM infrastructure. This has led to uncontrolled disposal of HW in the area, resulting to a dirty and unhygienic environment. Reckless dumping and lack of waste collection has left the area with ugly scenes of scattered waste. Lack of designated disposal site and disposal facilities has resulted to irresponsible waste disposal on the roads, drainage and outside their houses. This has caused land degradation and severe risk to the public health.

The residents of Juja sub-county are unaware of the negative implications of poor HWM. This has resulted in reckless dumping due to the fact that the residents are unaware of the implication of their actions to their health and to the environment. In addition, the residents are unaware of sustainable HWM practice this also facilitates reckless dumping. The challenges facing HWM in Juja Sub County need to be addressed by ensuring sustainable HWM practices. In the long run this will lead to sustainable development in Juja Sub County.

### **6.3 Recommendations**

#### **i. Provision of Household Waste Infrastructural Facilities**

The poor disposal options are caused by lack of proper waste infrastructural facilities, for example, allocation of waste collection points, litter bins and containers should be provided to residents. These should be located in areas which are accessible to residences to dispose waste in them and later emptied and disposed of by the environment department or CBOs.

#### **ii. Public Education**

There is need to educate the residents to enhance awareness on the effects of poor HWM practice and benefits of sustainable HWM practice. Educating the public will also empower residents resulting in the invention of new ideas on use of waste and the elimination of reckless dumping.

#### **iii. Use of 4R Concept**

The 4R (reduce, reuse, recycle, and recover) concept can be used to minimize the quantity of HW produced and dumped. This involves: Reduce - training residents on how to reduce the waste generated. Reuse - encouraging residence to reuse products there have used before intending of disposing them for example, polythene bags. Recycle - training residences to reuse the commodities once they exhaust their useful life instead of its disposal. Recover - training the residence to use the HW as a resource. Formation of waste management partnerships

More effective environmental governance is required to reverse the effects of poor household waste-management planning. Such a strategy includes government collaboration with key stakeholders and sharing of responsibilities and information. This may involve formation of waste management partnerships with stakeholders such as the Community Based Organizations (CBOs), Community Development Associations (CDAs) and Non- Governmental Organizations (NGOs) that will go a long way to ensure full participation and sustainability of HWM schemes.

#### **iv. Enforcement**

There is need to implement successful enforcement procedures to safeguard efficient waste gathering and dumping. Officers should be deployed to regularly conduct field visits to ensure strict adherence and fines should be imposed on offenders.

#### **6.4 Area of further research**

As per the outcomes of the research, further research is needed in aspect of sanitation and drainage as the area is relatively flat, covered by black cotton soil, hence flooding occurring during heavy rains. The area lacks modern sewer system, proper storm waste drainage and roads.

A recommended approach for waste collection in Juja should involve organised collectors. Here, collectors should organise themselves into “unions” or “co-operatives” and requests can be made to recognise their role in SWM as proposed by (Raman, 1995; Medina, 1997). Such an organisation will promote sustainable grassroots development. However, the low educational levels, lack of financial resources, inability to access credit, and lack of business experience of potential collectors may hinder the formation, operation and profitability of such unions. This therefore calls for education opportunities to the locals to encourage the development of such operations.

The waste collectors should be able to provide door-to-door collection services and more so that of separated wastes, with households paying a fee for this service. This research therefore suggests for more studies to explore the implications and efficiency of this proposed approach of integrating informal waste management into the formal SWM systems.

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## APPENDICES

### Appendix 1: Research Questionnaire

**SOUTH EASTERN KENYA UNIVERSITY SCHOOL OF ENVIRONMENT  
AND NATURAL RESOURCES MANAGEMENT DEPARTMENT OF  
ENVIRONMENTAL SCIENCE AND TECHNOLOGY**

#### Research questionnaire

I am a student in South Eastern Kenya University, pursuing Masters of Science in Environmental Management. I am carrying out a research on the title Assessment of Household Waste Management, Kiambu County, Kenya

This questionnaire is aimed at collecting information which will be useful in the above academic work. The information gathered will be used strictly on academic purpose only and will be treated with privacy.

Your co-operation will be highly appreciated.

Yours Faithfully:

\_\_\_\_\_

Stephen N. King'oo

Date \_\_\_\_\_

Questionnaire NO \_\_\_\_\_



## BACKGROUND INFORMATION

1. Area of study? Gachororo [ ] Juja Town [ ]
2. Sex of the respondent? Male ( ) Female ( )
3. Age? 17 and below ( ) 18-30 years ( ) 31-45 years ( ) 46- 60 years ( ) 61+( )
4. Education level? Primary [ ] High School [ ] Collage [ ] University [ ]
5. Occupation? Employed [ ] Self-employed [ ]
6. Income level per month? Less than Ksh 10,000 [ ] 10,001-25,000 [ ] 25,001-40,000 [ ] 40,001-55,000 [ ] +55,001 [ ]
7. How many are you in your household? 1-2 ( ) 3-6 ( ) 7-10 ( ) 10+ ( )
8. How many years have you lived in Juja? 1-5 years ( ) 5-10 years ( ) 10-15 years ( ) 15+ ( )

## HOUSEHOLD WASTE MANAGEMENT PRACTICES

9. What type of waste does your household generate?  
  
Organic waste [ ] Inorganic waste [ ] Both of the above [ ]
10. On average how much waste does your household generate per day?  
1-2 kg [ ]  
3-5 Kg [ ]  
6+ Kg [ ]
11. How do you dispose household waste?  
  
On the road side [ ] Throwing outside the house [ ] Burning [ ]  
others.....
12. How do you store waste in your household?  
Using dust bins [ ] using polythene papers [ ] others.....

13. Do you carry out waste segregation at the source?(household level) Yes [ ] No [ ]

14. Are waste management services provided in the area? Yes [ ] No [ ]

15. Do you pay for waste collection service? yes [ ] No [ ] If yes how much per month?.....

16. How frequent is the waste collected? .....

17. Do you take any measures to reduce waste generation in your household?  
yes [ ] no [ ]

If yes which measures do you take?

Reuse [ ] recycle [ ] recover [ ] others.....

18. What are the challenges facing in household waste management?

Lack of waste management infrastructure [ ]

Lack of waste collections services [ ]

Lack finances to conduct effective household waste management [ ]

Inadequate waste management facilities [ ]

Lack of knowledge on different aspects of household waste management [ ]

Others.....

**PERCEPTIONS AND ATTITUDES ON HOUSEHOLDS' WASTE MANAGEMENT**

19. Do you like how people dispose waste in the area? Yes [ ] No [ ]

20. How often would you like waste to be collected in the area?

Twice a day [ ] once a day [ ] Five times a week [ ] Three times a week [ ]  
others.....

21. Do you support the idea of separation of waste? Yes [ ] No [ ]

22. Who do you think should be responsible for handling household waste in the area?

Community [ ] Chief [ ] County Government [ ] Central Government [ ]

23. How would you rate the household waste management in the area?

Very good [ ] Good [ ] Bad [ ] Very Bad [ ]

24. What do you think should be done to enhance household waste management?

.....  
.....  
.....  
.....  
.....  
.....  
.....

25. In case you saw someone dumping waste on the road would you be willing to sue him/her?

Very willing [ ] willing [ ] slightly willing [ ] unwilling [ ]

### **FACTORS DETERMINING HOUSEHOLD WASTE MANAGEMENT**

26. Do you practice any HWM in your household?

Yes [ ] No [ ]

27. Are HWM services available in your area?

Yes [ ] No [ ]

28. Can you afford waste management services?

Yes [ ] No [ ]

29. Are you aware of HWM practice?

Very aware [ ] Aware [ ] Slightly Aware [ ] Not Aware [ ]

30. What factors affect HMW practice?

Lack of funds [ ] Lack of awareness [ ]

Lack of HWM services [ ]

### **AWARENESS OF HOUSEHOLD WASTE MANAGEMENT**

31. Have you seen or heard any information on household waste management?

Yes [ ] No [ ] If yes where?

Clean up campaign [ ] anti-litter campaign [ ]

others.....

32. If you were to learn more household waste management how would you like to get the

information? TV [ ] Radio [ ] phone [ ]

others.....

33. Do you currently receive any information on household waste management?

Yes [ ] No [ ]

34. Are you aware of regulations concerning waste management?

Very aware [ ] Aware [ ] Slightly Aware [ ] Not Aware [ ]

35. How aware are you on implications of poor household waste management?

Health impacts: Very aware [ ] Aware [ ] Slightly Aware [ ] Not Aware [ ]

Environmental impacts: Very aware [ ] Aware [ ] Slightly Aware [ ] Not Aware [ ]  
Economic impacts: Very aware [ ] Aware [ ] Slightly Aware [ ] Not Aware [ ]

36. How intense are implications of poor household waste management on the environment in Juja?

Land degradation: Very intense [ ] slightly Intense [ ] Intense [ ] Not intense [ ]

Air Pollution: Very intense [ ] slightly Intense [ ] Intense [ ] Not intense [ ]  
Water pollution: Very intense [ ] slightly Intense [ ] Intense [ ] Not intense [ ]

Unhygienic environment: Very intense [ ] slightly Intense [ ] Intense [ ] Not intense [ ]

Dirty Environment: Very intense [ ] slightly Intense [ ] Intense [ ] Not  
intense [ ]

**End of questionnaire.**  
**Thank you for your time.**