FACTORS INFLUENCING SOLID WASTE MANAGEMENT IN URBAN CENTRES: A CASE OF THIKA SUB COUNTY, KIAMBU COUNTY, KENYA

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A Research Project Report Submitted in Partial Fulfillment of the Requirement for the Award of Degree of Masters of Arts in Project Planning and Management, of the University of Nairobi

2015
DECLARATION

This Research Project is my original work and has not been presented for any examination in any other institution.

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L50/70663/2011

This Research Project has been submitted to the department with my approval as the university supervisor.

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DEDICATION

I would like to dedicate this Research Project to my husband John Macharia and my two sons: Louis Wanjoji and Shiza Kariuki.
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I wish to express my gratitude to Dr. Lydia Wambugu for her support and mentorship. I would also like to acknowledge my supervisor, Dr. Angelina Mulwa for her guidance, support and insight throughout this research process. I also acknowledge the lecturers, Nicasio Njeru for editing my work, Rachael Wanjiru for typesetting and printing my work and my fellow students who have been supporting me throughout this research process. May the Almighty God bless you all.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION</td>
<td>ii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>iv</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF FIGURE</td>
<td>ix</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS/ACRONYMS</td>
<td>x</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>xi</td>
</tr>
</tbody>
</table>

## CHAPTER ONE: INTRODUCTION

1. Background of the Study ........................................................................... 1
2. Statement of the Problem ......................................................................... 2
3. Purpose of the Study .............................................................................. 4
4. Objectives of the Study .......................................................................... 4
5. Research Questions .................................................................................. 5
6. Significance of the Study ....................................................................... 5
7. Delimitations of the Study ..................................................................... 6
8. Limitations of the Study ........................................................................ 6
9. Assumptions of the Study ....................................................................... 7
10. Definition of Significant Terms ............................................................. 8
11. Organization of the Study ..................................................................... 9

## CHAPTER TWO: LITERATURE REVIEW

1. Introduction .............................................................................................. 10
2. Solid Waste Management Practices .......................................................... 10
3. Waste Management ................................................................................... 13
4. Factors that Influence Waste Management ............................................ 17
   - 2.4.1 Enforcement of Sub county By-Laws and Solid Waste Management .... 18
   - 2.4.2 County Governance and Solid Waste Management ........................ 19
   - 2.4.3 Public Training and Solid Waste Management .............................. 20
   - 2.4.4 Private and Public Partnerships on Solid Waste Management ......... 22
2.5. Measures of Enhancing the Waste Management Process ........................................... 23
2.6. Waste Hierarchy Model .......................................................................................... 25
2.7. Conceptual Framework .......................................................................................... 27

CHAPTER THREE: RESEARCH METHODOLOGY ......................................................... 29
3.1 Introduction .................................................................................................................. 29
3.2 Research Design ......................................................................................................... 29
3.3 Target Population ....................................................................................................... 30
3.4 Sample and Sampling Technique .............................................................................. 30
3.5 Research Instruments ............................................................................................... 31
  3.5.1 Questionnaires ...................................................................................................... 32
3.6 Validity and Reliability of the Research Instruments .................................................. 33
  3.6.1 Validity of the Research Instruments ..................................................................... 33
  3.6.2 Reliability of the Research Instruments .............................................................. 33
3.7 Data Collection Procedures ...................................................................................... 34
3.8 Data Analysis Techniques ......................................................................................... 35
3.9 Ethical Considerations of the Study ......................................................................... 35
3.10 Operationalization of the Variables ........................................................................ 36

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND
INTERPRETATION ........................................................................................................... 38
4.1 Introduction .................................................................................................................. 38
4.2 Demographic Information .......................................................................................... 38
  4.2.1 Respondents’ Distribution by Gender ................................................................. 39
  4.2.2 Respondents Marital Status ................................................................................ 39
  4.2.3 Respondents Age Bracket ................................................................................... 40
  4.2.4 Respondents Highest Education Qualification .................................................... 41
  4.2.5 Respondents Occupation .................................................................................... 41
  4.2.6 Respondents Residence in Thika ......................................................................... 42
  4.2.7 Respondents Period of Stay in Thika .................................................................... 42
  4.2.8 Respondents Income Level .................................................................................. 43
4.3 Garbage Collection in your Area .............................................................................. 44
  4.3.1 The Frequency Garbage Collection. ..................................................................... 44
4.3.2 Garbage Pile up in your Area .................................................................45
4.3.3. Garbage Collection Payment .................................................................45
4.3.4. The ability of Garbage Collector to cope up with the Volume of Garbage in your Area.................................................................46
4.3.5 Service by the Garbage Collectors ..........................................................46
4.3.6 Suggestion on Improvement of Garbage Collection in your Area .............47
4.3.7 Respondents Satisfaction with Garbage Collection in the Area ................47
4.4 Services of Garbage Collectors ....................................................................48

CHAPTER FIVE: SUMMARY OF THE FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS .................................................................50
5.1 Introduction ....................................................................................................50
5.2 Summary of the Findings ...............................................................................50
5.3 Conclusions of the Study ...............................................................................52
5.4 Recommendation ..........................................................................................54
5.5 Suggestions for Further Studies ....................................................................54

REFERENCES .................................................................................................56

APPENDICES ..................................................................................................62
APPENDIX I: Introduction Letter ........................................................................62
APPENDIX II: Respondents Questionnaire ..........................................................63
APPENDIX III: Research Permit ..........................................................................66
LIST OF TABLES

Table 3.1: Sampling of Biashara Household ..........................................................31
Table 3.2: Sampling of Key Informants .................................................................31
Table 3.3: Operationalization of variables ............................................................37
Table 4.1: Respondents’ Distribution by Gender ..................................................39
Table 4.2: Respondents Marital Status ..................................................................40
Table 4.3: Respondents Age Bracket ..................................................................40
Table 4.4: Highest Education Qualifications .......................................................41
Table 4.5: Respondents Occupation ..................................................................41
Table 4.6: Respondents Residence in Thika .........................................................42
Table 4.7: Respondents Period of Stay in Thika ....................................................43
Table 4.8: Respondents Income Level ..................................................................43
Table 4.9: The Frequency Garbage Collection .....................................................44
Table 4.10: Garbage Pile up in your Area .............................................................45
Table 4.11: The Ability of Garbage Collector to cope up with the Volume of Garbage in your Area ........................................................................................................46
Table 4.12: Service by the Garbage Collectors .....................................................47
Table 4.13: Respondents Satisfaction with Garbage Collection in the Area ..........48
Table 4.14: Services of Garbage Collectors .........................................................48
LIST OF FIGURE

**Figure 1:** Waste Hierarch Model .................................................................26

**Figure 2:** Conceptual Framework ...............................................................28
LIST OF ABBREVIATIONS/ACRONYMS

CCN: City Council of Nairobi

CSIRO: Commonwealth Scientific and Industrial Research Organization

JICA: Japan International Co-operation Agency

SPSS: Statistical Package for Social Science

THIWASCO: Thika Water and Sewerage Company

UNEP: United Nations Environmental Program

WASREB: Water Services Regulatory Board
ABSTRACT

The purpose of the study was to investigate the factors influencing solid waste management in urban Centers. The study used Thika Sub-County as a case. The Study aimed at achieving the following specific objectives: To identify the influence of public and private partnerships on solid waste management practices in Thika Sub-County, to determine the influence of public training on solid waste management practices in Thika Sub-County, to assess the influence of institutional framework on solid waste management costs in Thika Sub-County and to identify the influence of the enforcement of county by-laws on solid waste management and environmental preservation in Thika Sub-County.

The study adopted descriptive survey research design using both qualitative and quantitative research paradigms. The target population for this study constituted 2607 respondents of biashara location and it had a sample size of 271 respondents. The Data Collection Instrument was a questionnaire that was self-administered. The data was analyzed using descriptive statistics namely Frequencies, percentages and presented by use of tables. The study concludes that; Garbage collection was not up to household expectations. These findings concurs with Kazungu (2010) study that the lack of financial and physical capacity by government agencies and other players involved in waste collection is to blame for ineffective and inefficient waste management practices in developing countries. Respondents were for the opinion that garbage collector was able to cope with volumes of garbage; while just a few had contrary opinion that collector did not cope with the garbage volumes. Half of the respondents were for the opinion that the area was well served by garbage collectors, while the other half indicated that the area was not well served by the garbage collectors. Garbage collection companies should increase the number of collectors to ease collection, the number of vehicles should also be increased to aid the garbage collection, and respondents further suggested that the bins at points of collection should be placed at the strategic points and finally town council planners to put in consideration the population size of the area. Thika sub-county needs to improve garbage collection system by providing man power, enough vehicles to ease garbage collection. Services of garbage collectors were good in provision of collection bins and providing enough collection polythene bags. However services of garbage collectors being fair in provision of adequate work force, provision of enough collection vehicles, provision of enough equipment and in consistent in collection. Kiambu County Government Act and by extension most of the County By-Laws are traditional in nature and therefore not consistent with Waste Management regulations 2006. The study recommends that; The study recommends that Kiambu County should provide financial and physical capacity county and sub-county agencies and other players involved in waste collection for effective and efficient waste management practices in county. The study recommends that Thika town council needs to improve garbage collection system. The Kiambu County Government Act and by extension sub-County By-Laws should be modernized in nature and in order to be consistent with Waste Management regulations 2006.
CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Waste is described as objects or substances which are disposed of because the initial user has no further use for them (Bilitewski, Hardtle and Marek, 1997; Williams, 2005). Solid waste has been in existence since human beings started living in settled societies and communities. In addition, solid waste has been an issue of concern to modern societies because waste production and generation has increased tremendously.

According to Mazzanti and Zoboli (2008), the generation of waste is linked to population growth, economic prosperity and urbanization. Waste generation is positively correlated to economic growth and development. This implies that as nations grow economically, the more they generate waste. Both developed and developing countries are in pursuit of economic growth. This is because; it is through economic growth that socio-economic welfare of citizenry can be enhanced. Consequently, the generation of waste is unavoidable to all economies. However, waste can have adverse effects on both social and economic welfare if not adequately managed (Wilson, Velis and Cheeseman, 2006). Waste management thus plays a critical role in social and economic welfare.

Solid waste management is a system for handling waste which is collected in solid form (Kumar, 2009; Anand, 2010). Solid waste management encompasses activities such as recycling and incineration. Ahmed and Ali (2004) conducted a research study whose findings suggest that developed countries have invested in adequate waste management
processes and activities. In addition, through campaigns, public and private partnerships
the governments of developed countries emphasize on the importance of waste
management. On the contrary, most developing countries like Kenya have challenges
when it comes to managing their waste (Kazungu, 2010).

A number of research studies have highlighted the following as the challenges of solid
waste management in developing countries: (1) lack of proper governance structures to
manage waste; (2) the lack of partnerships of public and private institutions when it comes
to waste management; (3) lack of adequate resources to manage solid waste; (4) the lack of
proper legislation; (5) the lack of commitment by public and society to manage solid waste
various measures and strategies have to implemented in order to enhance waste
management within all countries be they developed or developing.

Thika Sub-County is located in Kiambu County and it’s headquarter is Thika town. Thika
is a town which is located 40 kilometers from Kenya’s capital city Nairobi. According to
the official website of Municipal Council of Thika (2013), Thika is considered as one of
the cleanest towns in Kenya. The waste management process for Thika Sub-County is
managed by Kiambu County government.

1.2. Statement of the Problem

Gakungu, Gitau, Njoroge and Kimani (2012) assert that Kenya including many other
countries in the world is experiencing challenges in waste management. The challenges
that both developed and developing nations are facing in disposal of waste as a waste management practice (Gakungu, Gitau, Njoroge and Kimani, 2012). This suggests that solid waste management is a problem which needs to be addressed due to the fact that the population within urban areas in Kenya is increasing tremendously. It is therefore necessary and imperative to carry out a research study that will seek solutions to the problem of solid waste management within urban centers in Kenya and other developing countries.

There are only a few research studies – Muniafu and Otiato (2010), Henry, Yongsheng and Jun (2006), Sira (2010), Karanja (2005), and Gakungu, Gitau, Njoroge and Kimani (2012) – that have been carried out in Kenya with reference to solid waste management activities. Henry, Yongsheng and Jun (2006) conducted a research study which sought to examine the overview of the municipal solid waste management activities of local authorities in Kenya. The study indicates that recent social and economic changes over the last 30 to 40 years have resulted in increased rural-urban migration. However, increased rural-urban migration has been at the expense of solid waste management within urban centers.

The study further highlights that local authorities have challenges in managing solid waste because of the following factors: political interference, underfunding of solid waste management activities, increased rural-urban migration, poor infrastructure, and the lack of stakeholder involvement. Another study that highlights the solid waste management within urban centers was a challenge was conducted by Muniafu and Otiato (2010). Muniafu and Otiato (2010) argue that increased globalization and industrialization have
resulted in increased solid waste. This study highlights that measures addressing solid waste within urban centers must be urgently put in place to ensure the better livelihoods within urban areas.

The central government, county governments and local authorities which carry out solid waste management activities face a number of challenges as they perform their duties (UNEP, 2004). The challenges are numerous and that is why Kenya is faced with solid waste management problems and inadequacies. This study seeks to fill this empirical literature gap by providing current data on the solid waste management practices within urban centers in Kenya. In addition, the findings of this study seek to highlight the measures that the central government and the county governments can implement and adopt in order to enhance solid waste management practices within urban centers.

1.3. Purpose of the Study

The overall aim of this study was to investigate the factors influencing solid waste management in urban Centres. The study used Thika Sub-County in Kiambu County as a case.

1.4. Objectives of the Study

The study used the following research objectives:

i. To establish the influence of public and private partnerships on solid waste management practices in Thika Sub-County.

ii. To determine the influence of public training on solid waste management practices in Thika Sub-County.
iii. To assess the influence of institutional framework on solid waste management costs in Thika Sub-County.

iv. To establish the influence of the enforcement of county by-laws on solid waste management and environmental preservation in Thika Sub-County.

1.5. **Research Questions**

i. What is the influence of public and private partnerships on solid waste management practices in Thika Sub-County?

ii. How does public training influence solid waste management practices in Thika Sub-County?

iii. What is the influence of institutional framework on solid waste management costs in Thika Sub-County?

iv. How does the enforcement of county by-laws influence solid waste management and environmental preservation in Thika Sub-County?

1.6. **Significance of the Study**

The study was of significance to the existing body of waste management in Kenya. There are only a handful of research studies – Muniafu and Otiato (2010), Henry, Yongsheng and Jun (2006), Sira (2010), Karanja (2005), and Gakungu, Gitau, Njoroge and Kimani (2012) – that have been carried with reference to waste management in Kenya. This study seeks to fill this gap and could furthermore be used as a foundation for future research in this area. The study would also be used as a secondary source of literature.
The study would also be of significance to the Thika Sub-County. This is was because; the study would highlight the challenges the Thika Sub-County faces as it manages waste in Thika Sub-County. In addition, the study would make recommendations on the measures that should be implemented in order to overcome the identified challenges. By so doing, waste management would be made more effective and efficient. In addition, the study would be of significance to the household of Thika Sub-County. It would enable the household appreciate the efforts that the Thika Sub-County was making in its waste management efforts.

1.7. Delimitations of the Study

Thika Sub-County was used as the case for this research process. This was because; the Thika Sub-County is responsible for waste management in Thika. Its employees thus understand the challenges of waste management in the district. They were the best persons to recommend measures that should be implemented in order to ensure waste management systems and procedures in Thika Sub-County. By so doing, the researcher would collect the right information that would enable them answer the research questions of this study.

1.8. Limitations of the Study

The employees at Thika Sub-County could be of the thought that the study would result in victimization. They may thus be reluctant to give information. As a result, the validity of the study could be adversely affected. In order to overcome this challenge, the researcher would assure the respondents that their responses would be anonymous and would only be used for study purposes.
This would enable the respondents be free when responding to the questions raised by the researcher. Some respondents would be unwilling to cooperate due to their busy schedules. To overcome the limitation the researcher would visit the sub-county management earlier to be given a convenient time, to allow for data collection process.

1.9. Assumptions of the Study

The study was based on the following assumptions:

1. The research assumed that public private partnership, public training, institutional framework, and enforcement of county by-laws are some of factors influencing solid waste management in Thika Sub-County and that the respondents would cooperative and honest in giving the information required.

2. There were various measures that would been implemented to enhance the waste management processes within Thika Sub-County?
1.10. Definition of Significant Terms

Public and private partnership: This is whereby the government or government institutions work together with non-governmental institutions and the society with the aim of managing solid waste.

Recycling: Act of converting waste materials or products into new usable products. Recycling is done with the aim of preventing waste, environmental pollution and to reduce the consumption of new materials.

Waste: Objects or substances, which are disposed of because the initial user has no further use for them.

Waste management: A discipline that is concerned with the generation, control, storage, Selection transport and disposal of waste.

Public training: Citizens knowledge on solid waste management and furthermore be more involved in the routine waste collection activities as they are supposed to know their responsibilities.

Institutional framework: The systems of formal laws, regulations, and procedures, and informal conventions, customs, and norms, that shapes socioeconomic activity and behavior.

County by-laws: It is a rule or law established by the county government to regulate itself, as allowed or provided for by some higher authority. The higher authority, generally a legislature or some other government body, establishes the degree of control that the by-laws may exercise.

Urban Centre: A large and densely populated urban area; may include several independent administrative districts.
1.11 Organization of the study

The study was organized into five chapters. The first chapter had the introduction that covers the background of the study, statement of the problem, purpose of the study, objectives of the study, significance of the study, limitations of the study, delimitations of the study, basic assumption of the study, definition of significant terms and organization of the study. The second chapter covered literature review that covers: solid waste management, waste management and waste management activities, factors that influence waste management, measures of enhancing the waste management process, waste hierarchy model, and the conceptual framework.

The third chapter dealt with research methodology, which includes introduction, research design target population, sample size and sampling procedure, research instrument validity, instrument reliability, data collection procedure, data analysis techniques, ethical issues and the operationalization of the variables. Chapter four dealt with analysis of data, presentation and interpretation. Chapter five comprised of the summary of the findings, discussion conclusions, recommendations, and suggestions for further research.
CHAPTER TWO
LITERATURE REVIEW

2.1. Introduction

This chapter highlights empirical literature written by accredited scholars and researchers with reference to the factors that influence solid waste management within urban areas. This chapter is divided into the following subsections: solid waste management, waste management and waste management activities, factors that influence waste management, measures of enhancing the waste management process, waste hierarchy model, and the conceptual framework.

2.2. Solid Waste Management Practices

According to Ngoc and Schnitzer (2009), waste generation is linked to population growth, prosperity and urbanization. Empirical findings show that waste generation correlates with the level of economic activities (Giegrich and Vogt, 2005). It is therefore impossible to de-link waste generation from economic drivers like gross domestic product. Most of the developing and developed nations experiencing rapid urbanization, population growth and prosperity are facing major challenges in waste management. Municipalities found in these jurisdictions are charged with the responsibility of collecting, recycling, treating and disposing the increasing amounts of wastes that are continually churned by the household and industries if these nations.

There is, therefore, a need for developing and developed countries to establish sustainable waste management practices. A sustainable waste management practice will help
developing nations achieve sustainable development. According to Giegrich and Vogt (2005), sustainable development can be achieved through a sustainable waste management system that is affordable and effective. Sustainable waste management practices pose numerous public health, safety and environmental co-benefits to the population of these nations, therefore reducing emissions, quality of life, and conservation of natural resources and prevention of water and soil contamination. Kenya over the past decade has been experiencing rapid population growth coupled with a growing economy.

From literature, it is evident that one of the major challenges posed by a growing population and urban areas is the management of the huge waste generated as a result of increased socioeconomic activities. This has led to increased levels of waste generation in all major towns in Kenya.

Nairobi’s solid waste situation, which could be taken to generally represent Kenya’s status, is largely characterized by low coverage of solid waste collection, pollution from uncontrolled dumping of waste, inefficient public services, unregulated and uncoordinated private sector and lack of key solid waste management infrastructure (UNEP, 2010).

Although the economy is growing relatively quickly, and the country is described as the ‘powerhouse’ of the region, it is anticipated that by 2020, urban poverty will represent almost half (48.9%) of the total poverty in the country (Kessides, 2006). In medium-sized towns such as Nakuru, the problems can be even more acute. The population continues to rise rapidly (at even higher rates than national averages), and the capacities and resources to manage and the associated problems of solid waste management. In its early days as a
town, Nakuru took great pride in its cleanliness. This memory remains alive among the city fathers and they are keen to maintain (or regain) this image of the town partly because of its high profile nature for tourists visiting the Nakuru National Park. Needless to say, the low-income settlements within the town are the ones which suffer most from the failings of the solid waste management system.

The case is even worse in areas like Thika, which is home to several industries. The increased discharges of effluent and home refuse require effective and sustainable waste management practices to mitigate cases of environmental pollution. Unfortunately, most, if not, all major towns in Kenya lack adequate waste management systems to treat, recycle and dispose waste from homes and industries.

For this reason, improper waste disposal generated in urban areas is alarming. This has resulted in waste being disposed in open spaces causing blockage of drainage channels, posing health hazards and damaging the aesthetic value of major towns in Kenya, yet few mitigation measures are in place. The greatest challenge affecting sustainable waste management practices is blamed on the administrators of waste management practices. Waste management in Kenyan urban areas has remained the purview of local authorities. One alternative waste management technique is the urban poor's re-use of refuse. Waste recycling is often undertaken as a survival strategy when the urban poor are unable to obtain formal employment, and when non-waste resources are scarce or unaffordable. Waste re-use also plays a role in improving the urban physical environment, further exploitation of scarce natural resources is minimized, thus containing the spreading
ecological footprint of the city. Despite these environmentally and socially beneficial aspects of waste recycling, it is not without its negative impacts, which include exploitation by waste buyers and poor health and living conditions for the urban poor who deal in waste picking (Furedy, 1992). The administration of Kenyan urban areas should ensure that waste management conforms to the best standards of public health and environmental conservation. In addition, waste management practices should be tailored to be responsive to public concerns and attitudes.

2.3 Waste Management

According to Sira (2010), waste management is a disciplined that is concerned with the generation, control, storage, selection transport and disposal of waste. Waste management, therefore, includes all activities carried out to remove waste from sources of generation to the disposal sites and the activities that follow on disposing the waste to ensure that environmental safety is observed. Waste management, Gakungu, Gitau, Njoroge and Kimani (2012) assert that Kenya including many other countries in the world is experiencing challenges in waste management. The challenges that developed and developing nations are facing in waste management practices, ranging from generation of waste, separation, collection, transport, treatment, reuse and disposal of waste.

According to UNEP (2005), developing nations, like Kenya, in their bid to accelerate industrial development usually pay inadequate attention to waste management. The result is characterized by inefficient waste disposal systems and environmentally unfriendly practices. In Kenya, for example, Otieno (2010) states that between 30 and 40 percent of
waste in urban areas in Kenya is uncollected and 50 percent of the Kenya population lack an efficient disposal mechanism of the waste they generate. The author further highlights that 80 percent of collection transport in the country is grounded, and therefore, if urgent measures are not taken, the country will in the future be engulfed in waste because waste generation continues to rise.

It is evident that local authorities in Kenya have not increased waste disposal despite increasing population, consumption patterns, economic development and rapid urbanization in most parts of the country. Though, there is a paucity of research on waste management practices in most urban towns in Kenya, a review of literature on waste management practices by the City Council of Nairobi, which attracted some level of research shows, according to UNEP (2004), that the City Council of Nairobi lacks the capacity of waste collection and disposal to deal with the prevailing situation. As a result, waste is dumped of along back lanes and street corners within the city and its environment.

UNEP (2004) continues to observe that in some places in the city of Nairobi; waste disposal has been much neglected, posing serious environmental and health concerns to the household. Magutu et al., (2010) explain that poor waste management practices in the City of Nairobi are as a result of inefficient government structures. The authors continue to observe that the council has failed to deliver waste management services because of an inadequate billing system, poor rate collection system and debt default by ratepayers, undermining service provision.
Issues affecting waste management in Kenya are similar from town to town. Therefore, general problems undermining efficient waste management practices in Nairobi County can be extended to a town in Kiambu County. Ikiara, Karanja and Davies (2004) observe that one of the problems affecting effective and efficient waste management practices in Nairobi is that the collection ratio of waste in Nairobi just like in other urban areas in Kenya including Thika West District is very low.

Ikiara et al., (2004) state that the City Council of Nairobi (CCN) lacks adequate and properly trained staff to handle city’s waste management processes, and as a result the vision and goals of the waste management department within the CCN cannot be realized. The authors continue to highlight that the department within the CCN charged with waste management has yet to develop a policy formulation and standardize operational guidelines for the city waste management practices, and as a result, the staff members in the department are ever embroiled in daily crisis management.

According to Magutu et al., (2010), the unprofessional manner through which the CCN handles water management is evident in the collection methods and dumping methods they use, which is mainly door-to-door type. The city council load their waste collection trucks using a manual method that is time consuming and unprofessional. The collected waste is then transported using open trucks to dumpsites located adjacent to residential areas, posing huge health and environmental risks to the citizens. In addition, the city council has not established formal structures to prevent dumping of hazardous and toxic waste into these dumpsites.
Privatization as an alternative to publicly provided waste management has been explored for developing countries. Bartone et al. (1991) conclude that the private sector can operate more efficiently than the public sector in providing municipal solid waste services, while Cointreau-Levine (1994) concludes that it is a possible opportunity, not a panacea, for improving solid waste management in developing countries. For example, in Nairobi, two formal sector companies provide private waste collection services. However, only upper-income household and businesses are able to afford the monthly fee. Neither company ventures into the informal settlements since they are unable to collect fees from household. The NCC has no official policy towards the privatization of waste collection, nor do they provide any assistance to private companies to enable them to operate in informal settlements (Personal communication, NCC Cleansing Section).

Thika West District, waste management is under the purview of the Thika Sub-County. According to Kenya National Water Development Report (2006), in Kenya, sanitation service provision is a duty of the Water Services Boards, which are regulated by the Service Provision Agreements (SPAs) to ensure that service provision conforms to standardized quality, service levels and performance benchmarks set by WASREB. Water services boards are mandated to provide sanitation services to citizens in Kenya.

However, they delegate the service provision role to commercial public enterprises called Water Service Providers, which are limited companies that operate within local authorities. The SPAs categorize SPAs into four classes, namely Category I, Category II, Category III and Category IV. Sanitation services, which include waste management services, in the
Thika West District are offered under Category I by a limited liability company formed by the local authority of Thika. The limited liability company that provides sanitation services, including waste management services is called THIWASCO, abbreviation for Thika Water and Sewerage Company.

Besides, waste management services offered by Water Services Provider, private sector players are also involved in the collection of waste in the area. According to Sira (2010), household of Thika town generate solid waste at a rate of 0.55kg per person per day, with the highest concentration consisting of compostable organics at 79%. It is evident that most of the waste collected by the Thika Sub County through its affiliate company is solid waste because the activities carried out by the household and that generate waste include domestic, commercial or industrial. According to Magutu et al., (2010) municipal solid waste is defined as solid waste, which includes domestic waste, commercial waste, institutional waste, street sweepings and construction debris. Municipal solid waste is mostly non-hazardous.

2.4. Factors that Influence Waste Management

CSIRO (2008) argues that efficient waste management is a basic requirement of ecological sustainable development. The report continues to stat that efficient waste management process reduces environmental effects. The process of waste management is a step-by-step approach that aims to reduce waste and its impact on the environment and human health. In both developed and developing countries, waste materials originate mainly from domestic activities.
In solid waste production, primarily the amount of waste produced should be reduced. Moreover, the need for awareness rising in households for separation of waste at the source, to make it ready for collection, should be encouraged. There is a need for countries and societies to develop effective and efficient waste management systems to deal with the menace of waste material. According to CSIRO (2008), the waste management process involves monitoring of waste material, collection of waste material, transportation of waste material, processing of waste material and disposal of waste material. Effective waste management strategies are central to economic development and improvement of quality of life. An observation made by CSIRO (2008) in their report, the report further asserts that waste management practices aim to a) conserve natural resources such as water, raw materials and energy; b) control environmental pollution; c) enhance corporate social responsibility and business performance; and d) improve occupational health and safety.

2.4.1. Enforcement of Sub county By-Laws and Solid Waste Management

According to Caplan, Grijalva and Jarkus (2002) stringent enforcement of municipal by-laws help in countries like the United States of America and Sweden facilitated in solving deep waste management problems in the cities. However, Kenya has made strides in enforcement of municipal by-laws a lot need to be done in harmonization and coordination of local government by-laws and waste management laws (Kazungu, 2010). Nairobi County by laws Section 8(9) requires the occupiers of domestic and trade premises to separate waste which can be recycled and place in a different container provided by County or the waste operator. This provision ensures that every generator of solid waste separates wastes which can then be recycled and put in separate containers. This has not
been applied by the households and commercial enterprises as the Sub County does not offer separate bins for 19 recyclables and therefore they put all the waste together (Nairobi County by law, 2008).

Kiambu County Government Act and by extension most of the County By-Laws are traditional in nature and therefore not consistent with Waste Management regulations 2006. Most of council By-laws are disposal oriented, while the Environmental Management and Coordination (Waste Management) regulations 2006 are prevention oriented. These inconsistencies make it difficult for enforcement.

2.4.2. County Governance and Solid Waste Management

Kazungu (2010) opines that the lack of financial and physical capacity by government agencies and other players involved in waste collection is to blame for ineffective and inefficient waste management practices in developing countries, especially in urban poor areas such as slums. Kazungu (2010) continues to observe that urban areas have a skewed wasted management service provision, with urban poor who reside in peri-urban areas and slums receiving little, if any, waste management support, which poses serious human and environmental health challenges. Kazungu (2010) supposes that poor waste management practices in urban areas of developing countries are due to poor governance. Rapid urbanization threatened governance systems in developing countries, especially in African countries. According to Werlin (1974), effective and good governance advocates for effective, accountable institutions and responsible government systems.
Kazungu (2010) observes that if there was effective governance systems in the urban areas of developing countries, the governance structures would institutionalizes necessary polices, programs and strategies for urban management, eliminating problems posed by rapid and unplanned urbanization. As a result, waste management practices would be improved in tandem with rapid urbanization to enhance urban sustainability. Besides lack of good governance structures and inadequate financial and infrastructure capacity to manage waste materials, other numerous factors affect the waste management process in developing countries.

A study carried out at Enugu, in Nigeria (Mensah, 2010) highlights recent efforts to visibly improve governance through reform of solid waste management in the urban area. Contribution of informal recyclers towards handling the city's solid waste problem, job creation and poverty alleviation is also noted. The study also reveals that the importance of the informal recycling sector has not been given adequate consideration within the framework of the reforms in solid waste management. With the focus of the Millennium Development Goals on poverty reduction, improvement of quality of life and environmental sustainability, this study observes that the informal recycling sector in Enugu possesses unacknowledged development potential. The study calls for official recognition and support of the activity and empowerment of people involved in it within the context of this reform programmes.

2.4.3. Public Training and Solid Waste Management

According to Rondinelli and Cheema (1988), lack of public training and lack of citizen
participation adversely affects waste management processes. Citizens are supposed to have knowledge on solid waste management and furthermore be more involved in the routine waste collection activities as they are supposed to know their responsibilities, collection timetable and the standard procedures of waste management (Nkwocha & Emeribe, 2008). According to Nkwocha and Emeribe (2008), little private sector involvement results from the lack of public training in waste management processes and this result in adversely affecting waste management practices in developing countries.

According to Kazungu (2010), some African cities such as Nairobi and Dar es Salam have a reciprocal stakeholder-participatory system of waste management; though, it is riddled with challenges. Rondinelli and Cheema (1988) observe that developing countries lack affordable and sustainable technology, a factor that has contributed to unsustainable waste management. For example, in Nairobi, collection of waste material has largely been through imported capital-intensive tools that the City Council of Nairobi lacks local maintenance capacity. Developing countries, therefore, need to explore and adopt non-conventional approached in waste management in order to foster economic development and improve quality of life, and thus contribute to urban sustainability.

Awareness and knowledge on sustainable waste management practices is key in achieving a zero waste principle in the country. Areas visited depicted poor attitude towards waste management due to ignorance and lack of awareness on the concept on Integrated Solid Waste Management. This is more common in the middle and low-income areas where segregation of waste is of low priority from the source to, transportation and final disposal.
2.4.4. Private and Public Partnerships on Solid Waste Management

According to Kazungu (2010), waste management problem has been because of rapid rate of uncontrolled and unplanned urbanization that has been witnessed in developing countries, and especially in Africa. Rapid and unplanned urbanization coupled with social and economic challenges that characterize developing countries has resulted in increased waste generation and consequently environmental degradation. By, extension, this is a case that continues to haunt a country like Kenya that the United Nations projects fast paced urbanization going into 2015, the year that the United Nations expects over 60% of world population to be living in urban areas, with the highest proportion of people living in urban areas being in developing countries such as Kenya. It is therefore evident that contemporary urbanization in Africa is not only fast paced but also a contributor to environmental degradation through increased waste generation (Hardoy, and Satterwaite, 1992).

However, Kazungu (2010) contradicts this observation by asserting that the problem in developing countries including Kenya and other African countries is not the huge volumes generated but the inability of agencies, both public and private, to control and manage waste generated in these countries. Kazungu (2010) continues to observe that the Kenya’s capital city Nairobi, for example, a city that was established in 1895 has lagged behind in matching provision of basic urban infrastructure and services and the rapid growth of the city. As a result, this has led to an ever-widening gap between the need for essential services and the supply of the said services.
Kazungu (2010) cites a JICA report that states that in Nairobi, over 1,530 tones of solid waste is generated daily; however, waste collection agencies that include the City Council of Nairobi and private firms only manage to collect between 20% and 30% of the generated waste material. The remaining solid waste material approximated to be about 1,130 tones of solid waste material is left uncollected, disposed in environmentally unfriendly ways or disposed by ad hoc groups such as community-based groups and voluntary groups based in the city. The same case applies to other major towns and urban areas in Kenya including urban and peri-urban areas, found in Thika West District.

2.5. Measures of Enhancing the Waste Management Process

Nkwocha and Emeribe (2008) observe that the most daunting functions in the waste management process in Nigeria include waste collection, waste storage and waste transportation. Therefore, there is a need for improved measures to ensure that there are efficient systems to ensure a smooth collection of waste from points of waste generation to the point of disposal or treatment. CSIRO (2013) reports that waste management is gaining importance, as governments and organizations are adopting strategies to minimize waste at source and down the chain. The report continues to observe that among the strategies that organizations and governments are adopting is zero waste policies. Zero waste policy is a systematic approach that seeks to reduce waste at the source by improving product design and fostering producer responsibility. In addition, the system approach further advocates for waste reduction further down the value chain activities. The reduction strategies proposed by CSIRO (2013) include cleaner production, product dismantling, recycling, repair and reuse.
Vincente and Reis (2008) assert that countries across the world are using diverse methods to improve waste management system by enhancing efficiency in the collection and disposal of waste material. According to Worku and Muchie (2012), the cleanest major cities and towns have used a set of methods to achieve efficiency in waste management. Worku and Muchie (2012) continue to highlight the methods that cities in the world have used to improve their waste management system. They include integrated sustainable waste management, enforcement of municipal by-laws, promotion of education on proper waste management, good governance, institutional frameworks, financial sustainability, incentives for efficient waste management processes and community based campaigns on the importance of sustainable waste management practices.

Kazungu (2010) argues that the problem of waste management in Nairobi and other major towns in Kenya is the result of poor governance structures. Improving governance structures in Kenya will lead to participation due to increased trust, interdependence, reciprocity and responsiveness between the ruled and the rulers (Werlin, 1974). Kazungu (2010) proposes citizen participation in waste management process. Good governance promotes cooperation between citizens and governments as a result increase citizen commitment on sustainable waste management practices. Kazungu (2010) further proposes introduction of public education to sensitize the public on critical issues such as waste minimization, waste collection, waste storage and efficient waste disposal mechanisms.
This will entrench waste management to be a public responsibility. Other measures of enhancing waste management process that Kazungu (2010) proposes include the use of geo-spatial technology to identify disparities in spatial coverage of waste management services.

There is a need to increase private sector involvement in waste management through incentives, training and capacity building. For example, small private players in waste management chain should be incentivized and encouraged to get into house-to-house collection of waste material.

2.6. Waste Hierarchy Model

The waste hierarchy model is a model that was developed with the aim of enhancing waste management process (Jones, 2000). The model arranges waste management options in a theoretical ladder on the basis of sustainability. According to Jones (2000), the following are the hierarchies of the waste hierarchy model: (1) waste minimization; (2) reuse; (3) recovery e.g. recycling and composting; (4) Incineration with energy recovery (5) treated disposal; (6) untreated disposal.
Figure 1: Waste Hierarch Model

Source: Ecoworld (2013)

Waste minimization is highly recommended while untreated disposal is least recommended.

Empirical evidence suggests that the waste hierarchy model has been extensively implemented in European countries. Jones (2000) argues that the model has for instance been adopted by England and Wales and has enhanced tremendously enhanced waste management. This study will use the waste hierarchy model as a tool that can be used in the enhancement of waste management practices in Thika Sub-County by the Thika Sub-County.
2.7. Conceptual Framework

The conceptual framework is composed of both independent and dependent variables. In this case, the study will have the following independent variables: enforcement of county by-laws, good governance, institutional frameworks, public training on waste management, public and private partnerships. The dependent variables for the study will be: decreased waste management cost, better waste management practices, and environmental preservation and conservation. The intervening variables for the study will be: political factors, economic factors, and technological factors. The conceptual framework for this study is presented in Figure 2 below.
Figure 2: Conceptual Framework
CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

The research methodology chapter outlined the steps that a researcher adhered to during the process of data collection and analysis. In this case, the research methodology chapter was divided into the following subsections: research design, target population, sample and sampling technique, data collection and instrumentation, data collection procedures, reliability and validity of research instruments, data analysis, and the ethical considerations of the study.

3.2. Research Design

Research design is the systematic plan to study a scientific problem (Silverman, 2011). In addition, research design reduces the chances of drawing incorrect inferences from data. This study employed a descriptive survey design. Descriptive survey design is used when a researcher wants to determine the characteristics of a particular element (Kothari, 2008). In this case, descriptive survey design was used to identify the challenges that Thika Sub-County faces as it manages waste in Thika Sub-County. In addition, the design was employed when determining measures that could be implemented in order to enhance waste management in Thika Sub-County. The study furthermore employed quantitative and qualitative research approaches.

Quantitative research method involves the analysis of numerate data while qualitative method involved the analysis of non-numerical data, which included words and pictures.
Qualitative research was subjective, depending largely on the researchers’ interpretation of events. The subjectivity of qualitative research poses both advantages and disadvantages (Rubin & Babie, 2009). One of the major disadvantages of qualitative research is that it suffers from researcher’s idiosyncrasy, resulting in bias results. However, a major advantage of qualitative research is that it is a faster research method than quantitative research. Whereas quantitative research is objective, as it uses established measurement concepts (Rubin & Babie, 2009). The study used Thika Sub-County as its case. Thika Sub-County is responsible for the management of waste in Thika Sub-County.

3.3. Target Population

Population is described as the total number of elements, variables or individuals that are under examination by a research study process (Kothari, 2008; Mugenda and Mugenda, 2003). The target population for this study was 2,706 household of biashara location in Thika west district, 2 sub-county (Senior Executives) and 3 sub-county Middle level managers in Thika Sub County. The total population was therefore being 2,711.

3.4. Sample and Sampling Technique

Mugenda and Mugenda (1999) defines sample as a small group obtained from the accessible population, while sampling is a process of selecting a number of individuals for a study in such a way that the individuals selected represent the large group from which they were selected. In this study, random sampling and Purposive sampling procedures were used. According to Gay, Mills & Airasian, (2009), when carrying out a descriptive study, 10% of the population can yield an adequate sample. In this study a sample of 271
household of biashara which represents 10% of the target population will be used. Purposive sampling was used for selecting the key informants who have information required in the study. Secondary statistical data will be obtained from the Kenya National Bureau of Statistics (KNBS), TCC, and (Provincial Administration).

Table 3.1 : Sampling of Biashara Household

<table>
<thead>
<tr>
<th>Location</th>
<th>Population</th>
<th>10% sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biashara</td>
<td>2706</td>
<td>271</td>
</tr>
</tbody>
</table>

Source: KNBS 2009, Kenya population and housing census

The study used purposive sampling decisions concerning the individuals to be included in the sample was taken by the researcher, based upon a variety of criteria which include specialist knowledge of solid waste management in the sub county and that they were most likely to contribute sufficiently rich data both in terms of relevance and experience.

Table 3.2 : Sampling of Key Informants

<table>
<thead>
<tr>
<th>Employment Level of key informants</th>
<th>No.</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Executives</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Middle Level Management</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

3.5. Research Instruments

Data collection refers to the manner in which the researcher would collect data from the respondents of the study (Welman and Kruger, 2001). There are two methods of data collection: primary and secondary data collection techniques. This study used both primary
and secondary techniques of data collection. Primary data is described as data that is used for the original purposes it was collection for. In this case, the researcher used questionnaires as the primary sources of data.

Secondary sources of data are described as when data which is used for other purposes than that which it was originally collected for. The secondary sources of data that was used in this study were articles published in accredited journals and written by accredited scholars. A comparative analysis was made between the findings of this study and the findings from other research studies. Consequently, the researcher was in position to develop elaborate conclusions and recommendations for this study.

3.5.1. Questionnaires

Questionnaires are data collection instruments which are administered to the respondents so that they answer on it in response to the questions asked. The questions were formulated according to the objectives of the study so that the respondents could give their opinion on the different variables being tested in the study. The questionnaires for the general respondents were divided into two sections: section one; consisted of structured questions all of which are about the respondents bio data and section two consisted of both structured and unstructured questions all of which sought information on the perception of the respondents on solid waste management in Thika sub-county. Questionnaires were chosen because they were simple to administer and the respondents were able to answer them within their own time. Questionnaires were administered by research assistants who may not necessarily be experts in research and therefore economical to administer.
3.6. Validity and Reliability of the Research Instruments

The researcher tested the validity and reliability of the research instruments that were used during the data collection process. This enhanced the findings and recommendations of this research process.


Validity is the accuracy and meaningfulness, which are based on the research results. Mugenda and Mugenda (2003) further define valid as the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. Validity is largely determined by the presence or absence of systematic error in data. A construct validity was used, which according to Evans (2002) is a quality control feature aimed at ensuring that researchers are researching what they think and what they report. The instruments were subjected to analysis by a team of supervisors and specialists in the area of study. They will assess the relevance of the content that is used in the instruments, develop and made structural changes for purposes of improvement and reinforcement of the instrument before embarking on the actual data collection.

3.6.2. Reliability of the Research Instruments

Mugenda and Mugenda (1999) define reliability as a measure of the degree to which a research instrument yields consistent result or data after repeated trials. To test reliability of the questionnaire, the researcher used the test – retest method (Orodho, 2004). This was done by administering the instruments to the total respondents in the pilot study. Same instruments were administered twice to the same subject groups. The instruments were
then administered to the same subject groups after an intervening period of one week. The
instrument and the data are said to be reliable if there is reliability from the test re-test
technique (Mugenda and Mugenda, 2003) computed by Pearson’s product correlation
coefficient formula,

\[ r_{xy} = \frac{N \sum xy - \sum X \sum Y}{\sqrt{N \sum x^2 - \left( \sum X \right)^2} \sqrt{N \sum y^2 - \left( \sum Y \right)^2}} \]

Reliability of an instrument is strong when the correlation coefficient is close to -1 while an
instrument is unreliable if the coefficient is close to +1 (Kerlinger, 1967).
A coefficient of reliability of 0.85 and above implies that the research instrument yields
data that have a high test-retest reliability, that is the research instrument yields consistent
results with every use.

3.7. Data Collection Procedures

Questionnaires were administered by the researcher and research assistants who asked
respondents questions and note down their responses on the questionnaire. The researcher
will train the research assistants before the data collection exercise begin. Questionnaire
surveys were carried out to determine how each of the stakeholders in study would
participate by giving out responses on garbage collection and disposal. The questionnaires
will be as discussed.

Household questionnaire survey: These types of questionnaire were set for garbage
collection service beneficiaries that are the Thika west district household. The main
purpose of this questionnaire was to obtain views and ideas of the household on the solid
waste collection services after the involvement of the private sector. Four locations in Thika west district Thika sub-county was selected as the representative sample was Biashara location. The selection of this area looked into account the characteristics of the area, and the key considerations were whether the settlement was planned or unplanned, population density, and income level of the inhabitants. The questionnaires were administered randomly but in a systematic manner.

3.8. Data Analysis Techniques

The researcher read through the completed questionnaires to document analysis recording sheets. Quantitative data collected by using a questionnaire will be analyzed by the use of descriptive statistics using the Statistical Package for Social Sciences (SPSS) version 20.0 and were presented through percentages, means, standard deviations and frequencies. The information was displayed by tables in APA format. This will be done by tallying up responses, computing percentages of variations in response as well as describing and interpreting the data in line with the study objectives and assumptions through use of SPSS.

3.9. Ethical Considerations of the Study

It is important for every research process to adhere to various ethical considerations during the data collection process (Francis, 1998; Israel and Hay, 2006). The researcher adhered to the following ethical considerations during the process of data collection. First, respondents participated in the study on a voluntary basis. This implied that should any of the respondents feel they need to withdraw during the process of data collection; they were allowed to do so. Second, the study was anonymous and thus respondents were required to
include their names on the questionnaire. Third, the information obtained from the questionnaires were treated with utmost confidentiality. Fourthly, the researcher would communicate the findings of the study to its research stakeholders.

3.10. **Operationalization of the Variables**

The table presents summary of the objectives, the type of variable. Indicators of the objectives, measurement scale, type of analysis and the tool used during the research
### Table 3.3: Operationalization of variables

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Types of Variables</th>
<th>Indicators</th>
<th>Measurement Scale</th>
<th>Type of analysis</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>To identify the influence of public and private partnerships on solid waste management practices in Thika Sub-County.</td>
<td>Independent</td>
<td>Number of solid waste management partnerships between Thika Sub-County and other stakeholders, and the society</td>
<td>Nominal</td>
<td>Descriptive</td>
<td>Questionnaires</td>
</tr>
<tr>
<td>To determine the influence of public training on better solid waste management practices in Thika Sub-County.</td>
<td>Independent</td>
<td>The number of public trainings the County has conducted with reference to solid waste management</td>
<td>Ordinal Nominal</td>
<td>Descriptive</td>
<td>Questionnaires</td>
</tr>
<tr>
<td>To assess the influence of institutional framework on solid waste management costs in Thika Sub-County.</td>
<td>Independent</td>
<td>To assess the assets the County has to manage solid waste</td>
<td>Nominal Ordinal</td>
<td>Descriptive</td>
<td>Questionnaires</td>
</tr>
<tr>
<td>To identify the influence of the enforcement of county by-laws on solid waste management and environmental preservation in Thika Sub-County.</td>
<td>Independent</td>
<td>Number of cases reported involving solid waste practices in the sub County</td>
<td>Nominal Ordinal</td>
<td>Descriptive</td>
<td>Questionnaires</td>
</tr>
<tr>
<td>Solid waste management in Thika sub-county</td>
<td>Dependent</td>
<td>Number of bins in households No of private organisations involving waste management</td>
<td>Nominal Ordinal</td>
<td>Descriptive</td>
<td>Questionnaires</td>
</tr>
</tbody>
</table>
CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction
This chapter presents analysis and findings of the study as set out in the research methodology. The results were presented on factors influencing solid waste management in urban Centers. The study used Thika Sub-County as a case. The research sought to answer these research questions; What is the influence of public and private partnerships on solid waste management practices in Thika Sub-County, how does public training influence solid waste management practices in Thika Sub-County, what is the influence of institutional framework on solid waste management costs in Thika Sub-County and how does the enforcement of county by-laws influence solid waste management and environmental preservation in Thika Sub-County. The study targeted 2,71 household of biashara location in Thika west district, out of which 250 household responded and returned their questionnaires contributing to the response rates of 93%. This response rates were sufficient and representative and conforms to Mugenda and Mugenda (2012) stipulation that a response rate of 70% and over is excellent. This commendable response rate was due to extra efforts that were made via personal calls and visits to remind the respondents to fill-in and return the questionnaires.

4.2 Demographic Information
The study initially sought to inquire information on various aspects of the respondents’ background, i.e. the respondent’s age, marital status, gender, highest academic qualification and occupation among others. This information aimed at testing the
appropriateness of the respondent in answering the questions regarding factors influencing solid waste management in urban Centers. The study will use Thika Sub-County in Kiambu County.

4.2.1 Respondents’ Distribution by Gender

The study sought to establish the gender of the respondents and the findings are as shown in Figure 4 below.

Table 4.1: Respondents’ Distribution by Gender

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>136</td>
<td>55</td>
</tr>
<tr>
<td>Female</td>
<td>114</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>250</td>
<td>100</td>
</tr>
</tbody>
</table>

According to findings in table 4: majority of the respondents 55% were male while the remaining 45% were female. This depicts that majority of the respondents in biashara resident were male.

4.2.2 Respondents Marital Status

The researcher also inquired on the marital status of the respondents. The findings are as shown in Table 5
Table 4.2: Respondents Marital Status

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>Singles</td>
<td>75</td>
<td>30</td>
</tr>
<tr>
<td>Divorced</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

From the study findings in Table 5: majority of the respondents 60% were married couples, 30% of the respondents were singles while 10% were divorced with none of the respondents being windowed.

4.2.3 Respondents Age Bracket

The question sought to establish the age of the respondents and the findings are as shown in Table 6

Table 4.3: Respondents Age Bracket

<table>
<thead>
<tr>
<th>Age Bracket</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>(20-29) years</td>
<td>35</td>
<td>14</td>
</tr>
<tr>
<td>(30-39) years</td>
<td>135</td>
<td>54</td>
</tr>
<tr>
<td>(40-49) years</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>50 years and above</td>
<td>30</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

According to the findings in Table 6: majority of the respondents were in age bracket (30-39) years accounting for 54%, (20%) of the respondents were in age bracket of (40-49) years of age,14% represented age bracket (20-29) years of age while 12% of respondents being 50 years and above an none being below 20 years of age. These depicts majority of Biashara household are middle aged people. This implies they have the idea on solid waste
disposal and its importance to environmental conservation. Alternatively they can actively be involved in solid waste disposal activity in their locality.

4.2.4 Respondents Highest Education Qualification

The researcher sought to know the highest education qualification for respondents and the findings are shown in the Table 7

Table 4.4: Highest Education Qualifications

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>University level</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td>Tertiary college</td>
<td>37</td>
<td>15</td>
</tr>
<tr>
<td>Secondary level</td>
<td>130</td>
<td>52</td>
</tr>
<tr>
<td>Primary level</td>
<td>65</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

According to study findings majority of the respondents 52% had attained secondary level education, 26% had primary level academic qualification, 15% had attained tertiary college level education while remaining 7% had university level education. These statistics demonstrate that residence of area under study had attained basic level education to understand the need for solid waste management in urban centers.

4.2.5 Respondents Occupation

The question asked the respondents occupation and the findings are shown in Table 4.3

Table 4.5: Respondents Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Un employed</td>
<td>48</td>
<td>19</td>
</tr>
<tr>
<td>Civil servants</td>
<td>120</td>
<td>48</td>
</tr>
<tr>
<td>Privately employed</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>Self employed business person</td>
<td>32</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
According the findings in Table 8: 48% of the respondents were civil servants, 20% were privately employed people, 19% were unemployed while the rest 13% were self employed business persons. This finding reveals that majority of Biashara household involved in this study had sustainable income.

4.2.6 Respondents Residence in Thika

The researcher sought to know where the respondents stayed in Thika; the findings are shown in Table 9

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kiandutu</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>Makongeni estate</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>Starehe</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Pilot</td>
<td>67</td>
<td>27</td>
</tr>
<tr>
<td>Section 9</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

According to the findings in Table 9: 40% of the respondents resided at Kiandutu estate, 27% of the respondents resided at Pilot, 20% resided at Makongeni estate, 8% resided at Section 9 estate while 5% come from Starehe estate. These depicts that all the estate in the study area were well represented.

4.2.7 Respondents Period of Stay in Thika

The researcher sought to enquire the period of time the respondents had resided in Thika Sub County and the findings are illustrated in Figure 4.3.
Table 4.7: Respondents Period of Stay in Thika

<table>
<thead>
<tr>
<th>Period of time</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 Year</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>(1-3 ) Years</td>
<td>130</td>
<td>52</td>
</tr>
<tr>
<td>( 3-5 ) Years</td>
<td>63</td>
<td>25</td>
</tr>
<tr>
<td>(5-10) Years</td>
<td>45</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

According to findings in Table 10: majority of the household 52% had resided in Thika Sub County for a period of (1-3) years, 25% had stayed in Thika Sub County for a period of (3-5) years, 18% had stayed for a period of (5-10) years while 5% had been residents for less than one year. These findings depicts that majority of respondents in this study had been residents of Thika sub county for less than 5 years.

4.2.8 Respondents Income Level

The respondents were asked to state their level of income, and findings are shown in the table

Table 4.8: Respondents Income Level

<table>
<thead>
<tr>
<th>Income level</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over ksh 100,000</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Kshs 50,00-100,000</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Kshs 25,000-50,000</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Kshs 15,000-25000</td>
<td>136</td>
<td>55</td>
</tr>
<tr>
<td>Kshs 6,000-15,000</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>Less than kshs 6,000</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

From the study findings in table 11; majority of them respondents 55% indicated that their income ranges’ from Ksh (15,000-25,000) ,20% had their income ranging from Ksh (6,000-15,000) ,10% of the respondents had income of Ksh ( 25,000-50,000) ,7% had
income of less than Kshs 6,000, 5% had income ranging between Ksh (50,000-100,000) while only 3% had income of over Kshs 100,000. These findings reveal that majority of Biashara household had average income being below 25,000 Kshs.

4.3 Garbage Collection in your Area

First majority of the respondents indicated garbage was collected by the county government of Kiambu, other respondents said that national youth service collected garbage from their residence.

This indicates a few private organizations were involved in waste collection and the county government has to involve more private organization to curb garbage piles in majority of the areas.

4.3.1 The Frequency Garbage Collection.

The researcher asked the respondents the frequency of garbage collection and findings are illustrated in Table 12

<table>
<thead>
<tr>
<th>Income level</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a month</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Once in two weeks</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Once a week</td>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>(2-3) times a week</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>Daily</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>250</td>
<td>100</td>
</tr>
</tbody>
</table>

From the study findings in table 12; majority of respondents 60% indicated that the garbage collection was done once a week from their residence, 20% said that they had their garbage collected (2-3) times, 10% indicated that they had their garbage collected once in
two weeks and daily bases concurrently.

There is need for the sub-county government through its institution to be consistent in garbage collection, through better mobilization of resources available as well as involving the residents.

**4.3.2 Garbage Pile up in your Area.**

The researcher enquired on whether there is garbage pile up in the area, and findings are shown in table 13

<table>
<thead>
<tr>
<th>Income level</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>150</td>
<td>60</td>
</tr>
<tr>
<td>No</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

From the study findings in table 13: majority of the respondents 60% indicated that there was garbage pile up in their residential areas while 40% had their residential areas being free of garbage pile up. These findings reveal that garbage collection was not up to household’ expectations. These findings concurs with Kazungu (2010) study that the lack of financial and physical capacity by government agencies and other players involved in waste collection is to blame for ineffective and inefficient waste management practices in developing countries.

**4.3.3. Garbage Collection Payment**

Researcher enquired on who pays for garbage collection in the area; some of the
respondents had their garbage collection being paid by Thika town council, while others had individual tenants paying for the collection through contribution of Kshs 20 per households.

4.3.4. The ability of Garbage Collector to cope up with the Volume of Garbage in your Area.

The question asked whether the garbage collector was able to cope with garbage collection in the area and findings are illustrated in Table 14

<table>
<thead>
<tr>
<th>Table 4.11: The Ability of Garbage Collector to cope up with the Volume of Garbage in your Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

From the study findings in Table 14: majority of the respondents 62% were for the opinion that garbage collector was able to cope with volumes of garbage, while 38% had contrary opinion that collector did not cope with the garbage volumes.

4.3.5 Service by the Garbage Collectors

The researcher asked whether the area was well served by the collector and findings are shown by the table 15
Table 4.12: Service by the Garbage Collectors

<table>
<thead>
<tr>
<th>Income level</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>125</td>
<td>50</td>
</tr>
<tr>
<td>No</td>
<td>125</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

From findings in table 15: half of the respondents were for the opinion that the area was well served by garbage collectors, while the other half indicated that the area was not well served by the garbage collectors.

4.3.6 Suggestion on Improvement of Garbage Collection in your Area

Respondents suggested that garbage collection companies should increase the number of collectors to ease collection, the number of vehicles should also be increased to aid the garbage collection, respondents further suggested that the bins at points of collection should be placed at the strategic points and finally town council planners to put in consideration the population size of the area.

4.3.7 Respondents Satisfaction with Garbage Collection in the Area

Researcher enquired whether the respondents were satisfied with garbage collection in the area; findings are illustrated in table 16
Table 4.13: Respondents Satisfaction with Garbage Collection in the Area

<table>
<thead>
<tr>
<th>Income level</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>88</td>
<td>35</td>
</tr>
<tr>
<td>No</td>
<td>125</td>
<td>50</td>
</tr>
<tr>
<td>Not sure</td>
<td>37</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>250</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

According to the findings half of the respondents were for the opinion that garbage collection was not satisfactory, 35% were for the opinion that garbage collection was satisfactory while 15% were not sure whether the garbage collection was satisfactory or not. These findings reveal that sub county needs to improve garbage collection system by proving more trucks for garbage collection and increasing man power.

4.4 Services of Garbage Collectors

Statement on the services of garbage collectors. The responses were rated on a five point likert scale where 1= bad 2= faire 3=good 4=very good, 5 =excellent, the mean and standard deviations were generated from SPSS and are as illustrated in Table 4.6

Table 4.14: Services of Garbage Collectors

<table>
<thead>
<tr>
<th>Statement on the services of garbage collectors</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have adequate work force</td>
<td>0.400</td>
<td>1.610</td>
</tr>
<tr>
<td>Have enough collection vehicles</td>
<td>0.490</td>
<td>1.104</td>
</tr>
<tr>
<td>Have enough equipment</td>
<td>0.430</td>
<td>1.501</td>
</tr>
<tr>
<td>Provides collection bins</td>
<td>3.243</td>
<td>0.590</td>
</tr>
<tr>
<td>Provides enough collection polythene bags</td>
<td>3.230</td>
<td>0.519</td>
</tr>
<tr>
<td>Are consistent in collection</td>
<td>0.454</td>
<td>1.600</td>
</tr>
</tbody>
</table>
According to the findings in Table 17: majority of respondents indicated that the services of garbage collectors were good in provision of collection bins and providing enough collection polythene bags shown by a mean score of 3.243 and 3.230 respectively. However respondents rated the services of garbage collectors being fair in provision of adequate work force, provision of enough collection vehicles, provision of enough equipment and in consistent in collection as shown by mean score of 0.400, 0.490, 0.430 and 0.454 respectively. These findings concur with Kiambu County Government Act and by extension most of the County By-Laws are traditional in nature and therefore not consistent with Waste Management regulations 2006.
CHAPTER FIVE

SUMMARY OF THE FINDINGS CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, discussion, conclusion drawn from the findings and recommendations made. The conclusions and recommendations drawn focus on the purpose of the study.

5.2 Summary of the Findings

Majority of the respondents 55% were male while the remaining 45% were female. Findings in table 4.2 majority of the respondents 60% were married couples, 30% of the respondents were singles while 10% were divorced with none of the respondents being windowed. Findings in table 4.3 majority of the respondents were in age bracket (30-39) years accounting for 54%, (20%) of the respondents were in age bracket of (40-49) years of age,14% represented age bracket (20-29) years of age while 12% of respondents being 50 years and above an none being below 20 years of age.

Majority of the respondents 52% had attained secondary level education, 26% had primary level academic qualification, 15% had attained tertiary college level education while remaining 7% had university level education. The findings in table 4.4; 48% of the respondents were civil servants, 20% were privately employed people, 19% were unemployed while the rest 13% were self employed business persons.
From the findings 27% of the respondents resided at Pilot, 20% resided at Makongeni estate, 8% resided at Section 9 estate while 5% come from Starehe. Findings in figure 4.4 majority of the household 52% had resided in Thika Sub County for a period of (1-3) years, 28% had stayed in Thika Sub County for a period of (5-10) years, 25% had stayed for a period of (3-5) years while 5% had been household for less than one year.

From the Findings; majority of them respondents 55% indicated that their income ranges’ from Ksh (15,000-25,000) ,20% had their income ranging from Ksh (6,000-15,000), 10% of the respondents had income of Ksh ( 25,000-50,000) ,7% had income of less than Kshs 6,000 ,5% had income ranging between Ksh (50,000-100,000) while only 3% had income of over Kshs 100,000. Majority of the respondents indicated garbage was collected by the county government of Kiambu, other respondents said that national youth service collected garbage from their residence.

Study findings indicated that ; majority of respondents 60% indicated that the garbage collection was done once a week from their residence, 20% said that they had their garbage collected (2-3) times, 10% indicated that they had their garbage collected once in two weeks and daily bases concurrently. Study findings in indicated that majority of the respondents 60% indicated that there was garbage pile up in their residential areas while 40% had their residential areas being free of garbage pile up.

Respondents had their garbage collection being paid by Thika sub county, while others had individual tenants paying for the collection through contribution of Kshs 20 per
households. From findings in table 4.6; majority of the respondents 62% were for the opinion that garbage collector was able to cope with volumes of garbage, while 38% had contrary opinion that collector did not cope with the garbage volumes. Half of the respondents were for the opinion that the area was well served by garbage collectors, while the other half indicated that the area was not well served by the garbage collectors.

According to the findings half of the respondents were for the opinion that garbage collection was not satisfactory, 35% were for the opinion that garbage collection was satisfactory while 15% were not sure whether the garbage collection was satisfactory or not.

5.3 Conclusions of the Study

Majority of the respondents in biashara resident were male. Statistics demonstrate that residence of area under study had attained basic level education to understand the need for solid waste management in urban centers. Biashara respondents involved in this study had sustainable income and the respondents in this study had been residents of Thika Sub County for less than 5 years.

Garbage collection was not up to respondents’ expectations. These findings indicate that lack of financial and physical capacity by government agencies and other players involved in waste collection is to blame for ineffective and inefficient waste management practices in developing countries.
Respondents were for the opinion that garbage collector was able to cope with volumes of garbage; while just a few had contrary opinion that collector did not cope with the garbage volumes. Half of the respondents were for the opinion that the area was well served by garbage collectors, while the other half indicated that the area was not well served by the garbage collectors.

Garbage collection companies should increase the number of collectors to ease collection, the number of vehicles should also be increased to aid the garbage collection, and respondents further suggested that the bins at points of collection should be placed at the strategic points and finally town council planners to put in consideration the population size of the area.

Thika sub county needs to improve garbage collection system. Services of garbage collectors were good in provision of collection bins and providing enough collection polythene bags. The county government has to involve the public in waste management by training the public. Waste management campaigns need to be carried out in public forums. The county government has to involve more private organizations to boost their garbage collection. Since most of the residents are of opinion that lack of enough vehicle and manpower was a problem the county government, has to provide for that through their institution.

However services of garbage collectors being fair in provision of adequate work force, provision of enough collection vehicles, provision of enough equipment and in consistent
in collection. Kiambu County Government Act and by extension most of the County By-Laws are traditional in nature and therefore not consistent with Waste Management regulations 2006.

5.4 Recommendation

i. The study recommends that Kiambu County should provide financial and physical capacity county and sub-county agencies and other players involved in waste collection for effective and efficient waste management practices in county.

ii. The study recommends that Thika sub-county needs to improve garbage collection system by providing more trucks for collecting garbage as well increase manpower to ease garbage collection.

iii. The Kiambu County Government Act and by extension sub-County By-Laws should be modernized in nature and in order to be consistent with Waste Management regulations 2006.

5.5 Suggestions for Further Studies

Since this study explored the factors influencing solid waste management in urban Centres, using Thika Sub-County in Kiambu County as a case, the study recommends that;

i) Similar research should be done in other Counties and Sub-Counties in Kenya for comparison purposes and to allow for generalization of findings on the factors influencing solid waste management in urban Centers in Kenya.
ii) The effectiveness of household solid waste management can be ensured when community based organizations (CBOs) take active parts in the services. A study should be done to determine the effect of CBOs support services to the Thika sub county in different areas such as build public awareness, financial support, mobilizing the community in general to participate in the services and providing any necessary facilities to waste collectors.
REFERENCES


Otieno, T. (2010). Storm clouds of our solid waste may blow us away if we don’t act now; Daily Nation Newspaper.


APPENDICES

APPENDIX I: introduction letter

Cecilia, Wangu Kariuki,
University of Nairobi,
P.O. Box 30197,
Nairobi, Kenya.
7th May 2015

To the Director,
Thika Sub-County,
P. O. Box 240-01000,
Thika, Kenya.

Dear Respondent,

Ref: FACTORS INFLUENCING SOLID WASTE MANAGEMENT IN URBAN CENTRES: CASE OF THIKA SUB-COUNTY KIAMBU COUNTY, KENYA

I am a post graduate student pursing for the award of Degree of Masters of Arts in Project Planning and Management at the University of Nairobi. I hereby request for permission to carry out research in your organization. The information to be gathered from your employees will be highly confidential and will only be used for research purposes only.

Your favorable response to this request will be highly appreciated.

Yours sincerely,

Cecilia Wangu Kariuki
APPENDIX II: Respondents Questionnaire

I am Cecilia Wangu Kariuki student at the University of Nairobi pursuing the degree of Master of Arts in Project Planning and Management of the University of Nairobi. As part of my coursework, I am expected to present a report towards that fulfillment. My project is on “factors that influence solid waste management in Thika Sub-County.” The questionnaire is therefore, to enable me gather information towards this endeavor. You are therefore urged to be as impartial as much as possible in giving your information. Responses given would be treated with much confidentiality and for academic purposes only.

SECTION ONE

1. Gender Male [ ] Female [ ]

2. Marital status a) married [ ] b) single [ ] c) divorced [ ]
   d) widowed [ ]

3. Age: under 20 b) (20-29) years c) (30-39) years d) (40-49) Years e) (40-49) years
   f) (50-59) years g) (60 and above)

4. What is your highest level of education? (Tick √ one
   a) Primary [ ]
   b) Secondary [ ]
   c) Tertiary college [ ]
   d) University [ ]

63
5. What is your occupation? (Tick √a) un employed [ ] b) civil servant [ ] d) privately employed [ ]
   e) Self employed business person [ ]

6. Where do you stay in Thika? a) Makongeni [ ] b) Kiandutu[ ] c) Landless [ ]
   d) Kalimoni [ ] d) Jujaestate [ ]

7. For how long have you stayed in Thika? (Tick one) a) less than 1 year [ ]
   b) (1-3) years [ ] b) (3-50) years [ ] c) (5-10) years [ ]
   d) (5-10) years [ ]

8. What is your income? (Tick one √) a) less than 6,000 Kshs [ ] b) 6,000-15,000 Kshs [ ]
   c) 15,000-25,000 Kshs [ ] d) 25,000-50,000ksh [ ] e) 50,000-100,000 Kshs [ ]
   f) 100,000and above Kshs [ ]

SECTION TWO

9. Who collects garbage in your area? .................................................................

10. What is the frequency of collection? (Tick one √)
   a) Daily [ ] b) (2-3) times per week [ ] c) once a week [ ] d) once in two weeks [ ]
   e) Once a month [ ]

11. Is there garbage pile up in your area? Yes [ ] No [ ]

12. Who pays for the garbage collection? TTC ourselves others (specify)

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

13. Is the collector able to cope with the volume of garbage in your area? Yes [ ] No [ ]

14. Is your area clean/well served by the garbage collectors? Yes [ ] No [ ]
15. If the answer to No. 13 above is No what could be the reasons?

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


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

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

17. Are you satisfied with the garbage collection service in your area?

Yes [  ] No [  ] Not sure [  ]

18. How do you rate the service of the collectors? (Tick √)

Use the key provided Key: 1= Bad 2=Fair 3=Good 4=Very good 5=Excellent

<table>
<thead>
<tr>
<th>Rating</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have adequate work force</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have enough collection vehicles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have enough equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provides collection bins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provides enough collection polythene bags</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are consistent in collection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. Does capacity affect the performance (success) of garbage collection companies in Thika? Yes [  ] No [  ]
APPENDIX III: Research Permit