FACTORS INFLUENCING THE PERFORMANCE OF SOLID WASTE FIRMS: THE CASE OF THIKA SUB-COUNTY, KIAMBU COUNTY, KENYA

LEE MWANGI NGUGI

A Research Project Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Arts in Project Planning and Management of the University Of Nairobi.

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DECLARATION

This research project is my original work and it has not been presented for any examination in any other institution.

Signature……. Date…….

Ngugi Lee Mwangi.

L50/71533/2014.

This research project has been submitted for examination with my approval as the university Supervisor.

Signature: …….. Date……..

Prof. Christopher Mwangi Gakuu.

Department of Extra Mural Studies,

University of Nairobi.

DEDICATION

This research project report is dedicated to my wife Lydiah Waithira, and my children Lynn, Lynette and Levy for the moral support they offered. My special thanks goes to my parents Patrick and Rosemary, my brothers and my sister, for their encouragement, prayers and support.

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TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACYRONYMS

EM Ecological Modernisation

EMT Ecological Modernisation Theory

EPA Environmental Protection Agency

GOK Government of Kenya

KSH Kenya Shillings

MSW Municipal Solid Waste

NEMA National Environmental Management Authority

SPSS Statistical Package for Social Scientists

SWM Solid Waste Management

SWMS Solid Waste Management Services

UNEP United Nations Environmental Programme

ABSTRACT

The study is an investigation of the factors that influence performance of Solid waste firms in Thika Sub-County. Study objectives included establishing how economic factors, social factors, technical factors and environmental factors influence performance of Solid Waste Firms in Thika Sub-County. The study did a census of all the thirteen solid waste firms in Thika Sub-County. In addition, cluster sampling research design was used to collect views from households in Thika Sub-county. From a total of 92,492 households, a sample of 156 respondents was chosen. The study combined both primary and secondary data. Primary data was collected using questionnaires, after which the data was summarized and categorized according to common themes. Data collected was then analysed using frequency distribution tables and descriptive statistics was used to describe the general characteristics of the population. The study found that financial factors namely financial allocation, service charges and willingness to pay influence performance of solid waste firms. The study found that there was inadequate financial allocation for effectiveness of the solid waste firms. The study found that the service charges were low, yet households were generally unwilling to pay more for services and were instead demanding utility from the little they were paying. Social factors like the health and social conditions of the workers, safety and perception of the workers as well as stakeholder participation influence solid waste firms. Analysis on technical factors showed lack in areas such as the number of skilled personnel, equipment and vehicles to deal with collection and disposal. Environmental factors such as use of waste containers, transportation and disposal procedures as well as awareness on health and environmental concerns were also identified. The study showed that waste containers and waste collection points were not adequate in the region. The study findings would be helpful in policy making and in designing appropriate programs and services for Solid waste management in Thika Sub-County. The study recommended Economic Empowerment of Solid Waste Firms operating in the region through the participation of both the households and the business community through Corporate Social responsibility. The study also recommended an improvement of the waste collection methods, from use of concrete containers and dumping waste along the road; to use of closed containers that are water-tight and environmentally acceptable. The study recommended that further research needs to be carried out to establish ways of engaging a participatory approach to waste segregation and sorting prior to proper disposal, as a way of minimizing waste.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Solid wastes are defined as nongaseous extracts from human activity that are not liquid in nature and are especially, regarded not valuable. They exclude liquid forms of extracts and are commonly referred to as garbage, sludge or refuse (Leton and Omotosho, 2004). Waste management is a process that involves handling, packaging, treatment, recycling, reusing, storage and disposal of waste in a way that is environmentally sound for human health and environmental protection (Government of Kenya, 2006). Developing Countries struggle with solid waste systems. It is observed that the solid waste market has become attractive for private investors, although there are challenges to achieving an integrated system of sustainable solid waste management. Key among the challenges is insufficient information. Neither the state nor private operators have sufficient information about the services contracted, leading to inefficiencies (Dorvil, 2007).

County governments and municipalities took over the responsibility of waste management from the Central government in developing countries. Municipalities were charged with organizing and managing public sanitation, as well as provision of the infrastructure for the collection, transportation, treatment and disposal of waste. Nevertheless, with growing population and economic development, municipalities are under pressure to keep SWMS working in a sustainable mode. Often, these systems either become poorly maintained or even cease due to social, institutional, and technical constraints. Global creation of waste has doubled over the past ten years and could reach 2.5 billion tons per year in 2025 from results of urban development and changing consumption patterns (Périou, 2012).

Solid waste collection has crucial consequences on public health and aesthetics of cities. Increased population and the resulting pressure on resources and amenities have resulted in large pockets of areas remaining without service by public utilities. Sadly, many County governments are unable to cope with increasing volumes of waste.

Unfortunately, coping with the ever increasing waste quantities requires regular training and transformation of ideologies which seem scarce among many urban administrators. The predominantly technology-oriented nature of waste management systems, without due social, ecological, and economic considerations, has been responsible in large part for many of the constraints and inefficiencies experienced in waste management. Financial constraints, inadequate service coverage and operational inefficiencies, ineffective technologies and equipment, inadequate landfill disposal, and limited utilization of recycling initiatives are all found to be challenges to the infrastructure of waste management systems in developing countries. These gaps in service relate not merely to availability of infrastructure and investments, but also to inappropriate management of the service. Major interventions need to take into account the circumstances and needs of the communities for which they are implemented. Improvements to infrastructure and technology within the waste management system need to be accompanied with community involvement and participation as well as educational and awareness campaigns in order to be successful in creating sustainable waste management systems (McAllister, 2015).

Company's performance can be evaluated from a profitability dimension, or the level of which company's earnings are bigger than its cost. How much profit is made by these solid waste firms is dependent on a number of factors which include the economic, technical, social and environmental factors. Economic factors affecting performance of the solid waste firms include financial capacity, service charges and willingness to pay.

Municipal solid waste collection schemes in towns in the developing countries are a preserve of few among the urban population who can afford. Low income earners remain without adequate solutions to their waste problems, thereby fueling environmental degradation in their attempts to solve waste issues through burning and dumping. One of the main reasons for these inefficiencies is the lack of financial resources to cope with the increasing amount of generated waste produced by the growing cities. A study conducted in Kenya found that resources were often centralized in the more affluent areas because there was not enough man-power to cover entire cities and these areas were more likely to pay for the services (Henry et al., 2006).

Social factors affecting the performance of firms describe the safety, health, the public perception on waste pickers and collectors and the levels of stakeholder participation and representation in solid waste management policies and management. There's a general perception that the status of the garbage collection workers is generally low in both developed and developing countries. This owes much to a negative perception of people regarding the work which involves the handling of waste or unwanted material. Low morale and poor work ethics result due to lack of value systems in waste processes as fueled by negative perceptions. This affects the perception of solid waste firms by the households and stakeholders.

Technical factors are related to use of properly designed operating landfills, use of adequate equipment, vehicles and technical capacity or skill among personnel. The technical skills define the knowledge and abilities needed to accomplish related duties, as well as other specific tasks. Lack of technical skills among personnel within government authorities (Hazra and Goel, 2009), poor roads and vehicles deficient infrastructure, insufficient technologies and reliable data are some of the existing challenges (Henry, 2010).

Environmental factors that affect the performance of solid waste firms describe policies and procedures undertaken to ensure responsible solid waste collection and disposal so as to mitigate against ecological hazards. This includes use of waste containers, proper transportation and disposal procedures; as well as awareness on environmental and health concerns. These environmental factors describe the discrepancy between people's concern over the environmental harm posed by household waste and the limited action by those same people to reduce their waste or engage in other pro-environmental behaviors. Unmanaged dumpsite and improper methods of solid waste disposal create serious hazards to public health, pollution of air and water resource, accident hazards as well as irritation and spread of diseases from insects and rodents. They also fuel serious environmental degradation through emission of greenhouse gases and the resultant global warming. Dump sites are inadequate in number, while the negative perception on solid waste workers has aggravated the dismal performance in sustainable solid waste management. The constitution of Kenya in the forth schedule stipulates that responsibility for waste management is a function of county governments. The constitution of Kenya stipulates in Article 42 that every Kenyan right to a clean and healthy environment. It

further states that it is the duty of every citizen to safeguard and enhance the quality of the environment. Kenya Vision 2030 recognizes the need for efficient and sustainable waste management systems to be established as the country transforms through industrialization by year 2030. Vision 2030 specifically mentions Mombasa, Kisumu, Eldoret, Nakuru and Thika as the flagship projects for sustainable solid waste management practices to be delivered by the National Environment Management Authority, NEMA. These NEMA operations are guided by the Environmental Management and Coordination Act of 2006 (EMCA) and other pertinent legislation.

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. The waste management process for Thika Sub-County is managed by Kiambu County government. Garbage disposal around the urban centers within the county of Kiambu cover a small percentage of waste collection. Only 2.6 percent of the total population under coverage has facilities for waste disposal. Approximately 0.7 percent of the total population utilise private firms, 29.1 percent regularly utilise waste pits, 29.6 percent utilise farm gardens; 12.1 use public garbage heap whilst 25.9 percent opt to burn the waste. The environment is impacted negatively, necessitating the need for more robust methods of waste disposal that are sustainable and environmentally sensitive and favourable so as to ensure cleanliness. Ultimately, Kenya should be directing effort towards transforming dumpsites to properly designed landfills equipped with modern incinerators. Electricity generation and other myriad of opportunities could result, including, biogas supply and compost manure. The County plans to formulate policies that will increase efficiency in waste collection; as well as ensure stakeholder participation and engagement, including the private firms in waste collection in efforts to increase revenues (County Government of Kiambu, 2015).

1.2 Statement of the problem

Research studies have been carried out in Kenya with reference to solid waste management. A study sought to determine the overview of municipal solid waste management activities of local authorities in Kenya indicated that increased rural urban migration had adverse effects on solid waste management in Kenya. The study also indicated that local authorities had challenges in managing solid waste (Henry, 2006). A

study on solid waste management in Eastleigh showed solid waste collection is done by private cleaning companies. The city council had workers in the area but they were not effective in dealing with the huge waste generated in the area (Ibrahim, 2014). A study on the challenges and opportunities of inorganic waste reuse and recycling in Thika showed that the sub county collection crew participated in separating waste while loading the trucks. However, the study showed that the information on recycling policies was scanty and no by laws of reuse and recycling of solid waste existed in the sub county (Kinyanjui, 2014). A study on determinants of effective solid waste management in Kakamega county investigated how economic factors, technical factors, institutional and social factors influence effective solid waste management. The study found out that financial factors played a significant role while technical factors such as lack of professional personnel and equipment had an association to effective solid waste management. The recommendations of this research centered on effective waste management in Kakamega were strict enforcement of bylaws and policy, more budget allocation and proper waste allocation systems (Malenya, 2015).

A study on factors influencing Solid Waste Management in Urban Centers showed that garbage collection was not up to the households' expectations. The author used a sample of 271 residents from Biashara location, located in Thika West District. The results show that in collecting waste, participation was from the county government and the national youth service only (Wangu, 2015). The recommendation by the author to improve garbage collection system in Thika motivates a deeper investigation on what influences the performance of the solid waste firms. There is need to widen the scope of study to other areas of Thika sub-county so as to get representation on the performance of collection from the range of different service providers who collect waste in these areas. In addition, the results from the study depicted that majority of respondents were male. There is need to confirm the perception of performance of solid waste companies from the households' perspective, and the general expectation is that women would form a larger representation from households in residential environment in Thika Sub-County.

In summary, the study seeks to add to the existing wealth of knowledge by contributing empirical literature on the factors influencing the performance of solid waste firms in Kenya. This study seeks to fill this gap in literature; and will form a reliable basis to replicate results of improved collection of waste to other parts of Kenya.

1.3 Purpose of the Study

The study sought to establish the factors that affect the performance of Solid Waste firms in Thika sub-county, Kiambu County, Kenya.

1.4 Objectives of the Study

The objectives of the study were:

i. To examine how economic factors influence performance of Solid Waste Management by solid waste firms in Thika sub-county.
ii. To establish the extent to which social factors influence performance of Solid Waste Management by solid waste firms in Thika sub-county.
iii. To determine how technical factors influence performance of Solid Waste Management by solid waste firms in Thika sub-county.
iv. To establish how environmental factors influence performance of Solid Waste Management by solid waste firms in Thika sub-county.

1.5 Research Questions

The research questions which were used in this study were:

i. How do economic factors of Thika sub-county influence performance of Solid Waste Management by solid waste firms in Thika sub-county?
ii. What is the extent to which social factors of Thika sub-county influence performance of Solid Waste Management by solid waste firms in Thika sub-county?
iii. How do technical factors of Thika sub-county influence performance of effective Solid Waste Management by solid waste firms in Thika sub-county?
iv. How do environmental factors of Thika sub-county influence performance of Solid Waste Management by solid waste firms in Thika sub-county?

1.6 Significance of the study

This study will assist policy makers in determining the most suitable method of involving the solid waste firms in the management of municipal solid waste. The study will also provide evidence for development of future engagements between the County Government and Solid Waste firms on policy and regulatory framework for solid waste management. The study is therefore of importance to governmental agencies and other stakeholders such as the environmental regulators responsible for ensuring among other things, safe disposal of Municipal solid waste; and the County Governments which are directly charged with the management of solid wastes within their areas of jurisdiction. The study will also be of interest to the world of academia, in attempts to build on and motivate areas of further research.

1.7 Delimitations of the study

The study was limited to the economic, social, technical and environmental factors influencing the performance of solid waste firms carried out in Thika Sub County. The study was delimited to Thika Sub County since there has been growing interest and research work on solid waste management in this region and the region is likely to set pace for other parts of Kenya due to the level of advancements expected.

1.8 Limitations of the study

Confidentiality and Cooperation: Some respondents were likely to shield away from giving critical information for fear of being exposed or being victimized. To deal with this, the researcher assured respondents information collected would only be utilised for research work. The instruments for data collection ensured that names are not captured, and this was repeated to respondents at the start of interviews so as to assure them of

confidentiality. Also, to avoid respondents in this study being reluctant in providing the required information; the researcher explained to the respondents the importance of the study.

1.9 Assumptions of the study

The study assumed that the respondents would be honest in their responses. The study also assumed that Solid Waste Firms already exists in the region and that there were factors affecting performance of these Solid Waste Firms.

1.10 Definitions of significant terms

Economic Factors: refers to the financial capacity and needs that influence the performance of the firms. These include labour productivity, vehicle productivity, the ability and willingness to pay user charges and the license fees charged.

Environmental Factors: refers to ecological concerns that influence performance of waste collection. There are ecological concerns like the fly menace, hazardous household wastes,, the impact of waste quantity on transport trucks and landfill requirements.

Municipal solid wastes (MSW): refers to the waste that is produced from residential and industrial (non-process wastes), commercial and institutional sources with the exception of hazardous and universal wastes, construction and demolition wastes, and liquid wastes (water, wastewater, industrial processes)

Social factors: refers to the plight of waste collectors in terms of their safety, health and social conditions. The social conditions include a level of awareness on environmental and health concerns; as well as the perception by the community about waste collection companies and their workers.

Solid Waste Firms: These refer to projects handling Municipal Solid Waste in the region. They normally operate for one year under contracts which can be renewed or fail to be renewed.

Solid Waste Management (SWM): refers to a practice using several waste management techniques to manage and dispose of specific components of solid waste. Waste management techniques include avoidance, reduction, reuse, recycling, recovery, and disposal.

SWM infrastructure: refers to all facilities (e.g. landfills, transfer stations), equipment (e.g. vehicles, rubbish bins, crushers), and public infrastructure (e.g. roads, SWM education programs) necessary for effective SWM.

Technical factors: refers to the availability and type of equipment, technology and skill in use, as well as the human resource training required for waste management. This includes the capacity to handle the complex waste management issues and the capacity to absorb the technical assistance and training in these issues.

1.11 Organization of the Study

The research project is organised into five chapters: chapter one presents the background of the study on the performance of Solid Waste firms in Thika; statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, assumptions of the study, scope of the study, limitations and delimitations of the study and definitions of significant terms used in the study. Chapter two presents literature review relevant to the research topic, and includes measures of performance for solid waste firms, factors influencing the performance of these firms and the theoretical framework. The chapter concludes with conceptual framework, knowledge gap and a summary of literature review. Chapter three presents a detailed methodology used in the research in terms of research design, target population, sample procedure and size, research instruments, validity and reliability of instruments, data collection procedures, data analysis techniques and operational definition of variables. Chapter four presents data presentation and analysis, as well as a detailed discussion on the results. Chapter five entailed the summary, conclusions and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter highlights literature on factors that influence performance of solid waste firms. The chapter is divided into the following sub-sections: performance of solid waste firms, economic factors affecting performance of solid waste firms, social factors affecting performance of solid waste firms, technical factors affecting performance of solid waste firms and environmental factors affecting performance of solid waste firms. Theoretical framework, conceptual model, knowledge gap and a summary of literature review are given at the end of the chapter.

2.2 Performance of Solid waste firms

A company's performance can be evaluated in three dimensions. The first dimension evaluates a company's productivity by measuring how efficient inputs can be processed into outputs. The second is profitability dimension which compares a company's earnings to its cost. Thirdly, market premium describes the level at which company's market value exceeds its book value and is called market premium (Walker, 2001). The study will measure performance of solid waste firms from the profitability dimension, in terms of profits/revenue and turnover. How much profit is made by these solid waste firms is dependent on a number of factors which include the economic, technical, social and environmental factors.

In Nairobi County, financial performance of private solid waste companies is influenced by size, leverage, age and liquidity of these companies. A study by Mungai recommends that debt financing should be reduced for solid waste management firms because these firms that are highly leveraged risk bankruptcy in the event of their inability to pay their debt. They may also be unable to find lenders in future. These firms need to increase their liquid asset base in order to increase the ability of the business to meet financial obligations in a timely fashion. These Solid Waste firms should utilise an investment fund as liquid assets to finance activities. Higher liquidity enables an investment fund to deal with unplanned contingencies while managing its obligations when business is not

too profitable. Larger and mature solid waste management firms are also known to have predictable and better financial outlay (Mungai, 2014).

A study on the performance of private companies involved in urban solid waste management was done with a focus on three cities in Ghana. From fifteen private companies involved in solid waste, performance of service providers was accessed in terms of market share, productive efficiency and collection vehicles' utilization. According to the study, performance can be influenced by company size or number of vehicles, service charges and payment, waste collection, vehicle maintenance and supervision and planning (Oduro Kwarteny, 2011). Performance of firms was reviewed in terms of productivity and quality of service (Cointreau, Sandra, & Adrian, 2000). Organizational performance assessment approaches study purely on efficiency and effectiveness. However, it is difficult to measure quality of many outputs without relevant benchmarks (Boston, 2000).

Performance assessment of solid waste service delivery establishes the basis for monitoring and evaluating the efficiency and effectiveness of the service delivery. The performance assessment helps understand the relationships in contractual arrangements. Normally, the contractual agreement between principal and the service provider defines the performance measures for monitoring the performance of the service provider and the sanctions for each failure. According to Public choice theory, conventional contract and performance monitoring improves service quality (Awortwi, 2003). However, relational contracting theory states that aspects like mutual trust and shared values, and cooperation between the principal and agent explain contract performance better; hence much better than rigorous contract performance monitoring (Fernandez, 2005). It is now important to monitor and access performance of service providers involved in Solid Waste. Clear and defined performance targets do not exist and there are no standards for assessing performance of solid waste providers. This allows therefore, for different approaches to be used by researchers (Oduro Kwarteny, 2011).

2.3 Economic factors influencing the performance of solid waste firms

Economic factors describe the financial capacity, the ability and willingness to pay user charges and the license fees charged; that influence the performance of the firms. Economic factors affecting performance of the solid waste firms affect the level of economic development. Economic and industrial development influence solid waste management. Obviously, an enhanced economy ensures more funds for solid waste management, hence providing a more sustainable financial basis (Abayomi, 2015). However, by definition, developing countries have weak economic base. This renders them in a position with inadequate finances for sustainable growth for solid waste management. Local industry which produces comparatively economical solid waste equipment and vehicles can reduce, or eliminate the need for importing expensive foreign equipment and therefore foreign exchange. Such local industry can also supply associated spare parts, lack of which is often triggers insufficient and irregular solid waste collection and disposal procedures. However, developing countries lack industry manufacturing solid waste equipment and spare parts. In addition, foreign exchange for importing equipment/spare parts is scarce in developing countries (Ogawa, 2001).

Higher levels of solid waste are generated by households with higher incomes and in more urbanized economies. This is due to their higher purchasing power that leads to higher consumption levels. In contrast, cities in developing countries have waste often dumped in open areas, roadsides and even alleys, naturally damaging the environment (Niringiye & Omortor, 2010). This Lack of finances has made Municipalities fail to manage solid waste. Delivery of proper waste management services has been hampered by the huge capital outlay needed, lack of financial support, limited resources, unwillingness of the users to pay for service and deficient use of monetary instruments. Involvement of the private sector is a factor that could improve the efficiency of the system (Dorvil, 2007). A study in Ghana stated that 55% of the respondents across cities felt that cost for communal collection should be collectively paid by generators, Assemblies and the Government. Only 13% of house-to-house respondents and 4% of those served under communal collection thought that only generators should pay, whereas 39% said the Assemblies should pay for the collection cost. This presupposes better household involvement and accountability for results by firms so as to ensure more responsiveness to the user. This will enlighten households about the financial burden on the Assemblies

and the dire need to pay for service improvement. Solid waste management accounts for a bigger share of the total recurrent municipal budget. Despite financial impediments, local authorities habitually struggle to offer sufficient and dependable services (Oduro Kwarteny, 2011).

According to USAID municipalities in developing countries spend 20–50 percent of their available finances on solid waste. This can only stretch to serve less than 50 percent of the population. Public sector inefficiencies coupled by continuously increasing cost has resulted in local authorities attempting to analyze if this service can better be outsourced. Increasingly, outsourcing has emerged as an alternative to improve municipal solid waste service performance at lower costs (Mc Allister, 2015). But even with a new partnership approach the financial aspects of municipal solid waste management remain critical for ensuring sustainability of the system. This concerns budgeting, cost accounting, financial monitoring and evaluation aiming at improving adequate capital to cover recurrent operational expenditures of the garbage collection and to also expand resources for new investments or large maintenance. These methods are too rarely engaged and the municipality hardly ever knows the actual rate of providing the service. While external capital may frequently be desired for key investments, the recurrent costs should by preference be covered by a combination of customer cost, and local taxes, however some level of cross-subsidization and/or financing out of governmental sources may be needed to guarantee equitable admission to service (Wilson, 2007).

Financial allocations for waste management services are usually low in government budgets, both at the national and local levels. It is the duty of municipal and county governments to collect and remove waste and oversee waste management in the respective regions. The county governments have increasingly sought help from the private sector. For instance, a study on waste management in Kakamega revealed that the County had not allocated sufficient funds for solid waste management. In addition, the government had not passed legislations to help in proper implementation and sustainability in the sector (Malenya, 2015). Although there have been attempts to heal the problem by advocating for a shift from collective municipal garbage disposal to outsourcing to private firms; there is still a wide disparity between residents income levels and ability to pay user fees for collection. This is a challenge on sustainable waste management practices because even if donors cater for the initial investment costs, funding is required for the procedure and maintenance costs in waste management. Worse

still, there has not been enough capacity in fiscal planning and management hence bringing about programs that are not sustainable, resulting in loss of public trust (Ogawa, 2001). A study re-inforcing these sentiments state that there are scarce opportunities for sustainable waste management since budgets are limited, hence overlooking proper wate collection systems (Al-Khatib et al., 2010). Another study conducted in Kenya found that the municipal budget for waste management pays for an over-staffed and under-qualified workforce instead (Henry et al., 2006). These funds would go a long way into making improvements within their own infrastructure, if allocated properly. The data from another study suggests that the inadequacies of vehicles, supervisors, and solid waste employees were the main obstacles to sustainable solid waste management. These problems were attributable to financial constraints and possibly to misappropriation of finances within the offices that manage waste.

Economic factors affecting performance of the solid waste firms are closely linked to the level of economic development. Economic and industrial development enables more funding more SWM, hence bringing about sustainability. However, developing countries often struggle with funding and poor industrial development leading to unsustainable SMW. Instead of importing expensive equipment or vehicles costing the country foreign exchange; the local industries could make cheaper solid waste tools and essentials. They can also make related spare parts, thereby curbing the trend of unbalanced and poor solid waste services. Currently, developing countries lack the necessary industries to push the SWM agenda forward as evidenced by lack of equipment and spare parts manufacturing at the local levels (Ogawa 2001).

Implementing changes towards efficiency is a hard process for county governments in developing countries. Investment demand far outweighs funding accessible from the budgets. With the ever-increasing waste generated, the challenge is implementing sound environmentally friendly policies to match this growth. Millennium Development Goals of poverty alleviation and access to solid waste services can only be achieved if there are deliberate efforts particularly in urban areas that are growing haphazardly yet they remain low priority in government budgets although they are high priority to the citizen. The private sector is increasingly being seen to provide solutions in the area of SWM. The public sector is hardly able to cope due to the level of funding required, running costs and other competing needs of the national budget. Hence the private sector is increasingly

partnering with the public sector through zoning and allocation of contracts. In a region, at least one zone is retained by the public organization with adequate capacity hence ensuring fairness in pricing and service delivery efforts in addition to ensuring that standards do not deteriorate. Sometimes private firms can tend to charge high user charges and levies so as to maximize profit, and this may disadvantage low income earners; unless the levies are regulated and cross subsidization also done.

2.4 Social factors influencing the performance of solid waste firms

The social factors describe the plight of waste collectors in terms of their safety, health and social conditions. The social conditions include a level of awareness on environmental and health concerns; as well as the perception by the community about waste collection companies and their workers. Social factors also look at the level of stakeholder participation and representation in solid waste management policies and management. There's a general discernment that the status of the garbage collection workers is generally low in both developed and developing countries. The negative perception of people regarding SWM fuels this perception, resulting in disrespect for the vocation. Low work ethics and poor productivity are the fruits of such actions. In some regions, the workers in solid waste could be from a particular locality or tribe or affiliation whereas elsewhere, "waste mafia" controls the industry. Where the mafia are involved, work productivity and work ethics tends not to be too much affected as this is dictated by the group. Unfortunately, the private sector in the developing countries has had a slow uptake in the solid waste industry; hence solutions are often derived through community engagement, with some help from NGOs. However, it is crucial to expand environmental education so as to have sustainable and effective partnerships with the community. Unemployment and poverty are inextricably linked to presence of waste collectors and these social challenges means attention should be given to the social factors affecting performance of solid waste collectors in policy development. The challenge is that in developing countries, there is hardly any interaction between administrators and the citizen, hence diminishing partnership opportunities (Ogawa, 2001).

The social prestige of waste collector workers is connected to the political will and priority given to waste services. This is evidently very low although most governments are now acknowledging the magnitude of the challenges in waste management and their

significance to the economic and environmental concerns of the masses. Sustainable SWM is limited by lack of political will and public sector engagement in developing countries (Oduro Kwarteny, 2011).

Due to lack of funding, firms have resulted in community mobilization for resources. A few of these efforts continue to bear fruit, while inactive communities lack economic and social incentives to improve participation in SWM. Individuals are expected to take responsibility to improve their environment, and their engagement in community cleanups is enhanced through school education programs and public awareness efforts. Therefore, when education programs and awareness campaigns on the importance of sustainable SWM practices to the social and health wellbeing of the society lack; community-based approaches in developing countries collapse (Ogawa, 2001). In developing nations, waste scavenging activities are common scenes at the street bins, transfer stations and dumpsites. These scavengers lack formal or vocational training for other jobs, hence they land on waste as a means of livelihood. The situation is also fueled by high unemployment rates in the formal sector. In many situations, existence of these scavengers creates an impediment to smooth or effective waste collection since they also spill over waste as they rummage through the garbage. However, if well organized, their activities can be formalized under waste recycling systems as a way of promoting sustainable SMW (Ogawa 2001).

The private sector is regulated by the public sector to safeguard public interest. Therefore, regulatory instruments are used to regulate the private sector engagements in customer orientation and households' involvement where the private sector involves customers and households. Regulatory instruments include incentives and legislative powers of management (World Bank, 1997). Increasingly engaging private sector without commensurate households' commitment in terms of user levies and education in service provision denies customer-oriented service and service quality opportunities. Service delivery through customer- oriented service requires SWM firms with ability to fuel and manage demand and then be more liable for outcome to users and quick to respond to their needs in delivering the services. Customers can specify their choice then effectively monitor performance of the service providers since they are at the service delivery (World Bank, 1997).

2.5 Technical factors influencing the performance of solid waste firms

Solid waste processes have transformed human history over the ages, and continually influences the future (Hoornweg & Tata, 2012). There have been technical advances over the ages up to the 19th and 20th Century on waste management. From street sweeping to use of garbage bins, use of incinerators and more recently sanitary landfills; the level and use of technology has been transformative. This has helped the developed countries move from open dumping to more organized sustainable waste management systems supported by structures and policies to improve the industry (Amechi, 2010). These technical efforts include human resource capacity, recycling and composting as ways to deal with growing waste production.

Inadequate landfill contributes tremendously to infrastructural challenges facing SWM. Lack of proper disposal sites in Ghana led to unprotected and uncontrolled dumps. These manifestations are also in developing countries and they result in dangerous environmental and human health hazards that also jeopardize residential development in these areas (Oduro Kwarteny, 2011). Lack of proper sanitary landfills or even disposal sites located at considerable accessible distance from communities ultimately results in costly constraints related to collection, transfer and disposal which county governments continue to struggle with. It is now difficult to plan future landfill locations due to rapid population growth and pressure on resources due to urbanization. Interventions that are currently being developed to improve SMW in developing countries include constructing better dumpsites, upgrading roads, trucks, improved storage containers and community engagement for example in construction of transfer stations and dumpsites (Amechi, 2010). This is a great way to reduce transport costs while at the same time increase services.

Use of inappropriate technology has resulted into operational inefficiencies in developing countries and deficient management capacity of SWM institutions (Zhuang et al., 2008). A study in Kenya showed that the more affluent areas got more resources for waste management since these areas afforded pay for the services; while other areas lacked personnel and resources (Henry et al., 2006). Places with narrow streets usually had no space for storage containers and motorized collection vehicles may be inappropriate. In Nairobi, lack of technical skills plus lax employees who deliver inconsistent and

inadequate services were the major contributors to poor waste management (Henry, 2006). Technical training helps people get technical help, which also helps improve comprehensive planning in sustainable waste processes. This includes collection and analysis of waste data, which often lacks among human resource personnel in developing countries. As a result, there are very few waste systems experts to formulate and implement plans tailored specifically for the regions in these developing countries. Hence it turns out that technologies are not suitable, up to date or adaptable and it becomes extremely difficult to make technical advancements for the local conditions (Mc Allister, 2015). Absence of human technical resources at national and local levels with technical expertise necessary in engineering or management affects operations. Therefore projects initiated by external consultants are discontinued due to capacity constraints. Summarily, technical human resources in a host country determines the level of utility derived from expatriates and external help essential for sustainable solid waste processes in the collaboration (Ogawa, 2001). Human resource capacity helps to ensure that the right plans are put in place in waste management, and priorities of funding for technology types carefully selected appropriately.

It is important to ensure that the right technology is used to provide a facility for waste disposal. External aid to improve a dumpsite may not be very effective if the real struggle is on the low coverage of solid waste collection service. Low coverage will result in waste generated being dumped at undesignated areas hence beating the objective of a need for a proper landfill. Hence it would be strategically cost-effective to upgrade the collection in this instance than to invest in the landfill (Makindi, et al., 2016). Due to insuffucient research on solid waste inappropriate technology is often applied which is not in sync with the local climatic and physical environment, funding and human resource capabilities, and social or cultural acceptability. Since the particular technology is not properly utilized, resources are wasted, resulting in unsustainable projects. Manuals exist in literature that guide on the type of technology to use, but such literature lacks context sensitivity so as to be tune with the local prevailing conditions. Hence local studies should be incorporated into a collaborative project; possibly involving local research institutions (Ogawa, 2001).

Many types of waste in alleys in slum areas of developing countries are inaccessible and they largely affect the selection of equipment (Zhuang et al., 2007). In India, lack of proper containers and inadequately maintained worn-out collection vehicles have resulted

in illegal dumping and littering, justified by inadequate waste services by the residents (Hazra and Goel, 2009). Sometimes technology is misused, evidenced by failure of sophisticated expensive recycling and composting waste systems (Yousif and Scott, 2007). Failure to extensively consult relevant stakeholders, use of inappropriate technology with expensive imported mechanical and electrical parts usually difficult to maintain or replace are among the problems stated. Others include lack of adequate economic assessments, funding challenges and absence of skilled technicians to manage the processes (Yousif and Scott, 2007). Many developing regions are unable to adopt technology from developed countries due to absence of skill and infrastructure to manage the technology.

The human resource capacity continues to be a challenge in developing countries where experts on planning, operations, monitoring and evaluation of waste projects are not sufficient (Eggert, 2005). The county governments are unable to attract and pay for expertise hence projects initiated by external consultants collapse due to lack of continuity due to human capacity gaps and loss of funding. A study noted that technical expertise required is lacking both at national and local regions, where training on technical background in engineering or management, lack (Burntley, 2007). Research in Kampala, Uganda depicted that execution on waste management suffered due to lack of appropriate technology and personnel (Amechi, 2010). The study also discovered that managerial, technical staff and even labourers in Dar es Salaam were lacking. This was blamed on poor training and poor conditions of service. Even labourers shun the sector due to poor perception and working conditions (Niringiye & Omortor, 2010).

Equipment for collecting waste for short term storage varies. Size and type of collection equipment depends on facility size, waste volume and its characteristics, storage space available, and costs (CCME, 1996). Tools for managing and transporting waste ought to be suitable whilst some places have legislation outlining specific requirements (Government of Canada, 2008; USEPA, 2005).

2.6 Environmental factors influencing the performance of solid waste firms

Environmental factors describe the difference between the concerns of the masses over the harm made by waste and the limited action by these same people to reduce their waste or action environmentally friendly measures. Kenya’s waste regulations instructs that

waste should not be thrown in public highways, streets, roads, recreational areas or other public areas, but in designated waste areas (GoK, 2006). However, waste is haphazardly dumped especially in densely populated urban centers. With lack of waste containers, people in developing countries result in open dumping especially in areas where collection is limited or nonexistence (Government of Canada, 2008). With rapid urbanization and more waste generation, there is undue pressure on the environment due to increased consumption patterns. Left unmanaged, waste has detrimental effects on both environmental and human health (Mc Allister, 2015).

Currently, there exists, neither sanitary landfills, nor properly designed dumpsites in any of the counties in Kenya. Scenic beauty is destroyed by unmanaged and uncontrolled dumping and lack of sanitary landfills or dumpsites due to inadequate waste containers and collection points. This also increases insect vectors and fuel greenhouse gases emission, leading to global warming (Amechi, 2010). Garbage dumping sites are inadequate, while waste keeps increasing translating to environmental challenges. With the ozone layer getting destroyed, the ecosystems are constantly challenged. Most waste generated remains uncollected, piling up and even blocking drains, resulting in floods and diseases. Domestic and industrial effluents in the water ways remain untreated, fueling the environmental concerns (World Bank, 1997). Sanitation regulations are not enforced in Nairobi and other urban areas and these waste departments are under-funded with over 100 million people in East Africa lacking proper sanitation (Hazra & Goel, 2009). Waste is dumped in abandoned quarries, like Dandora dumpsite in Nairobi; where diseases and environmental problems prevail. Dumpsites in these region are normally in wetlands, forest edges, near water bodies or other environmentally-sensitive areas (Hazra & Goel, 2009). The people in these areas result in open dumping or burning which is detrimental to human health and their environment (U.S Environmental Protection Agency, 2005). These environmental hazards depict a situation resultant from lack of adequate waste containers and waste collection points.

Transportation and disposal procedures in developing countries are inadequately addressed. Land for disposal is scarce; hence most waste is dumped in low-lying areas ignoring all environmentally sound disposal procedures. Industrialisation and urbanization have increased the impact of solid waste on the environment in developing regions. A study conducted in various rural cities in India found that trash was frequently dumped or burned in unregulated areas. Although burning garbage is not allowed, masses of

population in these developing areas have no vehicle or means to dispose waste. Households in these communities have what they call compost pits, which they use to dump or burn waste as they so wish and when they deem fit. In other areas, pits are dug for disposal, and once they fill up, other pits are dug perhaps at the outskirts of the town centers. A study on solid waste management in Eastleigh showed solid waste collection is done by private cleaning companies. The city council workers are ineffective in dealing with the huge waste generated due to lack of adequate waste containers and inadequate disposal and transportation procedures (Ibrahim, 2014).

Awareness on environmental and health concerns is crucial for sustainable waste management. Ultimately, social, economic and environmental factors need to be considered when designing an adequate landfill or dumpsite in efforts towards sustainable waste management. Sanitary landfills are costly but communities can start by waste reduction, composting and recycling. Waste reduction processes are being emulated in places like Cameroon (Batley & Larbi, 2004). The right combination of infrastructure and technology that serves the community appropriately; while conserving the environment and avoiding ecological hazards; needs to be deployed. A study on the challenges and opportunities of inorganic waste reuse and recycling in Thika showed that the sub county collection crew participated in separating waste while loading the trucks. No by laws of reuse and recycling of solid waste existed in the sub county; while information on recycling policies was scanty (Kinyanjui, 2014). This depicts inadequacy in awareness on environmental and health concerns in the region since there would be more solid construction of legal framework and supporting policies for enforcement when these factors are adequately addressed. A case study in Thika on factors influencing Solid waste management showed that garbage collection was not up to the households' expectations and the author recommended improvement of solid waste collection (Wangu, 2015).

2.7 Theoretical Framework

The study exposes one theory, namely Ecological Modernization Theory which provides a sociological interpretation of reforms in the environmental sector (Malenya, 2015). The theory advocates for a robust national policy and effective sustainable systems of solid waste management. Environmental drivers set in motion financial, institutional, social and

operational shifts which catalyse new social arrangements, new discourses, and new scientific and technical advancements. The drivers also catalyse changes in propositions of participation from both the private and public sector; affect relations between a government and its population; cause changes within economic actors and other array of arrangements within a wide range of disciplines. In the past, political influence on institutions has resulted in poor environmental outcomes. However, Ecological Modernisation Theory argues that reforms can adjust the politics so as to address ecological matters in a better and efficient manner.

The theory points out that marginal shift in focus could cause political players to build new and robust coalitions and agreements making environmental conservation attainable (Malenya, 2015). The theory critically examines the institutional infrastructure that catalyses change from government policy to environmental governance. Decentralized, consensual governance structures are advocated for; coupled by more robust forms of political intervention where the nation-state is deemed central to achieving transformational steps towards sustainability in these societies. These efforts translate to democratic decisions that encourage stakeholder participation and engagement for broader social justification in an open and transparent form. Escalated activism by civil society, NGOs and other stakeholders is required so as to transform the economic and institutional fabric of society.

Ecological Modernization outlines the debate within safe boundaries, by encouraging industrial revolution and liberal democracy; thereby influencing policy. The theory argues that institutional transformation can bring about the needed change in economic growth rates combined with environmental protection. According to this theory, cleaner and more efficient industrial revolution can be achieved through technical advancement that embraces economic growth and industrial advancement free from environmental pollution. Hence more eco-efficient technical capacity should be achieved through enhanced research development and deployment such that there is less energy consumption utilizing minimal raw materials while ensuring minimal emission of pollutants. Production should concentrate majorly on sustainability of renewable energy sources; eradicating usage of hazardous materials while ensuring the conservation of biodiversity and environmental protection in waste management.

Ultimately, the theory portrays all environmental concerns including solid waste, as a challenge geared towards transforming design to remove inefficiency. In this case, accumulation of increased waste is seen as a mark of inefficiency which must be dealt with. Hence Ecological Modernization Theory gives a sociological explanation for environmental reforms. The theory champions need for national and regional level policies on waste systems that propagate sustainability of SWM. National policies that are redundant, impractical or ineffective should be revised to ensure that they depict the happenings at local levels and that they also involve most sustainable measures in pursuit of environmental protection in development. The theory gives an innovative framework for understanding and analyzing sustainability of waste systems. Non-receptive government workers and representatives should be replaced to remove inefficiencies, policy and institutional gaps. Managerial weaknesses coupled by failed privatization methods should be dealt with rapidly, so as to induce a culture of sustainable solid waste management practices that are environmentally friendly (Malenya, 2015).

2.8 Conceptual Framework

Figure 1 presents the conceptual framework of the study. In this case, the study will have the following independent variables: economic factors, social factors, technical factors and environmental factors. The moderating variable for the study will be the government policy. The conceptual framework illustrates how the independent variables are related to the dependent variable which is the performance of Solid Waste Firms; where the arrows show the interrelationships among the variables of the study.

CONCEPTUAL FRAMEWORK

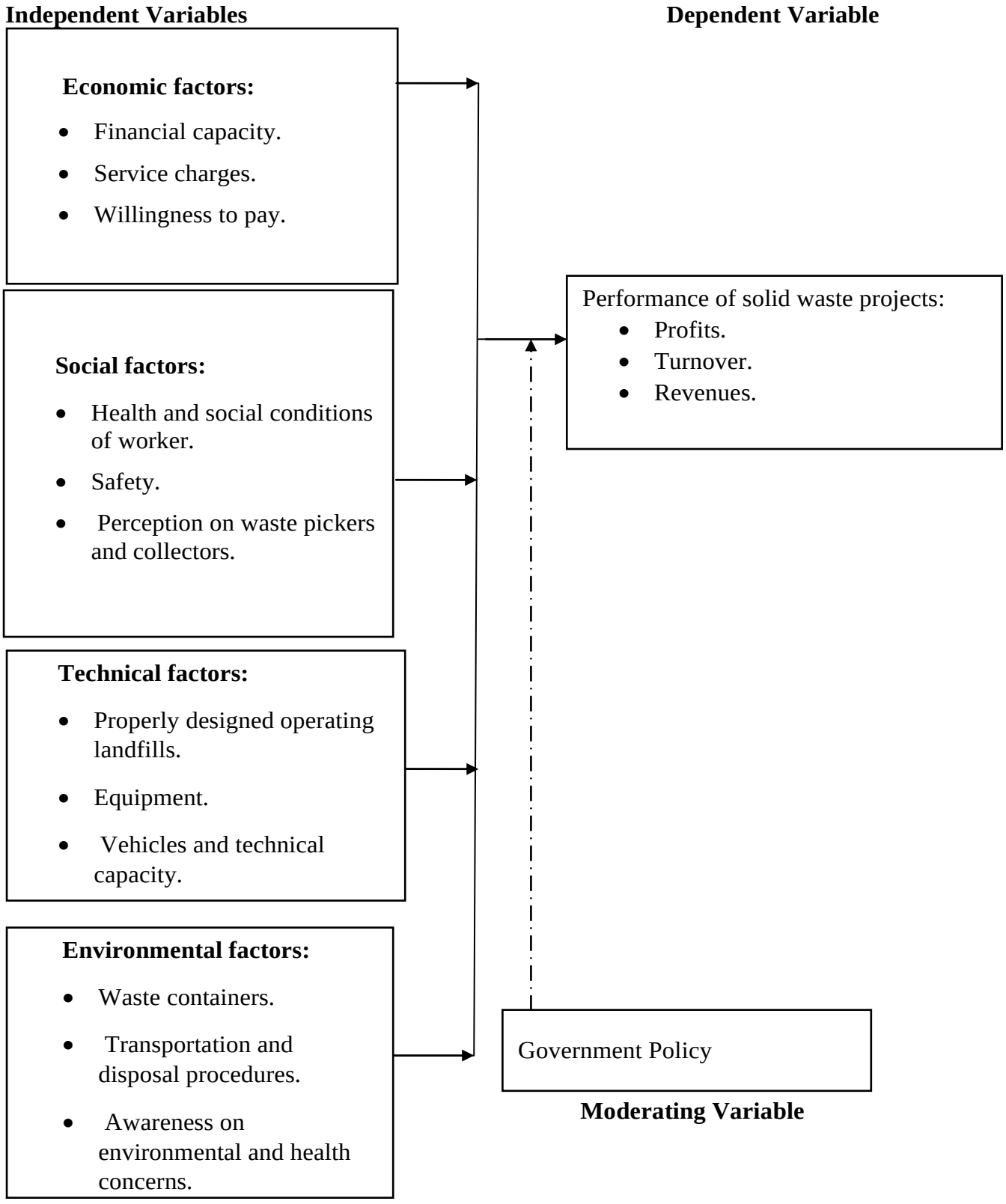

Figure I: Conceptual Framework.

2.9 Knowledge Gap

From the literature reviewed, few studies have been done on Solid Waste Management in Kenya. The focus of most literature and research is either on privatization of municipal services, recycling and reuse or general Solid Waste management studies. In Africa, research and project intervention in Solid Waste management received attention rather recently. There is a lack of comparative studies on performance of solid waste management firms in different countries. Emphasis is usually on all kinds of environmental action or on urban services. However, literature on the performance of Solid Waste Firms in Kenya lacks. Many experiences, problems, solutions and the effects of performance of Solid Waste firms have not yet been discovered in empirical literature, as this specific area has been ignored. Significance of the contribution of these firms to waste management cannot be ignored; hence the study fills the void in literature by providing specific knowledge on the performance of these solid waste firms.

2.10 Summary of Literature Review

Most of the literature covered solid waste management practices especially on collection of waste, transportation and disposal procedures, financial, social, technical and environmental factors influencing waste systems. In Ghana, studies on the performance of private companies participating in solid waste management depicted the financial, social, technical and environmental factors that influence performance of solid waste firms (Oduro Kwarteny, 2011). In the study, performance of service providers was accessed in terms of market share of companies, productive efficiency and utilization of waste collection vehicles. The study outlined the factors likely to influence performance as the size of the company or number of vehicles, service charges and payment, vehicle maintenance and solid waste collection planning and supervision. In Kenya, studies by (Henry, 2006), (Mary, 2013), (Ibrahim, 2014), (Kinyanjui, 2014), (Wangu, 2015), (Makindi, *et al.*, 2016) cover municipal solid waste, household solid waste and waste recycling. None of these studies cover the factors influencing performance of solid waste firms in Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter consists of the research methods that were used in carrying out the study. It includes research design, target population, sampling procedures and sample size, research instruments, piloting, validity and reliability of research instruments, data analysis techniques, ethical considerations and operational definition of variables table.

3.2 Research Design

This study adopted a descriptive survey design. Descriptive survey research is a research method involving the use of questionnaires and/or statistical surveys to gather data about people and their thoughts and behaviors. A survey is an attempt to collect data from members of a population in order to determine the current status of that population with respect to one or more variables. (Mugenda, 2003) argues in favour of the use of descriptive surveys in fact-finding because they provide a great deal of accurate information. Survey research collects data at particular time frames and helps to deduce the effect on prevailing conditions. The descriptive nature of research was used in order to gain information on the factors influencing performance of solid waste firms.

3.3 Target Population

The research was conducted in Thika Sub-county. Major players in Solid Waste Management included the County government and solid waste firms. The study targeted the existing seven private solid waste firms, the five youth groups in the Sub County, the Sub County government collector as well as a sample of households from each of the five wards in Thika Sub County.

3.4 Sample Size and Sampling Procedure

The sampling procedure was guided by the general rule in most social science research which suggests that the use of the largest sample will facilitate generalization (Mugenda, 2003). The study undertook a census of all the seven private solid waste firms, the five youth groups in the Sub County and the Sub County government collector. Regarding representation from the households in the five wards of Thika Sub County, the cluster sampling method of probability sampling was used because of the limitation of obtaining a sample frame due to the population density. Cluster sampling involves the selection of an intact group and all members of such an intact group are then included in the sample and each member becomes a unit of observation (Mugenda, 2003). The sample was apportioned according to the relative share of households in each Ward based on the results of the 2009 Population and Housing Census. The resulting sample size in each stratum is shown in Table 3.1 with a sampling frame of 92,492 households in accordance with the 2009 Population and Housing Census by Kenya Bureau of Statistics (HPHC, 2009). The total number of households sampled was determined with the formula:

$$n = N/1+N\,(e)^2$$

whereby n is the sample size; N it the total number of households and e is the margin of error with 8percent margin of error representing 92percent confidence level (Gomez and Jones, 2010). Using simple proportion method, 21,65,35,67 and 28 households were sampled from the wards as shown in Table 3.1.

Table 3.1: Sample Size

Ward	**Number of Households**	**Calculation**	**Sample size (SS)**
Township	12633	(12633/92492)100% = 13.6%	13.6/100*156= 21
Kamenu	38359	(38359/92492)100% = 41%	41/100*156= 65
Hospital	21059	(21059/92492)100% = 22.7%	22.7/100*156= 35
Gatuanyaga	16617	(16617/92492)100% = 17.9 %	22.7/100*156= 28
Ngoliba	3824	(3824/92492)100% = 4.1%	4.1/100*156= 7
Total	**92492**	**(92492/92492)100% = 100%**	**100/100*156= 156**

3.5 Methods of Data Collection

The research instruments used in conducting this research were questionnaires as well as observation method. The questionnaire as a tool was used because it is familiar to most people who have had experiences completing the questionnaires (Mugenda, 2003). Questionnaires are generally designed to be friendly and are not meant to fuel fear. The respondents are usually allowed enough time to complete the questions, and are even free to respond to questions during their own time then mail back responses usually within a stipulated agreed reasonable period. This method is sometimes necessitated by the vast numbers of respondents in a study due to the fact that it facilitates faster and easier information processing within reasonable timeframes.

The structured (closed-ended) questionnaires was used so as to get the responses from respondents because they provide a greater standardization whilst the data can be processed with considerable ease. The structured questionnaires were accompanied by a list of all possible choices from which respondents selected the suitable answer that describes their situation by simply ticking. Use of observation method allowed the researcher to observe the happenings in the field and record accurate information as it happened.

3.6 Data Collection Instruments

The researcher deployed the questionnaires, engaging research assistants so as to avoid "drop and pick" method of misconception. These questionnaires were coded in such a way that eased analysis by use of statistical analysis software, in particular, SPSS version 16 which was deemed adequate for the needs of the study. The responses were collected in a uniform manner, for objectivity, and the process was relatively quick to administer. The researcher also recorded observations by taking pictorials in the field, whose results are depicted in the appendix.

3.6.1 Piloting of Instruments

A different sub-county within Kiambu County was used for pilot testing. The researcher did the pilot testing in the neighbouring Ruiru sub-county where the pilot sample was two of the solid waste companies that have been in operation in the County. Ten households were also picked for pilot testing, to represent data from households' perspective.

3.6.2 Validity of instruments

Validity defines the extent to which an instrument measures what it was intended to measure as well as measuring whether it performs as it was designed to. Hence validity refers to the extent of precision and meaningfulness of deduction based on research results. Content validity defines the extent to which the content of the items reflects the content domain of interest. Validity can also be defined as the act of asking the right questions without ambiguity and these are done in reference to study objectives (Best and Khan, 2005). In this study, validity of the data was done using content-related validity. The instrument for data collection was presented to the supervisor; where appropriateness and applicability of the content was evaluated so as to ascertain clarity and construction adequacy. Validity can also be described as defining the extent to which data collected by use of a particular instrument actually represents a specific dormain of indicators or content of a specific concept (Mugenda and Mugenda, 2003). In this study, the indicators inferred from the variables were clearly outlined then scrutinized before data collection instruments were designed to match them.

3.6.3 Reliability of instruments

Reliability of a research tool is realized if it yields consistent information or data after repeat measurements are taken under the same conditions. Using test-retest method, the reliability of the research instruments was measured by the researcher prior to final data collection. The questionnaires were pre-tested (pilot testing) with the respondents from Ruiru Sub-County and adjustments and corrections were made as appropriate. The main purpose of pre-testing the research instrument was to identify any weaknesses and improve them. The pre-test also gave an indication of the time required to complete

the tool. The respondents were retested a second time two weeks later and their consistency between the two sets of the score was computed using Cronbach's alpha coefficient test. Therefore, the instruments' reliability was determined by the interpretation of the alpha value obtained; where a value of 0.8 percent was interpreted to be reliable representing 92percent confidence level (Nunally, 1998).

3.7 Methods of Data Analysis

Primary data was collected from the study and analyzed using descriptive statistics including frequency tables. Data was analysed by feeding it into a statistical package for social sciences (SPSS, Version16) and the outputs on frequency tables and graphs were generated.

3.8 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 ethical considerations during the process of data collection. First, respondents participated in the study on a voluntary basis. There was an option for any of the respondents who felt they needed to withdraw during the process of data collection; they were allowed to do so. Second, the study was anonymous and thus respondents were not required to include their names on the questionnaire. Third, the information obtained from the questionnaires was treated with utmost confidentiality. Fourthly, the researcher would communicate the findings of the study to its research stakeholders.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Introduction

The chapter presents the data analysis, presentation and interpretation of findings on the factors that influence the performance of solid waste firms in Thika Sub-county. The data collected was collated and reports produced in form of descriptive tables.

4.2 Questionnaire Return Rate

The research study administered one hundred and sixty-eight (169) questionnaires. The response rate is as depicted in Table 4.1.

Table 4.1: Response Rate

Response rate	Frequency	Percentage
Response	126	75
Non-response	42	25
TOTAL	169	100

From the one hundred and sixty-eight (169) questionnaires administered, one hundred and twenty-six (126) questionnaires were collected, constituting a response rate of 75%. This rate was deemed sufficient and representative comparative to Mugenda whose specification outlined a response rate of 70% and over as excellent (Mugenda, 2003).

4.3 Demographic Information

The study initially sought to inquire gender and age of the respondents. This information added to the wealth of information about the characteristics of the region under study. In addition, the information also helped test the appropriateness of the respondent in answering the questions regarding factors influencing performance of

solid waste firms in Thika Sub-County.

4.3.1 Respondents' Distribution by Gender

Findings from the study on the gender of respondents involved are as shown in Table 4.2.

Table 4.2: Distribution according to Gender

Gender	Frequency	Percentage
Male	25	19.8
Female	101	80.2
TOTAL	126	100.0

According to results in Table 4.2, majority of the respondents 80.2% were female while the remaining 19.8% were male. This depicts that women form a larger representation from households in residential environment. Majority of the men had no concern on solid waste matters, as these were dealt with by the women in the homes in residential areas. This study agrees with a study on Solid waste Management in Wote, where the trend showed that most men stay away from home, hence most respondents were female (Mutungwa, 2012).

4.3.2 Respondents' Distribution by Age

The age of each of the respondents was recorded and the findings are depicted in Table 4.3.

Table 4.3: Respondents Age Bracket

Age	Frequency	Percentage
(20-29) years	83	65.9
(30-39) years	30	23.8
(40-49) years	10	7.9
50 years and above	3	2.4
TOTAL	126	100.0

According to the findings in Table 4.3; majority of the respondents were in age bracket (20-29) years, accounting for 65.9%; while 23.8% of the respondents were in age bracket of (30-39) years. Age (40-49) were 7.9% while 2.4% were 50 years and above. The results show that majority of the respondents are middle-aged people. This implies they have an idea on solid waste disposal and its importance to environmental conservation.

4.4 Perception of profit margins

An investigation into the perception of respondents on the profit margins of solid waste firms was done. The results are as shown in Table 4.4.

Table 4.4: Profit Margins

Profit Margins	Frequency	Percentage
1-20%	119	94
21-50%	7	6
	126	100

From the results, 94% of the respondents believed that solid waste firms were making profits up to 20%; while 6% of the respondents believed the solid waste firms were making between 20 and 50% profit. Most of the private waste collectors were youth groups and young people trying to make out a living; hence the community seems to perceive that there wasn't much business from solid waste collection in the county during the period.

4.5 Economic Factors and Performance of Solid Waste Firms

This section provides an analysis of how economic factors like financial capacity, service charges and willingness to pay influence performance of solid waste firms in Thika Sub-County. The results of the study are summarised in Table 4.5.

Table 4.5 Economic Factors and Performance of Solid Waste Firms

Variable	SA	A	U	D	SD
Sufficient financial allocation for waste transportation and disposal	0	21(17%)	0	72(57%)	33(26%)
Existing service charges are fair, sufficient and affordable	0	34(27%)	13(10.3%)	66(52.4%)	13(10.3%)
Willingness to pay more for waste collection	14(11.1%)	10(8%)	4(0.03%)	65(52%)	33(26.19%)

N=126

Key: SA= Strongly Agree, A= Agree, U=Undecided, D= disagree, SD= Strongly Disagree.

On the query as to whether there was sufficient allocation for waste transportation and disposal; 17% agreed, 57% disagreed and 26% strongly disagreed. Hence the study revealed that there was need to improve on the financial capacity, as 83% of the respondents stated that there was inadequate financial allocation compared to 17% who felt the financial allocation was sufficient.

Inquiry as to whether the existing service charges were fair, sufficient and affordable showed that 27% agreed, 10.3% were undecided, 52.4% disagreed and 10.3% strongly disagreed. Hence only 27% of the respondents felt that the existing service charges were fair, sufficient and affordable.

Respondents' willingness to pay more for solid waste collection showed that 11.1% strongly agreed, 8% agreed, 0.03% were undecided, 52% disagreed and 26.19% strongly disagreed. Hence from the results, 78.2% were unwilling to pay more for waste collection services.

4.6 Social Factors and Performance of Solid Waste Firms

This section provides an analysis of how social factors namely the health and social conditions of workers, safety; and perception on waste collectors influence performance of solid waste firms in Thika Sub-County.

Table 4.6 Social Economic Factors and Performance of Solid Waste Firms

Variable	SA	A	U	D	SD
Waste workers have poor working conditions that affect their health and social conditions negatively.	88(70%)	28(22%)	0	6(0.05%)	4(0.03%)
Adequate safety measures are put in place to protect the waste collectors (Personal protective garments)	1(0.8%)	14(11.1%)	0	84(66.7%)	27(21.4%)
There is a negative perception concerning waste pickers and collectors that affects their level of performance.	52(41.3%)	47(37.3%)	0	6(0.05%)	21(16.7%)

N=126 Key: SA= Strongly agree, A= Agree, U=Undecided, D= disagree, SD= Srongly Disagree.

Investigation as to whether waste workers have poor working conditions that affect their health and social conditions negatively showed that 70% strongly agreed, 22% agreed, 0.05% disagreed and 0.03% strongly disagreed. Summarily, the results illustrated that 92% of the workers have poor working conditions that affect their health and social conditions negatively.

Results on whether adequate safety measures are put in place to protect the waste workers showed that 0.8% strongly agreed, 11.1% agreed, 66.7% disagreed and 21.4% strongly disagreed. Hence the results also showed that 88.1% of respondents felt that the safety measures put in place to protect the waste collectors were inadequate.

The study findings disclosed that there is a negative perception concerning waste pickers and collectors that affects their level of performance. This was evidenced by 41.3% of respondents strongly agreeing and 37.3% agreeing. From the remaining respondents, 0.05% disagreed and 16.7% strongly disagreed.

4.7 Technical Factors and Performance of Solid Waste Firms

This section provides an analysis of how technical factors namely disposal of waste in a properly designed operating landfill, use of adequate effective equipment; enough vehicles and skilled personnel influence performance of solid waste firms in Thika Sub-County. Results from the variables under study are summarised in Table 4.7.

Table 4.7 Technical Factors and Performance of Solid Waste Firms

Variable	SA	A	U	D	SD
Firms dispose waste through open dumping at a designated area allowed by the County government.	18(14.3%)	95(75.4%)	8(6.3%)	2(1.6%)	0
The equipment used in waste management is effective and adequate in number.	8(6.3%)	14(11.1%)	7(5.6%)	53(42.1%)	44(34.9%)
There are enough vehicles and skilled personnel to deal with waste collection and disposal	7(5.6%)	42(33.3%)	7(5.6%)	64(50.79%)	6 (4.8%)

N=126

Key: SA= Strongly agree, A= Agree, U=Undecided, D= disagree,
SD= Srongly Disagree.

The results point out that solid waste collected by the firms is disposed in the designated area; strongly agree (14.3%), agree (75.4%), undecided (6.3%) and disagree (1.6%) while 3 respondents did not attempt the question, representing 2.4% of the respondents. The study showed that waste was collected and transported to Kangoki Dumpsite for crude dumping. The County Government outlined that the plans were underway to transform Kangoki Dumpsite to a proper landfill.

Inquiry as to whether the respondents were satisfied with the effectiveness and adequacy of equipment showed that 6.3% strongly agreed, 11.1% agreed, 5.6% were undecided, 42.1% disagreed and 34.9% strongly disagreed. Hence only 17.4% of the respondents agreed that the equipment used in waste management is effective and adequate in number. The study showed that 77% of the respondents were dissatisfied with the effectiveness and adequacy of equipment.

On the query as to whether there were enough vehicles and skilled personnel to deal with waste collection and disposal; 5.6% strongly agreed, 33.3% agreed, 5.6% were undecided, 50.79% disagreed while 4.8% strongly disagreed. Hence from the study, 55.59% of the respondents thought that vehicles and skilled personnel for waste collection and disposal were not adequately provided for Thika Sub-County.

4.8 Environmental Factors and Performance of Solid Waste Firms

This section provides an analysis of how use of waste containers, transportation and disposal procedures; and awareness on health and environmental concerns influence performance of solid waste firms in Thika Sub-County as summarised in Table 4.8.

Table 4.8 Environmental Factors and Performance of Solid Waste Firms

Variable	SA	A	U	D	SD
Adequate awareness on health and environmental concerns has been done by the service provider	0	17(13.49%)	9(7.14%)	100(79.4%)	9(0.07%)
Environmentally friendly procedures are observed during transportation and disposal of waste	0	40(32%)	1(0.8%)	79(62.7%)	6(0.05%)
There are adequate waste containers and waste collection points to aid in improved collection of waste	7(5.6%)	18(14.3%)	2(1.6%)	69(54.7%)	30(23.8%)

N=126
Key: SA= Strongly agree, A= Agree, U=Undecided, D= disagree, SD= Srongly Disagree.

Inquiry as to whether there adequate awareness on health and environmental concerns showed that 13.49% agreed, 7.14% were undecided, 79.4% disagreed and 0.07% strongly disagreed. Hence from the results, 79.47% of the respondents believe that adequate awareness on health and environmental concerns has not been done by the service provider.

Investigation as to whether procedures observed during transportation and disposal were environmentally friendly showed that 32% agreed, 0.8% undecided; 62.7% disagreed and 0.05% of the respondents strongly disagreed. Summarily, the results illustrated that 62.75% of the respondents were dissatisfied with the procedures undertaken during transportation and disposal to safeguard on the environment.

Findings from the study as to whether there are adequate waste containers and waste collection points show that 5.6% strongly agreed, 14.3% agreed, 1.6% were undecided, 54.7% disagreed and 23.8% strongly disagreed. Hence 78.5% of the respondents stated that waste containers and waste collection points were not adequately supplied.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of the findings, discussion, conclusions reached and recommendations following the objectives of the study. The summary of the analysis of each research indicator is featured and from this study analysis, associated recommendations for improvement of performance of solid waste firms' services were made.

5.2 Summary of the Findings

The study initially sought to inquire information on the respondents' gender. According to findings, 80.2% of the respondents were female while the remaining 19.8% were male. This depicts that women form a larger representation from households in residential environment.

The study sought to find out the perception of respondents on the profit margins of solid waste firms. From the results, 94% of the respondents believed that solid waste firms were making profits up to 20%. The community seems to perceive that there wasn't much business from solid waste collection in the county during the period under study.

An analysis of how economic factors influence performance of solid waste firms in Thika Sub-County was done. The factor studied were financial capacity, service charges and willingness to pay. The results of the study revealed that there was need to improve on the financial capacity, as 83% of the respondents felt that there was inadequate financial allocation compared to 17% who felt the financial allocation was sufficient. Only 27% of the respondents felt that the existing service charges were fair,

sufficient and affordable, while 63% felt that the charges were high. From the results, 78.2% were unwilling to pay more for waste collection services. Research on solid waste management in Kakamega had similar results which depict that financial factors in terms of financial allocation for waste disposal, service charges and willingness to pay were inadequate for effective solid waste management (Malenya, 2015).

An analysis of how social factors influence performance of solid waste firms in Thika Sub-County was done. The factors studied were: the health and social conditions of workers, safety; and perception on waste collectors. The results illustrated that 92% of the workers have poor working conditions that affect their health and social conditions negatively. The results also showed that 88.1% of respondents felt that the safety measures put in place to protect the waste collectors were inadequate. The study findings disclosed that there is a negative perception concerning waste pickers and collectors that affects their level of performance. This was evidenced by 41% of respondents strongly agreeing and 37% agreeing.

An analysis of how technical factors influence performance of solid waste firms in Thika Sub-County was done. The factors under analysis were disposal of waste in a properly designed operating landfill, use of adequate effective equipment; enough vehicles and skilled personnel. The results point out that solid waste collected by the firms is disposed in the designated area; strongly agree (14.3%), agree (75.4%), undecided (6.3%) and disagree (1.6%). The study showed that waste was collected and transported to Kangoki Dumpsite for crude dumping. The study showed that 77% of the respondents were dissatisfied with the effectiveness and adequacy of equipment. From the research, 55.59% of the respondents thought that vehicles and skilled personnel for waste collection and disposal were not adequately provided for Thika Sub-County.

An analysis of how environmental factors influence performance of solid waste firms in Thika Sub-County was done. The analysis included use of waste containers, transportation and disposal procedures; and awareness on health and environmental concerns. From the results, 79.47% of the respondents believe that adequate awareness on health and environmental concerns has not been done by the service provider. Results show that 62.75% of the respondents were unhappy with the procedures during transportation and disposal of waste. This was attributed to waste spillovers during

transportation. The study results showed 78.5% of the respondents stated that waste containers and waste collection points were not adequately supplied.

5.3 Discussions

From the results of the study, economic factors, namely, financial capacity, service charges and willingness to pay influence performance of solid waste firms in Thika Sub-County. The study revealed that there was need to improve on the financial capacity, as 83% of the respondents felt that there was inadequate financial allocation compared to 17% who felt the financial allocation was sufficient. A study on SWM in Kakamega showed that only 36.9% of respondents agreed that there is enough budget allocation to cater for solid waste system processes (Malenya, 2015). Only 27% of the respondents felt that the existing service charges were fair, sufficient and affordable. In Ghana, an investigative study showed that free communal collection of waste had been offered over the years by the existing governments thereby resulting in funding constraints that affected efficiency levels as well as service quality in waste collection. The study recommended that households should be prompted and engaged to take responsibility and pay for waste collection services. Community education and awareness campaigns were deemed necessary as the private sector was also encouraged to respond better to precise customer needs so as to help realize the full cost recovery policy (Oduro Kwarteny, 2011). From the results, 78.2% were unwilling to pay more for waste collection services. In a research in Kibera; households were encouraged to willingly pay for waste collection and disposal by private collectors in order to enjoy a clean and healthy environment (Nthambi, 2013). In Kenya, evidence from research depicted that funding budget for waste handling and management processes were diverted to unscrupulously reward undeserving, over-staffed and under-qualified employees (Henry, 2006).

Social factors namely the health and social conditions of workers, safety; and perception on waste collectors influence performance of solid waste firms in Thika Sub-County. The results illustrated that 92% of the workers have poor working conditions that affect their health and social conditions negatively. This agrees with a study done in Nakuru that showed that 68.2% of the individual actors had received some cuts from waste while 91.7% were complaining of dust related ailments. All categories of responses were very high for different ailments, evidence to the fact that individual actors

collecting waste worked in risky environment (Njoroge, et al., 2013). The results also showed that 88.1% of respondents felt that the safety measures put in place to protect the waste collectors were inadequate. This agrees with a study on Waste Pickers in Nakuru that mentioned that safety, and working conditions were deplorable. Waste pickers described their workplace as dangerous, foul, smoky and toxic. Participants noted that they had been burned by chemicals, and that they need protective gear since they frequently encountered syringes, blood, cotton pads, and medicines (Nyonyintono, et al., 2013). The study findings disclosed that there is a negative perception concerning waste pickers and collectors that affects their level of performance. This was evidenced by 41% of respondents strongly agreeing and 37% agreeing. A study on waste pickers in Nakuru showed that waste pickers were not recognized as workers and their needs were not addressed. The findings from this study, for example the perpetual harassment of waste pickers, strongly suggest that rules governing waste picking in Nakuru were generally inappropriate. The study mentioned it was apparent that the importance of and rights of waste pickers are seldom recognized and there was gratuitous violence through excessive harassment of waste pickers (Nyonyintono & N, 2013). In another study, waste pickers in the study were asked to propose how institutions and actors could help them. Virtually all their proposals revolved around promoting and securing the rights and dignity of waste pickers. For instance, they asked that the municipality stop the harassment and instead collaborate with waste pickers. Similar demands were made of the police, and rich people were urged to behave humanely and respectfully toward this vulnerable group (Karanja et al., 2013).

The results of the study show technical factors namely disposal of waste in a properly designed operating landfill, use of adequate effective equipment; enough vehicles and skilled personnel influence performance of solid waste firms in Thika Sub-County. The results point out that solid waste collected by the firms is disposed in the designated area. The study showed that waste was collected and transported to Kangoki Dumpsite for crude dumping. The County Government outlined that the plans were underway to transform Kangoki Dumpsite to a proper landfill. The findings of the study was similar to a study in Thika that found that organic waste that was not recycled from the households was collected and dumped at the Kangoki Dumpsite (Kinyanjui, 2014). Another study in Eastleigh area depicted environmental and health hazards resulting from the designated Dandora dumping zone that had brought numerous illegal

dumpsites in the area. Lack of clearly articulated comprehensive policy that encompasses all aspects of waste systems dampened efforts by the county government to contain the situation (Ibrahim, 2014). The study showed that 77% of the respondents were dissatisfied with the effectiveness and adequacy of equipment. A previous study in Biashara location, Thika showed that respondents rated the services of garbage collectors as being fair in provision of enough equipment (Wangu, 2015). However, the current study depicting a fair representation of Thika sub-county showed that 77% of the respondents were dissatisfied with the effectiveness and adequacy of equipment. The results could be explained by the fact that ineffective technologies and equipment were influencing inadequate service coverage and operational inefficiencies. According to another study, lack of funding and skilled manpower to manage waste processes resulted in ineffectiveness in equipment usability in developing countries (Yousif and Scott, 2007)

From the research, 55.59% of the respondents thought that vehicles and skilled personnel for waste collection and disposal were not adequately provided for Thika Sub-County. A study in Kenya suggested that technical factors that control solid waste management system performance are due to deficient human resource capacity, even within government; coupled by poor roads and vehicles (Henry, 2010). In India, dilapidated waste containers and use of worn-out vehicles fueled illegal dumping and littering as residents justified their actions by stating they were discouraged by the lack of capacity of government in waste management and maintenance services (Hazra and Goel, 2009).

Awareness on health and environmental concerns, transportation and disposal procedures; and use of waste containers influence performance of solid waste firms in Thika Sub-County. From the results, 79.47% of the respondents believe that adequate awareness on health and environmental concerns has not been done by the service provider. A study done on Solid Waste management in Kiptembwa, Nakuru indicated that 57% of respondents indicated that the spread of disease was the most likely effect of poor disposal of waste on the environment (Makindi, et al. 2016). Results show that 62.75% of the respondents were unhappy with the procedures during transportation, and disposal of waste. This was attributed to waste spillovers during transportation. A previous study among Biashara residents in Thika indicated that half of the respondents indicated they were satisfied the area was well served by garbage collectors, while the other half

indicated that the area was not well served by the garbage collectors (Wangu, 2015). The study results showed that waste containers and waste collection points were not adequately supplied; strongly disagree (23.8%), disagree (54.7%). A study in Makina, Nairobi established that majority of Makina residents (80%) store their solid waste in shallow rubbish pits outside their houses. With time these pits turn into large dumpsites due to the irregular waste collection services in the area (Mwangi, 2011).

5.4 Conclusions of the study

Results from research on Solid Waste management in Thika Sub-County showed that in Ngoliba and Gatuanyaga areas, waste is collected along the road by the Sub-County government at no charge. In other areas, service charges are too low, yet willingness to pay is also poor as most residents are used to free service; with the perception that Waste Management responsibility vests entirely with the Sub-County. There is no reprieve when households refuse to pay the due fees to private waste collectors.

Rubber gloves, dustcoats and gumboots are used mostly by the County Government workers. The other young upcoming youth groups that complement waste collection efforts by Thika Sub-County have to make do with the rakes and spades only; when these become available. Private Protection Clothing (PCC) is a preserve of a few, confirming that the safety and welfare of workers involved in waste collection is compromised.

Solid Waste transportation has improved tremendously through the purchase of five new County Government trucks to service Thika and its environs. However, this still does not adequately serve the needs of communities in this fast growing town. Thika Sub-County relies on street boys for labour, as they are known to be cleaner and more efficient than the employees under the previous government regimes who were permanent and pensionable, yet much less effective.

Results show the inadequacy of waste containers and waste collection points. Waste is dumped along the roadside, and when it rains, the waste remains uncollected, thereby becoming an environmental hazard. It was evident from the study that households actually place the waste deliberately on the drainage, so that the county government

collectors can see and collect the waste. There is need to investigate a more environmental friendly way of collecting this waste.

5.4 Recommendation

i) Economic Empowerment of Solid Waste firms operating in the region needs to be done by the community. The youth groups charge too low, yet there are unmet needs like provision of Personal Protective Clothing that need to be bought for the employees. There should be efforts to economically empower these groups by both the households embracing the responsibility to cater for hygienic management of waste; as well as the community through Corporate Social Responsibility (CSR).

ii) Drastically improve waste collection methods, to use more of closed containers that are water-tight and environmentally acceptable.

iii) Community Engagement on Solid Waste Management should be done, and forums like these should ensure both the households and the government are taking responsibility for waste generated.

iv) Legislation should be introduced outlining specific ways that Solid Waste Firms are empowered to do their collection and disposal functions. Reprieve should be offered against households who refuse to cater for costs of keeping their immediate environment clean.

5.5 Suggestions for Further Studies

Since this study explored the factors influencing performance of solid waste firms in Thika Sub-County;

i) Similar research should be done in other Counties and Sub-Counties in Kenya in order to compare and to allow for generalization of key results on factors that influence performance of solid waste firms in Kenya.

ii) The effectiveness of solid waste management by firms can be ensured when a participatory approach is embraced by the community on management of collection and segregation of waste before transportation. A study should be done to determine cost effective methods of encouraging segregation of waste before transportation; as well as appropriate legislation that needs to be enforced to encourage environmentally appropriate

storage for waste awaiting collection.

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APPENDICIES

Appendix 1: Letter of Transmittal

Lee Mwangi Ngugi,

P. O. Box 31668, 00600,

Nairobi.

1st October, 2016.

To the Director,

Thika Sub-County,

P. O. Box 240-01000,

Thika, Kenya.

Dear Respondent,

I am a student of University of Nairobi undertaking a Master of Arts Degree in Project Planning and Management degree. I am undertaking a research on the "Factors influencing the performance of Solid Waste Firms: The case of Thika Sub-county, Kiambu County, Kenya". Kindly assist me to fill the required information as honestly as possible. Any information provided will be used purely for academic purposes and will be kept confidential. Kindly tick or give short answers where appropriate.

Yours Faithfully,

Lee Mwangi Ngugi.

Adm. Number: L50/71533/2014.

Appendix 11: Households' Survey Questionnaire

Household Characteristics

A. Locality ☐ Township Ward ☐ Kamenu Ward ☐ Gatuanyaga Ward
☐ Hospital Ward ☐ Ngoliba Ward

B. Gender ☐ Male ☐ Female

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

Performance of solid waste firms

1.1 Where do you empty or dispose your waste? (Tick as appropriate)

a) Door-to-door collection ☐

b) Communal collection ☐

c) Private disposal/dumping ☐

1.2 How would you rate the performance of the solid waste firms in terms of profit margins, if you were to estimate?

a) 1-20% profit b) 20-50% profit c) Over 50% profit. d) Unable to estimate

Economic factors

2.1 How will you rate the performance of solid waste services in the sub-county, *using these scales? (1) Strongly agree (2) agree (3) Undecided (4) Disagree (5) Strongly Disagree*

	1	2	3	4	5
a) There is enough financial capacity for delivery of solid waste services.	☐	☐	☐	☐	☐
b) The existing service charges are fair, sufficient and affordable.	☐	☐	☐	☐	☐
c) If better service was offered, you would be willing to pay more.	☐	☐	☐	☐	☐

2.2 For communal or door to door services, how much do you pay per month in Kenya Shillings for the collection service?

a) Ksh. 1-80 b) Ksh. 81-240 c) Ksh. 241-600 d) Do not pay for the service

Social Factors

How will you rate the performance of solid waste services in the sub-county, *using these scales? (1) Strongly agree (2) agree (3) Undecided (4) Disagree (5) Strongly Disagree*

	1	2	3	4	5
a) Waste workers have poor working conditions that affect their health and social conditions negatively.	☐	☐	☐	☐	☐
b) There is a negative perception concerning waste pickers and collectors that affects their level of performance	☐	☐	☐	☐	☐
c) Adequate safety measures are put in place to protect the waste collectors (use of gumboots, gloves, nose masks)	☐	☐	☐	☐	☐

Technical factors

4.1 How would you rate the performance of solid waste firms, using these scales? *(1) Strongly agree (2) agree (3) Undecided (4) Disagree (5) Strongly Disagree*

	1	2	3	4	5
a) Firms dispose waste in an environmentally acceptable way (Properly designed operating landfill)	☐	☐	☐	☐	☐
b) The equipment used in waste management are effective and adequate in number.	☐	☐	☐	☐	☐
c) There are enough vehicles and skilled personnel to deal with waste collection and disposal.	☐	☐	☐	☐	☐

Environmental Factors

How will you rate the performance of solid waste services in the sub-county, *using these scales? (1) Strongly agree (2) agree (3) Undecided (4) Disagree (5) Strongly Disagree*

	1	2	3	4	5
a) Adequate awareness on health and environmental concerns has been done by the service provider	☐	☐	☐	☐	☐
b) Environmentally friendly procedures are observed during transportation and disposal of waste	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

c) There are adequate waste containers and waste collection points to aid in improved collection of waste in Thika sub-county.

Appendix III: Questionnaires for Private Waste Collection Firms

Questionnaire Number ……..

Coverage Area: ……

1.1 How much do you charge for Communal collection service in Ksh.?

a) Ksh. 1-80 b) Ksh. 81-240 c) Ksh. 241-600 d) Do not charge for the service

1.2 For door to door services, how much do you charge per month in Kenya Shillings for collection?

a) Ksh. 1-80 b) Ksh. 81-240 c) Ksh. 241-600 d) Do not charge for the service

1.3 How would you rate the performance of your firm in terms of profit margins, if you were to estimate?

a) 1-20% profit b) 21-40% profit c) 41-60% profit. d) Over 60% profit

Economic factors

2.1 How would you rate the performance of your firm, *using these scales? (1) Strongly agree (2) agree (3) Undecided (4) Disagree (5) Strongly Disagree*

	1	2	3	4	5
a) There is enough financial capacity for delivery of solid waste services	☐	☐	☐	☐	☐
b) The existing service charges are fair, sufficient and affordable.	☐	☐	☐	☐	☐
c) If you were to offer better services, would your clients be willing to pay more?	☐	☐	☐	☐	☐

Social Factors

How would you rate the performance of your firm, *using these scales? (1) Strongly agree (2) agree (3) Undecided (4) Disagree (5) Strongly Disagree*

	1	2	3	4	5
a) Waste workers have poor working conditions that affect their	☐	☐	☐	☐	☐

health and social conditions negatively.

b) There is a negative perception concerning waste pickers and collectors that affects their level of performance ☐ ☐ ☐ ☐ ☐

c) Adequate safety measures are put in place to protect the waste collectors (use of gumboots, gloves, nose masks) ☐ ☐ ☐ ☐ ☐

Technical factors

4.1 How would you rate the performance of your firm, using these scales? *(1) Strongly agree (2) agree (3) Undecided (4) Disagree (5) Strongly Disagree*

1 2 3 4 5

a) Firms dispose waste in an environmentally acceptable way (Properly designed operating landfill) ☐ ☐ ☐ ☐ ☐

b) The equipment used in waste management are effective and adequate in number. ☐ ☐ ☐ ☐ ☐

c) There are enough vehicles and skilled personnel to deal with waste collection and disposal. ☐ ☐ ☐ ☐ ☐

Environmental Factors

How will you rate the performance of your firm, *using these scales? (1) Strongly agree (2) agree (3) Undecided (4) Disagree (5) Strongly Disagree*

1 2 3 4 5

a) Adequate awareness on health and environmental concerns has been done by the service provider ☐ ☐ ☐ ☐ ☐

b) Environmentally friendly procedures are observed during transportation and disposal of waste ☐ ☐ ☐ ☐ ☐

c) There are adequate waste containers and waste collection points to aid in improved collection of waste in Thika sub-county. ☐ ☐ ☐ ☐ ☐

Appendix IV: Photograph observations from the field.

There is need to improve on the waste containers and waste collection points. Ideally, the containers should be closed, to prevent rain, with lids so that there are no spill overs. Plate 4.1 shows the existing collection points.

Plate 4.1 Collection points for solid waste constructed by Jugglenuts Company.

In Ngoliba and Gakuanyaga areas, waste would be put along Garissa Highway, awaiting collection by the County Government. Plate 4.2 shows how waste is put along Garissa road. There is need to come up with a better way to collect this waste.

Plate 4.2 Waste put along Garissa Highway, awaiting collection by the County officials.

The picture below, in plate 4.3 shows waste being dumped along the drainage as a way of helping the county government to locate the waste since it is conspicuous.

Plate 4.3 Waste put along the road, blocking the drainage; as it awaits collection by the County officials.

The county government has constructed waste containers at the markets. In Ngoliba, there are two such containers, as shown in plate 4.4 below.

Plate 4.4 Two waste containers at market place to aid in waste collection.

Appendix V: Research Permit