

THE ROLE OF SOLID WASTE MANAGEMENT SERVICE PROVIDERS IN KARATINA TOWN

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DECLARATION

This project report is my original work and has not been presented for a degree in any other University

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This project report has been submitted for examination with my approval as University Supervisor

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Date

DEDICATION

To my wife Susan Wanjiru a special thank you for your continued support and prayers through the whole process of this masters course, to my mom Theresa Wanjiku thank you for always supporting me through my entire education life and for your continued support and finally to my two daughters Lynn Wanjiku and Victoria Muthoni Dad loves you.

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ABSTRACT

The main aim of this study was to assess the management of solid waste in Karatina town households and markets. This is because of the increasing sites of unattended solid wastes in its public places. The objectives of the study were: to profile solid waste management service providers, to analyze existing solid waste management framework, to establish the level of customer satisfaction and to recommend alternative solid waste management framework. The study adopted purposive sampling since the subjects sampled were not randomly assigned to groups but were all relevant cases in the study. The researcher used simple random sampling in selecting the desired sample of 144 households; the study also used purposive sampling method in identifying key informants with relevant information such as the Self-help Groups, the Nyeri County staff and other stakeholders involved in the management of the household wastes. Being a survey research, in collecting the primary data, the researcher designed and administered 144 household questionnaires to the randomly selected Karatina residents as well as interview schedules that were used to collect the data from the snow-balled key informants. Two Focus Group Discussions were also conducted in two locations of Karatina town as well as observation that was done through transects walks with an aim of gathering more information that did not require interview. The secondary data was obtained from the previous documented information on Solid waste management, and informal settlements. The data collected was qualitative and quantitative in nature. Descriptive and inferential statistics were used in the data analysis. The results indicated that polythene papers and plastic container are the most generated domestic solid waste. The study also found that Karatina residents have inadequate capacity to handle solid wastes generated from their households. The practice of the 3Rs: Reduction, Reuse and Recycling of the domestic solid waste is barely there. Most of the residents dump the generated domestic solid waste in compost pits and others in illegal dumpsites and only a small fraction can afford to pay for the existing collection services. The findings also identified various opportunities that exist in Karatina town for improvement of the current situation like intensive community training how to reduce, reuse and recycle domestic solid waste. The study makes various recommendations as follows; there is need to create intensive community awareness on integrated solid waste management especially on the 3Rs for Karatina residents. The main service providers handling domestic solid waste in Karatina such as the Karatina residents, Karatina University, group pitted to be contracted and the County Government; should employ an integrated approach and work together in the management of the household solid wastes. Finally, the Nyeri County should enforce the waste management's by-laws in order to ensure Adherence from Karatina residents.

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LIST OF ABBREVIATIONS AND ACRONYMS

UNEP:	United Nations Environment Programme
EMCA:	Environmental Management and Coordination Act
SWM:	Solid Waste Management
NGO:	Non-Governmental Organization
SDGs:	Social Development Goals
PSI:	Private Sector Involvement
NEMA:	National Environment Management Authority
3Rs	Reduce, Reuse and Recycle
GOK	Government of Kenya
ISWM	Integrated Solid Waste Management
SPSS	Statistical Package for Social Sciences
PASW	Predictive Analysis Software

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Most countries experience challenges in managing waste. Solid Waste can be defined as materials for example home garbage, food waste and demolition or construction wastes. This includes items like household appliances, abandoned vehicles, scrap metal and machinery. Another definition of solid waste is any refuse, garbage, sludge and any other discarded material including: solid, semisolid, or contained gaseous material, emanating from community activities (Majale, 2011).

Solid waste management can be defined as collection, treatment and disposal of solid wastes generated by all urban population groups in socially and an environmentally satisfactory manner using the best economical means available (World Bank, 2011). Therefore waste management includes collection, processing, transportation, and environmentally friendly disposal of the waste. Solid waste management also incorporates approaches for lowering the volume of waste discarded. Sustainable solid waste management improves on health, environment, aesthetics (Kaluli, 2010). Integrated solid waste management includes source reduction, source separation, reutilizing and reuse as well as materials recovery. The waste materials that linger should be disposed in an environmentally friendly way into a sanitary landfill

According to a report by UNEP (2002), solid waste management founds one of the most crucial health and environmental difficulties facing administrations of African cities. The reason for this is even though these cities consume 20 to 50 % of their budget in solid waste management, merely 20 to 80 % of the waste is collected. The uncollected or illegally discarded wastes create a disaster for human health and degrade the environmental. Additionally growth of population, industrialization, urbanization,

economic growth rates result in enormous increase in the quantity of wastes generated every day in nations with weak and underfunded administrations, and poverty prevents proficient management of wastes. Additionally a problem that is faced in developing countries' cities is unplanned, unsystematically constructed, sprawling slums that have narrow roads which are not easily accessible by collection vehicles. Additionally, environmental and social capital stock is often much smaller in developing countries.

Solid waste management for urban areas in Kenya is legally the obligation of the county governments. Financial resources including Human and material capital resources that have been devoted to waste management by this level of government haven't been effective (Cointreau, 2009). Therefore this has resulted to lack of effective waste management systems in all urban areas of the country. Therefore this has led to urban population randomly dumping, burying and or burning of solid waste. The most prevalent procedure in the few urban areas where a SWM system is working is where authorities that manage waste collect it from public curbside collection points and households regularly using a collection truck. It is unfortunate that processes managed by county waste authorities have mostly been incompetent, this is evidenced through heaps of putrefying waste that are a consistent sight in many urban communities. Looking at the environmental situation as pronounced above many urban areas in Kenyan have been described as filthy, unhygienic, and visually displeasing in the world (UNEP, 2000).

No urban centre in Kenyan has a hygienic landfill and heaps of putrefying solid waste along city and town pathways are a very common sight. Urban authorities in most nations are the organizations or authorities generally liable to provide solid waste management service. A crisis in solid

waste management can negatively impact on credibility of any urban authority. According to World Bank (2012) volume of solid waste is increasing at a faster rate compared to urbanization as urban residents begin to consume more therefore generating more waste. Karatina town which is within Nyeri County is situated approximately 156 kilometers to the north of the capital city of Kenya, Nairobi. It lies within the country's highlands in the central that is very productive; it lies between the eastern base of the aberdare ranges that forms a portion of the of the great Rift valley at the eastern end, and the mount Kenyan slopes to the west. The mean maximum temperature is 28°C and minimum is 11°C and the Yearly rainfall pattern fluctuates from 600mm to 1500mm for the duration of short rains and 1200mm to 1600mm for the duration of the long rains. Mt. Kenya and The Aberdare range are the main rainfall influence. This climate therefore brings about soggy surfaces and wetness in the solid waste which in turn boosts reproduction of pests in the discarded solid waste; the situation worsens during the rainy season (Kihonge, 2012).

1.2: Solid Waste Management Service Providers

Public institutions such as the urban authorities are the most renowned players in management of solid waste. However, Evans (2006), posits that this is an indication of positive contribution by the public. County authorities should play its planning, technical and organizational role during which the private sector guided by the county government structure implements the best practices. The desire, amongst the providers in the private sector to work with the county council on management of solid waste can be seen and this further provides opportunity for collaboration and complementarity as argued by Evans (2006). According to Cointreau (2009), in most urban centers people do not feel that there is anything they can do to minimize the amount of solid waste they produce. Therefore this clearly indicates that the

persons still lack comprehension and consciousness on benefits of deliberate reduction on solid waste. A few people discussed some very realistic ways and people need to make daily decisions on what to consume and spend on. Even though only a small number seem to be familiar with waste reduction, it is a great place to start so that public consciousness comes from the public arena. Many people agree that some of the things they discard can still be used.

Studies conducted on functioning of service providers usually have arrived at the conclusion that service delivered by private sector are related with advances in effectiveness and efficiency compared to when the services are provided by the public sector. Cullivan (2008), argued that outcomes of performance of the private sector compared to public sector delivery showed that productivity improvements are mixed and the discourse on private sector productivity improvements over public sector is inadequate. The outcomes from these studies indicated that their illustrative factors are inadequate, and thus there is need for additional studies into other methods.

Failure of the private sector to efficiently deliver in most emerging countries is because of feeble capability. Zurbrugg (2009), argues that the inefficiencies service of collection of waste in most emerging countries is because of limitations in institutional arrangements, inadequate capability of the private and public sector institutions involved, and the use of inappropriate technologies. It follows from this that efficient operation of the provider of the service in the midst of other factors are essential for private sector productivity improvements and enhanced performance.

In most towns, only a trivial percentage of the waste produced every day is picked and disposed of in a sanitary manner. Challenge of solid waste management in Kenya is real (Gakungu, 2011). Structures of collection are ineffective and waste is disposed of in a manner that is not environmentally friendly.

Consequently of all waste generated 30 to 40 percent isn't collected and less than 50 per cent of the population gets the service. 80 percent of machinery and vehicles used for collection and transportation of solid waste are out of service or need to be repaired (Otieno, 2010). It is thus of importance that the issue of sustainable solid waste management in Kenya is taken up with immediate effect failure to which all towns will be engulfed in waste. In response to the environmental challenges, Kenya reviewed its laws and associated policies and endorsed the Environmental Management and Coordination Act (EMCA) of 1999. These Act gives privileges and confers duties to persons to protect and improve the environment. It assures every Kenyan of a sanitary and healthy environment. These provisions also visualize safe guarding of the environment for the advantage of the current generations and those of the future.

1.3: Problem Statement

Human activities have dramatically altered this planet and its inhabitants where their effects have been exaggerated by increased population growth rates. The need to sustain the ever increasing population through industrialization is vital in the present modern society. Production of solid waste is therefore unavoidable through continued development. Something turns into waste when it is discarded without compensation for its natural worth. These wastes may pose a probable risk to the environment or human health when they are improperly treated, stored, transported or disposed (Collins, 2007).

This implies that without adequate enforcement of the existing environmental legislations and increased public involvement, important components of the integrated waste management systems including waste source separation, recycling and improved storage and collection systems will never see the light of day.

According to Hoornweg (2012), Kenya is urbanizing fast and as it does so, the complications related to solid waste management are escalating. According to GOK (2009) the Kenya urban population is estimated to be 12.9 million (32%) compared to 5.6 million (19%) in 1999. With this increase in urban population it is expected that solid waste generated daily will more than double. For example in the capital city Nairobi it is expected that the amount will rise from 2000 tonnes generated daily to 10,171 tonnes daily by the year 2025.

The challenge of management of Solid Waste in Kenya is real. Structures of collection are ineffective and those of disposal are not sanitary. Consequently of all waste generated 30 to 40 percent isn't collected and less than 50 per cent of the population gets the service. (Magutu and Onsongo, 2011; Gakungu, 2011). The challenges of solid waste such as insufficient service coverage, waste collection that is not regular, overflow of waste in storage containers and bins as well as carefree attitude of people towards unselective discarding on unapproved areas and waste scattering are common in emerging countries (Zurbrugg, 1999; Onibokun and Kumuyi, 1999; Oduro-Kwarteng et al., 2006). These can ultimately result in negative impact on public health, visual irritant, and environmental pollution. Due to inadequate coverage of service, solid waste that remains uncollected is often discarded into rivers, drains and surrounding areas, or the society burns or buries it.

Karatina town hosts one of the biggest open air markets in East Africa and the second largest in Africa ,the town is also a host to many households who also generates a lot of waste. Majority of waste generated is not collected on time and disposed of in a sanitary manner. These practices have led to pollution and degradation of the environment, and cause serious health risk to the population. These

complications damage, in the long run, not only the quality of life of Karatina's underprivileged populations but also affect the well-being of urban dwellers.

Presence of solid waste from households and markets which is not properly disposed creates a need to find out why the situations is the way it is. To enable us understand the role of SWM service providers, it is crucial that studies are conducted to identity the SWM providers in Karatina town, analyze the existing solid waste management framework and to establish the level of customer satisfaction. This study also seeks to offer recommendations on how to make the existing framework more efficient and effective.

1.4 Objectives of the Study

1.4.1: General Objective

Assess the roles providers of service play in management of solid waste in Karatina town and their effectiveness.

1.4.2 Specific Objectives

- i. To map out the solid waste management providers in Karatina town.
- ii. To analyze the existing solid waste management framework in Karatina.
- iii. To establish the level of customer satisfaction with solid waste management in Karatina town.
- iv. To recommend an alternative solid waste management framework for Karatina town.

1.5: Research Questions

This study sought to answer the following research questions;

- i. Who are the solid waste management providers in Karatina town?

- ii. What is the existing solid waste management framework and how effective is it in Karatina town?
- iii. To what extent are customers satisfied with solid waste management within Karatina town?
- iv. Is there an alternative solid waste management framework that can be recommended for Karatina town?

1.6: Justification of the Study

The study will help the local scholars, researchers, scientists and other stakeholders understand and relate to the concept of waste management strategies it will also increase the economic growth. It will help project developers, potential investors and other non-governmental organizations understand the framework of solid waste management in Kenyan better considering the obstacles, chances and high capabilities. In the long run, this study will help Kenya position itself better to attain the Social Development Goals (SDGs) by the year 2030 and thus plays a more important role in establishing consciousness to households on the prominence and requirement for improved environmental sanitation and hygiene for better health.

The selection of this area of study thus came from the want to immediately formulate a solution to the prevalent situation, of accumulation of domestic solid waste in various open dumpsites and the prevailing official institution charged with waste management have failed. It is of paramount importance to involve the entire community at household level in sustainable management of solid waste because official institutions have failed. This denotes the want to develop sustainable household-based waste management approaches that could be replicated in other urban centers. Therefore there is need for integration of all stakeholders in approaches for management of waste to ensure accomplishment and sustainability of such approaches.

The failure by the official institutions and the civil societies in the management of the household solid waste management points to the necessity of a more participatory and integrated approach. Therefore this study pursues to fill that academic gap in the field of sustainable solid waste management in towns within rural areas. It seeks to assess the responsibilities and actions taken by various service providers in Karatina in managing solid wastes. And explores the existing solid waste management framework and emanating from the conclusions derived from the study, the scholar will make proposals that relate to Karatina. The recommendations could also be replicated in other towns in Nyeri County in particular and Kenya in general. By implementing proper solid waste management strategies and technologies, Kenya is bound to benefit tremendously from alternative waste energy sources, improved environmental conservation, reduced soil and water pollution and increased foreign direct investment. It is now time for Kenya to tap enormously the benefits of efficient waste management strategies as a tool for promoting sustainable development.

1.7: Scope and Limitation of the Study

The study was ran in households and market areas within Karatina town a growing urban town within Nyeri County covering an area of 31.3 square kilometers with an estimated population of 23,278 from the 2009 census. Karatina is on the Nairobi – Nyeri highway, 20 kilometers southeast of Nyeri town and south of Mount Kenya. It is at an elevation of 1868 metres. Karatina town is a growing urban area with varying types of waste that is generated from households, markets, industries and hospitals. Samples for this study will be taken from population of households and markets within Karatina town. The study covered both private and public service providers and their

1.8: Operational definition of terms

Solid Waste Management- is a term that is used to refer to the process of collecting and treating solid wastes. It also offers solutions for recycling items that do not belong to garbage or trash. As long as people have been living in settlements and residential areas, garbage or solid waste has been an issue.

Solid waste- means materials such as household garbage, food waste and demolition or construction debris. It also includes discarded items like household appliances, furniture, scrap metal, machinery, car parks and abandoned or junk vehicles.

Systems- are sets of interacting and adaptive structures and processes which together produce functional outputs and outcomes

1.9: Organization of the Report

Chapter one provides the general introduction, underlining the issues of management of Solid Waste in Africa. The problem statement, objectives of the study and research questions are also part of this chapter after which the scope of the research work, operational definition of terms follow in this report and finally a brief of how this report is organized. Chapter two presents the study area where this study research was conducted illustrated using a map showing the geographical location of Nyeri County within the map of Kenya and consequently Karatina town within Nyeri County.

Chapter three presents the theoretical approach from institutional analysis and Capacity Building. Analysis and details of institutions constituents are presented. The theories are used to pinpoint the institutions established of solid waste management arrangements in metropolises. This are later used in chapter five on the report analysis there is also an introduction of rudimentary ideas of SWM. Additionally, waste maneuvers and trials facing the urban areas are offered to give a summary of the

situation of waste management in Africa. The chapter also provides an understanding of the tactics for waste management schemes in African urban areas. Likewise Integrated waste management approach that is endorsed in this study is presented in this chapter. Additionally a summary of urban solid waste management from the governance standpoint is illustrated. Chapter four presents the situation followed by the explanation of waste management operations in the instance the information forms the base for the discussion in chapter five. Chapter five outlines the analysis of the waste management system in the event followed by a discourse on the analysis of establishments that manage waste in the towns. Chapter six provides an overview of findings and conclusion of the study and offers some recommendations.

CHAPTER TWO: STUDY AREA

2.1: Introduction

The chapter portrays an examination of the study area

2.2: Overview of the study area

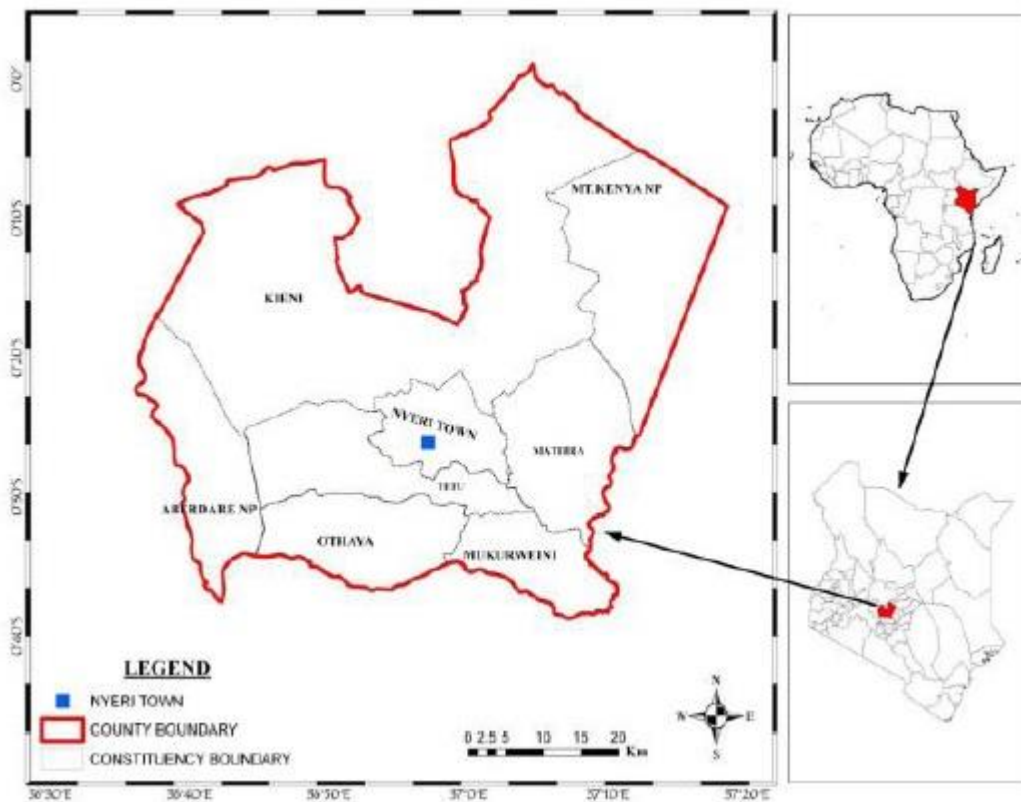
Karatina town is in Nyeri County which is located in central Kenya. According to Muturi (2015) It is one out of the five counties in former Central Province. Its landscape is often depicted by valleys and sharp ridges. The county goes through equatorial rainfall because of its location and its presence within the equatorial zone of the highlands of Kenya. The total population of Nyeri County as per the statistics of the national census of 2009 is 693558(339,725-49% males and 353833-51%) Nyeri county is one of the five counties in the former Central Province. The others are Kirinyaga county, Muranga county, Kiambu county and Nyandarua county. It has the following areas on its borders: Meru to the North East, Laikipia to the North, Muranga to the South, Kirinyaga to the East, and Nyandarua to the West. It covers a region of 3337.1km²

The landscape is repeatedly typified by sharp ridges and valleys, occasionally interrupted by hills such as Tumutumu, Karima and Nyeri. The northern section of the county is flat, however the topography further western and southwards, is characterized by steep ridges and valleys, occasionally interrupted by hills like Tumutumu, Karima and Nyeri. These hills affect the rainfall pattern to some extent, this therefore has an influence on the mode of agricultural production in some areas within the county. The county experiences equatorial rainfall due to its proximity to the equator. The yearly rainfall fluctuates from 500mm in the dry extents of Kieni tableland to 1,500mm. Agriculture is the main economic activity with 53% of the residents engaged in it. Dairy farming ,Tea and coffee and are the main

activities. Many residents work in government offices, tea, coffee and dairy factories religious organizations, retail, supermarkets, banking and insurance and in some professional bodies. The poverty level of Nyeri County is 32.7% with an age reliance ratio of 100:68.

The study was conducted in households and market areas within Karatina town a growing urban town within Nyeri County covering an area of 31.3 square kilometers with an estimated population of 23,278 from the 2009 census. Karatina is on the Nairobi – Nyeri highway, 20 kilometers southeast of Nyeri town and south of Mount Kenya. It is at an elevation of 1868 metres. It is an area with varying types of waste that is generated from households, markets, industries and hospitals.

FIGURE 2.1: Map of Nyeri County showing location in Kenya and Kenya in Africa.



Source:<https://www.google.com>

CHAPTER THREE: LITERATURE REVIEW

3.1: Introduction

This chapter examines the role of solid waste management service providers, explores the various theories that were used to inform the study on the role of solid waste management. It also explores the ideas of solid waste management (SWM), SWM service providers, SWM and customer satisfaction and Integrated Solid waste management systems. It continues to present the existing legal and Institutional frameworks that exists for solid waste management and finally presents the conceptual Framework.

3.2: Theoretical framework

This segment examines various theories used to inform the study on role of solid waste management service providers. The following theories are associated to the concept of solid waste management; market theory ,systems theory, and integrated solid waste management systems.

3.2.1: Systems Theory

The idea of solid waste management stems from systems theory. Systems are sets of co-operating and adaptive arrangements and processes which together generate functional products and results. They are typified by their capability to uphold their practical productions and results within desired parameters while altering and adapting to deviations in inputs. Feedback methods alter system processes and structures in response to input deviation to maintain outputs and outcomes. Variation is an integral part of systems (Baud, 2004). While systems are able to adjust to change in inputs, they remain relatively sustainable. When they cannot change, a break occurs until a new equilibrium is reached or breakdown occurs.

Systems theory has been applied widely to understanding of social organizations. For human service organizations, plans are systematized sets of inputs (people, facilities, and equipment) which carry out processes designed to achieve specific outputs and outcomes. The three key attributes of solid waste management are the benefits that are produced over time for individuals and populations, the contingencies which cause the benefits, and the costs of the program capitals that are essential to achieve them (Onibokun and Kumuyi, 2006). Programs can be assessed as unmaintainable because adequate advantage is not produced, the eventualities which cause results cannot be generated or maintained, and the cost of the program resources required to achieve the benefits is too high. This ideas of maintainable growth need to be well integrated into solid waste management and other environmental intercession programs.

The SWM is very imperative as an ecological health service and it is a very crucial portion of rudimentary urban services. Study conducted on SWM in emerging nations is established from two major concerns: public sector reform including issues to do with privatization and sustainable development. The prior is closely connected to the neoliberal principle declaring a resurgence of the market and a decrease of state control. The second focuses on private sector participation in service provision; it raises issues of public attention and appropriateness. These two ideas births the request for an effective administrative system (Wilson and Whiteman, 2001). Effective SWM system is a sure and reliable way to ensuring economic development.

In Kenya, towns and urban areas have set the pace in the course of environmental cleanliness via effectual waste management. It is of utmost prominence to explore the opportunities and challenges brought about by spreading of the benefit of solid waste management service in Kenya. Interventions

can only be triumphant in the long term if their intentions and actions are achieved. Public and private sector operation in Solid waste management project needs to be looked at to verify the quality of service provided and highlight the challenges facing its sustenance.

3.2.2: Market Theory

Public choice philosophers contend that service delivery by public officials is not effective because of the lack of flexibility and more proper regulation organization, budget maximization by bureaus (Niskanen, 2004) and the uncontrollability of the bureaus. The public sector was unresponsive to users 'choice and incompetent, and thus provision by the private sector was seen as an alternative for cost efficiency and better service quality. These philosophers contend that contract market and competition lead to gains in efficiency.

The managed market for public service tries to mitigate for failure in the market and encourage competition. An efficient solid waste marketplace need promotion of competition for the market, reducing of skewedness of information, and reduction of expenditure on transaction. County governments and households involve institutions in collection of solid waste in a market which has the features of sole buyer and where entrance and exodus is controlled. For public goods and services, there prevails competition for the production market whereby private and public firms engage in competition for the supply of services and goods to government that is the main and sole purchaser.

In Such a production marketplace the public authority wields the authority to control the rules of engagement and mostly favors powerful politicians (Hogget, 2006). The three main control strategies for public service markets are formation of decentralized elements with centralized regulation over plan and rule; managed competition through contracting to public and private sectors at county government level; and managing and monitoring actions. To be able to manage the market-based public service there is

need and involves separation of providers and purchasers, using of contracts and commercial operations dependent on user choice and prices.

Charging for services is deemed a way of recovering cost for provision of swm services, likewise a way of tackling the general issue of efficiency and effectiveness. The lack of effective prices for public service can be viewed as resulting to accidental subsidy, where the rich are subsidized. The contentions behind pricing and charging are clearly strong. The people against charging of users contend that the establishment of charges for solid waste may result in undesirable externalities and therefore should be provided for free (Walsh, 2005).

3.3: Concept of Solid Waste Management

Raw materials have become limited while energy more expensive, all over the world pollution of soil air and water pose a risk to sustainable development. Waste management has a close relation with both of the problems: waste disposal problems are prevailed more by patterns of changing consumption, industrialization and growth of urban areas; in turn means that traditional methods and systems for solid waste disposal and recycling are no longer appropriate (Scharff and Vogel, 2004). This issue is more prevalent in informal settlements in particular. The form and volume of the solid waste generated in an area is not only based on the standard of living and lifestyle of the population in that area, but also of the availability and type of the region's natural resources. Wastes generated in urban areas can be categorized into two major components i.e. living and non-living generally organic waste can be grouped into: fermentable, putrescible, and non-fermentable. Putrescible wastes decays quickly and if not carefully controlled, it decays with the production of very foul smells and it is not pleasant to look at (Morwood, 2000). Fermentable wastes decompose quickly, but without the bad smells. Non-fermentable

wastes do not decompose and, thus, decay very slowly. A main source of putrescible waste is preparing and consuming food. Consequently, its traits differs with standard of living, lifestyle and seasonality of foods. Fermentable wastes are characterized by crop and market debris.

3.4: Solid Waste Management Service Providers

The justification for the (PSI) in collection of solid waste is to enhance efficiency though cost reduction and effectiveness of service delivered this happens when the private sector competes with the monopoly government in the production market for the solid waste management service provision. However, recent case studies of PSI in management of solid waste in some emerging countries for example, in Kenya there has been an improved coverage in some of the counties, but the value of service, efficacy and sustainability of services delivered by the private sector are areas that require additional research to ascertain causes of performance (Schubeler, 2006). The private sector s encounters challenges of incompetence and meagre service value caused by issues of the permitting environment, legislative arrangements between organizations, and generally how institutions are run.

According to Onibokun and Kumuyi (2006), there has been improved participation of the private sector in SWM in many municipalities in emerging countries. Nevertheless, regardless of the upsurge in public-private-community partnerships, it is evidenced that need for environment cleanliness and service coverage haven't been realized. Despite the shift of ideas from delivery of SWM service by public sector to involvement of the private sector coverage has not yet improved. Municipal management of solid waste in emerging nations is faced with difficulties of sustainability. A sustainable SW management structure embraces a system that is financially, environmentally and socially acceptable, and meets the benchmarks of development that is sustainable these in turn meets the desires of the current generation without compromising the capability of forthcoming generations to cater for their

desires (World Commission on Environment and Development, 1987). The three highly important and related facets of sustainability when met guarantee that solid waste does not bring about public health hazards and environmental pollution (Baud, 2004).

According to Morwood (2000), the issues that drive sustainability of SWM in emerging nations are still not certain. Therefore there is no forthright evidence on the prevailing circumstances and the influences that stimulate sustainability. Investigations that open up and connect prevailing circumstances with enhancers for sustainability are necessary to improve and withstand private sector participation in collection of waste, upto a place where they are interested in recycling waste, sanitary landfilling and recovery in emerging nations. Because of prevailing challenges only a small number of private firms participate in the above issues (Narayana, 2009).

3.5: Solid Waste Management and Customer Satisfaction

In developing nations, the governments intervene through typical provision of SW collection services for free and consequently raising revenue via city taxes. Providing a service for free to customer doesn't necessarily mean they will take advantage of it because there is still requirement of some effort to take waste to collection point by them (Walsh, 2005). From the view of the individual it is easier to dump litter on the floor rather than taking to the dustbins thus a substitute to ensure that this is discouraged is strict enforcement of laws (Walsh, 2005), argues that because this legislation is a prerequisite regardless of whether the service is provided for free. Provision of the services for free might not reduce negative impacts. The consequences related to solid waste provide a robust case for provision of solid waste service by the government. PSI is associated with government and market failures. It is claimed that PSI is a means to secure private financing for collection and SWM and maintain discipline in the market.

The justification for PSI in provision of solid waste management service is that it brings technical skills, expertise, ability to provide financial capital and achievement of better quality of service and minimal costs (Bartone, 2001). The upside of PSI include access to private finances, improved quality of service and efficiencies of cost (van Dijk, 2008).

Increased cost reduction when providing SWM service is often achieved via introduction of principles of commerce and giving attention to satisfaction of the customers. Although public sector effectiveness in provision of services in many municipalities has improved in many emerging nations via introduction of principles of commerce and competition PSI is viewed as a means of achieving greater cost reduction and efficiency (Bartone, 2001). The measures of service quality in solid waste management are service reliability, customer satisfaction, coverage, responsiveness to customers, and cleanliness of the environment. The aims which are the results of service or standards of quality are frequently set by the main partner of the contract of service, for example the Waste Management Sectors in most municipalities in the world. The difference between production and result is pertinent because administrations frequently control more production than result, because results depend on the discernment of the customers whereas production can be easily measured.

3.6: Legal Framework for Solid Waste Management

According to Keriko (2006), domestic solid waste management benefits from the legal instruments inherent in the relevant multi-lateral environmental agreements as well as the draft Waste Management Regulations of 2006. Multi-lateral environmental agreements play a significant role in managing global environmental issues. They ensure that concerted actions are undertaken across various countries. Some of the relevant multi-lateral environmental agreements to issues relating to domestic waste include; The

Basel convention that was on cross boundary movements of hazardous and their disposal, united nations convention on the law of the sea , tripartite environmental management programme for Lake Victoria, Rotterdam Convention, Montreal Protocol among others. About 77 statutes exist addressing various aspects of the environment through specific sectors (NEMA, 2005). However, the sectoral statutes were independently inadequate to manage the environment and especially waste thus requiring harmonization. This led to formulation and enactment of Environmental Act of 1999 thus creating synergies and strengthening legal instruments for managing the environment. The harmonization of the environmental legislation under Environmental Act of 1999 improved environmental management. This has enabled environmental issues to be resolved in the event of any conflict with existing laws (NEMA, 2005).

3.7: Institutional Framework for Solid Waste Management

The sectoral legislation is implemented through specific institutions, agencies and organizations. These institutions administer, enforce, coordinate and monitor various Acts of parliament including those related to the environment. Case example of these institution would be the National Environment Management Authority (NEMA) created under Part III – Administration – 7:1 of Environmental Act No.8 of 1999. The Act establishes NEMA as the main mechanism of Administration for the execution of all strategies associated with the environment. Karatina town is overseen by the Nyeri County government whose obligation over the town results from the County Government Act, 2012. The County government provides or regulates the delivery of services in public health, physical planning, social services and sanitation, including solid waste management and education. These services are regulated by the environment department through the county by-laws on management of solid waste together with other governmental procedures and strategies adopted by the County government.

However, despite these elaborate institutional frameworks, environmental degradation has continued to occur unabated thus demonstrating lack of coordination and enforcement of the various sectoral laws. Providing of the environmental service including drainage and all forms of waste water and garbage collection are the duty of the county government. Although responsibility of waste management is vested in County authorities, most of them lack the necessary capability to deal with waste produced (GOK, 2005). Before enactment of the constitution in 2010 there were 174 local authorities in Kenya and merely 32 had some method of treating sewage and facilities for disposal, just two had typical treatment plants and 30 had oxidation lagoons that only handled organic waste. The management of waste in Karatina is under the Nyeri county government, the Ministry of Local Government and the Provincial Administration. To address these challenges, National Environmental Management Authority (NEMA) has started partnerships between local authorities, the private sector, civil society organizations and the public in handling waste. Research reveals that Nairobi County, Central Counties and Western Counties are among the regions with improved sanitary facilities in the country while North Eastern counties have the least access to such facilities (NEMA, 2005). In rural areas, half of the home's discard domestic waste in farms. Much of the hazardous wastes end up in water and on land.

3.8: Integrated Solid Waste Management (ISWM) systems

Agenda 21 (UNEP, 1992) defines solid waste as all domestic refuse and non-hazardous wastes such as commercial and institutional wastes, street sweepings and construction debris. Being aware of the problems in our environment has culminated in the development of new technologies to minimize the environmental impacts associated with solid waste. It changed the main concern of the management of waste from disposal to inhibition of waste, recycling and reduction. This days waste management

involves consideration of a related series of options that aim at reduction of waste at source, recycling and finally treatment and disposal. If properly managed, ISWM can ensure the efficient management of waste through recycling, re-use or recovery (Bazzani, 1998). Agenda 21 (UNEP, 1992) also proposes the use of the integrated life cycle management concept, that provides a good chance to unite growth with safeguarding of the environment. The aims of a framework like this focuses on the four major waste related program areas: waste minimization; Improved environmentally friendly solid waste recycling and reuse; Ensure hygienic waste disposal and treatment; and increases waste service coverage.

These four areas are related and they support each other therefore they must be integrated in order to provide an all-inclusive and comprehensive waste management system. There is varying emphasis given to the four areas based on the local physical social and economic conditions, production rates of waste and constituents of waste. All sectors of society should participate in all the program areas. ISWM systems thus merge: waste collection, and waste treatment and methods of disposal; with the objective of gaining benefits of the environmental optimization of the economy and acceptability by the society (Bortoleto, 2007). According to Ball (2006) the waste hierarchy', which was effectively promoted internationally at conferences such as the United Nations Conference on Environment and Development and Habitat II is now accepted as a global parameter in national making of policy for management of solid waste. This concept is based on principles of the environment and upholds the fundamental maxim that prevention is better than cure'. Preventing generation of waste is the most favored choice for management of solid waste. Later followed by reuse and recycling of waste based on the wastes respective form and characteristic is preferred to dumping, disposal in landfill sites, or open burning.

The present day concept of ISWM is very complex and comprises of the environmental aspects of the waste hierarchy or otherwise technical aspects of the ordinarily used approach, and incorporates the legal, economic, institutional, cultural and political approaches together with social aspects. Environmental protection and economic feasibility of the system are the first priorities of this approach. Implementation of the present day concept calls for effective organizational arrangements including policies and principles, that describe the obligations of the administrative, technical and financial standards coupled with a high technical and healthy experience in operating an efficient waste collection and disposal system. The assumption is that solid waste mustn't be considered just as a menacing problem but rather as a resource or even a livelihood (Böll, 2006). The basic goal of ISWM system is to manage communities waste in a way that meets concerns of health and is economical and encompasses the publics 'desire to reuse and recycle waste materials. The following is a diagram showing the various levels in integrated solid waste management hierarchy.

Management of domestic solid waste needs to remain efficient environmentally, affordable and generally acceptable in society . SWM systems should ensure issues of human health and safety are taken care of. This systems must ensure environmental impacts of waste management that is pollution of air, land and water, energy consumption and loss of amenity. The system must also be affordable to private citizens, businesses and government.

FIGURE 3.1: Integrated Solid Waste Management System



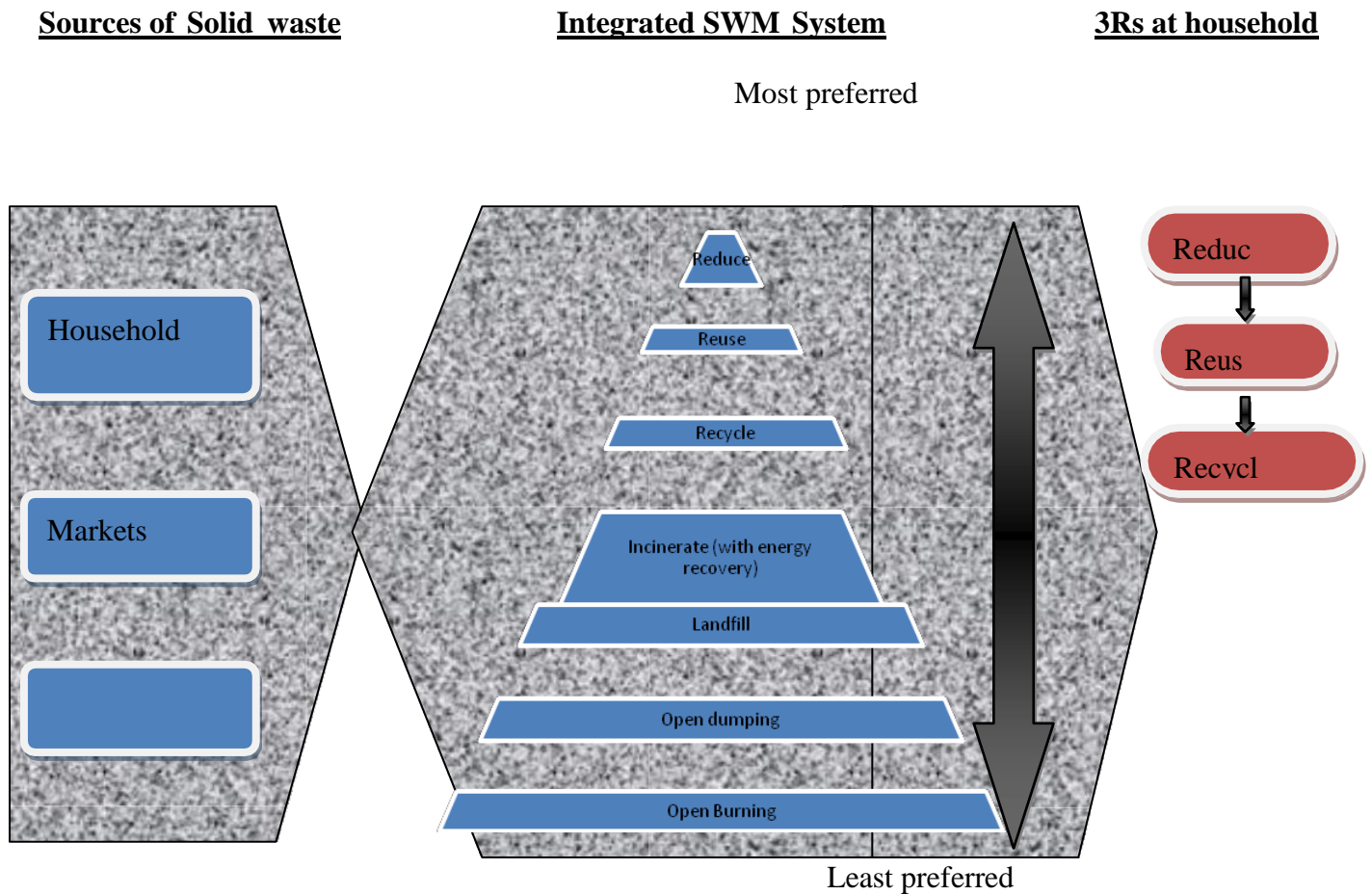
Source: (AESSL, 2001)

3.9: Conceptual Framework

The conceptual framework is informed by the ISWM system that promotes reduction, recycling and reuse of solid waste at all levels of waste management hierarchy i.e. from when waste is generated until its disposal. There are many sources of solid waste: households, industries, institutions and other sources. For the purposes of this research, the researcher concentrated on the solid waste that is generated at the household level and market areas in Karatina town. The study sought to map out the managers of solid waste, analyze the existing solid waste management framework in Karatina, establish the level of customer satisfaction and to recommend an alternative solid waste management framework for Karatina town. The following flow diagram demonstrates the conceptual framework that informed the study carried out at Karatina town. The Waste management level is acceptable locally and internationally. And aims at achieving optimal outcome in the environment. It maps the favored order of practices of waste management from the most preferred to least preferred (Zero waste, 2008). Solid waste generated at the household level can be minimized, reused and/ or recycled. These are the top

most preferred ways of managing wastes whereas incinerating, land filling, open burning and open dumping are least preferred in handling of solid waste.

FIG 3.2: Conceptual Framework



Source: (Mwangi, 2006)

The dependent variable in this study will be management of solid waste. Management of Solid waste is attained through several roles by service providers, solid waste management profiling, customer satisfaction, solid waste management framework and alternative framework that constitute the independent variables. There are many sources of solid waste in Karatina Town: households, industries,

institutions and other sources. Due the aims of this research, the researcher concentrated on the solid waste that is generated at the household and market level in Karatina town. The study sought to establish how Karatina town households and market dwellers (buyers and sellers) manage the solid waste generated at the households and markets. The study assessed whether the residents of Karatina households and markets practiced the 3Rs in order to minimize the waste generated as well as benefit through recycling and reusing solid waste.

CHAPTER FOUR: METHODS AND MATERIALS

4.1: Introduction

This chapter presents the layout of the research, the targeted population, the sample size, the procedure of sampling and methods of collecting data used in investigating the problem in study. It also discusses the methods that were employed to analyze the qualitative and the quantitative data collected from the field.

4.2: Research Design

This study took up a descriptive research design. According to Schindler (2003), a descriptive research design is relevant and appropriate where a study looks at describing the features of certain groups, estimating the percentage of people who have particular features and making forecasts. According to Mugenda and Mugenda (2003), descriptive research design is described as logical, experiential inquiry of which the researcher doesn't have power over the independent variables because their exhibition occurred already or because the independent variable can't inherently be influenced. This study took up a survey design where a sample of 140 respondents from households were randomly selected from the entire Karatina population which was approximately 35000 people living in 5000 households (GoK, 1999). The survey design was favored to be the most appropriate since considering the entire Karatina area population in data collection was going to be a tedious and long process. An assessment was carried out on the existing solid waste management framework in Karatina, how solid waste is managed at the household level as well as profiling the service providers engaged in the management of the household solid wastes.

The primary data was collected using the house-hold questionnaire (Appendix I), key informant interview schedules (Appendix II.) for county environment managers and officers and (Appendix III.)

managers and employees from private company(s), NGO's and CBO's and finally informal waste workers at Karidudu dumpsite. The house-hold questionnaires collected the quantitative data while the other instruments mentioned above collected the qualitative data.

4.3: Data needs

To complete this research there was need for collection and analysis of data. This research required collection of data on household characteristics and income generating activities they are engaged in at the general information part of the questionnaire. There was need to establish the service providers engaged in solid waste management and the particular solid waste management activities they carried out. It was also important to establish if the community was involved in these solid waste management activities and whether there are any solid waste management awareness programs carried out within the community. It was also important to establish the types of solid waste generated and how it was stored before transportation and disposal and the frequency of collection by the various service providers and the cost that the households have to meet for this collection service. There was also need to establish how these households dispose of waste where there was no service coverage.

4.4: Population

Targeted population in any research is the particular population for which information is looked for. According to Ngechu (2004), a population is a set of people distinct or group of things or households, elements, services, and events that are being examined. The targeted population for this study was members of households from all electoral wards who are constituents of Karatina, key informants from the newly formed County environment office, the former Karatina municipal council which is currently under this county offices, managers and employee of participant private companies and informal waste workers in Karindudu dumpsite that serves Karatina. .

The household is the sampling unit where by 140 households were randomly picked and questionnaires administered. All Karatina households constituted the target population in this study. It was assumed that anyone with a household in the area is a resident. Karatina is a town within the administrative area of Nyeri County. It has a population of about 35,000 people (GOK, 1999). The area is cosmopolitan with the majority tribe being the Kikuyu. For the household questionnaires, a sample size of 140 will be carefully chosen using random sampling. The researcher triangulated Karatina town into seven non-overlapping homogenous sub-regions which are Kiangaru, Kiharo, Muthua, Ragati, Baricho, Ichuga and Itati the seven electoral wards within Karatina town. Simple random sampling was then carried out by picking 20 subjects from each of the sub-regions in order to realize the desired sample of 140 households. The study used purposive sampling and snow-balling method in identifying the key informant interview respondents with the relevant information for the study such as the managers and employees of private companies, the Nyeri County Environment office staff and other providers of solid waste management service.

4.5: Sample and Sampling Techniques

Sampling is the procedure of picking a number of entities for a study in such a way that the entity embodies a larger group from which they are selected (Kothari, 2004). Sampling means picking a given number of entities from a defined population as representative of that population. Any declarations made about the sample must also be true of the population (Mugenda and Mugenda, 2008). Kothari (2004), argued that when well-chosen samples of 10% can give a correct description of the entire population. Other texts have shown that selection of sample size to a great extent is decided judgmentally.

The sample will include key participants like the 10 Nyeri county environmental administrators, 10 executives and laborers of private firms, 10 workers of the former Karatina Municipal council, 5 Informal waste collectors at Karindudu dumpsite and 140 residents from the various wards upon which questionnaires were administered to facilitate data collection which informed this study. This population was dispersed amongst Cheru/Kiangaru, Kiharo, Muthua, Ragati, Baricho, Ichuga and Itati electoral wards within Karatina.

4.6: Data Collection Instruments

This study developed and utilized a structured questionnaire. These questionnaires had close and open ended questions for gathering of primary data. The questionnaire was preferred because respondents were able to answer questions with little or no help and retaining anonymity, and it was quicker and cheaper than other methods with the capability of reaching out to a larger sample (Dooley, 2007). The researcher made requests to respondents to give answers to questions and then collected the questionnaire soon after they answered the questions.

4.7: Data Collection Procedure

Permission was sought from the County management officials to collect data from the county officers, after the approval from the department in the university to take up the research. The researcher was also given an introductory letter by the county officials. The researcher went to different wards at different times and sought permission to collect data as pertains to the different ways discussed above. The researcher gave the questionnaire to Nyeri county environmental managers, managers and workers of private firms, workers of the former Karatina Municipal council, Informal waste collectors at Karidudu dumpsite and residents from the various wards.

4.8: Data Analysis

The data that was collected was both quantitative and qualitative. On receiving the questionnaires and answers to the targeted interviews, the collected data was edited and checked to make sure there was completeness, consistency, uniformity and accuracy. Qualitative data from the questionnaires was analyzed using content analysis (It is used when one has sets of existing written or visual documentation which require analysis) (Carol, 2007). Quantitative analysis of data was done using descriptive statistics, this often involves measures of variability, measures of central tendency, measures of reliability and frequency among others. Quantitative data that was collected using questionnaires was analyzed via the use of descriptive statistics using SPSS (Statistical Package for Social Sciences) and was posed through means, percentages, and frequencies.

4.9: Presentation of data

4.9.1: Quantitative Method

Questionnaire data from 140 households was analyzed using both inferential and descriptive statistics due to the nature of the variables under investigation. The data from the questionnaires was first coded and entered in PASW (Predictive Analysis Software) formerly SPSS (statistical package for social scientists). All numerical or empirical information gathered in the field was analyzed using rankings and percentages, frequency, counts, correlation co-efficient among other methods deemed statistically suitable. This will be determined by the nature of variables under investigation such as types of wastes generated, cost of solid waste management service, solid waste. Storage facilities, domestic wastes reduced and recycled.

4.9.2: Qualitative Method

The majority of information in this study was analyzed qualitatively or through descriptions because it involved parameters that could not be quantifiable; for example, for the third objective, information was qualitatively analyzed because the variable is the level of customer satisfaction in Karatina town. All data collected using qualitative methods, for example, key informant interviews, focus group discussions, and observation were analyzed qualitatively and presented in the form of narratives, descriptions, diagrams, ranks, and perception.

CHAPTER FIVE: RESULTS AND DISCUSSIONS

5.1: Introduction

This chapter presents a discussion of findings obtained from the study. The results indicate that residents of this rural town have poor capacity to handle solid wastes generated from their households and the market. The findings also identified various opportunities that exist in Karatina town for improvement of the current situation. Below is a summary of the findings from the study gathered using household questionnaires and key informant interviews and observations.

5.2: Background profile of Households

5.2.1: Household size

According to the Kenya Population and housing (1999), Karatina town had a population of 35,000. Out of the 144 respondents, only 2.8% had not acquired any formal education. 14 which constituted 9.7% of all the respondents had acquired primary school education; majority of the people in this category were entrepreneurs in the informal sector for example farming and small business enterprises. 37.5% of the respondents were educated up to the tertiary level ; majority of the respondents in this category are self-employed in business whereas the others are employed in the informal sector like carpentry, masonry ,culinary skills and mechanical engineering. 62.5% had gone through university and college level education with 56 of them having mid-level college skills while the other 34 were graduates in various fields; this category had taken up white-collar jobs. Majority of this category worked in Nyeri town and Karatina town and their environs.

FIGURE 5.1: Bar chart showing education level



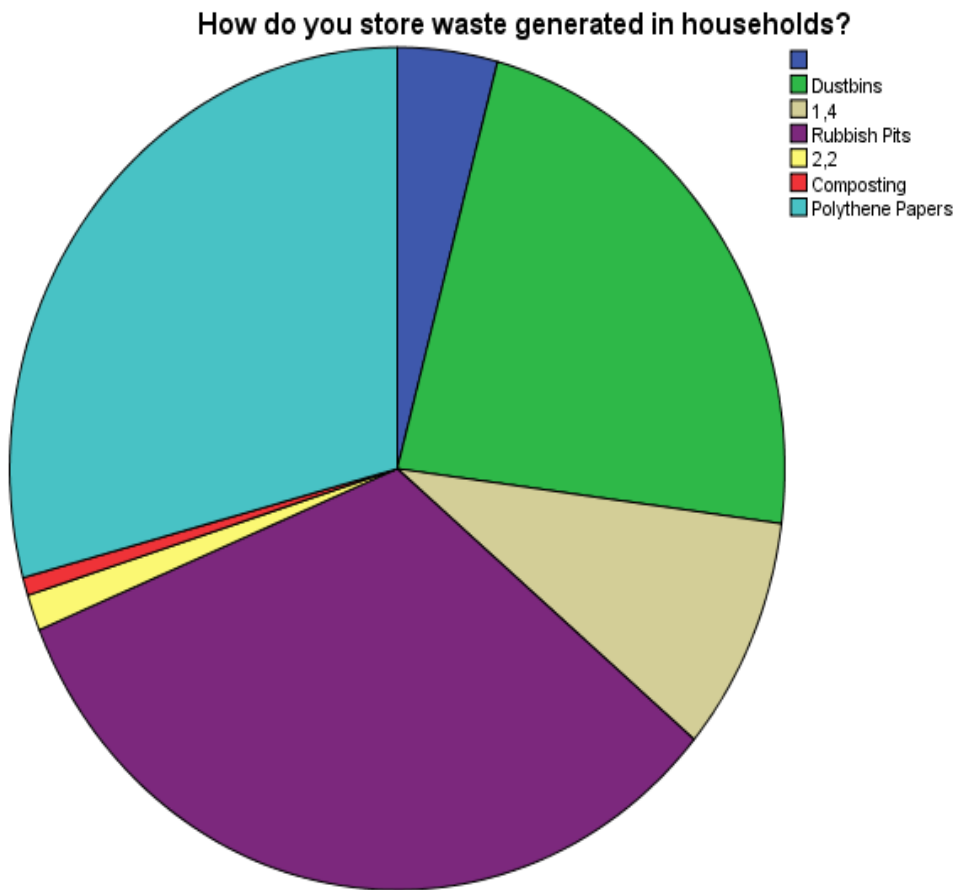
Source: (Author, 2017)

5.2.2: Storage of DSW (DSW)

5.2.2.1: Types of storage containers/items used in Karatina Households

The study established that majority of Karatina residents (68.7%) store their Domestic Solid Waste in shallow rubbish pits and plastic dustbins in some of the households; most of them were old broken buckets recycled as dustbins. The remaining 31.3% stored their domestic Solid waste by composting and use of polythene papers.

FIGURE 5.2: Storage of generated solid waste



Source: (Author, 2017)

The targeted interviews established that the Nyeri Municipal Council had built concrete curbside disposal and collection points in some strategic places in the past and they are still in use by households and traders in Karatina Market and the county government. According to the discussions this curbside collection points are not sufficient to handle this household waste especially when there is breakdown of

the sole collection truck provided by the county to transport waste from this curbside collection points to the disposal site.

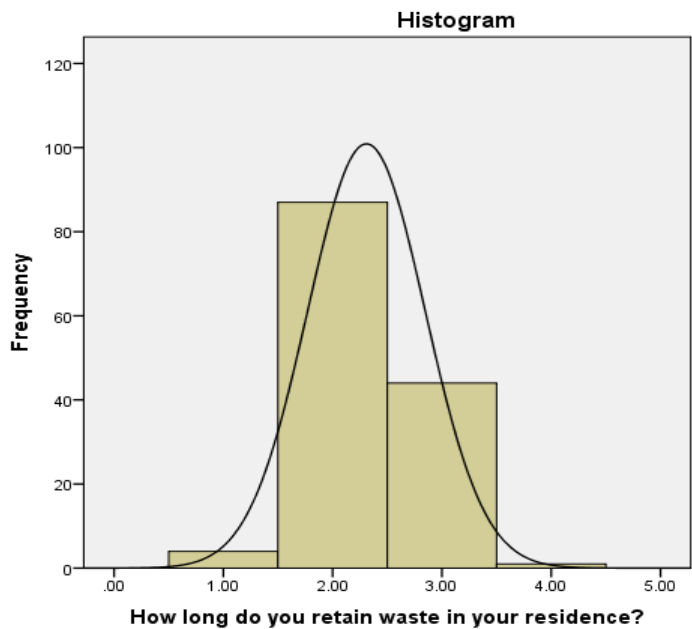
The Loudoun County Solid Waste Collection and Transportation Ordinance (1992) established in 1992 stipulate clearly the characteristics of a good storage container: Storage containers for municipal solid waste shall be made of watertight, durable, rust-resistant material having a closely-fitting lid and handles to facilitate collection. The Ordinance was very clear about the size of the Storage containers for residences and businesses; shall not be less than ten gallon nor more than thirty-two gallon capacity, unless the containers are of the type that can be mechanically lifted and emptied by a collection vehicle, in which case they shall be of appropriate size and design. All storage containers shall be leak-proof. No person shall permit the accumulation of residue of liquids or solids or a combination of such materials on the bottom or sides of a container. The interior of a container shall be kept clean by thorough cleaning and sanitizing as often as necessary. Storage containers shall be kept in good repair. Containers with loosely fitting lids or doors or containing holes or cracks shall not be used. All storage containers designed for mechanical lifting shall be designed, constructed and placed to prevent accidental overturning. Such containers shall be constructed of fire retardant material. Standards of the Federal Consumer Product Safety Commission shall be used in determining compliance with this subsection.

5.2.2.2: DSW Retention rates in the Households

The study showed that a big percentage of the households that is 91 households (63.2%), retain their solid wastes for a day or less in their residence before disposal. Majority of these include the middle-class households whose income is generated from small business enterprises and farming. Another 31.3% retained their waste for more than one day while 8 (5.6%) did not respond. Generally, the longer

solid waste is retained at the residence the higher the risk to potentially harming the members of the households either directly or indirectly. According to Harvey (2002) decomposing organic wastes provides reproduction site for parasites, snakes, pests, and rodents that escalate the probability of disease transmission.

FIGURE 5.3: Retention of solid waste generated in households



1. 12 hours
2. One day
3. More than one day
4. Did not respond

Source: (Author, 2017)

This retention rates mainly apply to respondents whose households are in areas where the county government delivers service. In more rural households organic waste is largely dumped in open compost pits where it is retained until it full decomposes and is later used in farms as manure, in this areas open burning of non-bio degradable waste is largely practiced.

5.2.3 Domestic Solid Waste collection and transport in Karatina

5.2.3.1 Domestic Solid wastes collection services in Karatina

Karatina town is a locality within Nyeri County and therefore entitled to urban solid waste management services by the Nyeri County government. However, as observed by the World Bank website (2009), the rendering of the services is hindered as the municipalities grow economically, business activity and consumption patterns drive up solid wastes quantities and as traffic congestion increase among other factors. It was also noted that 30-60 percent of all the municipal solid waste in emerging nations is left unpicked and not more than half of population is served.

Of the 144 respondents interviewed all 140 respondents or (97.2%) acknowledged that they receive collection services and that the services are almost entirely provided by the county government. They also acknowledge that on some occasions students from Karatina university are involved in provision of solid waste management service i.e. collection, transport and disposal of solid waste within the town and residential areas neighboring the town. Only 4 respondents or (2.8%) responded alluding to not receiving solid waste management service from any service provision agent.

5.3: Domestic solid waste management service providers

The main aim of solid waste management is to collect, treat and dispose of solid wastes generated by all urban communities in a socially satisfactory and environmentally friendly manner using the most economical means available. County governments have the responsibility for providing solid waste management services, and the Kenya constitution gives them absolute ownership of waste that has been put outside the households for final collection. As municipalities grow activities of business and patterns of consumption increase quantities of waste produced. Traffic jams also have adverse effects on the

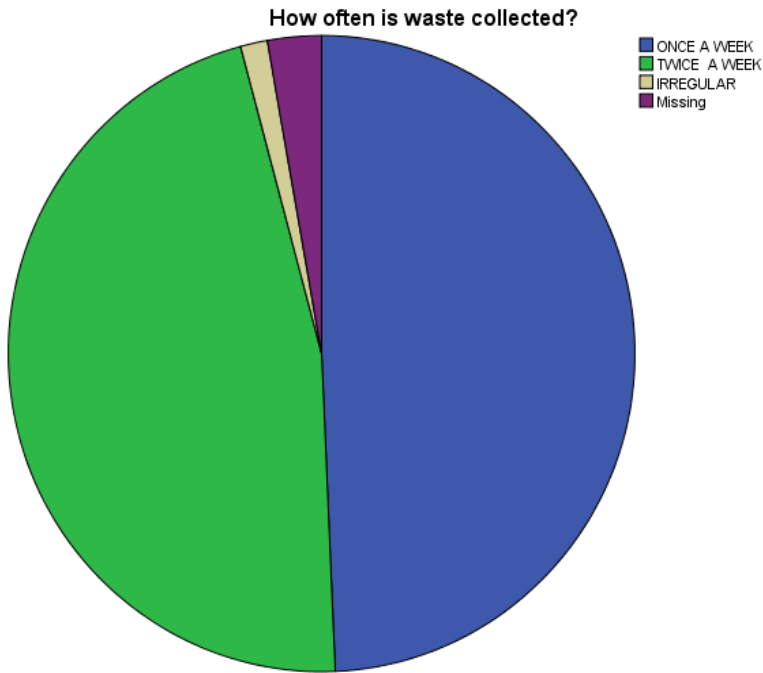
productivity of the fleet that carries solid waste. Productivity loss is increased by longer hauls required of the fleet this is also exacerbated by the long distances the fleet has to travel to dumpsites that have been moved further away from municipalities.

In emerging countries, it is normal for urban areas to spend 20-50 percent of their budget on solid waste management. It is also common that 30 to 60 percent of solid waste generated in emerging nations is left uncollected and more than half of the population is not served.

Open dumping and burning is very rampant in most developing nations. This applies to Karatina town where the Nyeri County government is overwhelmed in maintaining collection and transport equipment according to the County manager in the department of health services upon which the docket of solid waste management falls squarely.

According to the respondents interviewed 87.5% acknowledge that they receive collection, transport and disposal services from county government, 3.5 % acknowledge they receive the service from both County collectors and private firms. 9% acknowledged receipt of the services from private firms.49.3% of the respondents acknowledged that solid waste generated in their households is collected at least once every week and 46.5 % acknowledged collection of their solid wastes twice a week.

FIGURE 5.4: Waste collection intervals



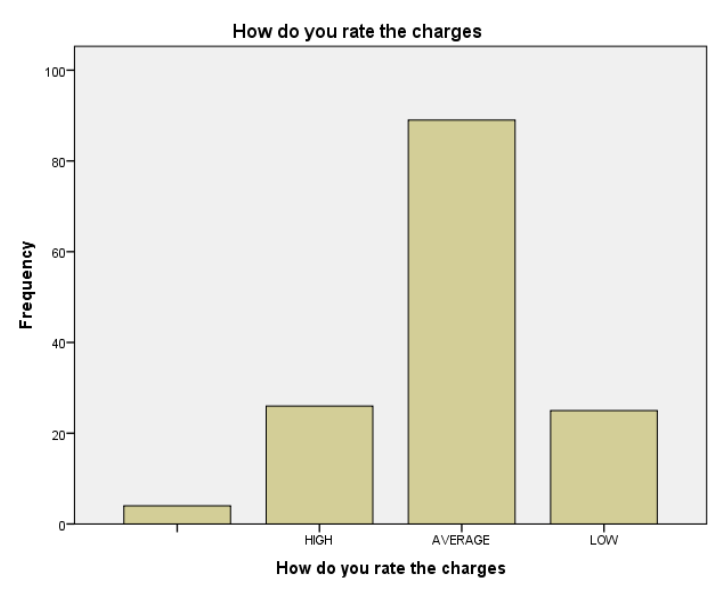
Source: (Author, 2017)

5.3.1: Charges for Domestic Solid Waste Collection and transportation

Karatina residents are largely paying for the services offered for waste collection by the county government according to 54.9 percent of the questionnaire respondents. This assessment revealed that it is the Nyeri County that places charges for waste collection services. Households pay on average Kenya shillings 1,200 (USD 12) annually for waste service per household this paid mostly by the town dwellers. This is paid directly to the county government and of the 140 households (87.5%) who responded received services from the county government, a good 45.1% did not pay for these services.

Among the households (n=140) 17.3% considered the fees low, 61.8% considered them average and 20.9% considered the charges high. Non-payments by some households may contribute further to the unsustainability of the county government operations.

FIGURE 5.5: Ranking of fees charged



Source: (Author, 2017)

5.3.2: Disposal methods used by residents of Karatina

Polythene papers which was described as the most problematic type of solid waste by the county public health manager because of its inability to decompose forms the largest portion of solid waste generated. 61.1 % dispose it by burning which produces very dangerous fumes, 34% by composting and 4.9% by open dumping. Batteries and glass solid wastes are widely disposed through composting with 70.1% and 75.7% respectively of the respondents using this form of disposal.

From the respondents interviewed metal and glass solid wastes are the most widely types of solid waste recycled whereby 63.9% of respondents recycled metal and 10.4% recycled glass. Open burning is also very popular method of disposing solid waste within households of Karatina town whereby 61.1 % burn polythene papers, 10.4% burn batteries, 61.8 % burn waste cloth, 22.2 % burn wood and 56.2% burn containers.

Table 5.1: Disposal method for various types of waste widely generated.

	Open Dumping	Composting	Recycling	Burning	Reusing	Other methods
Polythene	4.9%	34%		61.1%		
Batteries	6.2%	70.1%		10.4%		13.3%
Glass	5.6%	75.7%	10.4%			8.3%
Waste Cloth	20.2%	3.5%	2.8%	61.8%	11.7%	
Wood	18.8%	7%	52%	22.2%		
Containers	41%	0.7%	0.7%	56.2%	1.4%	
Food remains	30.6%	68.1%			1.3%	
Metals	31.3%	0.7%	63.9%			4.1%

Source: (Author, 2017)

5.3.2.1: Dumping sites

Karatina town has several curb side collection points where households and small and medium enterprises within the town dispose their solid waste the county government then collects, transports and disposes the solid wastes at the main dump site in Karidudu. Sometimes this curb side collection

points fill and the solid waste spills over especially when the collection truck and tractor have broken down. This is elicited in the pictures below taken by the author during the filled work.

FIGURE 5.6: An overflowing curbside collection point in Karatina



Source: Author, (2017)

Pictures of curbside collection point in Karatina that are totally full and soiled over. According to the County Public health manager the Karidudu dumpsite is more than 75% full a similar case with Nyeri town the administrative centre for Nyeri County. The county government has currently floated a tender seeking to purchase land that is to be used as the dumpsite once the existing dumping sites are full. In residential areas that are not close to the town there are illegal dumpsites where open dumping is widely practiced

5.4 Stakeholders' role in Domestic solid wastes management

About one half of the respondents from Karatina asserted that there are firms involved in solid waste

management. These are either local authorities or students from the neighboring Karatina University.

5.4.1 Specific DSWM roles taken by various Stakeholders

5.4.1.1: Private Sector

There is a private sector organization involved in providing general waste management services in Karatina that is students of Karatina University who from time to time take off time from their studies and the clean up the town. They two take the roles of collection, transportation and disposal of solid wastes The Council however does not recognize the efforts of these group and does not accord them any assistance. The county government is currently carrying out a pilot project to involve eight groups at the sub county levels i.e. 3 groups in Nyeri, 1 in Tetu, 1 in Othaya, 1 in Mukurweini, 1 in Kieni and 1 in Mathira where Karatina town lies. This groups as per the county government will be contracted to sweep the streets, distilling of drains, disposal at curbside collection points and loading county trucks when they collect for final disposal at the dumpsites within the towns where they are contracted. According to two focus group discussions held within the town the study established that there are some private firms whom have expressed their willingness to carry out this services within Karatina town and its surroundings but due to lack of appropriate legislation and lack of willingness by the county government to let go of fees they collect and refusal to issue licenses they have not been able to provide this services

5.4.1.2: Nyeri County Government

Majority of Karatina residents acknowledge that domestic solid waste management services are rendered by the Nyeri County Government. The Council's main role is collection of the domestic solid

waste from the curbside collection sites, transporting it to the Karidudu open dumpsite where it is finally disposed. Nyeri County Solid waste management falls under the department of health services and its main roles are:

- Sensitize the community and create public awareness on Solid waste management
- Collection of solid waste.
- Transport of solid waste.
- Dispose solid waste at Karidudu dumpsite
- Maintain and manage dumpsites within the county.
- Formulate and implement policy

The Nyeri County Government is involved in providing solid waste management service in all areas within Karatina town and aims at collecting at least one time a week within the town and surrounding communities. The County government does not do waste separation but there are scavenger within the dumpsites whom involve themselves in collecting metals to sell as scrap and plastic bottles which they sell to some private entities whom involve themselves in producing goods from this plastics. The county government charges for the service(s) it renders and the rates are set by the county government to be enforced within a specific financial period and they are gazetted.

The county government absorbed some of the employees of the former municipal councils within the county and according to the management it does not recognize there being any private firms that involve themselves with solid waste management and is currently carrying out a pilot project to involve eight groups at the sub county levels i.e. 3 groups in Nyeri, 1 in Tetu, 1 in Othaya, 1 in Mukurweini, 1 in Kieni and 1 in Mathira where Karatina town lies. This groups are faced with some

challenges already established within this early stages and they are: Insufficient workforce, poor capacity in terms of machinery, poor budgets and forecasts, lack of take-off. The county government is very optimistic that eventually these groups will find a sound footing in providing solid waste management services and they will get full year contracts.

According to respondents from the County government Nyeri County has two side loaders one in Nyeri and the other in Karatina, Four trucks one for Karatina, one Othaya, one Nyeri and one in Kieni it also has 3 tractors one in Karatina, one in Othaya and one in Nyeri. The County government also has one compactor which at the time of this study was grounded and has been for quite some time this capacity grossly mismatches the amount of solid waste that is required to be collected and disposed in the dumpsites therefore the county government cannot carry out solid waste management efficiently. The respondents also reiterated that amount collected from residents of the County for solid waste management service added to the budgetary allocation by the county government is not sufficient to cater for salaries, fuel, repair and maintenance of the machinery and acquisition of new machinery and this therefore contributes greatly to the existing gaps in solid waste management within the county including Karatina town where this study was conducted.

The frequency of the service is; 50.7 % acknowledged collection of Solid waste once a week, 47.9% twice a week while only 1.4 felt collection was irregular most respondents considered the service affordable because they have to pay an average annual fee of Kenya shilling 1200 or 100 Kenya shilling monthly for solid waste collection services

5.4.1.3: Community members' involvement in DSW Management

According to the respondents in Karatina 38.9 % are involved by the private sector and the government institutions in solid waste management, 51.4% reiterated that they are not involved by the institutions while 9.7% did not respond. Members of the community whom are involved by the institutions are engaged in collection and disposal of the solid waste in curb side collection points where the county government collects and disposes off at the karidudu dumpsite.

FIGURE 5.7: Involvement of the County Government in SWM



Source: (Author, 2017)

5.5: Community Awareness programs on DSW management

Only 28.5 percent of the respondents from Karatina town asserted that there are community awareness programs on management of domestic solid wastes. According to these respondents and two focus group discussions, the groups that conduct these awareness programs include: -

- The area chief during the Public meetings
- Old people around the residents

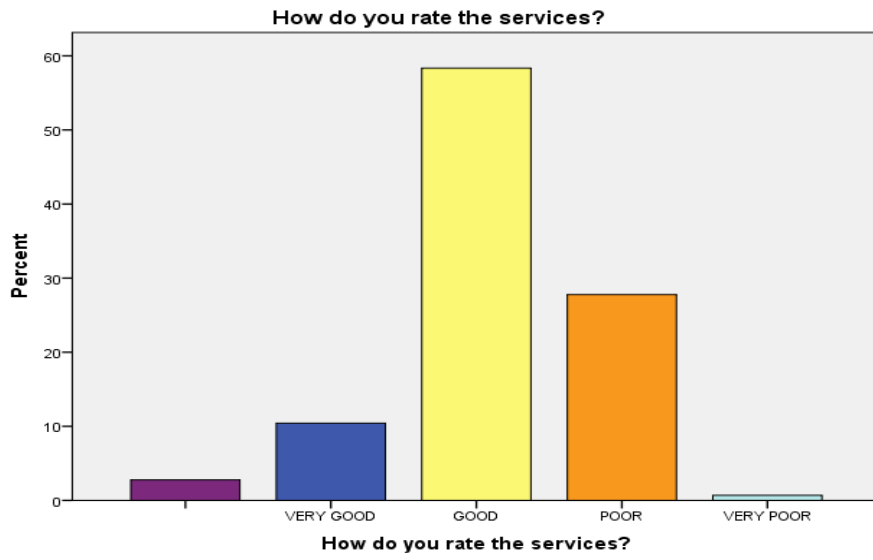
- Youth groups and women groups
- Tourists from various parts of the country and outside the country

The respondents interviewed and two focus group discussions recommended an integrated approach whereby all the stakeholders involved in domestic solid waste would come up with a standard sustainable system that would intervene in filling the existing gaps. This would only happen if the County government recognized the part they play in solid waste management in Karatina town. The Focus groups discussions also recommended that the Nyeri County should supply each household with either permanent bins or regular supply of polythene bags for garbage/domestic solid waste Storage and also collection services. The county government should also dispatch messages on proper handling of household solid waste be done repeatedly, for example every month until correct standards of practice are achieved.

5.6: Customer Satisfaction

According to the respondents only 10% of them rated solid waste management services rendered to be very good, 48% rated the services as good. So generally more than half of the respondents rated the services offered as satisfactory and only 41 % rated the services as unsatisfactory pitting a point to the service providers that a lot need to be done to ensure that the services they offer are acceptable and appreciated even by the residents who feel that they are below expectation.

FIGURE 5.8: Customer satisfaction



Source: (Author, 2017)

CHAPTER SIX: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1: Introduction:

This chapter presents a summary of findings discussing them per study objective,

6.2: Summary of findings

Objective 1: Map out solid waste management service providers

99% of Karatina residents acknowledged that domestic solid waste management services are rendered by the Nyeri County Government. The Council's main roles being collection of the domestic solid waste from the curbside collection sites, transporting it to the Karidudu open dumpsite where it is finally disposed.

Nyeri County refuse collection and solid waste management was transferred to the department of health in December of financial year 2014/2015. and its main roles are to sensitize the community and create public awareness on Solid waste management, Collection of solid waste, transport of solid waste, dispose solid waste at Karidudu dumpsite, maintain and manage dumpsites within the county and formulate and implement policy(s) this function and responsibility was however not followed with adequate budgetary support and therefore pitted negatively into the health budget. According to respondents from the County government Nyeri County has two side loaders one in Nyeri and the other in Karatina, Four trucks one in Karatina, one Othaya, one Nyeri and one in Kieni it also has 3 tractors one in Karatina, one in Othaya and one in Nyeri. The County government also has one compactor which at the time of this study was grounded and had been for quite some time these capacity in terms of machinery grossly mismatches the amount of solid waste that is required to be collected and disposed in the dumpsites therefore the county government cannot carry out solid waste management efficiently.

The county government levies fees for services rendered and these fees are determined for a set financial period by the county government and they are gazetted.

There are also private sector organizations involved in providing general waste management services in Karatina. These are students of Karatina University who occasionally take off time from their studies to provide solid waste management services within town. They carry out the roles of collection, transportation and disposal of solid wastes. The County however does not recognize the efforts of these groups and does not accord them any assistance. The other is a group participating in a county government pilot project that involves eight groups at the sub-county levels, i.e. 3 groups in Nyeri, 1 in Tetu, 1 in Othaya, 1 in Mukurweini, 1 in Kieni and 1 in Mathira where Karatina town lies. These groups, as per the county government, will be contracted to sweep the streets, desludging of drains, disposal at curbside collection points and loading county trucks when they collect for final disposal at the dumpsites within the towns where they are contracted.

According to two focus group discussions held within the town, the study established that there are some private firms who have expressed their willingness to carry out these services within Karatina town and its surroundings but due to lack of appropriate legislation and lack of willingness by the county government to let go of fees they collect and refusal to issue licenses, they have not been able to provide these services.

Objective 2: Analyze existing solid waste management framework

The Constitution of Kenya, Article 42 on the Environment provides that- Every individual has a right to a healthy and clean environment and to have his environment protected for present and future generations through statutory and other means that have duties connected to the environment satisfied.

According to NEMA's National solid waste management strategy, the government shall boost public

participation in the protection, management and conservation of the environment, create structures of environmental audit, environmental impact assessment, and monitoring of the environment, eliminate processes and activities that are likely to jeopardize the environment; and use the environment and natural resources for the advantage of the people of Kenya.

Solid waste management remains a major challenge in all the 47 counties in the country. Over the years most local authorities did not prioritize the establishment of proper waste management systems and hence the County Governments have inherited this state of affairs. This has led to the current poor waste management situation across the country. Although Vision 2030 has prioritized on the five cities and towns for implementation of sustainable solid waste management systems, this Strategy shall be applied countrywide in an effort to address poor solid waste management, NEMA developed some minimum requirements as a baseline for implementation by the Counties. These included designation, securing and manning of the disposal sites, promotion of efficient collection and transportation of waste.

In Karatina town Nyeri county government is the principal service provider and its performance is commendable although this study established that there exists inhibitions for the private sector entrance. The County government has however mitigated this by encouraging and choosing eight groups to participate in solid waste management at the sub county level. One such group is in Karatina town and according to respondents from Nyeri County there is high optimism that this groups will overcome teething problems and general challenges inhibiting their efficient and sustainable performance in service delivery and they will contribute greatly in a bid to seal existing gaps in solid waste management in Karatina town and the wider Nyeri county. Engagement of these youth groups in solid waste management is one of the ways that ensures that the integrated approach in solid waste management is implemented in this County.

Objective 3: Establish Level of customer satisfaction

According to the respondents only 10% of them rated solid waste management services rendered to be very good, 48% rated the services as good. So generally more than half of the respondents rated the services offered as satisfactory and only 41 % rated the services as unsatisfactory putting a point to the service providers that a lot is still needed to be done to ensure that the solid waste management services provision delivers higher customer satisfaction especially by the residents who feel that they are currently below expectation. The high percentage of the population that was not satisfied by the service provision was because of the irregular frequency of waste collection and disposal in some areas i.e. some areas especially the affluent neighbourhood's get waste collected more times compared to less affluent neighbourhoods. This high percentage can also have been contributed to by there not being proper communication between the community and service providers. communication is considered as favourable factor for the sustainability of community participation. It generates a broad-based understanding on solid waste issues. Among community members on the one hand and responsiveness of the service providers to the demands of the community on the other.

Objective 4: Recommend alternative solid waste management framework

The study established that there has not been any integrated approach in managing the domestic solid waste. The residents that are generating wastes, the youth group being pitted to be handling wastes and the local government are all pulling differently and do not share the same approach. The youth group has attempted to handle the domestic solid wastes for entrepreneurial benefits but they lack in capacities, political will, as well as the appropriate skills required in managing domestic solid wastes. The NGOs in the area attempting to sensitize the residents on sustainable domestic solid waste management have been faced with various challenges such as lack of political will from the Local authority (Nyeri County), the residents 'negative attitude about the idea of managing the wastes

whereas they have paid the Nyeri County to carry-out such services. The county government suffers a lot of bureaucracies that influences the delivery of services at the grassroots it also faces severe budgetary constraints taking into account that solid waste management was transferred to the department of health where by the budgetary provision for this department can not sufficiently cater for principally purchase of drugs, workers remuneration let alone provision of this SWM service across the county. It is therefore paramount that in the consequent budgetary allocation Solid waste management is accorded relevant and appropriate resources in the budget to ensure that this department can adequately provide this service to the population within it. County government of Nyeri in its active attempt to better solid waste management service provision should implement Agenda 21 (UNEP, 1992) that proposes the use of the Integrated life cycle management concept which focuses on the following four program areas i.e. waste minimization, improved environmentally sound solid waste reuse and recycling, ensure sanitary waste disposal and treatment and increase service coverage.

6.3: Recommendations

6.3.1: Intensive Community Training on 3Rs

Overall the respondents had good knowledge on health hazards associated with incorrect solid waste management and were also aware about the polluter pays law but the practice of correct solid waste management was low; only a small percentage of households practiced correct methods of solid waste management. This level of Incorrect solid waste management poses health and environmental problems in urban Nyeri. According to the findings already discussed there was no awareness created on how people can reduce wastes in their households thus messages on proper handling of household solid waste should be done repeatedly, for example every month until correct standards of practice are achieved; only 50.7% of the interviewed reuse household wastes and only applies to food remains

which are used to feed domestic animals and as manure when wastes decompose in the compost pits and 46.5% recycle it whereby containers are used as storage of some household items like sugar, salt and tea leaves, waste cloth used as rags and wood wastes used to repair animal sheds and as alternative fuel i.e. firewood. This therefore suggests that there is huge untapped potential for reuse and recycle of other types of solid wastes generated within the households and business enterprises within Karatina town and in order to improve this situations household solid waste management options that involves the residents in the planning process have to be implemented

6.3.2: An integrated Approach

The County Government to employ the integrated approach in handling and managing domestic solid waste; this would mean officially involving other stakeholders interested in improving waste management services in Karatina . The local authority should work closely with NGOs in empowering the groups with the skills required in waste management. This will help them be effective in rendering the services.

Based on market theory an efficient solid waste market needs to encourage competition for the market, reduce information skewedness, and reduce the cost of transaction. Nyeri County government and households should engage companies in the market to provide solid waste collection service in a market which the County government is sole buyer and where it restricts entry and exit. A recap of what we learned in the systems theory SWM is very important as an environmental health service and it is a very crucial part of basic urban services. Research conducted on SWM in developing nations is developed from two main concerns: public sector reform including issues to do with privatization and sustainable development. The previous is closely connected to the neoliberal canon declaring a rebirth of the market and a decrease of state control. The former focuses on PSI in provision od service; it

raises issues of acceptability and public interest. These two ideas births the demand for an effective management system (Wilson & Whiteman, 2001). Therefore for Nyeri county to enforce an effective management system there is need to ease entry of private sector in solid waste management service provision and increase participation of all members of the community. Enhancing communication amongst all stakeholders and creating awareness about integrated solid waste management especially on how Karatina residents can prevent or minimize waste, improve environmentally sound solid waste reuse and recycling, ensure sanitary waste disposal and treatment and increasing service coverage to cover all households or a higher percentage within the county.

6.3.3: Enforcement of the Nyeri County by-laws

Nyeri County Government to enforce the by-laws set on waste management. For instance: the polluter pays fine should be implemented aggressively; if done it will force the polluters to do what is correct because of frequent fine payments.

6.3.4: Capital investments and restoration of broken down equipment

Nyeri County Government should in their budget planning add amounts to purchase of new equipment to enable them manage solid waste management because the existing equipment falls short of the expectation. In addition to purchase of new equipment they should repair all broken down equipment and restore them to proper working condition

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APPENDIX I: Household Questionnaire

THE UNIVERSITY OF NAIROBI
SCHOOL OF THE BUILT ENVIRONMENT
DEPARTMENT: ARCHITECTURE
MASTERS OF URBAN MANAGEMENT

Household Questionnaire

“Assessment of the role of solid waste management service providers in Karatina town”

Declaration

The information gathered from this questionnaire is solely for academic research purposes and will be treated with a lot of confidentiality. Do not write your name on this questionnaire.

General Information

Q1. Household characteristics

Household Member	Age	Sex	Education Level	Main Occupation	Monthly Income
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Q2. Specify the main household income generating activities you are involved in:

	Income Generating Activity	Household members involved	Location of activity	Monthly income
1.				
2.				
3.				
4.				
5.				

Q3. Are there any waste collection and transport services offered in the area?

- a) Yes b) No

Q4. If yes to Q 3; who provides the collection and transport services? Tick against any of these that could be providing waste collection services in the area at any given time.

- I. Municipality collectors
- II. Private firm collectors
- III. CBO collectors
- IV. Self-help groups e.g. women groups
- V. Others

Q5. How often do the collectors mentioned in Q4 collect the wastes?

		Number of times waste is collected					
		Once a week	Twice a week	Once per month	Twice a month	Irregular	Never collected
	Waste collectors						
1	NCC						
2	Private firms						
3	CBO						

4	Self-help groups						
5	Others						

Q6. Are there any charges levied for the services mentioned in Q 5 above?

- a) Yes b) no

Q7. If yes to Q 6; how much do you pay per month for the services mentioned in Q 3?

	Waste collector	Charges levied in Ksh per month
1	Nyeri County Council	
2	Private firms	
3	CBO	
4	Self-help groups	
5	Others	

Q8. In your own view how do you rate the charges?

- i) High ii) Average iii) Low

Q9. How often would you want the waste to be collected in a month?

- I. Once a week
- II. Twice a week
- III. Once in two weeks
- IV. Twice a month
- V. Once in a month

Q10. If there are waste collectors that collect domestic solid waste; how do you rank the services offered?

- a) Very good b) good c) poor d) very poor

Q11. In case there are no waste collectors indicate in the following table the waste disposal system(s) you use for disposing each waste

Waste disposal system							
		Open dumping	Composting	Recycling	Burning	Reusing	Other methods
	Household waste						
1	Plastic papers						
2	Food remains						
3	Containers						
4	Batteries						
5	Glass						
6	Waste cloth						
7	Metallic wastes						
8	Wooden wastes						
9	Others wastes						

Q12. How far (in metres) is the disposal site from your place of residence?

.....

Q13. Who normally takes the waste to the disposal site? *(Tick against the person/people responsible)*

- I. Father
- II. Mother
- III. Children

IV. House holds

Q14. Do you ensure that waste is taken to the designated disposal site?

- i) Yes
- ii) No

Q15. Are there any problems that have been experienced as a result of the waste disposal system(s) that you have indicated in Q11 above?

- i) Yes
- ii) no

Q16. If yes to Q 15; specify the problems.

.....

Q17. Indicate the problems you encounter while handling domestic solid wastes through-out these processes

	Waste management process	Problems encountered
1	Storage of domestic solid waste	
2	Collection and transportation of domestic solid waste	
3	Disposing domestic solid waste	
4	Reusing domestic solid wastes	
5	Recycling domestic solid wastes	

Q18. Which is the most problematic solid waste generated in your household

.....

Q19. Why is the solid waste you have mentioned in Q33 problematic?

.....

Q20. Is the County Government involved in waste management in your area?

- a) Yes b) No

Q21. If yes indicate the role(s) (e.g *waste separation, collection, transportation, purchasing waste, recycling, and disposal e.t.c*) they carry out.

.....

.....

.....

Q22. Are there any Community based organizations, churches, self-help groups, Non-governmental organizations, private firms involved in management of waste in the area?

- a) Yes b) No

If yes to Q 6; which organizations/groups are they?

.....

.....

Q23. Indicate in the table below the role(s) (e.g *waste separation, collection, transportation, purchasing waste, recycling, and disposal e.t.c*) played by each of these groups/organizations

No	Organization/groups	Activity/role played by each group
1		
2		
3		
4		
5		
6		
7		

Q24. Do the organizations/groups mentioned in Q23 involve the other members of the community in their activities?

- A) Yes b) No

Q25. If yes to Q24, how are the other members of the community involved in these activities?

.....
.....
Q26. Are there any community awareness programs on management of the domestic solid wastes?

- a) Yes b) No

Q27. If yes to Q26, who conducts such community awareness programs?
.....
.....

Q28. In your own opinion what can be done to improve domestic solid waste management in the area or the household
.....
.....

Q29.What types of wastes are generated in your household?

	Household waste	Tick Appropriately
1	Plastic papers	
2	Food remains	
3	Containers	
4	Batteries	
5	Glass	
6	Waste cloth	
7	Metallic wastes	
8	Wooden wastes	
9	Others:	

Q30. How do you store the wastes generated in your household

- i. Dustbins
- ii. Rubbish – pits
- iii. Composting
- iv. Polythene papers
- v. Others

Q31. How long do you retain the waste in your residence before disposal?

- a) 12hours b) 1-day c) more than one day

Q32. Do you sort the wastes before it is collected for disposal?

- a) Yes b) No

Q33. If yes to Q32, how?

.....
.....

Q34. Are there any wastes that are reused in your household?

- a) Yes b) No

Q35. If yes to Q34, indicate how you reuse the wastes in the table below

	Household waste	How do you reuse it
1	Plastic papers	
2	Food remains	
3	Containers	
4	Batteries	
5	Glass	
6	Waste cloth	
7	Metallic wastes	
8	Wooden wastes	
9	Others:	

Q36. Do you turn (recycle) domestic solid waste generated in your house into other usable product

- a) Yes b) No

Q37. If yes to Q 38; indicate in the following table the usable products you make from each of the waste listed

	Household waste	Products made from the waste
1	Plastic papers	
2	Food remains	
3	Containers	
4	Batteries	
5	Glass	
6	Waste cloth	
7	Metallic wastes	
8	Wooden wastes	
9	Others:	

APPENDIX II: Institutions' Interview Schedule (CBOs, Self-Help groups, NGOs; involved in domestic waste management in Karatina)

1. When was the organization established?
2. What were the objectives for the establishment of the organization?
3. What are the activities conducted by the organization
4. What is the role of your organization in the management of domestic solid wastes in Karatina?
5. Which is the operation scope of your activities?
 - What area(s) within Karatina town do you carry out solid waste management?
 - How often do you collect waste in this areas?
 - How much do you charge for the solid waste management service?
 - Whats the maximum distance from area of collection to area of disposal?
6. What is your human resource capacity?
 - Skilled.....?
 - Semi-skilled.....?
7. Whom in your workforce is involved in removal of waste from households and markets in Karatina?
8. How often do you remove solid waste from your areas of operation?
9. What is are the types of solid waste collected from households and markets?
10. What is the estimated amount in tons of this wastes collected?
11. How are this forms of solid waste treated after removal from households and markets disposal sites?
12. What is the capacity of the dumpsite where this solid waste is disposed off?
13. What machinery(s) does you organization have for solid waste management service providence?
14. Why do you target the above area?
15. Do you collaborate with any other stakeholders in your activities?
16. Have you been successful in achieving the objectives of the organization?
17. How do you involve the community in waste management programs?
18. What challenges do you face in executing these activities?
19. Are there any opportunities that you could explore in ensuring better management of domestic solid waste?

APPENDIX: III Nyeri County Council

1. What is your role in the management of domestic solid wastes in the Karatina town?
2. Which is the operation scope of your activities?
 - What area(s) within Karatina town do you carry out solid waste management?
 - How often do you collect waste in this areas?
 - How much do you charge for the solid waste management service?
 - Whats the maximum distance from area of collection to area of disposal
3. What is your human resource capacity?
 - Skilled.....?
 - Semi-skilled.....?
4. Whom in your workforce is involved in removal of waste from households and markets in Karatina?
5. What is the budget set aside for Solid waste management for Karatina and the entire Nyeri county.
6. . How often do you remove solid waste from your areas of operation?
7. What is are the types of solid waste collected from households and markets?
8. What is the estimated amount in tons of this wastes collected?
9. How are this forms of solid waste treated after removal from households and markets disposal sites?
10. What is the capacity of the dumpsite where this solid waste is disposed off?
11. What machinery(s) does you organization have for solid waste management service providence?
12. Do you undertake any activities for managing domestic solid wastes in slum areas?
13. Are there any stakeholders involved in undertaking the above activities?
14. How do you collaborate with such stakeholders?
15. What are the challenges faced in your activities?
16. What are the opportunities in solid Waste Management?
17. What are the most problematic wastes generated?