

**FACTORS INFLUENCING SUSTAINABLE SOLID WASTE
MANAGEMENT: A CASE OF THIKA TOWN, KENYA**

BY

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DECLARATION

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

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DEDICATION

This research project is dedicated to my parents Mr. and Mrs. George Mutala Ngusya. I also dedicate it to my dear family, my wife Ann Rose Mutemi and to my two daughters Queen Mutemi and Faith Ndila.

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LIST OF ABBREVIATIONS AND ACRONYMS

CSR	:	Corporate Social Responsibility
IEBC	:	Independent Electoral and Boundaries Commission
ISWM	:	Integrated Solid Waste Management
MDG	:	Millennium Development Goals
MEMR	:	Ministry of Environment and Mineral Resources
NEMA	:	The National Environment Management Authority
NGO	:	Non-governmental Organizations
SPSS	:	Statistical package for the social science program
UN	:	United Nations
UNRISD	:	United Nations Research Institute for Social development
WCED	:	United Nations World Commission on Environment and Development

ABSTRACT

This study was aimed at analyzing Factors influencing sustainable solid waste management in Thika Town. The importance of a clean environment needs not to be over-emphasized for the survival of our generation and the future generations. The community as the main beneficiary of a sustainable solid waste management has to play a bigger role than has been realized. This can only happen through active community participation. The community has to be empowered to undertake this important role. The right policies have to be in place, the community has to be sensitized on their roles and imparted with knowledge of the environment and cost sharing has to be considered to increase resources available for conserving the environment. The research was guided by the following objectives: to determine the influence of community mobilization in the sustainability of solid waste management; to investigate the influence of Environmental knowledge in the sustainability of solid waste management; to determine the influence of cost sharing in the sustainability of solid waste management; and to determine the influence of sanitation on sustainable solid waste management. The research design used was descriptive survey design. A research instrument was developed which was a questionnaire. The research instrument was discussed with the supervisor and other experts to determine its content validity. A pilot test was done in Juja Town. The reliability of the research instrument was determined by split half method and the Cronbach's coefficient Alpha used to calculate reliability. The researcher then collected data in Thika town. The population was stratified into two, the beneficiaries and the service providers. The heads of the household were sampled through simple random sampling while a census was done for all the service providers. The data collected was analyzed by use of SPSS. The researcher determined relations and correlations and gave recommendations about Thika Town. This research project determined the factors that influence sustainable solid waste management. It gives light and help in decision making in making the environment better for the residents. From the study the awareness of the benefits of solid waste management should be created and the general population mobilized. The county government should be the initiator of community participation. The several methods studied would be effective in changing mindset of the population. The TV media, public Barrazas, posters and person to person should be utilized depending on the budgets available. The knowledge learned in was found sufficient though there is need to including more learning in order to boost the confidence of the population on their undertaking as regards to solid waste management. The system of cost sharing should be improved by involving all stakeholders from the initial stages in order to communicate the benefits and increase ownership of the programs. The locals should be decision makers to strengthen the procedures. The sanitation facilities are not designed with the involvement of the locals to ensure that they are convenient and sufficient. The study recommends another study on other social factors affecting the performance of Sustainable solid waste in Thika which may not have been identified in this study. The study recommends studies on the treatment of the solid waste at the final stages and how its effects on the population.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Solid waste management can be defined as the creation, collection, transportation and disposal of solid waste (Cal Recovery Inc., 1994). Solid waste is generated from human activities which include domestic, industrial, agricultural as well as other commercial activities. In management of this waste the 3R's method have been recommended which means Reduce, Recycle and Re-use. The first R means the endeavor to reduce the garbage produced from an activity. The second R means to recycle any garbage material as far as it can be practicable. The third R means to re-use any material produced from an activity in a convenient way as much as possible (Girling, 2005).

Richard (2002) has indicated that in our cities, as the populations grow from rural to urban migration and natural growth, there are increased effects of the population on the environment. We therefore need to develop better means of tackling this problem as individuals, communities, organizations and as governments as well as global partnership. Policies, methods, means as well as resources are required in order to address this important issue. The United Nations bodies need to support, develop and encourage environmental support systems globally. Communities need to be more empowered to maintain and support good environment (Sjaastad & Larry, 1962). More funds are needed to be dedicated to support environment management activities. Involvement of the community has been tried elsewhere successfully e.g. Karachi in Pakistan as documented by Christian (1999).

Sustainable development has been defined in many ways with the most frequently quoted definition being the United Nations World Commission on Environment and Development (1987). In its 1987 report, it defines sustainable development as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. It contains within it two key components. First is the component of needs and in particular the essential needs of the world's poor which has overriding priority. There are however limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

There should be good focus in reducing the amounts of waste created whether domestic, agricultural or industrial. The process of sorting garbage should be improved at the source so as to determine what can be recycled or what can be re-used. Good methods of waste disposal should be employed to reduce further pollution to the environment. In most regions burning of garbage has been observed which leads to air pollution. UNRISD Research and Policy Briefs (2004) indicates there are two ways of decision making which are technocratic and democratic. Technocratic method means technical experts are used in making decisions. This may have advantages but has disadvantages also as some of the decisions do not work as expected. Democratic decisions method involves representatives of the population being encouraged as to improve ownership and support.

Nour (2011) has stated that ordinary citizen will be motivated to participate fully and voluntarily in nation building depending on the circumstance or outcomes of the events. The process must be beneficial to all the participants. The sustainability of solid waste

management will be more successful if the citizens are fully aware of the benefits of a well-functioning system. Many projects fail if the stake holders do not benefit from them. A good waste management system ensures that garbage does not become any eyesore to the persons inhabiting a location. It also ensures the inhabitants health is not affected in any way by the waste. The air quality is well sustained which means there is no air pollution while retaining the beauty of natural beginnings. The value of land does not go down but will appreciate. The quality of water will be sustained with good solid waste management. This case being for both surface water runoff as well as for underground water. The importance of water for survival is critical and immense

United Nations Centre for Human Settlements (Habitat, 1989) has indicated that Community participation is also enhanced with empowerment of the general citizenry to fully carry out their portion. The United Nations (UN) emphasizes the need for environmental education to all in the world for them to participate in environmental protection. Community participation gives the normal citizen the courage and motivation to do what he fully understands. The element of education and awareness in sustaining solid waste management is very important. Many project failures result from failure to raise awareness to stakeholders on their role in participation. United States Environmental Protection Agency (1994) has established that in sustaining a solid waste management system that the element of cost cannot be underestimated.

According to Kimani (2013) due to dwindling resources, few resources are being committed by governments in supporting environmental conservation in terms of processes, studies, and actual waste management. Few resources are likely to be

committed for this purpose in Kenya with current trend of decentralization of government. There will be reduced capacity to handle this important issue. There are increasing challenges as the waste generated becomes more complex and increases in tonnages due to development. There are new threats to the population due to increase of environmentally related disease and public health concerns. We have seen new diseases coming up like Ebola which are threatening to wipe communities like in the current outbreak in West Africa.

From Sira (2010), Thika Sub County does not have policy and by laws on waste re-use and recycling. Thika Sub County does not offer any incentives to enterprises involved nor does it train its staff and residents on inorganic solid waste re-use and recycling. This means the community participation has not been embraced in solid waste management in Thika Town. This researcher has revealed that residents of Nakuru and Thika towns generated solid wastes at rates of 0.49kg/person/day and 0.55kg/person/day, respectively. Thus Thika residents produced more waste which is not adequately managed. This has led to high costs of collecting garbage and litter is left uncollected becoming an eyesore. Uncollected garbage is infested with rodents which spread diseases.

1.2 Statement of the problem

Waste generation increases with population expansion and economic development. Improperly managed solid waste poses a risk to human health and the environment. Uncontrolled dumping and improper waste handling causes a variety of problems, including contaminating water, attracting insects and rodents, and increasing flooding due

to blocked drainage canals or gullies. Further, it may result in safety hazards from fires and explosions.

Tibaijuki (2007) has identified solid waste management as a major issue facing the residents of Nairobi which is the capital city of Kenya. The city lacks a systematic solid-waste disposal. Uncollected garbage has contributed to a vicious cycle of water pollution, water-borne diseases, poverty, and environmental degradation. The proper management of waste has thus become one of the most pressing and challenging environmental problems in the city. The sewers and drains are choked of garbage. Mosquitoes breed in stagnant waters causing the spread of malaria. The same problems face the residents of Thika Town which neighbours Nairobi.

In a research done by Ndikaru (2012) domestic solid waste is given as one of the major issues that affect many of the Thika residents. In particular polythene waste is seen to be very problematic due to the fact that it is non-biodegradable. The polythene papers are spread all over spoiling the natural beauty of the town. Community involvement in combating pollution is very minimal. With high awareness levels it was expected that this would translate into more involvement of the community in efforts geared towards pollution management.

According to Mugo, Kinyua & Njogu (2015) Thika Solid waste generation has been increasing fast posing a challenge to policy makers on how to handle the issue of waste generated. From statistical data analyzed waste generated translates to 31629 tonnes dumped at Kang'oki dumpsite. It is therefore important to find ways of utilizing or reducing the waste and including the local community in solid waste management. This

research study is aimed at investigating factors influencing sustainable solid waste management in Thika Town.

1.3 Purpose of the study

The purpose of the research is to investigate factors influencing sustainable solid waste management in Thika town.

1.4 Objectives of the study

The study was be guided by the following objectives

- i. To determine the influence of Community Awareness on sustainable solid waste management.
- ii. To determine the influence of Environmental knowledge on sustainable of solid waste management.
- iii. To determine the influence of Cost sharing on sustainable solid waste management.
- iv. To determine the influence of Sanitation on the sustainable solid waste management.

1.5 Research questions

- i. To what extent does the Community Awareness influence sustainable solid waste management?
- ii. To what extent does Environmental knowledge influence sustainable solid waste management?
- iii. To what extent does Cost sharing influence sustainable solid waste management?
- iv. To what extent does Sanitation influence sustainable solid waste management?

1.6 Significance of the study

This research studied ways of promoting and advancing community participation in order to improve sustainability of solid waste management in Thika Town. The local community was to be the major beneficiary of a healthy environment. The community should be actively involved in all stages of solid waste management. A healthy environment reduces environmental related diseases in the population. It provides a safe environment for everyone including future generations. The study provided guidance on means of improving community participation. Active community participation leads to increased capacity to handle environmental issues.

The government benefits in cost sharing in solid waste management as it fulfills its mandate of ensuring sustainable development. The demand for government services has increased despite lower budgets allocations to the environment unlike for Military and intelligence.

1.7 Delimitation of the study

This research was carried out in Thika Town constituency which covers the area surrounding the Town. The study used descriptive survey design. A sample of participants was drawn to represent the whole population. A questionnaire was developed for collecting information from the participants.

1.8 Limitations of the study

The limitations faced were language barriers which may have hindered some respondents to answer correctly. This was overcome by use of interpreters in case of such problems.

1.9 Basic assumptions of the study

The researcher assumed the respondents answered the questions correctly and truthfully.

1.10 Definition of significant terms

Community Awareness refers to a process that increases the level of information in a community. It also promotes change of attitudes in order to influence acceptability of projects.

Environmental knowledge refers to the levels of learning for both formal and informal learning which imparts skill necessary to tackle environmental issues.

Cost sharing refers to the means that bridge the gap between resources and services needed by citizens through their contributions.

Sanitation refers to provision of convenient waste disposal means to the users in a location and the process of disposing waste

1.11 Organization of the study

This research project is on the influence of community participation on sustainability of solid waste management in Thika Town. Chapter One of the study covers the background of the study, statement of the problem, purpose of the study, study objectives, research questions, significance of the study, limitation and delimitation of the study and definition of significant terms. Chapter Two covers literature review on the influence of community participation in sustainability of solid waste management in Thika Town as studied by other scholars. The theoretical framework background and conceptual framework is given. Chapter Three covers the

research methodology employed in this study. It also covers the target population, the sample size, the sampling techniques, the research instruments and the operationalization of variables. List of all reference materials is given. Included is the letter of transmittal of research and the research permit, instruments, the study. Chapter 4 contains the Data analysis, presentation and interpretation of the data. Chapter 5 has the summary of the findings, discussions, conclusion and the recommendation of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides the literature review. Literature review is the systematic study of collecting and analyzing the existing information on the research topic. According to the University of Reading (2015) literature review shows how the investigation you are conducting fits with what has gone on before and puts it in context. This chapter contains literature review in the fields of community participation, sustainable environment, policy making and their input towards attaining a clean environment as well as embracing development

This research revisits previous researches in these fields at global, regional and local levels. The chapter looks at the process of community participation and how it can be improved to better the sustainability of solid waste management. It looks at the stages and characteristics of community participation and how it can be promoted to achieve community good. It will look at the roles of the process owners and the effects on them. The chapter also outlines the theoretical and conceptual framework which gives the relationships between the independent, dependent, intervening and extraneous variables (Randolph, 2009)

2.2 Sustainable environment through sustainable waste management

Drexhage and Murphy (2010) states that sustainable development calls for a convergence between the three pillars of development which are economic development, social equity and environmental protection. Environmental issues should not be compartmentalized but be handled collectively. Sustainable development is also a

prominent component of the Millennium Development Goals, MDGs (2000) which have been widely endorsed by national governments and the world's foremost development organizations since they were adopted at the Millennium Summit in 2000.

The Earth's atmosphere contains many types of gases which include those known as greenhouse gases, which hold in the sun's warmth. Scientists call this naturally occurring phenomenon as the "greenhouse effect." Greenhouse gases do regulate global temperatures. Certain human activities such as burning fossil fuels and dumping solid waste produce additional greenhouse gases which upset the natural balance by raising global temperatures (USEPA, 2002). Greenhouse gas emissions are the reason for changing the Earth's climate. The Earth has been observed to have become slightly warmer in the past 100 years and will continue to become warmer. This could cause major human health and environmental consequences from a warmer climate which may cause more frequent and severe heat waves. It will damage agriculture as well as cause droughts in some places and floods in others.

The issue of managing waste is as old as civilization itself however the concept of Integrated Waste Management (ISWM) has developed during the past 30 years. ISWM systems combine waste generation, waste collection, and treatment and disposal methods into a practical waste management system. Each system can be specific for a region and combine appropriate mix of waste treatment options to reduce overall environmental burdens in an economically affordable and socially acceptable way. The level of integration of waste treatment methods implemented in any ISWM system will depend upon the prevailing local circumstances. This flexibility encourages continuous improvement in the processes in order to pursue the best technology and to customize

solutions which are necessary to accommodate shifts in the quantity and quality of the waste generated. The fundamental aim of any Integrated solid waste management strategy should be to maximise resource efficiency by promoting sustainable waste management that leads to reduced environmental emissions in an economically and socially acceptable manner UN Habitat (2009).

The international water and sanitation IRC (2004) says to evaluate if a waste management system is sustainable the following criteria can be used to check if it is functioning and whether it delivers an appropriate level of benefits. To determine whether it is continuous for a long period of time with its management institutionalized, with its costs covered and having little external support and with no negative environmental effects.

State of Hawaii (2000) observed that even before a material or product becomes solid waste, it goes through a long cycle that involves removing and processing raw materials, manufacturing the product, transporting the materials and products to markets, and using energy to operate the product. Each of these activities generate greenhouse gas emissions through one or more means .Extracting and processing raw materials, manufacturing products, and transporting materials and products to markets all generate greenhouse gas emissions by consuming energy from the fossil fuels.

When organic waste decomposes in landfills methane is generated which is a greenhouse gas. Trees naturally absorb carbon dioxide which is a greenhouse gas from the air and store it in wood through carbon sequestration. Through waste prevention and recycling of wood and paper products more trees are allowed to remain standing alive, where they can continue to remove carbon dioxide from the atmosphere and thus

help minimize climate change impacts. Different wastes and waste management activities have varying impacts on energy consumption, carbon storage and methane emissions. Recycling reduces greenhouse gas emissions by preventing methane emissions from landfills and from open dumps. It reduces the consumption of energy for extracting and processing raw materials. According to Memon (2002) communities aiming to prevent climate change can start by implementing an integrated solid waste management program.

When developing or changing a solid waste management system three important dimensions should be considered. The dimensions consider three key questions, the stakeholders, the elements which are the technical and the aspects. Sustainable development has been appreciated in the private sector in the form of the corporate social responsibility (CSR) agenda and also active solid waste management as an economic activity (Garcia, 1997). Local Non-governmental organizations (NGOs) around the world have taken up the cause of sustainable development. In Thika NGO's which are active in solid waste management include Jungle Nut foundation which has been active in Garbage collection and disposal. Several private companies are involved in garbage collection and disposal. The county government is also involved in the same as well as individuals.

2.3 The Influence of Community Awareness on sustainable solid waste management

According to Reid (2000) community participation is the active involvement of the whole community in development activities. In participating communities many people are involved in the community's activities. Business is not run by an elite leadership but everyone is involved fully. It is whereby power and responsibilities are

decentralized which engages the natural enthusiasm and talents of citizens. The communities are open and accountable to their activities. All ideas are treated equally and are welcome for contribution and are seen as of potential benefit. All persons are involved regardless of color, level of education, race, experience, occupation, reputation age, handicap, religion or any other factor. Participating communities operate openly and their leadership is used to facilitate discussion of a diversity of ideas. Active community participation is key to building an empowered community. Communities that have chosen it achieve more results rapidly and with greater benefit to the community as a whole

Wilcox (2001) has stated that community participation has to be initiated. The practitioner then manages the process over time and allows others to be involved more with less control over what happens. The community participation process is described during four phases which include initiation, preparation, participation, continuation. The problems faced in participation processes are mainly due to poor preparation within the promoting organization.

The initiator is in a strong position to decide how much control to allow to others to have in what is to happen. Community participation involves understanding power i.e. the ability of the different interests to achieve what they want. The Power will depend on who has information and money. It will also depend on people's confidence and skills and the ability to decide and achieve goals. Successful community participation has to move through all the stages to a maturity stage where stake holders are able to sustain the activities. The fruits of the process are thus realized and sustained by the community. Kenya has a comprehensive environmental policy which fully encourages community participation.

As amplified by Environmental policy (2013), Public Participation is encouraged described as a coordinated and participatory approach to environmental protection and management. It is enhanced to ensure that the relevant government agencies, county governments, private sector, civil society and communities are involved in planning, Implementation and decision making processes. The mandate of the Ministry of Environment and Mineral Resources (MEMR) is to protect, conserve and manage the environment and mineral resources. This is achieved through sustainable exploitation for socio-economic and political development and its mission is to promote, monitor conserve, protect, and sustainably manage the environment and mineral resources for national development.

The ministry has the strategic objectives which include improving policy, institutional, legal and regulatory framework for a sustainable environment that allows effective coordination at horizontal and vertical levels of government and with the private sector and civil society. It mainstreams environmental, climatic and mineral concerns into overall planning, implementation and monitoring activities in order to reduce environmental degradation .This strengthen the role of environment and natural resources in reducing poverty.

It ensures that all units within ministerial departments and partners have clear roles and responsibilities with sufficient trained staff and resources to implement and monitor their responsibilities effectively and efficiently. It raises real awareness of the importance of environmental matters within national and local political leadership. It stresses social and economic importance as well as ecological consequences in these activities.

In Kenya, the National Environment Management Authority (2015) has the objective to exercise general supervision and coordination over all matters relating to the environment. It is the principal instrument of the Government of Kenya in the implementation of all policies relating to the environment. NEMA policy supports the enhancing of environmental education, public participation and awareness.

According to Samuel (1987) community participation serves a number of objectives. It is an instrument of empowerment, which gives equitable sharing of power. Community members can make decisions and implement them together. It builds the capacity to undertake projects. The community members take their responsibilities and contribute effectively. It improves sustainability of projects. There is effectiveness in the process as it improves accountability. This means output improves as compared to inputs. Cost sharing can be implemented thus sharing in the cost of the projects with the people it benefits. The beneficiaries may contribute labor, money or undertake to maintain the project. Lastly there is improved efficiency which gives smoother flow of the Project services.

According to Mercy Corps Community (2008) mobilization is the process of building community capacity to identify their own priorities, needs, resources, needs, and solutions .This is a way to promote representative participation, good governance, accountability, and peaceful change. With community mobilization, participation is about meeting the interests of the whole community. When every Member of a community has the chance, directly or through representation, to participate in the design, implementation and monitoring of community level initiatives. This ensures a higher likelihood that the program accurately reflects people real needs and interests.

This approach takes into consideration the different experiences, needs and capabilities of various groups in a community for women and men, youth and the elderly. It includes persons with disabilities and the able bodied, ethnic, religious, language minorities and majorities. In community mobilization, every community and all citizens have the right to know the procedures, decision-making processes, and financial flows of the programs being implemented. Community mobilization promotes sustainable use of natural resources. It gives access to information for all members of the community. It provides opportunities for economic advancement, good healthy practices and well-being for each community member. The Knowledge by community members of their own rights and their ability to advocate for themselves is underscored by Ndikaru (2012).

2.4 The Influence of Environmental knowledge on sustainable solid waste management

As per the National environmental policy (2013) both formal and informal environmental education is vital to changing people's attitude to appreciate environmental concerns. Formal education is important to increase awareness, improve extension services, sensitize people on environmental issues and to build institutional capacities. Non formal environmental education benefits people outside the formal education system. Public awareness empowers the public to develop a strong sense of responsibility on environmental issues

The Kenya Government has committed itself to develop a National Strategy on Environmental Education and Public Awareness. It has pledged to develop a National Environmental Education Curriculum examinable at the primary, secondary and tertiary levels. It documents, disseminates and encourages the use of indigenous knowledge in

environmental protection and conservation. It aspires to strengthen capacities for acquisition, developing and distribution of environmental information. It has established various environmental resource centers at all levels. The government has developed and implemented Education for Sustainable Development Policy (2008).

The United Nations recognizes the role played by the general population in the sustainability of the environment. It has supported the education of the masses in both informal and formal matters of the environment. It supports the development of curriculum on the environmental education worldwide. Environmental education gained recognition when the UN Conference on the Human Environment which was held in Stockholm, Sweden, in 1972, declared environmental education as must use tool to address global environmental problems. The United Nations Education Scientific and Cultural Organization (UNESCO) and the United Nations Environmental Program (UNEP) made three major declarations that have guided the course taken in environmental education.

These include Stockholm Declaration UN (1972) in Sweden where this conference was held in Sweden in 1972 which was a United Nations Conference on Human Environment. This conference clearly recognized the relationship between the environment and society. The Belgrade Charter (Yugoslavia 1975) whereby, The Belgrade Charter was built upon the Stockholm Declaration .It adds goals, objectives, and guiding principles for environmental education programs. It defines an audience for environmental education, which includes the general public. This workshop was able to come up with a framework for environmental education. The program was given the

responsibility of developing relevant knowledge, attitudes, roles, skills, and values for improvement of the environment both for the present and future generations

The Tbilisi Declaration highlighted the important role of environmental education in the conservation and improvement of the world's environment. The Conference laid out the role, objectives, and characteristics of environmental education. It provided several goals and principles for environmental education (UNEP, 1978).

2.5 The Influence of cost sharing on sustainable solid waste management

According to NEMA (2014), The National solid waste management Strategy study there is need to introduce service charge to the residents for solid waste collection in order to offer commensurate service provision. It is proposed that a well-designed charging system can have a positive effect in reducing waste generation by producers through offering incentives for those who minimize waste by lowering their chargeable tariff. This initiative requires intensive social marketing and public goodwill.

Penrose (1998) has indicated that cost sharing has been used in different sectors in governments in order to facilitate services to the communities in situations where there is lack of enough budget allocations. It has been used in education sector, health sector, environment and infrastructure development etc. There are several arguments for sharing the cost of services with communities who are the main beneficiaries. First it is observed cost sharing can help improve the quality of service and make up for limitations in what the government is able to provide. Some researchers argue this can ultimately lead to the sector expansion and greater equity. Secondly it is argued cost sharing can improve management of funds at community level. It can also lead to increased community involvement and the development of community-level capacity. Finally, others believe

that if communities pay for services then they will have greater ownership of their projects .This will result in a higher value on them in general.

There are also several arguments against cost-sharing. In addition to prohibiting the poorest from accessing services, the desired results of cost-sharing may not be possible when a community does not have sufficient resources. Some citizens may not want to pay for services or feel that it is not their responsibility but that of the government to provide basic needs to the citizens. Also using fees as a means to increase quality can promote inequalities especially where the poor pay for services which do not improve. Cost sharing in community issues may not improve accountability, participation, or feelings of ownership. Some citizens may actually feel exploited in cases where they are not well represented in use of resources.

The issue of cost sharing should be well tackled from the beginning of community participation till maturity considering economic and social status. The Kenya Government is committed to provide adequate resources for environmental protection and management through annual budgetary allocation. The government promotes participation of public, individuals and private partnership in environmental sustenance as per Kenya Environmental Policy (2013)

2.6 The Influence of Sanitation on sustainable solid waste management

Sanitation is defined by Okonkwo (2010) as the hygienic means of preventing human harm from contact with multiple hazards associated with waste in order to promote good health. Some of the hazards include physical, biological microbiological and chemical. The most common hazards that pose health problems originate from human and animal faeces, domestic waste water, solid wastes, industrial and agricultural

waste. Okonkwo (2010) further defines Environmental Sanitation as control of environmental factors that cause disease transmission, for example, solid waste management, water and waste water treatment and industrial waste treatment.

Mshelia (2015) has concluded that Solid waste management is one difficulty problem of the urban environment in Nigeria. The popular concern of environment issues in our cities in recent times has been environmental sanitation. This is as a result of poor waste management, particularly solid waste that has become common with our urban centers. In his study, Mshelia (2015) identifies the sources of urban solid waste generation as rapid urbanization, population increase and urban land use. It has been observed while waste collection and storage facilities are odd polythene bags, dustbins and old bucket. Solid wastes are hence transported by human porter age, wheel barrows and metal carts and disposed of on open ground within the neighborhood resulting into mountains of wastes. During rainy seasons wastes are also disposed into gutters and drainages which block such systems resulting into flooding. Waste dumps manifest in areas regarded as no man's land thereby destroying the natural beauty of the urban landscape.

Sanitation as a whole covers safe collection, storage, treatment and disposal or reuse, recycling of human excreta .It covers the management of solid wastes like trash or rubbish, recycling of household wastewater, drainage of storm water, treatment and disposal of sewage effluents. It also covers the collection and management of industrial waste products and the management of hazardous wastes which include hospital wastes, and chemical/ radioactive and other dangerous substances. According to UNEP (2008) Integrated Solid Waste Management (ISWM) Plan actually is a package consisting of a

Management System which includes Policies (regulatory, fiscal, etc.), appropriate Technologies (basic equipment and operational aspects) and community measures (awareness raising, self-regulations). A management System covers all aspects of waste management; from waste generation through collection, transfer, transportation, sorting, treatment and disposal. Data and information on waste characterization and quantification which includes future trends and assessment of current solid waste management system for operational stages provide the basis for developing a concrete and locality-specific management system

A significant outcome of the World Summit on Development (Johannesburg 2002) was the adoption of an international sanitation target to half the number of people without access to basic sanitation by 2015. The Johannesburg Plan of Implementation was negotiated among governments, which reaffirms a wide range of commitments and targets for action to achieve more effective implementation of sustainable development, including implementation of the Rio Principles, the full implementation of Agenda 21, the Millennium Development Goals (MDGs) and the outcomes of the major UN conferences and international agreements since 1992. The Johannesburg Declaration on Sustainable Development had Heads of State and Government agreeing to assume a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development. These are economic development, social development and environmental protection at local, national, regional and global levels (UN, 2015).

2.7 Theoretical framework

Theories of community participation to be considered in this research are two prominent theories which have been put forward as a means of understanding and appraising participation structures and practices. They have been considered to provide a theoretical context within which the appropriateness of different approaches to community participation in Solid waste management in Thika can be assessed for success. The report provides a simple definition of participation. Two of the more prominent frameworks for community participation are then considered and explored.

2.7.1 Ladder of participation theory by Arnstein (1969)

The theoretical work in this research of community participation is by Arnstein (1969). The particular importance of Arnstein's work stems from the explicit recognition that there are different levels of community participation, from manipulation or therapy Participation .A theoretical context of citizens participation through to consultation and to what we might now view as genuine participation, i.e. the levels of partnership and citizen control .The limitations of Arnstein's framework are as follows. Each of the steps represents a very broad category or level within which there are likely to be a wide range of experiences. There is shift of power as you go up the ladder of participation as the masses get empowered. Some leaders fear to embrace community participation so as not to lose control of the masses.

For example, at the level of 'informing' there could be significant differences in the type and quality of the information being conveyed. The levels of participation are likely to reflect to a more complex continuum than a simple series of steps. The use of a ladder also implies that more control is always better than less control. However

increased control may not always be desired by the community and increased control without the necessary support may result in failure (Arnstein, 1969). The ladder of participation is as shown in Figure 1.

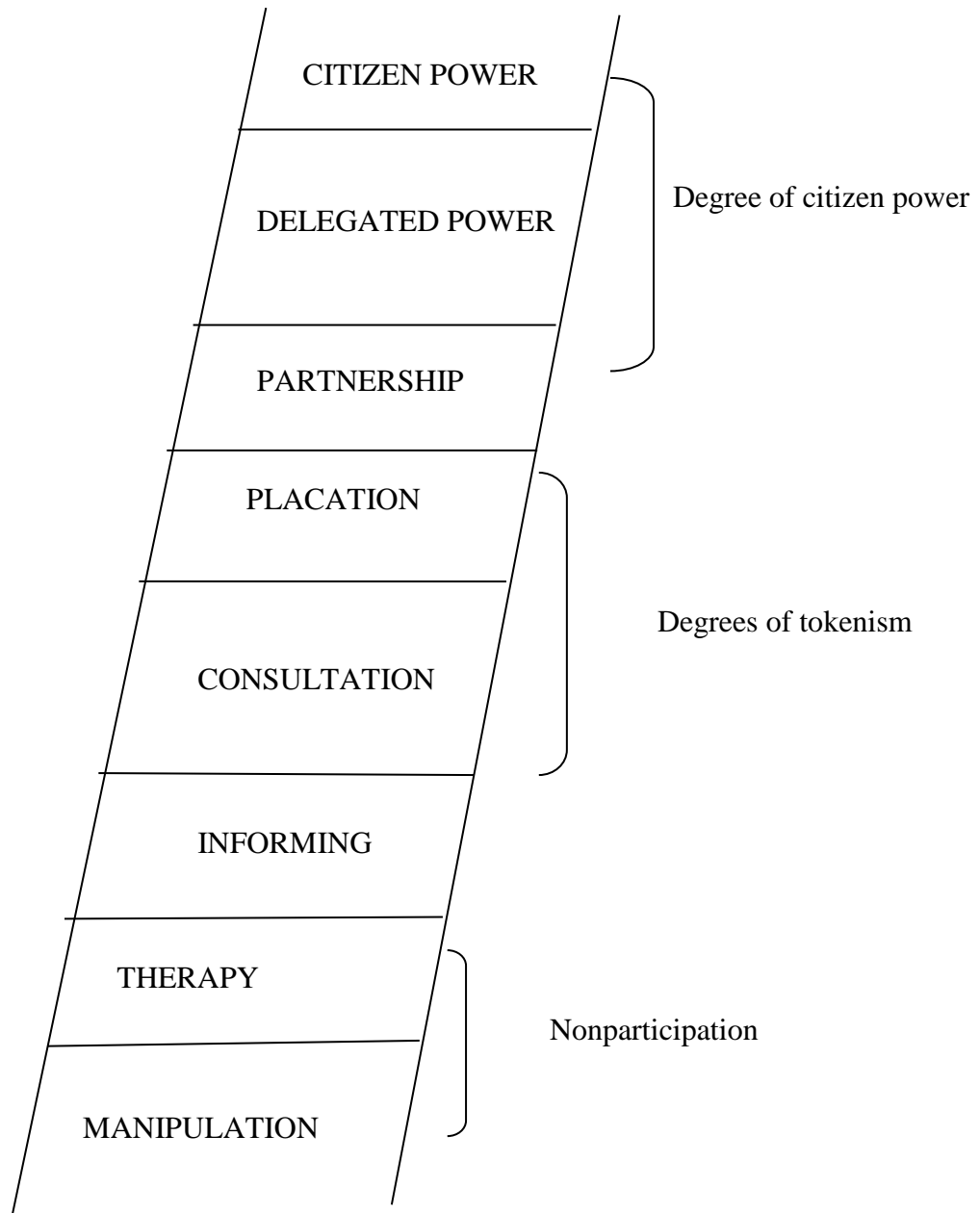


Figure 1: Ladder of Participation

2.7.2 Levels of participation Theory by Wilcox (1994)

Since Arnstein times, increasingly complex theories of participation have been advanced and new terminology added. There has been a shift towards understanding participation in terms of the empowerment of individuals and communities. This has stemmed from the growing prominence of the idea of the citizen as consumer, where choice among alternatives is seen as a means of access to power.

According to Parker (2002) people are expected to be responsible for themselves and should therefore be active in public service decision-making. This is more elaborate than Arnstein's ladder having more qualitative breakdown of some of the different levels. For example, a distinction is made between 'cynical' and 'genuine' consultation, and between 'entrusted' and 'independent' citizen control.

In CAG consultants (2015) publication, Wilcox identifies five interconnected levels of participation. The most importance principle is that power is not always transferred in participative processes. The steps involved include sharing information, having consultation, deciding together, acting supporting individual and community initiatives are encouraged .This indicates a continuum of involvement. According to Wilcox (1994) the theory indicates that different levels of participation are acceptable in differing context and settings. This progression recognizes that power is not always transferred in a participative process even though the processes have value. This theory is encouraging to leaders as there is no fear to lose power while practicing community participation.

2.8 Conceptual Framework

Independent Variables

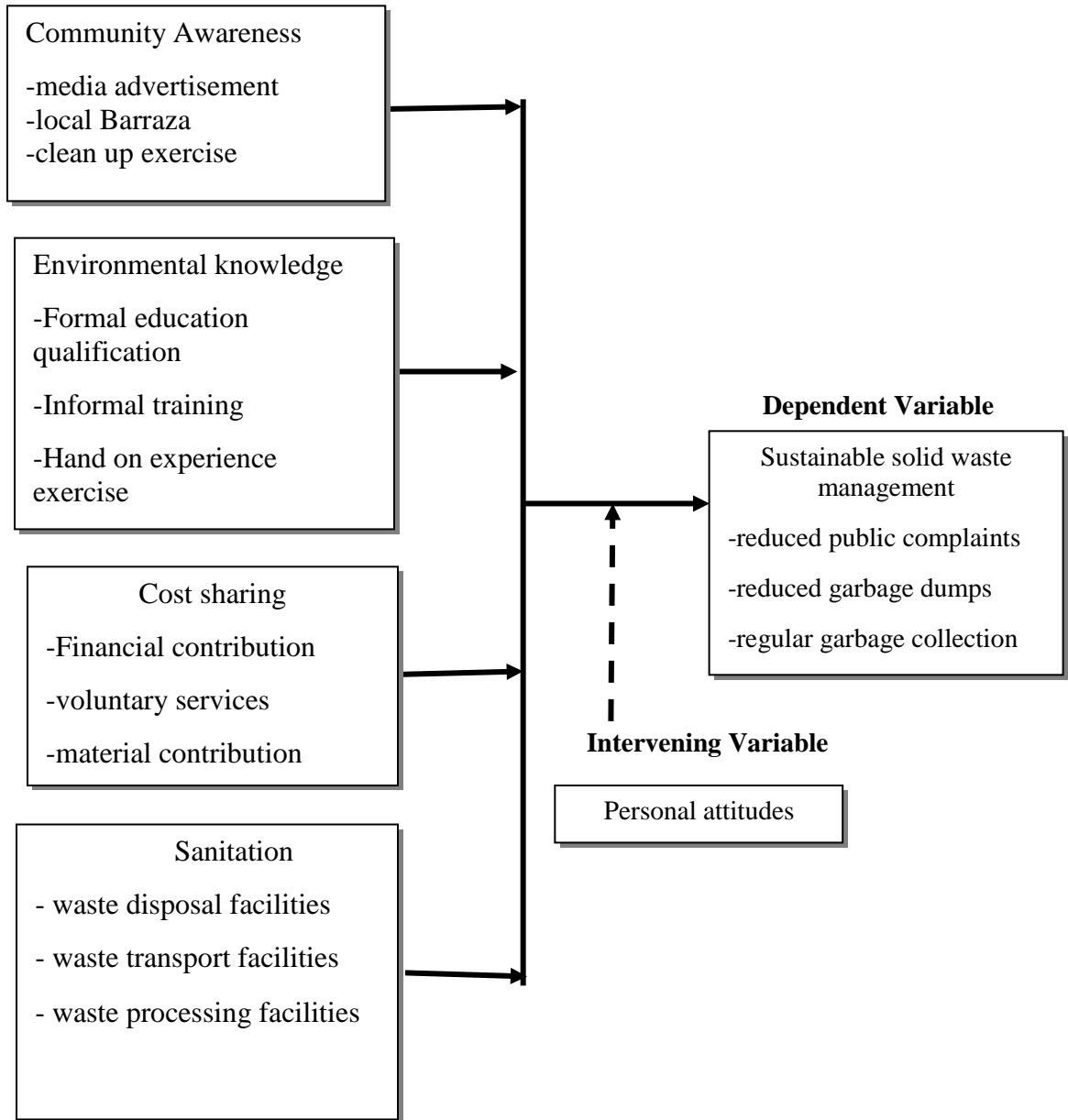


Figure 2: Conceptual Framework

2.9 Summary and Knowledge gaps identified

From the Literature the factors that influence sustainable solid waste management has not been studied. The problem of solid waste has been identified by several researchers worldwide and also locally. The waste generation trends has been studied in the county by Sira (2010) who also emphasized on policies. The nature of waste in Thika has been studied by Ndikaru (2012). The researcher however did not seek ways of tackling the problem. More studies should be done to encompass all stages of waste management seek ways to have sustainable solid waste management. Cost sharing has been used successfully in various sectors including education and health where there are constraints in resources from the government. The beneficiaries are involved in such endeavors and are facilitated to chip in resources in return for good services. In Thika, the researcher determined that this concept has not been developed as a means of ensuring sustainability in environmental conservation or where it has been done, it has not been well thought out. Awareness changes the attitudes of members of a society thus improving sustainability of programs. The priorities of a community are determined and communicated in various ways. In Thika Town there has been little effort towards achieving awareness on Environmental issues. The political class has also not engaged in the same. This research will thus investigate factors influencing sustainable solid waste management in Thika.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals with research methodology which includes research design, target population, sample selection and the sample size , research instrument, instrument validity and reliability, data collection procedures and data analysis techniques

3.2 Research Design

The research design is the plan or the structure of investigation to be used to obtain answers to research questions. Kothari (2003) refers to it as an arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance with the research purpose. This study used descriptive survey design. This design was appropriate in obtaining relevant data, analyzing and to get information on Factors that influence sustainable solid waste Management in Thika Town.

3.3 Target population

Population refers to an entire group of individuals, events or objects having a common observable characteristic (Mugenda & Mugenda 2003). The target population is the population under study. The target population was taken to be the total population of Thika which as per last census was counted to be 165000 with 72,051 households as documented by Kenya National Bureau of statistics (2013). There are 10 service providers doing waste management in Thika.

3.4 Sample and sampling procedure

The sample size is a subset of the total population that is used to give the general views of the target population. The sample size must be representative of the population in which the researcher would like to generalize the research findings. Using Krejcie (1970) model sample size was selected according to the corresponding table column population size. The study used stratified sampling technique. The population was divided into two subgroups called strata which are more homogenous than the whole population. One group was taken to be service providers while the other is the beneficiaries. Kamenu ward which has most diversified population was purposively sampled. It has 12164 households as per 2009 census. The heads of the household were sampled through simple random sampling. The sample size for the first strata was 370 for heads of the households in Kamenu ward. For the service providers who are 10, the chief executive who were sampled.

3.5 Data collection instruments

The research instrument used in this descriptive research studies was a questionnaire for gathering data. A questionnaire is a tool for getting self-report from respondents about their attitudes, knowledge, beliefs and feelings. The questions will be close ended.

The questionnaire contained five sections with Section 1 being the back ground information of the respondent, Section 2 being the influence of community mobilization in sustainable solid waste management, Section 3 being the influence of Environmental knowledge in sustainable solid waste management, while Section 4 being the influence of

cost sharing in sustainable solid waste management. The questionnaire was administered by the assistants who have been trained in order to direct the respondents.

3.5.1 Pilot testing

Pilot testing is a smaller version of a larger study that is conducted to prepare for the study or to field test the survey thus provides a rationale for the design. The instrument was pilot tested to determine whether the results obtained are valid and can be relied upon. Where necessary the questionnaire was modified to improve validity and reliability. The questionnaires were administered to 20 residents of Juja Town. The results were analyzed then adjustments were done on the questionnaire where necessary for improvements.

3.5.2 Validity of the instrument

Validity is the degree to which results obtained from the analysis of the data actually represent the phenomena under investigation (Orodho, 2009). The researcher used content validity which means the extent to which a measuring instrument has been tested by discussing its contents with supervisor and other subject experts and comments adopted.

3.5.3 Reliability of the instrument

The reliability of measurements is the degree to which a measuring instrument gives consistent results over a number of trials. It is considered as the degree to which instruments used for data collection are free from errors and thus can provide consistent results. From the pilot test the data obtained was split by half then was correlated with the other half.

The coefficient of reliability was calculated by use of Kuder –Richardson 20 formula. The value obtained was above 0.8 thus regarded as acceptable as recommended by Mugenda & Mugenda (2003).

3.6 Data collection procedure

The researcher obtained a permit from the National council of science and technology in order to carry out the research. The researcher approached the registered bodies where permission was required in order to collect data. The data was collected using the questionnaires which were administered by the researcher and the assistants to the respondents. Clarification was given to the respondents where necessary as much as possible.

3.7 Data analysis techniques

Data analysis deals with the organization, interpretation and presentation of collected data. The raw data collected will be coded before analysis. The researcher used descriptive statistics by use of frequency tables, percentages, measures of central tendency for display. The data will be further analyzed to determine and establish trends and information that can improve community participation in solid waste management.

3.8 Ethics in research

The researcher committed to observe requirements of ethics in research of social issues. The confidentiality of all respondents was guaranteed in all the stages of the research. The questionnaires did not carry names of the respondents. Consent was sought from the respondents prior to administering the questionnaire.

3.9 Operationalization of variables

The operationalization of variables was formulated to give the study a frame work on how the variables are going to be researched

Table 3.1: Operationalization Table

Objectives	Independent Variable	Indicators	Measurement level	Tools of data collection	Statistical analysis
To investigate the influence of community mobilization on sustainability of solid waste management	Awareness	Forums, campaign medium	Ratio	Questionnaire	Frequencies percentages
To determine the influence of Environmental knowledge on the sustainability of solid waste management	Environmental Knowledge	Education level	Ordinal	Questionnaire	Frequencies percentages
To determine to what extent does cost sharing influence the sustainability of solid waste management	Willingness to share cost in solid waste management	Payments for garbage collection	Ratio	Questionnaire	Frequencies percentages
To determine to what extent does sanitation influence the sustainability of solid waste management	Physical facilities	Availability of facilities garbage collection	Ratio	Questionnaire	Frequencies percentages

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents data collected from the field, its analysis, and finally the interpretation of the findings on establishing and analyzing the Factors influencing Sustainable Solid waste management in Thika Town, Kiambu County, Kenya

4.2 Response Rate

The study targeted 370 heads of households in Kamenu ward in Thika Town and 10 chief executives for service providers. Out of the targeted respondents, 239 participants filled and returned the questionnaires giving a response rate of 65% while 7 out of 10 service providers returned their questionnaire which is equivalent to 70%. The response rate is acceptable and agrees with Mugenda and Mugenda (2003) prescribed significant response rate for statistical analysis, which they established at a minimal value of 50%.

4.3 General characteristics of the respondents

4.3.1 Gender of the respondents

The study sought to find out the gender of the respondents which is presented in Table 4.1

Table 4.1: Gender Distribution table

Gender	Frequency	Percentage
Male	111	46.4
Female	128	53.6
Total	239	100

It was found 53.6% respondents were female while 46.4% were male signifying both genders were heads of households.

4.3.2 Age of respondents

The age of the heads of households was determined and is displayed in the Table 4.2.

Table 4.2 Age of respondents tabulation

Age in years	Frequency	Percentage
Below 18	0	0
18-25	49	20.5
26-40	159	66.5
41-60	23	9.6
Above 60	8	3.4
Total	239	100

The table shows that age group 26-40 years had the most respondents at 66%. Age group below 18 years was at 0%. Age group 18-25 years was average at 20% being fresh school leavers who have started life after school. Age group 41-60 are average at 10% .Age group above 60 years had 3 %.

4.3.3 Education level of the respondents

In this study the educational levels of the respondents was looked into as in Table 4.3

Table 4.3 Education level tabulation

Education	Frequency	Percentage
KCPE/Primary	31	13.0
KCE/Secondary	67	28.0
Diploma	91	38.1
Degree	43	18.0
Post graduate	7	2.9
Total	239	100

From the findings, the study found out that 28% of the respondents had achieved secondary level as their highest level of education. 38% of the respondents had achieved Diploma as their highest level of education. 13% of the respondents had achieved primary as their highest level of education while 18% of the respondents had university degree. 3% had post graduate education.

4.3.4 Income level of the respondents

In this study the monthly income levels of the respondents were looked into.

The findings are presented in Table 4.4

Table 4.4 Income levels tabulation

Education	Frequency	Percentage
Below KSh10000	67	28.0
Ksh 10001-25000	67	28.0
Ksh 25001-50000	61	25.5
Ksh 50001-100000	31	13.0
Above 100000	13	5.5
Total	239	100

From the study it was found out that 28 % of the respondents earned between Ksh10001-25000 per month. 28 % of the respondents earned less than Ksh10000 while 25.5% of the

respondents earned Ksh 25001-Ksh 50000. It was also found 13 % of the respondents Ksh50001 to 100000 while high earners above Ksh100000 were 5.5 %. These results indicates the majority of the respondents are low earning thus putting constraints to how much they can give towards community issues. Amounts demanded should be affordable across the population.

4.4 Influence of Community Awareness on solid waste management

In this study the various methods of raising awareness amongst the respondents was investigated.

4.4.1 Popularity of watching TV: Frequently Watch TV

The popularity of watching TV was investigated and the findings are presented here in Table 4.5

Table 4.5 Tabular display for Popularity of watching TV

Rating	Frequency	Percentage
Strongly Agree	25	10.46
Agree	127	53.14
Not sure	19	7.95
Disagree	67	28.03
Strongly Disagree	1	0.42
Total	239	100.00

From the study it was found out that 63 % of the respondents either strongly agree or agreed to watch TV frequently. While 28 % disagreed to watch TV frequently. 8 % of the respondents were not sure whether they watch TV frequently.

4.4.2 Popularity of attending Barraza's: Willingness to attend Barraza

The popularity of attending Barraza's is presented in Table 4.6

Table 4.6 Tabular display for Popularity of attending Barraza's

Rating	Frequency	Percentage
Strongly Agree	61	25.52
Agree	145	60.67
Not sure	13	5.44
Disagree	13	5.44
Strongly Disagree	7	2.93
Total	239	100.00

It was found 85% of respondents expressed importance of attending public Barraza to discuss community issues. Only 8% either disagreed or strongly disagreed to willingness to attend Barraza's. Thus the majority agreed to attend Barraza's.

4.4.3 Effectiveness of posters

The effectiveness of using posters was investigated and the findings are Table 4.7

Table 4.7 Tabular display for Effectiveness of posters

Rating	Frequency	Percentage
Strongly Agree	79	33.05
Agree	127	53.14
Not sure	14	5.86
Disagree	19	7.95
Strongly Disagree	0	0.00
Total	239	100.00

In the research 86% of respondents expressed effectiveness of posters to communicate community issues. Only 8% either disagreed to effectiveness of posters in

communicating issues. Thus this method can be used to effectively convey community issues.

4.4.4 The effectiveness of learning from peers

The effectiveness of learning from peers was investigated with the findings in Table 4.8 below.

Table 4.8 Tabular Display for The effectiveness of learning from peers

Rating	Frequency	Percentage
Strongly Agree	19	7.95
Agree	97	40.59
Not sure	37	15.48
Disagree	85	35.56
Strongly Disagree	1	0.42
Total	239	100.00

Only 48% of respondents strongly agreed or agreed to learn from a friend community issues. 35% either disagreed to learn from friends while 15.5% were not sure .This means this method may not be effective in learning community issues.

4.4.5 Importance of contribution to solid waste managements: Providing money for solid waste collection is important

Table 4.9 represents the findings on willingness of the respondents to contribute towards solid waste collection.

Table 4.9 Importance of contribution to solid waste management's tabulation

Rating	Frequency	Percentage
Strongly Agree	61	25.52
Agree	115	48.12
Not sure	19	7.95
Disagree	31	12.97
Strongly Disagree	13	5.44
Total	239	100.00

It was found 73 % of respondents expressed importance of contributing towards solid waste collection. 18 % were unwilling to contribute towards waste collection. This is a great percentage which should be addressed so as to achieve 100% community participation in waste collection.

4.4.6 Importance of solid waste management: It is important to collect /dispose solid waste

The table 4.10 below represents the rating by the respondents on the importance of solid waste collection and disposal

Table 4.10 Importance of solid waste management's tabulation

Rating	Frequency	Percentage
Strongly Agree	146	61.09
Agree	76	31.80
Not sure	8	3.35
Disagree	6	2.51
Strongly Disagree	3	1.26
Total	239	100.00

In the study 93 % of respondents expressed importance of solid waste management. Only 3.8% had reservations about solid waste management.

4.4.7 Effectiveness of contribution: My contribution is useful in cleaning the environment

Table 4.11 represents the findings on how the respondents perceived their contribution.

Table 4.11 Effectiveness of contribution tabulation

Rating	Frequency	Percentage
Strongly Agree	121	50.63
Agree	73	30.54
Not sure	19	7.95
Disagree	13	5.44
Strongly Disagree	13	5.44
Total	239	100.00

From the study 81 % of respondents perceived the importance of their contribution to solid waste collection. 11% indicated that their contribution may not have been useful in ensuring a clean environment. This should be addressed for everyone to appreciate their contribution. 8% were not sure their contribution was useful.

4.5 Influence of Environmental Knowledge on solid waste management

4.5.1 The Environmental Knowledge learned in school is sufficient

Table 4.12 represents the findings on how the respondents regarded Environmental knowledge.

Table 4.12 Sufficiency of the Environmental Knowledge learned in school table

Rating	Frequency	Percentage
Strongly Agree	61	25.52
Agree	97	40.59
Not sure	31	12.97
Disagree	43	17.99
Strongly Disagree	7	2.93
Total	239	100.00

The study found 66% of respondents regarded environmental knowledge learned in school as sufficient .21% however said it was not sufficient. 13% were not sure the environmental knowledge learned in school was sufficient.

4.5.2 The Environmental Knowledge learned in school is useful

Table 4.13 represents the findings on whether the respondents found the knowledge useful.

Table 4.13 Usefulness of the Environmental Knowledge learned in school table

Rating	Frequency	Percentage
Strongly Agree	121	50.63
Agree	73	30.54
Not sure	19	7.95
Disagree	13	5.44
Strongly Disagree	13	5.44
Total	239	100.00

About 81 % of respondents found environmental knowledge learned in school useful in making the environment clean. 11 % indicated that the knowledge may not be useful while 8% were not sure.

4.5.3 The necessity to learn more Environmental Knowledge

Table 4.14 represents the findings on the need by the respondents to learn more environmental knowledge.

Table 4.14 Tabulation of the necessity to gain more Environmental Knowledge

Rating	Frequency	Percentage
Strongly Agree	145	60.67
Agree	85	35.56
Not sure	1	0.42
Disagree	7	2.93
Strongly Disagree	1	0.42
Total	239	100.00

96.2 % of respondents found it necessary to learn more of environmental knowledge. 3.3 % indicated it was not necessary to learn more about the environment and only 0.4 % were not sure.

4.6 Influence of Cost Sharing on solid waste management

In this study the various methods of raising awareness amongst the respondents was investigated.

4.6.1 Frequency of cost sharing in solid waste management

The frequency of cost sharing was investigated and the findings are presented here in Table 4.15.

Table 4.15 Frequency table for cost sharing in solid waste management

Rating	Frequency	Percentage
Strongly Agree	43	17.99
Agree	109	45.61
Not sure	43	17.99
Disagree	37	15.48
Strongly Disagree	7	2.93
Total	239	100.00

The study found out that 46% of the respondents had been frequently requested to pay for solid waste management while 18% strongly agreed they had been frequently asked to pay. 18% had not been frequently asked to pay for solid waste management. 18% were not sure.

4.6.2 Willingness to cost share in solid waste management

The popularity of cost sharing was investigated and the findings are presented here in Table 4.16

Table 4.16 Table for willingness to cost share in solid waste management

Rating	Frequency	Percentage
Strongly Agree	61	25.52
Agree	139	58.16
Not sure	19	7.95
Disagree	19	7.95
Strongly Disagree	1	0.42
Total	239	100.00

In the study 83.7% of the respondents agreed or strongly agreed it was important to pay for solid waste management. 8 % were opposed to payment for solid waste management while 8% were not sure.

4.6.3 Acceptability of systems of cost sharing in solid waste management

The popularity of systems of cost sharing was investigated and the findings are presented here in Table 4.17.

Table 4.17 Acceptability table for cost sharing systems in solid waste management

Rating	Frequency	Percentage
Strongly Agree	13	5.44
Agree	91	38.08
Not sure	67	28.03
Disagree	49	20.50
Strongly Disagree	19	7.95
Total	239	100.00

In the study 43 % found the systems for payment for solid waste management were acceptable while 28 % found them unacceptable. 28% were found not sure whether the systems for solid waste management were acceptable.

4.6.4 The benefits of cost sharing in solid waste management

The perception about the benefits of cost sharing was investigated and the findings are presented here in Table 4.18.

Table 4.18 Benefits tabulation for cost sharing in solid waste management

Rating	Frequency	Percentage
Strongly Agree	43	17.99
Agree	115	48.12
Not sure	73	30.54
Disagree	7	2.93
Strongly Disagree	1	0.42
Total	239	100.00

It was found 66 % perceived that the benefits of cost sharing in solid waste management were big while 3% said the benefits were not big.30% were however not sure whether the benefits are big.

4.7 Influence of Sanitation on Solid waste management

In this study the various methods of raising awareness amongst the respondents was investigated.

4.7.1 Sufficiency of solid waste management facilities

The sufficiency of Solid waste management facilities presented here in Table 4.19.

Table 4.19 Table for Sufficiency of solid waste management facilities

Rating	Frequency	Percentage
Strongly Agree	13	5.44
Agree	55	23.01
Not sure	25	10.46
Disagree	115	48.12
Strongly Disagree	31	12.97
Total	239	100.00

Over 60% of respondents found the facilities not sufficient while 28.4 % found the facilities not sufficient. 10% were not sure whether the facilities were sufficient.

4.7.2 Convenience of solid waste management facilities

The Convenience of Solid waste management facilities was investigated and the findings are presented here in Table 4.20

Table 4.20 Convenience tabulation for solid waste management facilities

Rating	Frequency	Percentage
Strongly Agree	19	7.95
Agree	103	43.10
Not sure	55	23.01
Disagree	49	20.50
Strongly Disagree	13	5.44
Total	239	100.00

The study had 51 % of respondents who found the facilities convenient to use while 26 % found the facilities not convenient to use. 23% were not sure whether the facilities were convenient.

4.7.3 Placement of solid waste management facilities

The placement of Solid waste management facilities was investigated and the findings are presented here in Table 4.21

Table 4.21 Tabulation for Placement of solid waste management facilities

Rating	Frequency	Percentage
Strongly Agree	7	2.93
Agree	49	20.50
Not sure	55	23.01
Disagree	103	43.10
Strongly Disagree	25	10.46
Total	239	100.00

It was found 53 % of respondents felt the facilities were placed in the wrong areas to use while 23.4 % found the facilities placed in the right areas. 23% were not sure whether the facilities were placed in the right areas.

4.7.4 Convenience of solid waste management procedures

The convenience of Solid waste management procedures was investigated and the findings are presented here in Table 4.22.

Table 4.22 Table display for Convenience of solid waste management procedures

Rating	Frequency	Percentage
Strongly Agree	3	7.69
Agree	7	17.95
Not sure	3	7.69
Disagree	23	58.97
Strongly Disagree	3	7.69
Total	39	100.00

From the study 66.6 % of the respondents found procedures for solid waste management inconvenient while 25.64% found the procedures convenient. 7.69 % were not sure whether the procedures are convenient.

4.8 Service Providers feedback on Solid waste management

In this study the service providers' perceptions about Solid waste management was gathered.

4.8.1 Local community inclusion in solid waste management

The findings on local community engagement are presented here in Table 4.23

Table 4.23 Table for Local community inclusion in solid waste management

Factor	The Local community has been engaged frequently		It is necessary for local community to have environmental knowledge		The local community has been sufficiently involved in funding garbage disposal	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Strongly Agree	4	57.1	4	57.1	5	71.4
Agree	3	42.9	3	42.9	2	28.6
Not sure	0	0.0	0	0.0	0	0.0
Disagree	0	0.0	0	0.0	0	0.0
Strongly Disagree	0	0.0	0	0.0	0	0.0
Total	7	100.0	7	100.0	7	100.0

Among service providers 57.1% strongly agreed to have engaged the local community frequently in solid management with the remaining 42.9% agreeing to the same. The same ratio was realized on the necessity for the local community to have environmental knowledge.71.4 % strongly agreed that the local community had been sufficiently involved in funding garbage disposal.28.6% agreed to that the local community had been involved in funding garbage disposal.

4.8.2 Service provider’s performance in solid waste management

The findings on service providers’ performance are presented here in Table 4.24

Table 4.24 Table display for Service provider’s performance in solid waste management

Factor	There are enough facilities for garbage disposal		There are enough procedures for garbage disposal		The garbage collection facilities are emptied in time	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Strongly Agree	2	28.6	2	28.6	4	57.1
Agree	4	57.1	5	71.4	3	42.9
Not sure	1	14.3	0	0.0	0	0.0
Disagree	0	0.0	0	0.0	0	0.0
Strongly Disagree	0	0.0	0	0.0	0	0.0
Total	7	100.0	7	100.0	7	100.0

It was found 57.1% of the service providers agreed that there are enough facilities for garbage disposal while 28.6% strongly agreed that there are enough facilities for garbage disposal. Also 71.4% agreed that there are enough procedures for garbage disposal. 28.6% strongly agreed that there are enough procedures for garbage disposal. 57.1% strongly agreed that the garbage collection facilities are emptied in time while 42.9% agreed that the garbage collection facilities are emptied in time.

4.9 Relationship between Independent variables and Dependent variable

The relationship between Independent variables and dependent variable was calculated by use of Pearson correlation coefficient and is presented in Table 4.25.

Table 4.25 Relationship table for Independent variable and Dependent variable

Independent Variable	Pearson Correlation coefficient
Community awareness	0.86
Environmental Knowledge	0.52
Cost sharing	0.78
Sanitation	0.69

The Pearson correlation coefficient was calculated from the data for independent variables in relation to Sustainable waste management. The Pearson coefficient for Community awareness was 0.86 thus indicating that there is strong relationship between Community awareness and sustainable solid waste management. The Pearson coefficient for environment Knowledge was 0.52 indicating strong influence on Sustainable Solid waste management. For Cost sharing the Pearson coefficient was 0.78 indicating a positive relationship to Sustainable solid waste management. Sanitation yielded a Pearson coefficient of 0.69 indicating a strong relationship to Sustainable solid waste management.

CHAPTER FIVE
SUMMARY OF THE FINDINGS, DISCUSSIONS, CONCLUSIONS AND
RECOMMENDATIONS

5.1 Introduction

This chapter provides the summary of the findings from chapter four, and also the conclusions and recommendations of the study based on the objectives of the study. The objective of this study was on establishing factors influencing sustainable solid waste management in Thika Town Kiambu County.

5.2 Summary of the findings

The study sought to find out the gender of the respondents. Both genders were heads of households. It was found 53.6% respondents were female while 46.4% were male signifying both genders were heads of households. All age groups above 18 years were heads of households with the age group 26-40 years having the most respondents at 66% for heads of households. The study found out that 28% of the respondents had achieved secondary level as their highest level of education. 38% of the respondents had achieved Diploma as their highest level of education. 13% of the respondents had achieved primary as their highest level of education while 18% of the respondents had university degree. 56% of the respondents earned less than 25000 per month. These results indicates the majority of the respondents are low earning thus putting constraints to how much they can give towards community issues.

The study found out that 63% of the respondents either strongly agree or agreed to watch TV frequently. 85% of respondents expressed importance of attending public Barraza to discuss community issues. 86% of respondents expressed effectiveness of

posters to communicate community issues. Only 48 % of respondents strongly agreed or agreed to learn from a friend community issues.

Regarding the importance of contributing towards solid waste collection, 73 % of the respondents expressed importance of contributing while 93 % of respondents expressed importance of solid waste management. 81 % of respondents expressed the importance of their contribution to solid waste collection. 66% of respondents regarded environmental knowledge learned in school as sufficient.

A total 96.2 % of respondents found it necessary to learn more of environmental knowledge. 64% of the respondents strongly agreed or agreed to have been frequently requested to pay for solid waste management. 83.7% of the respondents agreed or strongly agreed it was important to pay for solid waste management. 66 % perceived that the benefits of cost sharing in solid waste management were big.

Over 60% of respondents found the facilities not sufficient while 28.4 % found the facilities not sufficient. 51 % of respondents found the facilities convenient to use while 26 % found the facilities not convenient to use. 53 % of respondents found the facilities placed in wrong areas to use while 23.4 % found the facilities placed in the right areas. From the study 66.6 % of the respondents found procedures for solid waste management inconvenient while 25.64% found the procedures convenient. 7.69 % were not sure whether the procedures are convenient.

Among service providers 57.1% strongly agreed to have engaged the local community frequently in solid management with the remaining 42.9% agreeing to the same. The same ratio was realized on the necessity for the local community to have

environmental knowledge. 100 % agreed that the local community had been sufficiently involved in funding garbage disposal. 57.1% of the service providers agreed that there are enough facilities for garbage disposal while 28.6% strongly agreed that there are enough facilities for garbage disposal. 71.4% agreed that there are enough procedures for garbage disposal. 28.6% strongly agreed that there are enough procedures for garbage disposal. 57.1% strongly agreed that the garbage collection facilities are emptied in time while 42.9% agreed that the garbage collection facilities are emptied in time.

5.3 Discussion of findings

From the background information both genders are represented as heads of households thus they are decision makers. To address any issues regarding Solid waste management both genders should be involved fully. All age groups above 18 years were heads of households. To communicate to the local community all the age groups should be considered. The literacy levels of the community are high with over 60 % of the population having secondary school education. This means the understanding levels would be good for interventions to be taken. Also to address community concerns about solid waste management its inclusion in secondary school curriculum could be effective.

Wilcox (2001) has stated that community participation doesn't just happen but it has to be initiated. There is poor awareness on the benefits of solid waste management. The study found out that 63 % of the respondents watch TV frequently. Thus broadcasting environmental concerns on TV would be effective to raise awareness. This however could be expensive. 85% of respondents expressed importance of attending public Barraza to discuss community issues. Public Barraza's are effective in engaging the local community. This could be the cheapest of all the methods. 86% of respondents

expressed effectiveness of posters to communicate community issues. Use of posters is all quite effective and less time consuming. However posters may be costly due to printing and distribution costs. Less than half of the respondents wanted to learn from a friend on community issues. This method was less effective though it can still be used as it is not costly.

According to Mercy Corps Community (2008) mobilization is the process of building community capacity to identify their own priorities, resources, needs, and solutions in such a way as to promote representative participation, good governance, accountability, and peaceful change. The majority of respondents expressed importance of contributing towards solid waste collection as well the importance of solid waste management. They expressed the importance of their contribution to solid waste management.

Penrose (1998) has indicated that cost sharing has been used in different sectors in governments in order to facilitate services to the communities in situations where there is lack of enough budget allocations. Though cost sharing was acceptable it had not been fully exploited. There is need to increase ownership in the program.

As per the National environmental policy (2013) Environmental education, both formal and informal, is vital to changing people's attitude to appreciate environmental concerns. The respondents regarded environmental knowledge learned in school as sufficient. A big percentage of the population were willing to learn more about the environment.

Sanitation is described by Okonkwo (2010) as the hygienic means of preventing human contact with multiple hazards associated with waste in order to promote health. The importance of sanitation cannot be overlooked in solid waste management. The majority also found solid waste management facilities not sufficient neither convenient. This contradicted the service provider who indicated the facilities were sufficient and solid waste management was effective. The government should ensure there are enough and convenient sanitation facilities.

5.4 Conclusions of the study

The study found there is disconnect between the general population and the service providers. The county government as a stakeholder has not prepared the ground for community participation. The Solid waste management procedures were not convenient to the users thus the right legislation is not in place. Although Cost sharing was effective and thus the solid waste management was effective it should be improved. The benefits of cost sharing was not well spread within the population. The service providers indicated sanitation facilities were sufficient and convenient while the population thought differently. The real needs of the population regards these facilities should be investigated and provided. The general population is not involved in decision making and thus the systems for cost sharing were not acceptable to many.

5.4 Recommendations of the Study

From the study the awareness of the benefits of solid waste management should be created and the general population mobilized. The county government should be the initiator of community participation. The several methods studied would be effective in changing mindset of the population. The TV media, public Barraza's, posters and person

to person should be utilized depending on the budgets available. The knowledge learned in school was found to be sufficient though there is need to including more learning in order to boost the confidence of the population on their undertaking as regards to solid waste management.

The system of cost sharing should be improved by involving all stakeholders from the initial stages in order to communicate the benefits and increase ownership of the programs. The locals should be decision makers to strengthen the procedures. The sanitation facilities are not designed with the involvement of the locals to ensure that they are convenient and sufficient.

5.5 Suggestions for Further Research

The study recommends another study on other social factors affecting the performance of Sustainable solid waste in Thika which may not have been identified in this study. The study recommends studies on the treatment of the solid waste at the final stages and how it affects the population.

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APPENDICES

APPENDIX 1: INTRODUCTION LETTER

Francis Mutala,
P.O. Box239
Thika
16th October 2015

To The respondent,

Dear Sir/Madam

REF: Introduction on Survey Questionnaire

This is to inform you that I am a Masters Student at The University of Nairobi. I am pursuing a Masters of Arts Degree in Project Planning and Management.

I am carrying out a survey to determine the Influence of Community participation on Sustainable Solid waste management in Thika Town.

I humbly request you to fill the question by making a tick on the appropriate answer as requested.

Yours Faithfully,

Regards,

Francis Mutala

REG.NO.L50/71714/2014

APPENDIX II: QUESTIONNAIRES FOR BENEFICIARIES

Please read through the questionnaire and answer by ticking your answer to all the questions. In case of any difficult feel free to ask for assistance.

SECTION I

Demographic Section: Population status

1. What is your gender?

Please indicate Male Female

2. What is your age group?

Please indicate

- A) Below 18years
- B) 18-25 years
- C) 26-40 years
- D) 41-60years
- E) Above 60 years

3. What is your education level?

Please indicate

- A) KCPE or Below
- B) KCE/secondary
- C) Diploma
- D) Degree
- E) Post graduate

4. What is your income level per month?

Please indicate

- A)Below Ksh10000
- B)Ksh10001-25000
- C)Ksh25001-50000
- D)Ksh50001-100000
- E) Above Ksh100000

SECTION 2

Community Mobilization Section: To determine the status of environmental awareness and contribution.

To what extent do you agree with the following statements?

1. I watch TV frequently.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

2. Attending Barraza's or seminars to discuss community issues is very necessary.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

3. Posters are very effective in communicating community issues.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

4. I consider that learning community issues from a friend is more effective than by other means. Please indicate

- Strongly Agree
- Agree
- Not sure
- Disagree
- Strongly Disagree

5. Personally providing money for solid waste collection is important.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

6. It is important to collect or dispose solid waste.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

7. My contribution to solid waste management can ensure the environment is kept clean.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

SECTION 3

Environmental knowledge: To determine levels of education and its relevance to the environment

To what extent do you agree with the following statements?

1. What I learned in school about keeping a good environment is sufficient?

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

2. The knowledge that I learned in school in making the environment clean is useful.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

3. It is necessary to learn more on the environment.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

SECTION 4

Cost Sharing: Willingness to share cost in solid waste management

To what extent do you agree with the following statements:

1. I have been requested to pay for solid waste collection frequently.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

2. It is important to pay for solid waste collection.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

3. The systems used to pay for solid waste management are acceptable.

Please indicate Strongly Agree
 Agree
 Not sure
 Disagree
 Strongly Disagree

4. The benefits from paying for solid waste collection are big.

Please indicate Strongly Agree
 Agree
 Not sure
 Disagree
 Strongly Disagree

SECTION 5

Sanitation: The influence of sanitation on solid waste management

To what extent do you agree with the following statements?

1. The facilities for solid waste disposal convenient are sufficient.

Please indicate Strongly Agree
 Agree
 Not sure
 Disagree
 Strongly Disagree

2. The facilities for solid waste disposal are convenient to use.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

3. The facilities for garbage disposal are placed in the right areas.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

4. The procedures for use of the garbage disposal facilities are convenient.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

APPENDIX III: QUESTIONNAIRES FOR SERVICE PROVIDERS

SECTION 6: QUESTIONNAIRE FOR SERVICE PROVIDERS

To what extent do you agree with the following statements?

1. I have engaged the local community on solid waste management frequently.

Please indicate Strongly Agree
 Agree
 Not sure
 Disagree
 Strongly Disagree

2. It is necessary for the local community to have environmental knowledge to improve on solid waste management.

Please indicate Strongly Agree
 Agree
 Not sure
 Disagree
 Strongly Disagree

3. The local community have sufficiently been involved in funding garbage disposal.

Please indicate Strongly Agree
 Agree
 Not sure
 Disagree
 Strongly Disagree

4. There are enough facilities for garbage disposal for community use.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

5. There are enough procedures for garbage disposal for community use.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

6. The garbage collection facilities are emptied in time.

- Please indicate
- Strongly Agree
 - Agree
 - Not sure
 - Disagree
 - Strongly Disagree

APPENDIX IV: KREJCIE & MORGAN TABLE

Krejcie & Morgan table for determining sample size

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

APPENDIX V: LIST OF SERVICE PROVIDERS

List of Service providers in Garbage collection in Thika Town

1. Kiambu County Government
2. Rethinking Youth Group
3. Jozak Youth Group
4. Mavuno Cleaners Youth Group
5. Kimuchu Youth Group
6. Utialo Youth Group
7. Shallow Youth Group
8. Stone Youth Group
9. Mount Evergreen Youth Group
10. Evening Moon Service Co. Limited

APPENDIX VI: RESEARCH PERMIT

THIS IS TO CERTIFY THAT: MR. FRANCIS MUTEKI MUTALA of UNIVERSITY OF NAIROBI, 239-10000 THIKA, has been permitted to conduct research in Kiambu County on the topic: FACTORS INFLUENCING SUSTAINABLE SOLID WASTE MANAGEMENT, A CASE OF THIKA TOWN, KENYA for the period ending 31st March, 2017. Applicant's Signature: [Signature] Director General National Commission for Science, Technology & Innovation



[Signature] Director General National Commission for Science, Technology & Innovation

CONDITIONS: 1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit. 2. Government Officers will not be interviewed without prior appointment. 3. No questionnaire will be used unless it has been approved. 4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries. 5. You are required to submit at least two (2) hard copies and one (1) soft copy of your final report. 6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice. RESEARCH CLEARANCE PERMIT Serial No. A 0541 CONDITIONS: see back page



REPUBLIC OF KENYA



National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No. A 0541

CONDITIONS: see back page