

**FACTORS INFLUENCING IMPLEMENTATION OF THE
NATIONAL SOLID WASTE MANAGEMENT STRATEGY: A
CASE OF KAMENU, THIKA SUB-COUNTY, KIAMBU
COUNTY.**

BY

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DECLARATION

I declare that this is my original work and has not been presented in any other university or any other institution of higher learning for examination for any degree or award

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DEDICATION

This research project report is dedicated to my late dad Apollo Macharia and my mother Gladys Wanjau who have been a great inspiration and motivation to me in education and character. To my daughter Gladys Wairimu and my son David Macharia. You believed in me and urged me on. God bless you.

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ABBREVIATIONS AND ACRONYMS

CBO – Community Based Organisation

EMCA – Environmental management Coordination Amendment Act of 2015

GDP – Gross Domestic Product

GHG – Green House Gases

NEMA – National Environmental Management Authority

NGO – Non-Governmental Organisation

NSWMS – National Solid Waste Management Strategy

SPSS – Statistic Package for Social Science

SWM – Solid Waste Management

ABSTRACT

This research project is on factors influencing the implementation of the National Solid Waste Management Strategy: A case of Kamenu Sub location, Thika Sub County, Kiambu County. This strategy had not yet been implemented and four objectives were developed as the basis of the research. These objectives were solid waste collection methods at households, knowledge level on SWM by households, public participation in SWM and resource capital in SWM. Based on the objectives, four research questions were developed and in addition a conceptual framework and a theoretical framework outlined. This research project adopted a descriptive survey research design. This enabled the researcher describe the relationship between the variables identified in the conceptual framework. The target population were households in Kamenu Sub location, staff in the ministry of Environment and the duly licenced private solid waste collectors in Thika Sub County in Kiambu County. The sampling procedure used was stratified random sampling, simple random sampling while a questionnaire was used as the main data collection instrument. The study analysed 300 questionnaires which represented an 80% return rate and a gender distribution of 41.0% and 59.0% male and female gender respectively. Both descriptive and inferential statistical tools were used in data analysis. The highest solid waste collection at households was observed to be done by licenced private companies who collected 61.8% of the solid waste. The county government account for 24.1% of collection and the rest of the solid waste being indiscriminately dumped and by use of skips. Household knowledge levels on solid waste reduction awareness and on solid waste segregation awareness were observed to be at 41.4% and 41.9% respectively. Education level on awareness levels in solid waste reduction and solid waste segregation had strong significant positive correlation coefficients of 0.965 and 0.952 respectively. There was high indication of households' need to be trained in solid waste management and the formation of residential solid waste committees. Households' response rates were at 88.9% and 95.8% in agreement for training need in SWM and formation of residential sold waste committee respectively. Age and monthly incomes had strong significant positive correlation coefficients of 0.998 and 0.990 respectively on need to have residential solid waste management committees. In addition, there was a 59.0% support for the youths to be involved in solid waste management. On resource capacity in solid waste management, the households responded with a 52.8%, 48.2% and 46.6% in agreement that equipment, staff and funding respectively, were adequate. This research project has identified that factors such as SWM knowledge levels at household and public participation in SWM have a significant influence on the implementation of NSWMS. The research project recommends that the county government and agencies involved in solid waste management could develop programs for training and involvement of households and the public in issues of solid waste management to increase their awareness and involvement.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

It is almost certain that in urban areas of emerging economies, one will find great volumes of paper, plastics, cans, etc. sprawling all over in an uncontrolled manner. This has contaminated rivers, clogged drainages systems, harboured rodents and other disease vectors and polluted the air. Uncollected solid waste is usually the leading contributor to local flooding and air and water pollution. (Bhada-Tata, 2012). The rapid development and urbanization being experienced in modern cities of the world, has come along with it challenges of balancing generation and disposal of solid waste. This is due to diverse activities that lead to high and rapid solid waste generation. Solid waste management refers to collection, transportation, processing and disposal of waste products. It also includes strategies for reducing the amount of waste to be disposed of (Kaluli, Mwangi, & Sira, 2011).

From a global perspective, a study in Mamanoneck (Town), Westchester County in New York had a 63% solid waste recycling rate and was 8th best in the County. The study observed that the ways the Town was seeking to increase this rate was by developing a near zero waste program. The approach was on waste separation and improvement of existing residence programs in communication, education and financial incentives (pay-as-you-throw) (Stacy Kotorac). A country like Germany is recognized as one of the greatest examples in the world on solid waste management. A case study on municipal solid waste management in the city of Karlsruhe in Germany recommended that clear goals and timeframes need to be established. It also identified that duties for national and local governments and industry needed to be clarified. Additionally, there is need to allocate funds in order to produce an effective waste management framework in developing in the world (Odile, Omran, & Rapp, 2008).

All over the world where waste management services have successfully been done, the governments subsidize the budgets for solid waste management up-to over 60 percent. In Japan for example, before privatization of solid waste management services, government subsidy to SWM used to be 80 percent while in Sweden it is 70 percent. This improves waste collection rates. Singapore has a collection rate of more than 90 percent while in Bangkok, Jakarta and Kuala Lumpur the rate is more than 80 percent. In Indonesia, collection rates have

been improved through a pre-collection system at villages, which deposit their municipal solid waste at transfer stations and or temporary storage facilities (Magutu, & Onsongo, 2011).

In Africa, South Africa's legal framework on waste management is one of the most progressive. There is a clear division of roles, responsibilities, and obligations of different spheres of government. This alignment of the law governing waste, demonstrates the country's ambition towards a clean environment and healthy society. For the waste sector in South Africa this means care is given to raw material use, product design, resource efficiency, waste prevention, and minimization where avoidance is impossible. However, South Africa's growing economy and population result in increased waste generation now and in the near future (Anna, & Mbali, 2012).

Studies conducted on solid waste management in other emerging economies, for instance Kenya by Mwangi, (2003), Karanja, (2005), Rotich, (2006) and in Tanzania by Mbulungwe, (2004) and Kassim, (2006) focused on service quality, institutional/governance issues, and the public and private relationship. The studies revealed solid waste problems and policy issues in urban solid waste management but did not explore empirical evidence of the link between performance and its determinants and what could be done to address solid waste problems and improve urban solid waste management. (Van Dijk, & Oduro-Kwarteng, 2007)

Due to the serious problem posed by waste management in Kenya, the National Environment Management Authority (NEMA), developed the National Solid Waste Management Strategy in 2014. The objective of the strategy is to guide sustainable solid waste management in Kenya thus ensure a healthy, safe and secure environment. The strategy will seek answers as to the current situation, preferred state and the strategy to get there. The NSWMS, 2014 is aimed at fulfilling the vision 2030 set flagship projects for five earmarked towns, namely Mombasa, Kisumu, Eldoret, Nakuru and Thika. These towns should have fully functional and compliant waste management systems by 2030. (NEMA, 2014).

The NSWMS, 2014 is based on Zero waste principle. Zero Waste principle - is a goal that is both pragmatic and visionary, to guide people to emulate sustainable natural cycles, where all discarded materials are resources for others to use. Definition of Zero Waste by Zero Waste International Alliance means designing and managing products and processes to reduce the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste principle will eliminate all discharges to land, water

or air that may be a threat to planetary, human, animal or plant health." To be considered to have achieved zero waste, the solid waste that is dumped at designated dumping site should be 10% or less of the total solid waste generated. (SCRD, 2011).

Thika Sub County faces the problem of solid waste collection and disposal as evidenced by sites of garbage heaps, clogged drainages and left overs of building materials. Studies carried out such as one done by Kaluli, Mwangi, & Sira, (2011) at Juja, states that in Juja, most people either dump waste in open spaces or burn it, creating water and air pollution. In Kiandutu, Thika Sub County a study indicated that solid waste management contributed to fire risk in addition to contaminating water, attracting insects and rodents, and increasing flooding due to blocked drainage canals or gullies (Gachago, 2013).

The constitution of Kenya 2010 under article 42 (Government of Kenya, 2010) and NEMA waste management regulation of 2006 (Govenment of Kenya, 2006) proclaim rights for citizen as well as apportion responsibilities to the citizenry respectively. Whereas each person has a right to a clean and healthy environment, every waste generator has a responsibility for refuse removal, refuse dumps and solid waste disposal. It also explicitly provides that the County Governments shall be responsible for solid waste management.

A study by Sira, (2010), revealed that residents of Thika town generated solid wastes at rate of 0.55kg/person/day with 79% of the solid wastes being compostable organics (food wastes). A study by Mugo, Kinyua, & Njogu, (2015) indicated that about 66.9% of solid waste dumped at Kang'oki dump site was from households. Private waste collectors managed 15% of the wastes from households in Thika municipality. Most of the households' solid waste does not reach the dumpsites as it is instead left on open grounds uncollected. Organic waste if not properly managed leads to an increase of disease causing vectors such as rodents, mosquitoes, flies.

In Kiambu County, the degradation of the environment has resulted in soil erosion and decreased food production. Pollution of rivers by factories may increase water borne diseases. In their Integrated Development plan 2013–2017, an area of concern is solid waste management within the County. The current dump sites are located near water bodies and pose great pollution threat. Community attitude towards refuse dumping is very wanting as very few people take seriously the responsibility on managing domestic waste. Among the County's new proposed projects areas is 400million budgeted for a waste dumping area between 2013 and

2017. Also earmarked is to enforce law on waste management and initiate household waste management. In addition, to build capacity of the community on proper waste management (County Government of Kiambu, n.d). The plan does not indicate how the households who generate the highest waste will be involved and engaged in solid waste management.

1.2 Statement of the Problem

Thika Sub-County has not yet implemented the NSWMS. NEMA developed a NSWMS to be implemented in 5 Municipalities (now Sub-Counties), one of which is Thika Sub County. The strategy developed thirteen (13) action points. Among them are the collection methods, improvement of collection facilities and solid waste activities. Thika does not yet have an efficient and sustainable solid waste management in place. There was a knowledge gap on identified factors that influence the implementation of the solid waste management strategy and their interaction with households, the community and the county government.

1.3 Purpose of study.

The purpose of this project study was to establish factors that influence implementation of the National Solid Waste Management Strategy.

1.4 Objectives of the study

This project study was carried out with the intention to meet the following specific objectives:

1. To determine the influence of solid waste collection methods at households on the implementation of the NSWMS.
2. To establish the influence of households' solid waste management knowledge levels on the implementation of the NSWMS.
3. To establish the influence of public participation in solid waste management on the implementation of the NSWMS.
4. To determine the influence of resource capital in solid waste management on the implementation of the NSWMS.

1.5 Research questions

These are the questions that this research project study sought to answer in order to provide information and knowledge to the research problem.

1. How do methods of solid waste collection influence the implementation of the NSWMS?

2. To what extent does households' knowledge on solid waste management influence implementation of the NSWMS?
3. To what extent does public participation in solid waste management influence implementation of the NSWMS?
4. How does resource capital in solid waste management influence the implementation of the NSWMS?

1.6 Significance of the study

This project study was on selected factors which were studied on how they influence the implementation of the NSWMS, 2014. Whereas Thika Sub-County is one of the earmarked location for the implementation of NSWMS, this strategy had not yet been implemented. This study has resulted in generation of information leading to the understanding of critical factors that influence solid waste management from households to the county government. The knowledge adduced has provided vital information that will advice and guide formulation of programs and subsequent actions/ activities in the implementation of the NSWMS. The implementation of this strategy will bring down the cost of SWM and thus save on tax payers money.

1.7 Delimitation of the study

The research project study area was Kamenu Sub-Location of Thika Sub County. Kamenu Sub-Location has five (5) residential estates, namely Makongeni Phase 4, 5 and 6, Kamenu Estate and Kiganjo. There are 12,164 households in total on an area of 33.29km² according to the 2009 national census (Government of Kenya, 2010). This project study selected households using stratified random sampling technique. One member of the selected household who was 18 years and above was be subjected to a questionnaire. Staff of Thika Sub-County government were subjected to a purposive sampling technique using both a questionnaire and an interview schedule. The researcher and his trained assistants also had a checklist which they filled as they visited the respondents.

1.8 Limitations of the study

It was likely that upon commencement of the actual research, there were limitations to be experienced. The limitation envisaged were; First, was literacy levels of respondents. This was mitigated by use of simple language as well as having the instruments go through a reliability test in addition to having trained research assistants to guide. Secondly, resistance to participate by some respondents. This was mitigated by clearly explaining the purpose of the study in a

language well understood by the proponent. In addition, transmittal/ authorisation letters accompanied each questionnaire and where necessary a pre-communication through welfare groups and religious groups was done.

1.9 Assumptions of the study

The key assumptions of this research project study were:

1. That it was possible to develop cogent arguments regarding the factors influencing implementation of the National Solid Waste Management Strategy, 2014 in Thika Sub County by benchmarking against other studied areas.
2. That the target sample had the required knowledge and understanding to furnish the study with factual and objective responses.
3. The researcher believed that the sampling technique was adequate to yield the data required for analysis.

1.10 Definition of significant terms used in this study

The key terms are as follows:

Household: Refers to a person or group of persons who reside in the same homestead/compound but not necessarily in the same dwelling unit, have same cooking arrangements, and are answerable to the same household head.

Human capital on solid waste management: These are employees/ staff of Thika Sub County, Private Companies', NGOs and community welfare groups' who are engaged in solid waste management activities in Thika Sub County.

Communal activities on solid waste management: These are party groups, church groups, welfare groups who come together respectively to participate in activities of solid waste management.

Equipment capital used on solid waste management: This is the equipment by Thika Sub County, Private Companies', NGOs and community welfare groups' engaged in solid waste management.

Financial capital used on solid waste management: These are finances employed by Thika Sub County, Private Companies', NGOs and community welfare groups used in solid waste management.

Indiscriminate option of waste collection on solid waste management: This is the dumping of waste on open grounds, road sides and in drainages on solid waste management.

Knowledge levels of households on solid waste management: This is the level of awareness and sensitization on solid waste management by households

Private Companies vehicles used on solid waste management: These are Private Companies vehicles licenced by NEMA for solid waste collection and disposal on solid waste management.

Public Participation on solid waste management: These are members of the public co-opted by the County Government in any decision making deliberation relating to solid waste management.

Waste collection methods at households: These include waste collection by the county government, licenced private companies and indiscriminate dumping.

National solid waste management strategy, 2014: This is the solid waste strategy developed by NEMA

Solid waste management: This means adequate solid waste collection and disposal coverage, well-coordinated and organised solid waste treatment, reuse, recycled and reduced solid waste.

Zero waste principle: This means that waste is a resource that can be harnessed to create wealth, employment and reduce pollution of the environment

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter is on critical analysis of scholarly studies carried out in different parts of the world on solid waste management. The literature review has focussed on studies and study results related and relevant to what has been studied in this research project. The chapter starts by definitions and brief general information on terms and what solid waste management is. It then gets into specific reviews on indicators that have been studied to answer the research questions in this research project. The reviews have shown both knowledge strengths and gaps from studies reviewed. The chapter concludes with a summary table showing knowledge gaps identified.

2.2 Empirical review on Solid Waste Management

In this research project study, solid waste is defined as “any residue that is of no use in its current status to the people who caused it” (Shapan, & Mohammad, 2012). There are several legal and institutional frameworks in Kenya that deal with solid waste management. These are the Constitution of Kenya, 2010, Environmental Management Coordination Act, 1999, the Environmental Management Coordination Amendment Act, 2015, Public Health Act and the Occupation Safety and Health Act, 2007 to mention a few. These laws are managed by their respective authorities and agencies. The legal and institutional framework have set responsibilities to both the generators and regulators of solid waste. They emphasise the need to address SWM from the source.

The term ‘Zero Waste’ originates from the latter and it has been increasingly adopted as a goal for commercial waste minimisation. It is an extension of the Japanese-based ideas of total quality management (TQM) into the environmental field towards zero emissions and Zero Waste. As one Japanese planning ministry once put it: ‘Waste is an un-Japanese concept.’ Japanese firms have been in the lead in adopting Zero Waste policies, with Honda (Canada) reducing its waste by 98% within a decade, and Toyota aiming for the zero target by 2003. The puritan aspiration is becoming an industrial reality (Murray, 2002).

In Vision 2030, one of the flagship projects is the Solid Waste Management initiative which calls for relocation of the Dandora dumpsite and the development of solid waste management

systems in five (5) leading municipalities and in the economic zones planned under vision 2030. Thika Sub County is among these leading municipalities in the economic zone. (NEMA, 2014).

Other articles that advocate on solid waste management are Agenda 21, article 6.39. All these are guided by the zero waste principle. A country is deemed to have attained zero waste when only less than 10% of the generated solid waste is dumped at the designated dumping sites.

2.3 Methods of Solid Waste Collection on solid management strategy

A study carried out in Mamaroneck in New York on near zero waste solid waste strategy recommended that there should be waste audits carried out, diversion of food waste to composting, improved existing recycling programs and pay-as-you-throw in Municipal solid waste programs. In solid waste management hierarchy, waste prevention is the best option followed by minimization, re-use, recycling and disposal being the worst option. The further an activity moves up the waste management hierarchy, the more greenhouse gains there are to be made.

1. **Reuse:** Requires less energy than recycling. There are many ways that clothes, cars, books, buildings and other materials are currently reused, such as:
 - a) Trash and treasure markets
 - b) Free giveaway swap websites.

Reuse is already part of our society, so there is an existing precedent to build on.

2. **Reduce:** Requires less energy than re-use. This is by designing out waste before it is created. Waste, in all its guises, is an indicator that systems and processes could be designed better. It makes no sense to pay both financial and energy/greenhouse costs for waste twice – first to create it, then to dispose of it.
3. **Avoid:** Is the ultimate zero waste challenge; the highest point on the hierarchy. The volume and rate at which resources are being channelled through the human economy needs to be slowed, along with a recognition that all our material goods have an energy 'price tag'.

In order to effectively address the zero waste, there is need to consider processes in terms of reuse, reduce and avoid, with a particular emphasis on eco-efficiency (Antony, & Liss, 2013).

A study carried out in Nigeria on evaluation of solid waste generation, categories and disposal options, it was observed that collection services only catered for 35.8% of the solid waste. The balance, 64.2% was indiscriminately disposed of. The study also indicated a high populace

awareness levels on waste collection services and waste management regulations which were at 68.7% and 58.7% respectively. However, this study did not indicate who were involved and at what levels in waste collection. Neither did it explain the reason behind the high levels of indiscriminate disposal. (Babayemi, & Dauda, 2009).

Another study on sustainable municipal solid waste management in Bhopal City observed that collections points were in the open and were left unmanned. This led to scavenging and littering. Biodegradable waste (which is the main waste from households), in the tropics needs to be collected frequently (Dasgupta, 2013). Another study on Solid Waste Management showed that in Cotonou, Benin and Cairo, Egypt where they have involved public groups and a cooperative respectively on solid waste collection has encouraging results. For example, in Cotonou, Benin, community groups participate in the collection process under contracts with the municipal agency (Koen, & Tsurumi-Ku, 2005).

A paper discussing key dimensions of waste addressing the sustainable waste management practises and education observed that Lagos faces a big challenge in collection of solid waste. The major problems caused by accumulated waste are environmental pollution and health related issues. The paper outlined the perceived causes of waste collection as waste disposal habits, attitude at work and lack of adequate equipment. The paper also identified that the role of scavengers as important in solid waste management. Scavengers play an important role of waste reduction into the landfill. In addition, the paper proposes that recycling programs be expanded (Waste-to-Wealth) and having a better landfill management (Waste-to-Energy). The paper does not address how domestic waste generators' are involved in SWM. Methods adopted by various waste management agencies were found to be ineffective and fell short of international standards in waste management practises and sustainable development (Adewole, 2009). This research project aimed at collecting data on County Government collection, the private companies' collection and indiscriminate disposal of household wastes.

A document from the encyclopaedia on disposal of solid waste states that source reduction can be achieved by

- a) Enhancing consumers' consciousness about environmental protection by public education.
- b) Reducing the quantities of material in production and packaging.

- c) Urge producers of products to accept a degree of responsibility on waste treatment and recovery.
- d) Reduce production and application of perishable consumer goods. (Guagyn, n.d).

A study in Kampala and Dar-es-Salaam on a model on Future Projection of Urban Waste flows and their Impacts in African Cities, observed that;

- a) There is lack of adequate transfer points/ facilities. This leads to indiscriminate dumping
- b) The number of skips provide are also not adequate.
- c) Most of the waste collected by private companies was done only in high income residential areas since they were be able to pay for the services.

This model however had limitation in the predicted results. This is because the scenarios considered were on assumptions that may change in real time. The scenarios only showed probable paths that can be followed based on those assumptions (Oyoo, Leemans, & Mol, 2010).

A study titled “The need for an integrated SWM in Kisumu, Kenya” observed that; there was a lot of uncollected solid waste with the residential areas especially for the low income people. Residents did not carry out solid waste segregation and in addition, the study observed that there was need for a social-cultural change among the residents at households’ level, (Munala, & Moirongo, 2011).

The study on solid waste management in urban centres in Kenya which was concerned with operations, community environment concerns and participation by Sira, (2010) observed that majority of the household residents were happy with the services by the private company collectors. The study further observed that private company collectors management 15% of the solid waste collection in Thika municipality. The residents also expressed concerns that solid waste was an environmental degradation.

2.4 Households’ knowledge level influence on solid waste management strategy

A study by Dasgupta, (2013) observed that where recycling and sorting were done at source, encouraging results were noted in SWM. Sorting that was done at collection points (transfer stations), however lead to littering and waste being blown around by the wind. The study does not have figures on the encouraging results observed. In the same study, it was observed that

recycling and sorting were not done by the low income households. The study recommended use of bins at transfer station to manage and control sorting. The study does not address the involvement of households in waste collection. This research project aimed at providing information on the extent reduction and segregation is done at source, namely the households.

Broad based education campaigns involving several sectors such as education, media and health departments would decrease indiscriminate dumping. This was adduced from a study by Koen, and Tsurumi-Ku (2005). The study further observed that there should be solid waste management training for three categories of people, namely; generators and pre-collectors, handlers and systems managers on occupational issues. In addition, the study proposed that Professional organisations be used to educate the public on their role in programs on SWM. This has worked well in urban centres such as Cairo, Bamako, Dakar and Johannesburg. Education should also be incorporated in the formal school curriculums and health extension services.

In a study on disposal of Solid Waste, it was observed that of the total expenses in SWM, approximately 60-90% is spent on collection and transfer phase. This means, an incremental improvement in this phase can result in significant savings on overall cost. Waste reduction at source, recovery (at source sorting/ separation) and recycling are important aspects to consider in collection and transfer phase (Guagyn, n.d). Another study on management of urban solid waste pollution in developing countries observed that segregation of wet and dry solid waste would reduce waste to landfills by 50% in Delhi, India (Firdans, & Ahmad, 2010). This shows there is a potential if knowledge of sorting and segregation is imparted to householders. This would lead to cost reduction in waste management.

There are success stories when households are well educated in primary collection, recycling, secondary collection and monitoring. This also has a positive impact on the public in their knowledge and practices in SWM. This was observed in the case of Surat in India where the town came from the filthiest town to the cleanest in 18 months (Kumar, & Chakrabarti, 2010). In another study in Los Baños, Lagun, Philippines, where waste segregation and anti-littering program led to clean a clean city (Atienza, n.d). This gives a positive indication that with increase in knowledge on SWM at source, there is a likely correspond improvement in cleanliness of the environment from waste.

A study on investigating household attitude towards recycling of solid waste in Malaysia revealed that participation in recycling at households was dependant on awareness and understanding they had. Improved education and increase to accessibility to recycling facilities

produced the positive attitude towards recycling. This is because it removed barriers that were preventing households from recycling. This study was conducted in Alor, Setar town, Kedah State in Northern Malaysia (Omran, Mahmood, Abdul, & Robinson, 2009).

2.5 Public participation influence on solid waste management strategy

In a study by Firdans, and Ahmad, (2010) where they reviewed data on the quality of Municipal Solid Waste generation, its physical and chemical characteristics, collection and disposal; it was observed that there was need to involve NGOs and CBOs to assist the local government in the SWM crisis in Delhi, India. Domestic waste ranked the highest and government agencies responsible were unable to cope. The study noted that the SWM systems and practices were unplanned, unscientific, poor supervision, poor vehicle maintenance, lack of public collection system and very low financial allocation. It further observed that there was low community mobilisation by the government agencies concerned with SWM. One of the study's recommendation was the development of community sensitization and awareness programs.

Workshops have been observed to produce positive results in solid waste management. This is in the case of Bangalore City Corporation which benefited immensely from a Best Practices Workshop for Solid Waste Management, organized in May 2000 by the CM-appointed Bangalore Agenda Task Force. Nine top performers ("navaratnas") from all over India were invited to present their success stories in 9 fields, including primary collection, recycling, secondary collection and monitoring, and innovative slum clean up. Some of the "navaratnas" were invited to start demonstration projects in Bangalore. The city managers of Gujarat have created a forum for sharing information between themselves in order to learn from each other. Their publication on Best Practices is worth studying carefully for successful ideas in several areas (Kumar, & Chakrabarti, 2010).

Asian metropolises face SWM challenges as other upcoming economies. A resource paper on citizen participation in solid waste management; addressed emerging concepts or citizen participation, cooperation and education for responsive SWM in Asians cities. It looked into citizen participation and education in SWM. It was also concerned on how to extend SWM to low income areas economically and effectively. Citizen participation is what the general public can do to assist in SWM.

The paper highlights five approaches that could be used to address the SWM, namely:

1. Management issues: How waste is managed at household levels, what reductions measures are in place, keeping neighbourhoods and public areas clean, supporting value changes in industries and the city regional projects.
2. Approach to citizens' participation and cooperation: This was proposed to be done in three ways, namely; public institutional structures and procedures and enforcing regulations. It accepts the status quo that the current structures and systems in place are adequate. Citizen should not object the decisions made on disposal sites and methods used.
3. Community oriented approach: it embraced SWM improvement through, education, people's participation in planning and decision making, greater understanding and responsiveness by the urban authorities to the needs of the residents particularly the poor. This approach further recognises the need to provide facilities to enable neighbourhood cleanliness. Finally, to encourage community voluntary organisation supported by charitable organisations.
4. Environmental movement approach: This looks at use of social movements to improve people's awareness and proactivity in SWM. To show the people the need to change their values and behaviour. To accept as a way of life practices beneficial to SWM, for example, people to accept and practise activities in waste reduction.
5. Integrated approach: This is a mix of all the other approaches in varying degrees.

The paper identified that in the routine services, separation and recovery were not done at household levels. There is a significant impact if separation is done at house levels (Furedy, C., 1991). That is the reason why public participation in SWM was studied in this research project.

A study on waste management problems in slums of Jimma Town, Southern Ethiopia focussing on indiscriminate and non-clearance of generated waste. The objectives were to orient inhabitants of Jimma on hygienic and participation in setting mitigation measures against environmental pollutions. Among the findings identified were inadequate facilities for waste collection and need for community involvement. The solutions provided included; sensitization programs and putting up sign boards on SWM (Filaba, 2008).

A study that was on peoples' attitude and awareness about solid waste management was conducted in Kumbakonam Town, Tamilnadu, India. Two of the objectives were to explain public awareness towards household waste disposal to analyse peoples' attitude regarding

household waste. From a sample (n) of 300, 183 were males and 117 females. Using SPSS, Karl Pearson correlation analysis was calculated. The findings observed were, that family size and clearance of dustbins were positively correlated to age and that age was negatively correlated to segregation and level of education. (Indhira, Senthil, & Vadivel, 2015). This research project has correlated several indicators to adduce inferential information.

In Kira Town, of Uganda, a study carried out there indicates the need for public participation. The study was on exploring the level of public participation, challenges and opportunities. The study proposed that the Kira Council should make the public have a sense of worth in getting involved with solid waste management. Fear of actual and perceived dangers of combined with social norms in waste motivated or hindered participation in solid waste management.

The same study revealed that the majority of the public in Kira Town Council exhibited concern on amount of solid waste but sorting of solid waste was rarely done. The level of item reuse was similarly low and the people still thought they could not do anything to reduce the volume of solid waste they generate. The level of public participation was also found to be low. The study proposed that the Town Council authorities show the people that they are worth by involving them in the initial planning process (Kirunda, 2009).

2.6 Resource capacity influence on solid waste management strategy

The need for financing SWM was observed in the study by Oyoo, Leemans, & Mol, (2010) where they recommended that NGOs, CBOs, City authorities and the general public have to increase their efforts in financing SWM. This study further said that the financing should be towards improvement of the environment and resource recovery. This is in line with the zero waste principle. It also agrees with an earlier study by Koen, and Tsurumi-Tsu (2005) who observed that finances were key in solid waste management. They proposed raising finances by taxes, user fees, bank loans and international aid.

In the study by Firdans, and Ahmad, (2010), they recommended an increase in the number of skips for communal collection points. They further advocated for penalties for those who were found guilty of indiscriminate dumping. This would call for higher financing that is not being done. In the implementation of the national solid waste management strategy, there will be need to have adequate financing in addition to running sufficient and efficient programs in SWM.

In a research titled “The narration and forecast of overseas municipal solid waste management” indicated that resources available in solid waste management are often not adequate and usually in poor condition. Resource (human, equipment and finances) availability is essential for effective solid waste management. It also observed that, garbage collecting transportation in most developing countries mainly depend on government. Other organizations and individual citizens do not play a significant role in a number of countries; where they do, they did not cooperate well with local residents and the government, resulting in inefficiencies.

In the same study, it was observed that government should encourage the establishment of regional waste disposal facilities, and set long-term waste disposal policies, which reflect sustainable development. In addition, to enhance the technology content of waste collection facilities. Most developing countries are still faced with the problems of waste collection, 3%~15% of municipal budget is spent on waste collection. This is not sufficient funding for recovery, treatment and sanitary landfill (Xuan, & Ling, 2014). This was also the observation by Munala, & Moirongo, (2011). In their study in Kisumu, Kenya, they observed that the County Government collected 10% and the private companies another 10% of the solid waste generated at households. The balance of 80% was indiscriminately dumped.

A study on operationalising the SWM, had the following objectives:

1. Formulation of the Municipal SWM strategy
2. Formulation of objectives for Municipal SWM
3. Establish waste management strategies to be used by Municipal SWM
4. To identify challenges facing implementation of sound SWM strategies

It was observed that waste materials that are organic in nature, such as plant material, food scraps, and paper products, can be recycled using biological composting and digestion processes to decompose the organic matter.

In the same study, the major source of solid waste is from households. Household organic wastes, including wastes from the restaurants, are often collected for animal feed. However, these are either not working or are not operating at full capacity for a number of reasons; the reasons include. High operating and maintenance costs, poor maintenance and operation of facilities/ equipment, low staff capacity, incomplete separation of material that cannot be made into compost, (example plastics and glass) and high cost of compost compared to commercial fertilizers.

The study observed that in middle and low income areas selective selection and recycling of waste is carried out. Mukuru Recycling project is one such case where this has been formalized. Men and women scavengers in this group select and recycle waste materials back to the industries where they are paid for the material. However, this is very dynamic as it depends on what materials the industries are ready to buy back. The buying fee for the recycled material could also be low and depends on demand. The recycling in addition leaves out the bulk of the waste which is organic material as very little composting is done.

Where SWM has been successful, the national governments have subsidized heavily (over 60%) in SWM services. Japan before it privatized SWM used to subsidize to over 80%, Sweden is over 70% in addition to residents paying an equivalent of 800/= per month. In Ghana, residents pay 700/= per month. Singapore has a collection rate that is over 90%, Bangkok, Jakarta and Kuala Lumpur, rates are over 80%. In Indonesia, rates have improved following the introduction of pre-collection in the villages (households) and the establishment of transfer stations. In Dar-es-Salaam, Tanzania, the government took a bold step in 1991 to privatize the collection and transportation aspect of SWM. In Cairo Egypt, the government invited international bidders for the SWM when the Council services failed. Jacorossi Impresse is one having a 15 year contract to clean the waste (Magutu, & Onsongo, 2011),

This study provides the hope that SWM can be managed by providing solutions that are out of the traditional mind-set box that only local government should carry out SWM.

2.7 Theoretical framework

This research is guided by the Citizen Participation Theory. According to Corgan & Sharpe (1986). In their journal, Unpacking participation models, meaning and practices, the roots of citizen participation can be traced to the ancient Greece and colonial New England. It was institutionalised in the 1960s with Lyndon Johnson's Great Society Programs (Corgan & Sharpe, 1986). Whereas this theory originated during the early Greek empire, it has undergone modifications (Parker, 2003).

A description by Wandersman, Florin, Friedmann, and Meier, Citizen Participation has been regarded as "the essence of democracy" and a "force for creating a sense of community and a sense of control over our lives and institutions". In 1990, they further got to define the theory as "a process in which individuals take part in decision making in the institutions, programs,

and environments that affect them” This definition does not describe what kind of process is involved, how individuals participate in it, or how much influence citizens might have in the decision making. A broader view by Renn, Webler, & Wiedemann in 1995 defines “public participation” as “forums for exchange that are organized for the purpose of facilitating communication between government, citizens, stakeholders and interest groups, and businesses regarding a specific decision or problem”. This broader definition suggests a collaborative process through which communication is exchanged and power is shared among diverse participants. How to facilitate this process of communication exchanging and power sharing presents public policy makers with a fundamental challenge. This challenge is on how best to involve citizens in decision-making processes that produce effective policy outputs and meet democratic expectations (Webler & Tuler, 2000).

A paper on citizen participation in democracy comparing citizen participation in the 1950s and 1960s shows that Democracy has evolved a lot over time. This is so because citizen are now more involved in governance especially in decision making. It further observes that participatory democracy theorist insist that democratic procedures should not be confined to politics but to extend to other institutions such as work places and local levels where citizens have control over issues affecting their daily lives (Bieglbauer, & Loeber, 2010).

Citizen participation is now accepted as a necessary part in urban planning and development and also a good aspect in urban governance. In Germany, citizen participation is regulated by the Federal Building Code in the process of urban planning and development. It follows a two-step format; first, public participation is done at the earliest possible stage. This is followed by the publication of the plan which is then given a month for any suggestion from everybody. This enhances public and private stakeholders’ interest to be captured (Muller-Jokel, 2003).

Administrators now view citizen participation as one of the strategies of gaining advice, co-opting pressure and improving services as this legitimatizes their policies. The approach framework employed in engagement being administrative and not political. However, citizen participation can be less inclusive if it is based on self-selection, self-selection tends to favour the educated, the wealthy, the more vocal and those with intense interest against the others. Citizen participation with citizen having some powers can lead to disaffection leading to decisions that are unrelated to the citizenry (Warren, n.d).

In a study named “role of citizen participation in sustainable development of urban areas; it was observed that citizen feel responsible for their neighbourhood. It was also observed that they are interested in decision making and participation in development plans in their neighbourhoods. The study recommended active use of citizen participation in decision making and also adaptation of self-participation, encouragement and strengthening of citizen participation in decision making (Kashi, & Ghobadi, 2013).

In this research project, there are two reason why this theory holds. First, the urgent changes needed to be achieved through households and the community. That is, households would feel part of the SWM when engaged in decision making and seeing waste as a resource that can create wealth. Secondly, households and the community will realise the clean environment in their neighbourhood and the opportunity to play a part bettering it.

2.8 Conceptual Framework

A conceptual framework is a set on broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation. This is the research blue print that has been used to help and guide this research project study. It creates awareness and understanding of the situation under scrutiny and communicates the same (Kombo, & Tromp, 2013). This conceptual framework has linked the problem and the fields that have been studied in order to provide answers. This conceptual framework is based on the four objectives of this research project. The independent variables have been broken down in indicators that were studied to provide answer to the research questions. Answers to the research questions have provided information to the identified statement of the problem on factors that influence the implementation of the NSWMS.

In addition, the dependant variable were identified namely; the result desired after the study is completed. To avoid confounding the research project study, an extraneous variable was identified. In order to get data for analysis for the four independent variables, the dependant variable and extraneous variable, each variable was broken down to its respective indicators which were studied and data collected.

Independent variables

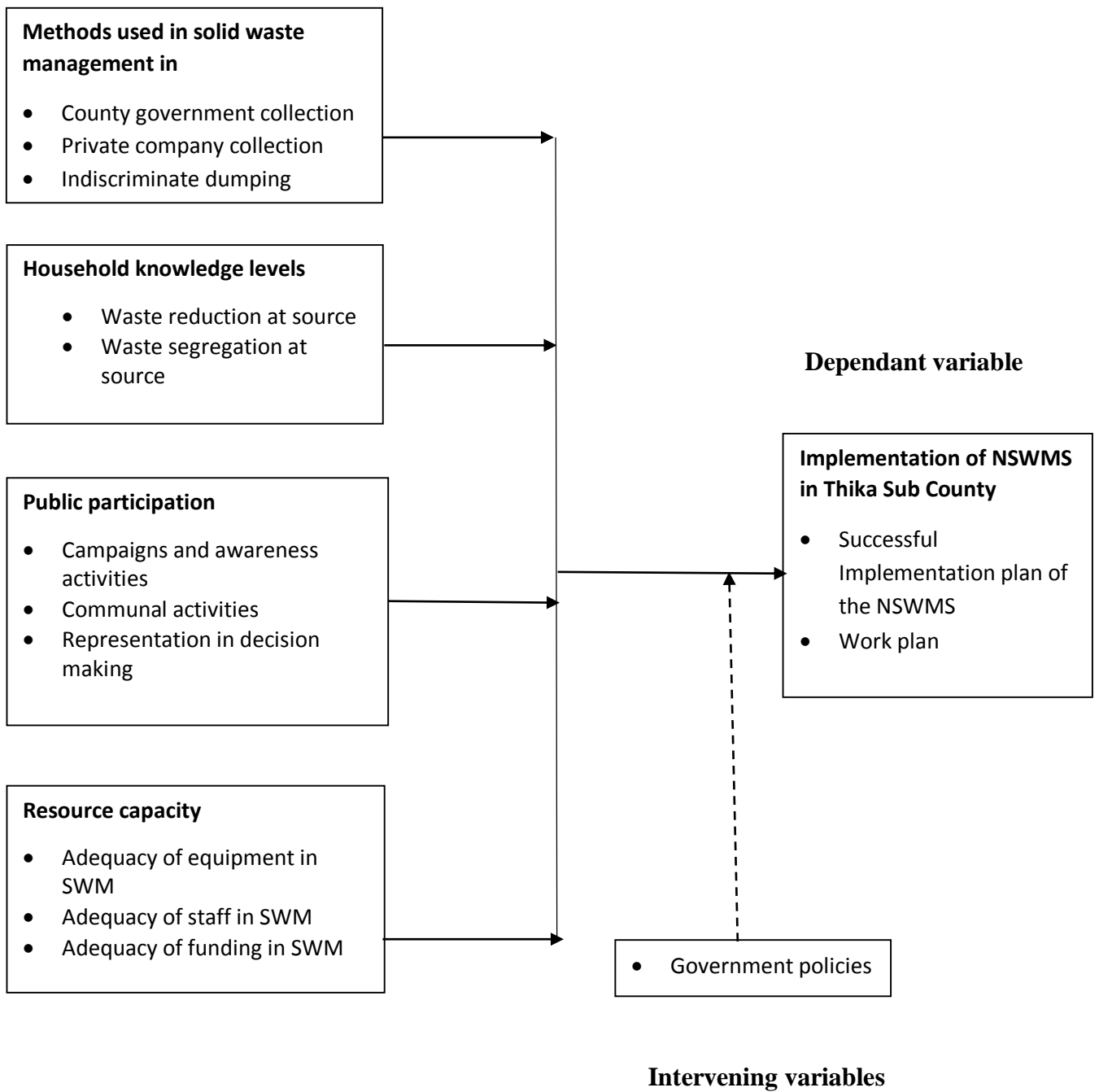


Figure 1: Conceptual frame work

2.9 Knowledge gap in this research project.

The table 2.1 represents a summary of the identified knowledge gaps. From reviewed literature it was been observed that there are knowledge gaps relating to the factors influencing the implementation of the NSWMS. This gaps were in the areas of solid waste collection at households, household knowledge levels on solid waste and public participation in SWM.

Table 2.1 Summary of knowledge gap in this study

Author(s)	Title of study	Observations	Knowledge gaps
Babayemi, & Dauda, 2009	Evaluation of Solid Waste generation, categorisation and disposal options in developing countries: a case of Nigeria	-Collection services only catered for 35.8% of solid waste generated. -64.2% of the solid waste was indiscriminately disposed of in Nigeria	-No indication on who were involved in solid waste collection -What was the reason for high indiscriminate waste disposal
Koen, & Tsurumi-Ku, 2009	Solid waste management	Involvement of communities and cooperatives in SWM can produce beneficial results	-Management of communal collection points -How community could be engaged
Dasgupta, 2013	Sustainable solid waste management of Bhopal City	Biodegradable waste needs to be collected regularly in the tropics	-Household involvement in SWM
Adewole, 2009	Waste management towards sustainable development in Nigeria: A case of Lagos State	Scavengers' role is important in SWM Recycling can improve SWM performance in	-How domestic solid waste generators can be involved

		waste-to-wealth and waste-to-energy	
Dasgupta, 2013	Sustainable solid waste management of Bhopal City	Sorting and recycling at households can improve SWM performance	Household knowledge on recycling and sorting
Koen, & Tsurumi- Ku, 2009	Solid waste management	Need for training on solid waste separation Use of multi-media in education campaigns	
Firdans, & Ahmad, 2010	Management of Urban solid waste pollution in developing countries	Need to involve NGOs and CBOs There was no community mobilization	Households involvement not addressed
Kirunda, 2009	Public participation in solid waste management: challenges and prospects: A case of Kira Town Council, Uganda. Masters thesis	Fear of perceived dangers and social norms deter public participation. Poor knowledge levels by the public in SWM	The study does not address the resource capacities in SWM
Oyoo, Leemans, & Mol, 2010	Future projections of Urban waste flows and their impacts in African Metropolises Cities	Lack of adequate waste transfer facilities Private SW collection companies do not operate in low income residences	-Models in the study were based on assumptions that are likely to change. -Solid waste collection and public participation not addressed

Xuan, & Ling, 2014	The narration and forecast of overseas municipal solid waste management research	Resources in SWM are mostly not adequate There is poor cooperation between the residents and the waste collectors	Waste reduction and recycling at source was not addressed
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CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter has dealt with the research designs and research methodology that have been used to collect the relevant data. It has also addressed the issues of research design, target population, sampling procedure, methods of data collection, operational definition of variables, methods used in data analysis and ethical issues.

3.2 Research Design

Research design is a structure the research study has adopted in order to provide for the answers to the research problem (Kombo, & Tromp, 2013). This research project has adopted the mixed method research approach. This is where quantitative and qualitative research approaches are used together. The research design used is the descriptive survey research design. Descriptive survey research design is defined as a process of collecting data in order to test hypothesis or to answer questions relating to the current state of a given phenomenon under study (Mugenda, & Mugenda, 2003). Descriptive Research Design is based on the positivist paradigm which holds that there is only one objective reality that is independent of the observer. This reality is discovered through a scientific research method. The purpose of positivist is to explain, to predict and to control phenomena. This design has gathered systematic and factual information that describes the characteristics of the sample population (Wambugu, Kyalo, Mbi, & Nyonje, 2015).

The researcher chose this design because of its characteristics. The researcher by use of this design was able to explain, predict and control the phenomena which is factors that influence the implementation of the Nation Solid Waste Management Strategy. This design also enabled the researcher to gather the relevant data for this research project. In addition, the researcher was able to generalise the findings to the target population as well as describe the existing phenomena by getting original data from the sample elements. This research project has several variables emanating from the four objectives of this study, which the researcher has explored and explained.

The design however has some demerits. First, the design is dependent on the cooperation of the sample elements. If the elements give inaccurate data then the whole study fails. Secondly, information not known by the respondent has not been captured and thirdly, information which

the respondent deemed as secret and personal could encourage incorrect responses (Wambugu, Kyalo, Mbii, & Nyonje, 2015). The researcher was able to get an in-depth information on factors that influence the implementation of the National Solid Waste Management Strategy.

3.3 Target Population

The target population for this research project was households in Kamenu Sub-location of Makongeni Location, Thika Sub County. This sub location is comprised of five residential estates namely; Makongeni phase 4, Makongeni phase 5, Makongeni phase 6, Kamenu estate and Kiganjo. This represents the residential area with one of the highest population density in Thika Sub-County.

Based on data from The Kenya Bureau of Statistics (2009), the number of households in Kamenu Sub-Location is 12,164 on 33,29km². Kamenu sub-location represents an area with fairly good infrastructure and a fairly homogeneous characteristic.

Table 3.1: Target population

Category	Population
Thika Sub County Staff	17
Kamenu sub location Households	12,164
Private Waste Collectors	10
Total	12,191

3.4 Sample Size and Sampling Procedure

The sample size was determined using the Krejcie and Morgan Table (1970). For populations of 10,000 and 15,000, the sample sizes are 370 and 375 respectively. The number of households in Kamenu ward is 12,164 (KNBS, 2009). For this research project, the researcher had a total sample size of 375 elements. Each strata (residential estate) had 75 elements selected using the simple random technique. Simple Random Sampling was executed by use of computer generated random numbers. From the County government and the private licenced solid waste collecting companies, one and three element respectively were selected purposively. The purposive sampling technique was used to get specific data from the staff of Thika Sub County and the owners of the private solid collection Companies.

Table 3.2: Sample Size

Sample source	Sample size
Makongeni phase 4	75
Makongeni phase 5	75
Makongeni phase 5	75
Kamenu	75
Kiganjo	75
Total	375

3.5 Data Collection Instruments.

Data collection refers to specific information collected and was used to prove or refute a fact. Data collection is a very important exercise and must be carried out with accuracy (Kombo, & Tromp, 2013). This research project used information gathered directly from respondents (primary source) and information not collected directly by researcher and information not collected directly from the user (secondary sources). The instruments that were used in this research project were a questionnaire, an interview schedule and an observation checklist. These three instruments were used in data collection in order to triangulate the data collected.

Questionnaires are the commonly used instrument in data collection. It collects data directly from the elements in the sample population. The questionnaire that was used in this research project was designed to address four areas of information namely; demographic, knowledge, attitude and perception of the elements (Wambugu, Kyalo, Mbii, & Nyonje, 2015). The questionnaire was self-administered with the help of four trained assistants. The questionnaire addressed each specific objective in this research project. The responses obtained from the questionnaire were then analysed.

The questionnaire had open ended and closed ended questions and had six sections. The sections were on demographic information, solid waste collection methods at households', households' knowledge on SWM, public participation in SWM, capital resources in SWM and implementation of the NSWMS. The open ended questions were intended to give the respondent the feel of freedom to air his/ her idea(s). Meanwhile, the closed ended questions limited the ambiguity in varied responses. This helped the researcher have the opportunity to get an in-depth information. The main instrument, the questionnaire was pre-tested to ensure validity.

The interview schedule was used in the purposive sampled element to get specific information. The checklist was used as an instrument to record observation as questionnaires were

administered. This helped capture information not catered for by the questionnaire and the interview schedule.

3.6 Piloting the Instruments

The instrument was piloted by being applied to a similar population as the one targeted by this research project. However, this sample population was not included in the actual study. The reason for piloting the instrument was to validate it on its capability to collect the required data. The questionnaire was streamlined by removing ambiguities and other errors observed during their administration and evaluation. The researcher used Kenyatta road estate in Juja as the piloting area where 40 questionnaire were distributed.

3.7 Validity of the Instruments

Validity refers to the appropriateness, meaningfulness and usefulness of the conclusions a research makes. It relates to the results an instruments gives (Wambugu, Kyalo, Mbii & Nyonje, 2015). Validity is the testing of an instrument to ascertain that it will be capable of ensuring accuracy and meaningfulness of inferences which are based on the research results Mugenda, & Mugenda, (2003). For the instrument to be valid, they must produce data that can be analysed and when analysed, be able to provide answers to the research question. The instruments underwent a content validity where they were scrutinized by three experts.

3.8 Reliability of the Instruments

Reliability as defined by Mugenda and Mugenda (2003), is a measure of the degree of consistency in a research instrument to produce the same data or results in every repeated application of the instrument. To ensure reliability, the data collection instrument was subjected to the Test-Retest method. Test-Retest method is measuring an element on the same instrument but at different times. The results are then correlated. It can be affected by the element's mood change between the Test and Retest (Wambugu, Kyalo, Mbii, & Nyonje, 2015).

Correlation was calculated using Carl Pearson Product Moment Correlation Coefficient. The Test-Retest method was carried out in a space of two weeks from each other. The calculated correlation obtained was 0.89. This indicated a strong positive correlation against the threshold coefficient of 0.75 the research aimed at.

3.9 Data Collection Procedure

Data was collected after determining the tools to be used to collect data (Wambugu, Kyalo, Mbii, & Nyonje, 2015). The research used a questionnaire, an interview schedule and a checklist. The researcher collected data by self administering the questionnaires to the elements being assisted by trained research assistants.

3.10 Data Analysis Method

Data collected from the field was analysed, presented and interpreted to make it meaningful to the audience of the research work. The data was classified into nominal, ordinal, interval and ratio data. This facilitated the respective statistical analysis namely; descriptive or inferential statistic (Wambugu, Kyalo, Mbii, & Nyonje, 2015). For descriptive statistics, percentages and frequencies were calculated while for inferential statistics variances were calculated where Carl Pearson Product Moment correlation Coefficients were determined. The data was analysed using the SPSS (ver. 20) computer statistical package.

3.11 Ethical Issues

The researcher committed to safe guard any information and or data collected. The same was used solely for the purposes of this research. Privacy of all respondents was respected and documents from respondents were used with great care and protection from any unintended use. This was achieved by proper communication and letters of commitment to ethical practices.

Civil language and professionalism were used in administering the data collection instruments. The researcher committed to treat all information and data collected for the research project in total confidentiality. Relevant authorisation letters from relevant authorities and proper identification documents were applied for and acquired.

3.12 Operationalization of Variables

Objectives	Variables	Indicators	Measuring Level	Tools Of Data Collection	Tools Of Analysis	Dependant Variables
Determine extent methods influence solid waste management performance	Waste collection methods at households	County government collection Private company collection Indiscriminate dumping	Ordinal Interval Nominal Ratio	Questionnaire	Measurement of central tendencies. Mode, Mean and Average for descriptive statistics and ANOVA for inferential statistics.	Implementation of the NSWMS
Establish how households' knowledge level influence solid waste management performance	Households' knowledge levels on solid waste management	Waste reduction at households Waste sorting at households Waste re-use at households	Ordinal and Nominal	Questionnaire	Mode, Average and Mean	
To establish the influence of public participation in solid waste management on implementation of NSWMS	Public participation in solid waste management	Campaigns and awareness activities Communal activities Representation in decision making	Ordinal and Ratio	Questionnaire and interview schedule	Measurement of central tendencies. Mode, Mean and Average for descriptive statistics and ANOVA for inferential statistics	

To determine the influence of capital resource in solid waste management on implementation of NSWMS	Resources capital strength	Sub County Human resource in SWM Sub County Equipment resource in SWM Sub County Financial resource in SWM	Ordinal Ordinal and ratio	Questionnaire and interview schedule	Measureme nt of central tendencies. Mode, Mean and Average for descriptive statistics and ANOVA for inferential statistics	
Implementation of the NSWMS in Thika Sub County	Dependant variable: Improvement on SWM practice towards zero waste principle.	Implementation plan of the NSWMS Work plan for the NSWMS programs	Interval Ratio	Questionnaire and interview schedule	Measureme nt of central tendencies. Mode, Mean and Average for descriptive statistics and ANOVA for inferential statistics	

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents the data analysis, presentation and interpretation of the findings on the factors influencing the implementation of the NSWMS. Descriptive statistics has been used to analyse and interpret the findings. Presentation has been done using tables which have then been discussed.

4.2 Questionnaires and response rate

In this research project, 375 questionnaires were distributed to households in Kamenu sub location in Thika sub-county and collected back after 5 days. The number of returned questionnaires was 308 but 8 were poorly filled up and thus discarded from this survey. There was a good return rate of questionnaires at 80.0%. Based on Mugenda, and Mugenda, (2003), a response rate of over 70.0% is excellent. Table 4.1 shows the response rate.

Table 4.1: Response Rate by Residential Estate

Estate	Response	Target	Percentage
Makongeni phase 4	67	75	89.3
Makongeni phase 5	54	75	72.0
Makongeni phase 6	49	75	65.3
Kiganjo	64	75	85.3
Kamenu	66	75	88.0
Total	300	375	80.0

4.3 Demographic Information

Demographic data was collected based on gender, age, education level attained and monthly income levels and the data was subjected to descriptive statistics analysis.

Table 4.2: Respondents by Gender

Gender	Frequency	Percentage
Male	123	41.0
Female	177	59.0
Total	300	100.0

Table 4.2 represents respondents by gender. There were more respondents from the female gender than from the male. A likely explanation is that more members of the female gender are likely to be at home than male gender during the day. This had a positive implication given that the female gender is mostly at the centre of domestic waste generation in households. Earlier studies indicate that households generate most of the solid waste in Thika Sub County, (Sira, 2010).

Table 4.3: Respondents by Highest Education Level attained

Education	Frequency	Percentage
Primary	8	2.8
Secondary	71	24.7
College	165	57.3
University	44	15.3
Total	288	100.0

Table 4.3 represents respondents by their highest level of education attained. There were 288 respondents who indicated their highest education level attained. Out of these, there were 72.6% with post-Secondary school level of education and 2.8% with primary school education. This had a positive impact in that the respondents were able to comfortably understand and answer the questionnaire.

Table 4.4: Respondents by Age

Age (Years)	Frequency	Percentage
20-29	123	42.0
30-39	115	39.2
40-49	37	12.6
50 and above	18	6.1
Total	293	100.0

Table 4.4 represents respondents by age group. Out of 293 respondents who indicated their age, 81.2% were below 40 years of age. This may indicate representation of families at the most active stage of their life and therefore at their pick in household solid waste generation.

Table 4.5: Respondents by Monthly Income.

Income Per Month (Ksh)	Frequency	Percentage
Below 10,000.00	57	22.1
10,001.00 -15,000.00	47	18.2
15,001.00 -20,000.00	66	25.6
20,001.00 -30,000.00	47	18.2
Over 30,000.00	41	15.9
Total	258	100.0

Table 4.5 represents respondents by their monthly incomes. There were 258 who indicated their monthly income levels. The result indicate that respondents were fairly distributed within the monthly income brackets considered. This research project was therefore able to capture data from the low income earners and high income earners.

4.4 Methods of Waste Collection

Data collected on the methods used in household solid waste collection was analysed to determine how it influences the implementation of the NSWMS. Four solid waste collection methods considered were namely; use of County government vehicles, use of licenced private companies' vehicles, skips and indiscriminate dumping.

Table 4.6 represents the methods that respondents used for solid waste collection against age, education levels and monthly incomes at households. In all the household attributes considered, licenced solid waste private companies contributed to over 60.0% of solid waste collection. This was further supported by the response of 79.3% by the respondents who agreed that the licenced private companies in solid waste collection were offering good services compared to 23.0% of the respondents who agreed that the county government solid waste collectors offered good services.

An interview with the private company involved in solid waste collection said that the private companies most did door to door collections. The county government vehicles had solid waste delivered to a given point for collection. In addition, the county government vehicles collected the solid waste that was indiscriminately dumped and from the skips.

Table 4.6: Respondents by Methods of Solid Waste Collection.

Indicators	Education	Percentage	Age	Percentage	Income	Percentage
			(years)		(Ksh)	
Method of Collection	Frequency		Frequency		Frequency	
County government vehicles	74	25.7	67	22.9	58	22.5
Private companies' vehicles	175	60.8	184	62.8	161	62.4
Skips	17	5.9	17	5.8	18	7.0
Indiscriminate dumping	22	7.6	25	8.5	21	8.1
Total	288	100.0	293	100.0	258	100.0

When analysis was done on respondents' perception on whether there were adequate number of skips in the residential areas, the research project observed that there were not enough skips in the residential areas with 71.0% of the respondents affirming to this. In addition, 66.5% of the respondents expressed that the skips were not emptied regularly. The indiscriminate dumping areas were not cleaned regularly as per a response rate of 62.3% of the respondents. Ranking was done on which method was used more among the four methods of solid waste collection against male, female, age, education and monthly income. The study found out that in all the cases, licenced private companies, county government, indiscriminate dumping and skips ranked 1, 2, 3 and 4 respectively.

From the observation checklist, an observation made was that there were vehicles, both from private companies and the county government which were not covered on top while others did not have tail gates. This is contrary to the requirements by NEMA waste management regulation of 2006 (Govenment of Kenya, 2006) for hauling solid waste. This research project also observed that some skips had overflowing solid waste. This indicated that the skips were either not emptied and or were emptied irregularly; thus supporting the households 66.5% reponse that the skips were not regularly emptied.

4.5 Household Knowledge Level on Solid Waste Management

On household knowledge levels in SWM, data was collected and analysed to establish the extent household SWM knowledge levels influenced the implementation of the NSWMS. The knowledge levels considered were on solid waste reduction awareness at households, solid waste segregation awareness, and legal requirements, training needs, solid waste collection fees and penalties for indiscriminate dumping. These were analysed against age, education levels and monthly income.

Table 4.7: Response on Awareness of Solid Waste Reduction by Age.

Age (years)	Frequency	Percentage	Total
20-29	53	45.3	117
30-39	36	32.1	112
40-49	21	60.0	35
50 and over	5	29.4	17
Total	115	40.9	281

Table 4.7 represents respondents who were aware of solid waste reduction based on age groups. On intra group comparison, there was higher awareness on solid waste reduction within the 40-49 year old age group than in the rest of the age groups. This was followed by 20-29 year old age group. However, overall awareness was at 40.9%. This indicated a need to create more awareness especially to the households with below 40 years old. This is because they form the majority age group in households as shown in Table 4.4. There was a strong positive correlational coefficient of 0.935 when age was compared to household awareness level in solid waste reduction. However, this results did not meet this research projects threshold on level of significance.

Table 4.8: Response on Awareness of Solid Waste Reduction by Education levels.

Highest Education Attained	Frequency	Percentage	Total
Primary	3	33.3	9
Secondary	18	27.3	66
College	65	39.4	165
University	26	60.5	43
Total	112	43.6	257

Table 4.8 represents respondents who were aware of the solid waste reduction based on different education levels. An Intra group comparison indicated that those with the university level of education were more aware on solid waste reduction at 60.5% response rate. The rest of the education levels had awareness response rates below 40.0%. This was supported by a significant positive correlation of 0.965 as shown in Table 4.9

Table 4.9: Education levels and Awareness in Solid Waste Reduction Correlation.

		Education level	Awareness level on solid waste reduction
Education level	Pearson Correlation	1	.965*
	Sig. (2-tailed)		.035
	N	4	4
Awareness level on solid waste reduction	Pearson Correlation	.965*	1
	Sig. (2-tailed)	.035	
	N	4	4

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.9 shows the correlation between the education levels against the level of solid waste reduction awareness. There is a very strong positive relationship between the level of education and the level of awareness in solid waste reduction at households. The higher the level of education, the higher the level of awareness. In Table 4.3, education categories below university education level form 84.8% of the households in Kamenu Sub Location. These are the same categories that have solid waste reduction awareness levels of less than 40.0%. This observation supports the need to education households on solid waste reduction at source.

Table 4.10: Awareness in Solid Waste Reduction and Monthly Income.

Monthly Income In Ksh	Frequency	Percentage	Total
Below 10,000.00	16	28.6	56
10,001.00 -15,000.00	21	43.8	48
15,001.00 -20,000.00	25	37.3	67
20,000.00 -30,000.00	24	51.1	47
Over 30,000.00	22	56.4	39
Total	108	42.0	257

Table 4.10 represents respondents that were aware of solid waste reduction based on their monthly income levels. Intra group comparison indicated that those at higher levels of monthly income were more aware on solid waste reduction. However, the overall solid waste reduction awareness at household was at 42.0%. This indicates a need to increase levels of solid waste reduction at households and more so to monthly income earners of Ksh20,000.00 and below. Analysis on monthly income levels collaborated those on age groups and education levels. However, when a correlation analysis was done, there was a very weak correlation coefficient of 0.093 when monthly income was compared to awareness level in solid waste reduction at households. The result indicated that awareness level in solid waste reduction at households was not influenced by monthly incomes.

Table 4.11: Awareness in Solid Waste Segregation and Age groups.

Age (Years)	Frequency	Percentage	Total
20-29	46	38.7	119
30-39	49	41.9	117
40-49	16	45.7	35
50 And Over	9	47.4	19
Total	120	41.4	290

Table 4.11 represents respondents that were aware of solid waste segregation based on age groups. The results did not show much descriptive difference intra age groups. Nevertheless, the overall solid waste reduction at households was at 41.4%

Table 4.12: Awareness in Solid Waste Segregation and Education levels.

Highest Education Attained	Frequency	Percentage	Total
Primary	2	22.2	9
Secondary	17	24.3	70
College	68	41.2	165
University	27	62.8	43
Total	114	40.6	281

Table 4.12 represents respondents that were aware of solid waste segregation against education levels. Based on intra group comparison, there was increased awareness on solid waste segregation

with increased education level. Within the university level of education, the awareness level was 62.8 %. The rest of the groups indicated awareness levels of less than 50.0%. Overall household solid waste segregation awareness was 40.6%. This was supported by a strong significant positive correlation coefficient of 0.952 as shown in Table 4.13. The results observed in Table 4.13 indicate that education has a significant, strong positive influence on the level of education at households. There is therefore need to education households on solid waste segregation and this will have a positive influence on the implementation of the NSWMS.

Table 4.13: Education levels and Awareness in Solid Waste Segregation Correlation.

		Education level	Awareness level on solid waste segregation
Education level	Pearson Correlation	1	.952*
	Sig. (2-tailed)		.048
	N	4	4
Awareness level on solid waste segregation	Pearson Correlation	.952*	1
	Sig. (2-tailed)	.048	
	N	4	4

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.14 Awareness in Solid Waste Segregation by Monthly Income.

Monthly Income Ksh)	Frequency	Percentage	Total
Below 10,000.00	14	25	56
10,001.00 -15,000.00	21	42.9	49
15,001.00 -20,000.00	20	29.9	67
20,000.00 -30,000.00	29	60.4	48
Over 30,000.00	28	68.3	41
Total	112	42.9	261

Table 4.14 represents the respondents that were aware of solid waste segregation against monthly income levels. On an intra-group comparison, there was increased awareness on solid waste segregation with increased monthly income levels. Respondents with incomes higher than Ksh20,000.00 indicated awareness levels of higher than 50.0% within their respective groups. The rest of the groups indicated awareness levels of less than 50.0%. Overall solid waste segregation

awareness was at 42.9%. There is need to increase solid waste segregation awareness considering that those with less than Ksh20,000.00 constitute 65.9% of the households in Kamenu Sub Location.

Table 4.15: Response on different Media to enhance SWM by Age groups

Age (Years)	Frequency	Percentage	Total
20-29	91	88.3	103
30-39	92	87.6	105
40-49	30	83.3	36
50 And Over	12	92.3	13
Total	225	87.5	257

Table 4.15 represents respondents who agreed that different media platforms (Radio, TV, posters, newspapers, SMS, banners, etc.) would enhance campaigns in SWM. There was a high indication by all age groups in favour of the use of different media in SWM campaigns. Overall, 87.5% considering age group agreed that different media platforms would enhance SWM. Similarly high results were also obtained when comparisons were done by education levels and monthly income with 89.0% and 90.2% respectively being in favour.

Table 4.16: Responses of Various SWM Knowledge levels by households.

Parameter	Agree		Disagree		Total
	Frequency	Percentage	Frequency	Percentage	
Scoring					
Fee charged for solid waste collection is acceptable	185	65.4	98	34.6	283
I need to pay for solid waste collection	175	60.5	114	39.5	289
I like the method used in solid waste collection	181	79.7	46	20.3	227
The law requires me to manage my solid waste	161	58.5	114	41.5	275
I need to be trained on solid waste management	249	88.9	31	11.1	280
There is no open dumping ground near my house	127	43.1	168	56.9	295
I should be penalized for dumping waste in the open grounds	155	55.4	125	44.6	280

Table 4.16 represents respondents' level of agreeing or disagreeing on various aspects of SWM. The households had a fairly high rate of acceptability on the fee charged for waste collection and the need to pay for solid waste collection, with responses in favour at 65.4% and 60.5% respectively. There was a high response in favour to be trained in SWM at 88.9%. The study result indicate that the households had a good general knowledge on issues of solid waste management. However, their knowledge on technical aspects on how to management solid waste was low.

4.6 Public Participation in SWM

On public participation, data was collected and analysed to establish the extent public participation influenced the implementation of the NSWMS. Aspects considered were levels of representation in SWM decision making, youth involvement in SWM and need to have residential committees to

address solid waste matters. These were analysed by age groups, education levels and monthly incomes.

Table 4.17 Response to representation in SWM decision making by age.

Age (Years)	Frequency	Percentage	Total
20-29	73	65.8	111
30-39	73	64.6	113
40-49	22	61.1	36
50 and over	9	52.9	17
Total	177	63.9	277

Table 4.17 represents respondents that felt not represented in SWM decision making by age group. The results indicate that over 50.0% of respondents in each of the age groups felt they are not represented in SWM decision making. The younger age groups felt more unrepresented. Overall there was a 63.9% of the households by age groups who felt they were not represented in SWM decision making. Similar results were observed when analysis was done on education and the monthly income. There was a bigger perception by low income earners of being unrepresented. This was in the groups with monthly income of Ksh20,000.00 and below where more than 70% of the respondents felt unrepresented.

On solid waste activities involvement, the levels of involvement were at 20.6%, 20.9% and 20.7% by age groups, education levels and monthly income respectively. The households had low levels of involvement in SWM activities. As the main generators of solid waste, they need to involve households more in solid waste activities.

Analysis on the households that did not agree that communities were involved in solid waste decision making had the following results. 82.9%, 82.6% and 77.9% by age groups, education level and monthly income respectively of respondents who did not agree that the community was represented in solid waste management decision making.

On the need to have residential SWM committees, the results observed were 95.7%, 95.4% and 96.4% by age groups, education and monthly income levels respectively. This indicates a strong need for the establishments of these committees. These observations were supported by strong

positive correlation coefficients of 0.998 and 0.990 by age groups and monthly incomes. This observation corroborates the one observed on need to be trained on SWM in Table 4.16.

4.7 Resource Capacity and Solid Waste Management

Data was collected and analysed to determine how resource capital influences the implementation of the NSWMS. The resources considered were equipment adequacy, adequacy in SWM staffing and adequacy in SWM funding. These were analysed against age groups, education levels and monthly income levels.

Data was collected and analysed based on how different age groups, education levels and monthly income levels agreed that equipment in solid waste management was adequate.

Table 4.18: Response on Equipment Adequacy in SWM by Age group.

Age (years)	Frequency	Percentage	Total
20- 29	54	47.4	114
30- 39	63	56.3	112
40- 49	18	54.5	33
50 and above	7	38.9	18
Total	142	51.3	277

Table 4.18 represents respondents who agreed that the equipment in SWM is adequate by age group. Overall, 51.3% of the respondents agreed that equipment in solid waste management was adequate.

Table 4.19: Response on Equipment Adequacy in SWM by Education levels.

Education level	Frequency	Percentage	Total
Primary School	8	62.5	8
Secondary School	19	27.1	70
College	97	62.6	155
University	25	61.0	41
Total	146	53.3	274

Table 4.19 represents respondents who agreed that equipment in SWM is adequate by education levels. Overall, 53.3% of the respondents agreed that equipment was adequate by education level.

Table 4.20: Response on Equipment Adequacy in SWM by Education levels.

Monthly Income level (Ksh)	Frequency	Percentage	Total
Below 10,000.00	16	30.2	53
10,000.00 -15.000.00	29	51.8	56
15001.00 -20,000.00	29	50.9	57
20,001.00 -30,000.00	35	76.1	46
Over 30,000.00	25	67.6	37
Total	134	53.8	249

Table 4.20 represents respondents who agreed that equipment in SWM is adequate by monthly income levels. Overall, 53.8% agreed that equipment was adequate.

Data was collected and analysed based on how different age groups, education levels and monthly income levels agreed that staff in solid waste management was adequate.

Table 4.21: Response on Staff Adequacy in SWM by Age.

Age (years)	Frequency	Percentage	Total
20- 29	44	37.3	118
30- 39	59	54.6	108
40- 49	18	52.9	34
50 and above	7	41.2	17
Total	129	46.6	277

Table 4.21 represents respondents that agreed that staff in SWM was adequate by age groups. Overall, 46.6% agreed that staff was adequate in SWM.

Table 4.22: Response on Staff Adequacy in SWM by Education levels.

Education level	Frequency	Percentage	Total
Primary School	3	37.5	8
Secondary School	17	24.3	70
College	87	56.1	155
University	23	56.1	41
Total	130	47.4	274

Table 4.22 represents respondents who agreed that staff in SWM is adequate by education levels. Overall, 47.6% agreed that staff was adequate.

Table 4.23: Response on Staff Adequacy in SWM by Monthly Income levels.

Monthly Income level (Ksh)	Frequency	Percentage	Total
Below 10,000.00	17	31.5	54
10,000.00 -15.000.00	27	50.9	53
15001.00 -20,000.00	24	42.1	57
20,001.00 -30,000.00	32	71.1	45
Over 30,000.00	24	66.7	36
Total	124	50.6	245

Table 4.23 represents respondents that agreed that staff in SWM was adequate by monthly income. Overall, 50.6% were in agreement.

Data was collected and analysed based on how different age groups, education levels and monthly income levels agreed that staff in solid waste management was adequate.

Table 4.24: Response on Funds Adequacy in SWM by Age groups.

Age (years)	Frequency	Percentage	Total
20- 29	41	37.6	109
30- 39	54	52.4	103
40- 49	15	46.9	32
50 and above	7	43.8	16
Total	117	45.0	260

Table 4.24 represents respondents that agreed that funds in SWM were adequate by age groups. Overall, 45.0% were in agreement.

Table 4.25: Response on funds adequacy in SWM by educational levels.

Education level	Frequency	Percentage	Total
Primary School	3	42.9	7
Secondary School	17	25.8	66
College	79	53.0	149
University	25	61.0	41
Total	124	47.1	263

Table 4.25 represents respondents that agreed that funds in solid waste management were adequate by education levels. Overall, 47.1% were in agreement.

Table 4.26: Response on funds adequacy in SWM by monthly income levels.

Monthly Income level (Ksh)	Frequency	Percentage	Total
Below 10,000.00	14	28.0	50
10,000.00 -15,000.00	23	42.6	54
15001.00 -20,000.00	23	43.4	53
20,001.00 -30,000.00	29	69.0	42
Over 30,000.00	23	67.6	34
Total	112	48.1	233

Table 4.26 represents respondents that agreed that funds in SWM are adequate by monthly income levels. Overall, 48.1% agreed that funds were adequate.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS OF THE STUDY

5.1 Introduction

This chapter puts up the summary of findings from analysed data result in chapter 4. The findings obtained have been discussed; and based on this study's research questions, recommendations have been made. Discussions have been done against the empirical findings in the literature and a conclusion made on factors that influence the implementation of the NSWMS. It also has recommendations on application of this research project's conclusions and suggestions for further research study areas.

5.2 Summary of findings.

This summary is on the findings of factors that influence the implementation of the NSWMS. Collected data was analysed in order to provide answers to the research questions.

The sample population gender distribution was 123 male and 177 female representing 41.0% and 59.0% respectively. The higher female gender distribution could be explained by that fact that the female gender is more likely to be found in the homes during the day than the male gender. 72.0% of the respondents had attained post-secondary level of education and 2.8% being of primary school level. This had a positive impact to the study as majority of the respondents were able to understand and fill in the questionnaire.

Over 80.0% of the respondents were below 40 years of age. This represented households that were likely to be most active in domestic solid waste. This again was a positive aspect to the study given that other studies have indicated that household solid waste constituted the highest volume of solid waste generated in Thika. On monthly income, the respondents were fairly distributed within the different monthly income categories considered. This gave the study a good opportunity to capture data from low to high income earners.

The study observed that 62.5% of the solid waste from households was collected by the licenced solid waste private collectors. The county government solid waste collection accounted for 24.1% of the waste collected with the balance of the solid waste handled through indiscriminate dumping and the skips at 7.1% and 6.3% respectively. This further indicated that over 80.0% of the household solid waste was collected from the households in Kamenu Sub Location in Thika Sub County.

The knowledge levels considered were on solid waste reduction awareness at households, solid waste segregation awareness, legal requirements in SWM, training needs, solid waste collection fees and penalties for indiscriminate dumping. These were analysed against age, education levels and monthly incomes. The study observed that solid waste reduction awareness levels based on age, education and monthly income was at 41.5%, 39.8% and 43.0% respectively. The overall households' solid waste reduction awareness was at 41.4%. Solid waste segregation awareness levels was at 43.3%, 37.3% and 45.2% for age, education levels and monthly income levels respectively with an overall at 41.9% of households being aware. There were strong positive and significant correlations between solid waste reduction and segregation against education levels with significant levels of 0.965 and 0.952 for solid waste reduction and segregation respectively at households. The project also observed that 88.9% of the respondents wanted to be trained in SWM. The respondents had a 58.5% awareness that the law requires waste generator to manage their waste while 60.5% were in agreement to payments for solid waste collection.

This study observed that 63.9% of the respondents did not agree that households were represented in SWM matters. Evaluation on need by households to have residential solid waste management committees, there were strong positive and significant correlation coefficients of 0.998 and 0.990 when compared against age and monthly incomes respectively. This was also collaborated by the need by respondents to be trained in SWM.

The overall responses by households that agreed that equipment, staff and funding in solid waste management were adequate were 52.8%, 48.2% and 46.6% respectively.

5.3 Discussion of Findings

The overall awareness levels on technical aspects (reduction and segregation of solid waste) in SWM were found to be low at 41.4% and 41.9% respectively. This relates with observation made by Dasgupta, 2010 where sorting and recycling were observed not to be carried out in low income earners. That study proposed that awareness could improve SWM performance. The same was observed in this study and supported by the strong household response to the need to be trained on SWM at 88.9%. Koen, and Tsurumi-Ku, 2009 in their study identified the need for training in solid waste separation and the use of multi-media in solid waste management campaigns. The finding in this study concur on the need to training/ educate households on solid waste reduction and separation. It also concurred with the need for the use of multi-media in solid waste campaigns.

This study observed high involvement in solid waste collection by licenced private companies in solid waste collection. This study also identified a felt concern that the number of skip within the households were not adequate with 71.0% of the respondents holding this view. Similar observations on need to have more skips were observed in studies by Furdans, and Ahmad, (2009) and Oyoo, Leemans, and Mol, (2010). However, contrary to the findings by Oyoo, Leemans, and Mol, (2010), this study observed high involvement by private companies on solid waste collection. This observations were also contrary to observations made by Sira, (2010) which observed 15.0% private company solid waste collection against the 62.5% observed in Kamenu Sub Location.

On indiscriminate dumping, this study observed a 56.9% response by respondents who agreed that there were indiscriminate dumping grounds near their houses. In a study in Nigeria by Babayemi, and Dauda, (2009), it was observed that solid waste collection service catered for 35.8% with 64.2% disposed of indiscriminately. In this study, combined solid waste collection services catered for 85.9% in Kamenu sub-location of Thika Sub County. This again is unlike observations in Kisumu by Munala, & Moirongo, (2011) where they observed that 80.0% of the solid waste in the residential areas was indiscriminately disposed of. In their study, both the county government and the private companies collected 10.0% each of the solid waste generated.

Resources in solid waste management are normally not adequate. This was an observation by Xuan, and Ling, (2014). This study concurs with the observation that the respondents agreed that equipment, staff and funding were not adequate. This was collaborated by findings from the interview with the Thika Sub County Government office staff.

5.4 Conclusions of the Study

The factors that were studied have an influence on the implementation of the NSWMS.

1. The method of solid waste collection at households needs to be addressed to eliminate indiscriminate dumping. This could be done by increasing the waste transfer facilities such as addition of more skips and regularly emptying them.
2. The knowledge level on solid waste management needs to be increased by campaigns and training in SWM on how to reduce and segregate solid waste at source (households). Education was found to have a strong positive significance to awareness levels in solid waste segregation and reduction.

3. The households and the community need to be more involved in SWM activities and also setting up residential solid waste management committees. There was a strong positive significance in the residents need for residential solid waste management committees.
4. There is need to boost the resource capacities but this would be better done after solid waste reduction and segregation at households have been improved. The Thika Sub County Government could take advantage of the positive attitude by households to be trained and that of having the youths involved in SWM.

The NSWMS is based on the zero waste principle where not more than 10.0% of the solid waste generated should go to the landfills. While this study has observed a high solid waste collection rate from households at Kamenu Sub Location, the study observes that there is a lot that needs to be done to attain the zero waste principle. There are positive observations by this study that agencies could use in order to implement the NSWMS. These observations are the positive attitudes by the households to be trained in SWM, their acknowledgement that they have a responsibility to pay for solid waste collection, their expression for the need to have residential solid waste committees, their acknowledgement on their legal obligation on solid waste management and the involvement by the youth to mention a few.

This research project was able to observe several indicators that met the significance levels of 0.95. These indicators consequently led to the conclusion that factors such as household knowledge level in SWM and the need for public participation in SWM are significant in the implementation of the NSWMS. This is attested by the strong positive correlation coefficients observed from the indicators studied in this research project. In addition, this research project has been able to explain, predict and provide control for the factors that influence the implementation of the NSWMS. The observations in this research project are considered to be important in filling the identified knowledge gap necessary in the implementation of the NSWMS. This research project findings are expected to complement the efforts by the county government and other support agencies who are involved in the implementation of the NSWMS.

5.5 Recommendations of the Study

Based on this research project findings, the following recommendation are made.

- i. The county government can formulate programs and education/training packages to empower the households in solid waste reduction and segregation. This will aid towards

achieving the zero waste principle which is that hallmark of the NSWMS. This informed by the positive attitude by households to be involved and trained in solid waste management.

- ii. The county government could help establish the residential solid waste committees. This will create a forum of communication, engagement and working together between the households and the department in solid waste service provision. This is supported by the citizen participation theory.
- iii. The county government could explore the various ways to used different media platforms. This way they could engage a bigger audience and get important inputs such as ideas, criticism, solutions and dynamic perception of the citizenry. In addition, to lobby for solid waste management to be included in the school syllabus.

5.6 Suggestions for Further Research

To enhance the findings of this study, the following research areas are proposed.

- i. Study on how the community could be involved in solid waste management in an economically, effectively and in a sustainably.
- ii. Study on the potential for the youth to generate wealth sustainably and professionally from solid waste.

REFERENCES

- Adewole, A. T. (2009). *Waste Management towards Sustainable Development in Nigeria: A case of Lagos state*. International NGO Journal Vol. 4 (4), pp. 173-179.
- Anna M., A. M. (2012). *2012 South Africa Environmental Outlook*. Environmental Affairs of South Africa.
- Antony, R. & Liss, G., (2013). *Waste Management Hierarchy*. Retrieved from <http://www.zerowaste.sa.gov.au/About-Us/waste-management-hierarchy>
- Atienza, A. V. (n.d). *A breakthrough in Solid Waste mnagement through participation and Community Mobilization. The experince of Los Baños, Lagun, Philippines*. Laguna: Ritsumeikan Asia Pacific university.
- Babayemi, J. O. & Dauda, K.T., (2009). *Evaluation of Solid Waste Generation, Categories and Disposal Options in Developing Countries: A case study of Nigeria*. Journal applied Science Environment Management. vol. 13 (3), pp. 83-88.
- Bhada-Tata, D. H. (2012). *what a waste*.
- Bieglbauer, P. &. (2010). *The Challenges of Citizen Participation in Democracy*. Vienna.
- County Government of Kiambu. (n.d). *County Integrated Development Plan, 2013-2017*. Kiambu: County Government of Kiambu.
- Dasgupta, T. (2013). Sustainable Solid Waste Managemnt of Bhopal City. *International Journal of Scientific Engineering and Technology*, 1103-1106.
- Filaba, M. A., (2008). Waste Management Problems in Jimma, Southern Ethiopia. *Ehtioipian Journal of Environment Studies and Management Vol 1 No. 2*.
- Firdans, G. & Ahmad, A., (2010). Management of Urban Solid waste Pollution in Developing Countries. *Int. J. Environ. Res 4 (4)*, 795-806.
- Furedy, C. (1991). *Citizen Participation in Solid Waste Management*. Bandung: International Expert group.
- Gachago, J. (2013). *An investigation of Fire Risk in Kiandutu Slum in Thika Sub County, Kenya*. Masters thesis.
- Government of Kenya, (2009). *Census vol 1 Question 1 Poulation, household and density by sub location*. Nairobi: Kenya National Bureau of Statitics.

- Government of Kenya, (1999). *Environmental Management Coordination Act, 1999 - Principle Act*. Nairobi: Law reforms of Kenya.
- Government of Kenya, (2015). *National Environmental Management Coordination Amendment Act*. Nairobi: Law reforms of Kenya.
- Government of Kenya. (2006). *NEMA, waste management regulations*. Nairobi: Law reforms of Kenya.
- Government of Kenya. (2010). *The constitution of Kenya*. Nairobi: The law reforms of Kenya.
- Guagn, Y. (n.d). *Disposal of Solid Waste* . Beijing: Dept. of Environmental Science and Engineering, Tsinghau University.
- Indhira, K., Sentil, J. & Vavidel, S., (2015). *Awareness and Attitudes of people perception towards to household solid waste disposal: Kumbakonam Town, Tamilnadu, India*. Retrieved from Scholars Research Library: <http://scholarsresearchlibrary.com/achieves.html>
- Kaluli, W., Mwangi, H. M. & Sira, F. N., (2011). *Sustainable Solid Waste Management Strategy in Juja, Kenya* . Retrieved from <http://elearning.jkuat.ac.ke/journals/ojs/index.php/jags/article/view/139/140>
- Karanja, A. (2005). *Solid Waste Management in Nairobi: Actors, institutional arrangement and contribution to sustainable development. PhD Dissertation. ISS*.
- Kashi, S.S. & Ghobadi, G. J. (2013). The Role of Citizen Participation in Sustainable Development in Urban Areas. (A case study: Qaermshahr Cit. *International Research Journal of Applied and Bsic Sciences*. Vol, 6 (7), 910-916.
- Kassim, S. (2006). *Solid waste collection by the private collectors. Finding from a study in Dar es Salaam city*.
- Kirunda, M. P. (2009, Decmber). *Master Thesis, University of Agder, Kristiansand*.
- Koen, R., (2005). Solid Waste Management. *UNEP International Environmental Technology Center (IETC) Vol. II Regional Overviews and Information Sources*, 2-110.
- Kombo, D. K., & Tromp, D., (2013 13th reprint). *Proposal and thesis writings* . Nairobi: Don Bosco Printing press.

- Kumar, S. & Chakrabarti, T., (2010). Effective Municipal solid waste management in India. <http://www.interchopen.com/books/waste-management/effective-municipal-solid-waste-management-in-India>
- Magutu, P. O., (2011). *operationalising municipal solid waste management*. Retrieved from integrated waste management volume II: <http://www.intechopen.com/books/integrated-waste-management-volumeii/operationalising-municipal-solid-waste-manangement>
- Mbuligwe, S., (2004). *Assessment of performance of solid waste management contractors: a simple techno-social model and its application*.
- Mugenda, O. M., & Mugenda, A. G. (2003, revised). *Research Methods*. Nairobi: Acts press.
- Mugo, E., Kinyua, R. & Njogu . P., (2015). An analysis of solid waste generation and characterization in Thika Municipality of Kiambu, Kenya. *Journal of environmental science and engineering B 4* (2015) pp 210-215 doi 10.17265/2162-5263/2015.04.005
- Muller-Jokel, R. (2003). Citizen's Participation in Urban Development and Land Management. *2nd FIG Reginal Conference*, (pp. 1-2). Marrakech. Morocco.
- Munala, G. & Moirongo, B. O., (2011). The need for an integrated solid waste management in Kisumu, Kenya. *JAGST Vol. 13* (1) 2011.
- Murray, R. (2002). *Zero Waste*. Canonbury Villas, London N1 2PN, United Kingdom: Published by Greenpeace Environmental Trust.
- NEMA, Kenya. (October, 2014). *National Solid Waste Management Strategy*. Nairobi: Nema.
- Odile schwarz-Herion, A. O. (2008). *A case study on successful solid waste management in industrialised countries*. Retrieved from *Annals Journal of Engineering*.
- Omran, A. M. (2009). Investigating Household attitude towards Recycling of Solid Waste in Malaysia. A case study. *Int. j. environ. Res* 3 (2), 275-288.
- Oyoo, R., Leemans, R. & Mol, A. P. J., (2010). Future Projections of Urban Waste Flows and their Impacts in African Metropolises Cities. *Int. j. Environ. Res*, 5 (3), 705-724.
- Parker, B. (2003, October 21). *Planning Analysis*. Retrieved from The Theory oonf Citizen Participat: <http://page.uregon.edu/rgp/PPPM613/class10theory.htm>
- Rotich, K. H. (2006). *Municipal Solid Waste Manangement Challenges in Developing Countries - Kenya Case Study*, *Waste Management* 26: 92-100.

- SCRD . (August 2011). *solid waste management plan-the foundation for zero waste plan*. Solid Waste Management Plan Update Working Group Department, AECOM Canada Ltd & SCR D Infrastructure Services.
- Shapan, C., & Mohammad, R. (2012). Urban solid Waste Management: A study on Comilla City. *Journal of Economis and Sustainability Development Vol 3, No 6, 1*.
- Sharpe., C. &. (1986). Unpacking models, meanings and practices. *community development journal* 43 (3), 269-283.
- Sira, F. N., (2010). Solid waste management in urban centres in Kenya: Operations, Community Environment and Participation.
<http://journals.jkuat.ac.ke/index.phd/pgthesis.abs/article/view/184>
- Stacy Kotorac, M. J. (n.d.). *A Near waste Strategy*.
- Van Dijk, M. P., & Oduro-Kwarteng, S. (23rd-27th September, 2007). Urban Management and solid waste issues in Africa. *Proceedings of th international conference on solid waste and climate change*. Armsterdam.
- Wambugu, L. N., Kyalo, N. D, Mbii, M. & Nyonje, R. O., (2015). *Research Methods. Theory and Practice*. Nairobi: Aura Publishers.
- Warren, M. E. (n.d). *Citizen Participation and Democratic Deficit: Considerations from the prospective of Democratic Theory*. London: cambridge University Press.
- Xuan, L, & Ling, M., (2014). *The narration and Forecast of overseas municipal solid waste management Resaerch*. Atlamtis Press.

APPENDIX 1. TRANSMITTAL LETTER

ERIC WANJAU

P. O. BOX 4868-01002

THIKA.

21st FEBRUARY, 2016

Dear respondent,

**RE: DATA COLLECTION FOR MY MASTER DEGREE IN PROJECT PLANING AND
MANAGEMENT**

My name is Eric Wanjau and I am a student at the University of Nairobi. I am pursuing a Master of Arts degree in Project Planning and Management (MA, PPM). As a partial fulfilment for the requirement, I have to do a research study project. My Project is on solid waste management at Kamenu sub-location. To collect the collect data, I have a questionnaire that I kindly request you to fill. The information that you give will be treated with uttermost confidentiality and will only be used for the purposes of this study.

You favourable cooperation and honesty is highly appreciated.

Thank you

Yours faithfully

Eric Wanjau

APPENDIX 2. RANDOM NUMBERS TABLE

225 142 291 221 154 254 329 204 202 109 010 207 370 084 187 053 179 077 107 295 208
190 146 278 257 045 203 005 047 019 104 127 234 013 023 092 163 125 339 076 212 357
120 079 002 232 297 301 289 325 217 166 218 061 155 150 266 293 313 253 057 167 113
375 244 261 033 240 273 374 072 224 321 229 129

Specifications: This table of 75 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 1 to 377. Duplicate numbers were allowed. This table was generated on 2/14/2016.

APPENDIX 3. KREJCIE AND MORGAN TABLE

Table for Determining Sample Size from a Given Population

<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.

8. How do you collect solid waste in your house?

- a In a polythene bag { },
- b In a Bin/ Bucket { }
- c Other { }

9. What is the most common method of solid waste collection in your area?

- a. Collection by municipal trucks
- b. Collection by private company trucks
- c. Dumping into nearby bulk metal containers/bins
- d. Dumping in nearby open grounds

10. To what extent do you agree with the way solid waste is collected in your neighbourhood?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED, A = AGREE, SA = STRONGLY AGREE

LEVEL OF AGREEMENT	SD	D	U	A	SA
1. I like the method used in collection of solid waste					
2. I like the frequency of solid waste collection					
3. I am comfortable with the time of the day solid waste is collected					
4. My solid waste is collected from my gate					
5. I agree with the fee charged for my solid waste collection					

11. How many times is waste collected in your neighbourhood?

- a. Once a week
- b. Once every two weeks
- c. Irregularly
- d. Never

12. What other method would you suggest on collection of solid waste in your neighbourhood?

.....

13. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED, A = AGREE, SA = STRONGLY AGREE

LEVEL OF AGREEMENT	SD	D	U	A	SA
1. The private solid waste collectors do a good job					
2. The county government solid waste collectors do a good job					
3. There are enough communal solid waste collection bins in our neighbourhood					
4. The community is well involved in solid waste clean up					
5. Open dump sites have been cleaned in our estate					

14. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED, A = AGREE, SA = STRONGLY AGREE

LEVEL OF AGREEMENT	SD	D	U	A	SA
1. There are scavengers (<i>chokora</i>) who collect solid waste in our area					
2. Scavengers help in solid waste collection					
3. Communal solid waste collection bins are emptied regularly					
4. There is a communal solid waste bin near my house					
5. Communal solid waste collection bins are enough					

SECTION C: HOUSEHOLD'S KNOWLEDGE LEVEL ON SWM

15. Are you aware of any waste **reduction** practices? a) Yes { } b) No { }

16. Are you aware of waste **segregation/ separation**? a) Yes { } b) No { }

17. Do you think that there is a role you could play in solid waste management in your residential area?

- a) Yes { } b) No { } c) I do not know { }

18. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED,

A = AGREE, SA = STRONGLY AGREE

LEVEL OF AGRREMENT	SD	D	U	A	SA
1. I have a solid waste bin in my house					
2. I separate my solid waste in the house					
3. I re-use some of my solid waste					
4. The law requires me to manage my solid waste					
5. I would like to be trained on solid waste management					

19. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED,

A = AGREE, SA = STRONGLY AGREE

LEVEL OF AGRREMENT	SD	D	U	A	SA
1. I should pay for solid waste collection					
2. There is no open ground dumping of solid waste in near my house					
3. Sometimes I dump solid waste in the open ground					
4. Some of the solid waste is burnt near my area					
5. I should be penalized for dumping solid waste in the open grounds					

20. Do you think that use of different media in campaigns would improve peoples' knowledge on solid waste management? (Media = radio, posters, newspaper, SMS, etc)

- a) Yes { } b) No { }

SECTION D: PUBLIC PARTICIPATION IN SOLID WASTE MANAGEMENT

21. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED, A = AGREE, SA = STRONGLY AGREE

LEVEL OF AGREEMENT	SD	D	U	A	SA
1. I am represented in solid waste collection decision making					
2. I have attended solid waste management campaigns					
3. I have been involved in solid waste collection activities					
4. The community is well represented in solid waste collection decisions					
5. The community has been sensitized on solid waste management					

22. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED, A = AGREE, SA = STRONGLY AGREE

LEVEL OF AGREEMENT	SD	D	U	A	SA
1. Youth groups are involved in solid waste management activities					
2. Communal solid waste bins are fenced off					
3. I would like to be involved in solid waste collection decision making					
4. I would advocate for residential solid waste management committees					
5. I think the community would like to be involved in solid waste management activities					

23. To what extent do you see solid waste management as an air pollutant in your neighbourhood?

- a) Serious pollutant b) Moderate pollutant c) Low pollutant

24. To what extent do you see solid waste management as a threat to human health in your neighbourhood?

- a. Serious threat
- b. Moderate threat
- c. Low threat

25. Do you have any other way you think the community could be involved in solid waste management?

.....

SECTION E: RESOURCE CAPACITY ON SOLID WASTE MANAGEMENT

26. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED, A = AGREE, SA = STRONGLY AGREE

LEVEL OF AGRREMENT	SD	D	U	A	SA
1. The equipment solid waste management is adequate					
2. The enough staff in solid waste management					
3. There is a work plan on solid waste management					
4. I think solid waste can be used to generate wealth					
5. Solid waste management has adequate funding					

SECTION F: IMPLEMENTATION OF THE NSWMS, 2014

27. Is there a work plan on solid waste management?

Yes { } No { }

28. Are there sensitization campaigns carried out on solid waste management?

Yes { } No { }

29. Is the public represented in decision making process on solid waste management?

Yes { } No { }

30. What other ways do you think waste could be collected

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

Thank you very much for your participation, cooperation and honesty in answering this questionnaire.

APPENDIX 5. INTERVIEW SCHEDULE

RESOURCE CAPACITY ON SOLID WASTE MANAGEMENT

1. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED, A = AGREE, SA = STRONGLY AGREE

FACTORS/ SCALE	1	2	3	4	5
1. Manpower is adequate in solid waste management					
2. Staffing is adequate in solid waste management					
3. Equipment is adequate in solid waste management					
4. Finances are adequate in solid waste management					
5. Public participation is adequate in solid waste management					

2. To what extent do you agree with the following statements?

KEY: SD =STRONGLY DISAGREE, D = DISAGREE, U = UNDECIDED, A = AGREE, SA = STRONGLY AGREE

FACTORS/ SCALE	1	2	3	4	5
1. Senior staff is well trained on solid waste management					
2. Junior staff are well trained in solid waste management					
3. Equipment in solid waste management is well maintained					
4. There are citizen trainings on solid waste management					
5. There are Public participation campaigns in solid waste management					

3. Do we have a solid waste management plan in Thika Sub County?
4. Who monitors private solid waste collectors?
5. Are there any programs to formally engage scavengers in SWM?
6. Are there any public awareness programs/ campaigns on SWM?
7. Are there any records of previous campaigns?
8. How does the public participate in solid waste management?
9. How many communal bins are there?
10. What is the budget allocation on solid waste and its proportion to the overall Municipal budget?
11. What trainings are offered to the Thika Sub County solid waste collection and disposal staff?
12. What PPEs are provided to the Thika Sub County solid waste collection and disposal staff?
13. What are the current equipment capacities of the Sub County SWM?
14. Are there any registered NGOs, CBOs and community self-help groups in solid waste management in Thika Sub County?

APPENDIX 6. OBSERVATION CHECKLIST

Item	Present	Not Present
Waste bins in household		
Communal bins near household		
Waste in open grounds near household		
Drainages with waste near household		
Burning of waste near household		

Observe a waste collection day.

1. Type of truck open/closed
2. How many staff
3. Any PPE
4. Any spillage/overflow
5. Use of paper bags or just dumping into truck
6. Council/ private
7. Ratio of household served
8. How many waste collection days per week

On normal day

1. Presence of scavengers
2. What are they selecting specifically
3. Estimated volume (e.g. one sack-full each)



**NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION**

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Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:

NACOSTI/P/16/34896/10641

25th April, 2016

Eric Wanjau
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “*Factors influencing implementation of the national solid waste management strategy: A case of Kamenu, Thika Sub County, Kiambu County,*” I am pleased to inform you that you have been authorized to undertake research in **Kiambu County** for the period ending **19th April, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Kiambu County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.


BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kiambu County.

The County Director of Education
Kiambu County.

