

**ASSESSMENT OF HOUSEHOLDS' KNOWLEDGE, ATTITUDES AND
PRACTICES ON SOLID WASTE MANAGEMENT IN NAKURU TOWN**

KAMWERU GRACE NYAGUTHII

C50/84004/2016

A research project submitted in partial fulfilment for Master of Arts Degree in
Environmental Planning and Management, Department of Geography and
Environmental Studies, University of Nairobi.

2019

DECLARATION

This project report is my original work, and it has not been presented for award of degree in any other University.

Grace Nyaguthii Kamweru

Signature: _____

Date: _____

This applied research project report has been submitted for examination with our approval as the University supervisors

Dr. T. Thenya

Signature: _____

Senior Lecturer
University of Nairobi

Date: _____

Dr. P. Shah

Signature: _____

Lecturer
University of Nairobi

Date: _____

DEDICATION

Ultimate gratitude to God for helping me to reach this far and aim higher for more. To my husband Salem Mugambi, my son Gael Leroy and my parents Naomi and Harun. Your care, love and support have been a source of encouragement. You have taught me the value of hard work and persistence.

ACKNOWLEDGEMENTS

I extend heartfelt gratitude to my supervisors, Dr T. Thenya and Dr P. Shah of the Department of Geography and Environmental Studies at the University of Nairobi for relentlessly and patiently guiding me through the writing and compilation of this research work. Their time and constant input are really appreciated. I appreciate the trust and time dedicated by the local community living in Kaptembwo, Shabaab, Kivumbini and Flamingo wards in Nakuru County, when they filled the questionnaires, which assisted me to understand how their neighbourhood manages its waste.

My gratitude to the County Director of Environment, Nakuru County, Chiefs of Kaptembwo and Flamingo, Nakuru Solid Waste Management (NASWAMA) officers, waste pickers and Giotto landfill workers; for sparing time for feedback during my fieldwork; Mr J. Macharia for the great insights concerning Nakuru town; Ms Kate Ronoh, Ms Christine Ita and Mr S. Onsabwa for the assistance you extended to me during my field work and also to the four enumerators; Peter, Nderitu, Oscar and James. I am indebted to Ms. Vivianne Odhiambo, Mr Brian Ochieng and Mr Wilson Karubiu for their assistance through the data analysis process.

TABLE OF CONTENTS

DECLARATION	II
DEDICATION	III
ACKNOWLEDGEMENTS	IV
TABLE OF CONTENTS	V
LIST OF TABLES	VIII
LIST OF FIGURES	IX
LIST OF PLATES	X
LIST OF ABBREVIATIONS	XI
ABSTRACT	XII
CHAPTER ONE: INTRODUCTION	1
1.1 Background of the study	1
1.2 Statement of the research problem	2
1.3 Research questions	3
1.4 Objectives of the study	3
1.5 Hypotheses	3
1.6 Study justification	4
1.7 Scope and limitations	4
1.8 Operational definitions	4
CHAPTER TWO: LITERATURE REVIEW	6
2.1 Introduction	6
2.2 Solid waste management	6
2.3 Knowledge on solid waste management	8
2.4 Attitudes on solid waste management	9
2.5 Practices on solid waste management	10

2.6 Research gaps.....	13
2.7 Theoretical and conceptual frameworks	14
2.7.1 Theoretical framework.....	14
2.7.2 Conceptual framework.....	14
CHAPTER THREE: STUDY AREA	17
3.1 Background information	17
3.2 Nakuru town review and inventory.....	17
3.2.1 Location, population and context.....	17
3.2.2 Physical and topographical features.....	19
3.2.3 Climate.....	19
3.2.4 Soils.....	19
3.2.5 Land uses	20
CHAPTER FOUR: RESEARCH METHODOLOGY.....	21
4.1 Introduction.....	21
4.2 Research design	21
4.3 Data Sources	21
4.4 Sample size	21
4.5 Sampling strategy.....	23
4.6 Data collection instruments.....	23
4.6.1 Questionnaires.....	23
4.6.2 Key informant interviews	24
4.7 Data analysis	24
4.8 Ethical issues and considerations.....	25
CHAPTER 5: RESULTS AND DISCUSSIONS	26
5.1 Introduction.....	26
5.2 Household characteristics	26

5.3 Types of solid waste generated at the household level	29
5.4 Level of knowledge toward SWM in the study area.....	32
5.5 Attitudes towards solid waste management.....	34
5.6 Practices towards solid waste management.....	36
5.7 Influence of age of respondents on their level of attitudes	38
5.8 Influence of education level of the respondents on their level of practice	39
5.9 KII review: Capacity of the SWM authorities in Nakuru County	40
5.9.1 Inadequate infrastructure to handle solid waste in Nakuru.....	40
5.9.2 Collaboration with the private sector and the challenges encountered.....	41
5.9.3 Lack of awareness on proper SWM practices and household waste separation.....	41
5.9.4 Waste disposal challenges in Nakuru	41
CHAPTER 6: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS	
.....	43
6.1 Summary of findings.....	43
6.2 Conclusion	44
6.3 Recommendations.....	44
6.3.1. Management recommendations	44
6.3.2. Policy recommendations	45
6.3.3. Research recommendations	45
REFERENCES	46
Appendix I: Letter of introduction.....	53
Appendix II: Research license	54
Appendix III: Research authorization letter.....	54
Appendix IV: Survey questionnaire.....	56
Appendix V: Interview schedule for Nakuru County environment officers.....	62

LIST OF TABLES

Table 4.1: Sample distribution in the study area.....	22
Table 5.1: Knowledge towards solidwastemanagement.....	33
Table 5.2: Attitudes towards solid waste management.....	35
Table 5.3: Practices on solid waste management.....	37

LIST OF FIGURES

Figure 2.1: Conceptual framework on knowledge, attitudes and practices on SWM.....	15
Figure 3.1: Nakuru County showing the location of Nakuru town and the specific study areas.	18
Figure 5.1: Distribution of the sample population of the four wards.	26
Figure 5.2: Age of the respondents	27
Figure 5.3: Education level of the respondents	28
Figure 5.4: Employment profile of the respondents	28
Figure 5.5: Organic waste from the households	29
Figure 5.6: Inorganic waste from the households	30
Figure 5.7: Recyclable waste from the households	31
Figure 5.8: Composition of household solid waste storage before disposal	31
Figure 5.9: The association between education level of the respondents and their level of practice.	39

LIST OF PLATES

Plate 5.1: Sacks are the most preferred form of household waste storage before disposal.	32
Plates 5.2 a,b,c: Illegal dumping and other poor practices of SWM often lead to unsightliness and clogged drainage channels in area of study.....	38

LIST OF ABBREVIATIONS

CBD	Central Business District
CBO	Community Based Organization
CL	Confidence Level
DF	Degree of Freedom
ECOSOC	United Nations Economic and Social Council
EMCA	Environmental Management and Coordination Act
ENRED	Environment, Natural Resources and Energy Department
IEBC	Independent Electoral and Boundaries Commission
KAP	Knowledge Attitudes and Practices
KII	Key Informant Interview
KNBS	Kenya National Bureau of Statistics
MCN	Municipal Council of Nakuru
NASWAMA	Nakuru Solid Waste Management
NEMA	National Environmental Management Authority
SDG	Sustainable Development Goal
SWM	Solid Waste Management
TPB	Theory of Planned Behaviour
UNEP	United Nations Environment Programme

ABSTRACT

A significant obstacle to implementing solid waste management (SWM) in our cities is lack of awareness and limited knowledge on SWM, negative attitudes, poor practices, lack of political goodwill and limited technical and financial capacity. This study was based on Nakuru town. The study aimed to analyse various types of solid waste generated at household levels, assess the attitudes of the households towards existing SWM systems and identify the levels of KAP by the households and the authorities. This study was informed by theory of planned-behaviour which provides a framework for human actions. The theory explains the linkage between the levels of knowledge and attitudes of a society to their behaviour or practices. With the help of the theory, the relationship between household respondents' knowledge levels, attitudes and practices (KAP) towards SWM was assessed. Systematic random sampling was used to get 380 heads of households from four wards of Nakuru town namely Kaptembwo, Shabaab, Kivumbini and Flamingo. The results revealed that there were two types of household waste namely organic and inorganic. The study findings revealed the respondents had relatively satisfactory knowledge and favourable attitudes, however their level of practice was generally poor. The respondents showed awareness of risks linked to poor SWM such as diseases, flooding, odours and loss of aesthetics. 61% of the residents expressed their willingness to sort their household waste before disposal. Majority (77%) were willing to cater for SWM collection charges. Their practices were contrary to their knowledge and attitude levels due to lack of proper facilities and limited options that would allow them to sort or to recycle their household solid waste. Poor practices documented included dumping of rubbish in open spaces and in drainage channels, burning and burying of solid waste in pits. 95% of the respondents approved the plastic ban effected by the Government since September 2017 citing decreased littering of the environment. Cross-tabulation analysis results revealed that age of respondents had a significant influence on the attitudes associated with SWM activities (95% CI, $X^2=138.521$; $df= 18$, $P<0.001$). The level of education of the residents was found to significantly exert influence on the residents' level of practices in SWM issues (95% CI, $X^2=126.648$; $df= 22$, $P<0.001$). Insights from the key informant interviews revealed constraints in inter-sectoral collaboration, shortage of infrastructure in collection and transportation of SW services and a section of uncooperative residents; which collectively lead to insufficient logistics. This study recommends that the County governments should invest in SWM infrastructure such as access roads, new landfills and purchase of new garbage trucks and safety wear for waste collectors; waste sorting at the source, promotion of the SWM knowledge by

introducing it in school curricula of all levels of education and improved inter-sectoral collaboration of institutions. Attitudes of the community could be improved by engaging residents in SWM activities, outreach and campaigns.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Providing suitable solid waste management (SWM) is perceived to be difficult in many communities globally, due to problems linked to population-growth, rapid-development and uncontrolled-urbanization. Increased affluence and urbanization often leads to increased solid waste generation and ultimately complication in management (Babaei *et al.*, 2015; Government of Kenya (GoK), 2015). The high rate of urbanization in Kenya has escalated urban poverty and increased informal settlements; strained urban infrastructure and improper provision of SWM services (Owuor, 2006). This is attributed by the slow rate of economic growth and development of cities which does not match the high rate of population growth. A significant obstacle to implementing good practices in SWM is a negative public perception, limited knowledge, negative attitude, lack of political goodwill, and limited technical and financial resources (Nasrabadi *et al.*, 2008; Babaei *et al.*, 2015; Hummer, 2017). People play a crucial role in SWM processes. Minimal public participation coupled with insufficient funding in SWM sector has contributed towards ill practices which have ultimately resulted to pollution of environment (Nasrabadi *et al.*, 2008). Negative-attitude towards SWM and failure in individual responsibility has contributed to this menace (GoK, 2015).

Solid waste includes refuse, garbage and sludge from commercial, residential and industrial activities. SWM encompasses all activities needed to handle SW from inception to final disposal. These activities range from collection, transfer, treatment, disposal, monitoring and regulation. Legal framework related to SWM involve initiatives such as recycling. Amounts of solid waste in cities of developing countries increases with population increase due to higher levels of consumption (McAllister, 2015).

This study was based in Nakuru town in Kenya. It is reported that there's fast growth of Nakuru town (13%) in terms of natural population and migration thus increasing the concerns of SWM. In moving towards a society that sustains a culture of environmental consciousness in regards to SWM, there is the need to undertake KAP study to assess existing gaps. However, there is lack of information on the perception of residents on SWM. Local governments including Nakuru County government need to provide adequate SWM infrastructure. This can be done by educating the public on SWM, their preferences on waste

disposal mechanisms, level of attitude and behaviours towards the SWM (Ahmed & Ali, 2006; Krook *et al.*, 2007; Keramitsoglou, 2013). De Feo & De Gisi (2010) and Ibrahim & Babayemi (2010) also emphasize on the role of encouraging and educating the community on SWM projects.

1.2 Statement of the research problem

It is apparent that there are ineffective solid waste collection-strategies and very few landfills in developing countries (Reyes, 2013). Practices of basic SWM are often neglected at household levels (Licy, 2013). Despite of the general awareness of the ill effects to the environment, people still continue with substandard practices because of their negative attitudes. These undesirable practices affects the public-health and environment when cities get overwhelmed by excess waste (GoK, 2015).

As natural population grows across towns in Kenya, the challenges of managing solid waste continue to grow (Gakungu, 2012). According to Bhada-tata & Hoornweg (2012) in Kenyan cities the daily solid waste generation would increase approximately from 2000 tonnes per day to over 10,000 tonnes per day by 2025. By 2010 Nakuru town had a 13% annual growth rate, which was consistent with other fast-growing African urban centres (UN-Habitat, 2010). According to a report by World Bank (2017), the estimated waste generation rate for Nakuru town is 250 tonnes per day. The rapid population rise has led to increased consumption and in turn increased generation of SW, which outstripped available resources and capacity to effectively cope with SW then (Kimani & Mwanzia, 2013).

In Nakuru, KAP may critically help to determine how solid waste is managed. It is futile to have SWM companies to deal with the collections; transportation and processing of solid waste without having clear policies that may improve awareness and how solid waste is perceived in the county so as to improve the practices. There is a need for critical understanding of KAP of the population on SWM. Establishing the level of knowledge and attitudes among Nakuru residents can help in implementing educational programs aimed at changing behaviour towards the environment. This is a critical step towards establishing and implementing sustainable county government plans and policies.

This study sought to generate knowledge to facilitate the local authorities and policymakers to foster effective and functional SWM practices in Nakuru by reviewing the residents' perspective. This research also generated information to enhance the residents' understanding of the challenges encountered by the local authorities in their SWM operations. Study findings will advise on the interventions stakeholders could use to design SWM mechanisms in the county.

1.3 Research questions

- 1 What are the various types of solid wastes generated at the household-level?
- 2 What is the level of knowledge of handling of solid-waste by the households?
- 3 What is the attitude of the households towards existing SWM systems?
- 4 What are the practices of the households and the local authorities when handling solid waste?

1.4 Objectives of the study

The broad objective of this study was to examine the levels of knowledge, attitudes and practices by the households and the local authorities on SWM systems in Nakuru town.

The specific objectives:

1. To document various types of solid-wastes generated at the households
2. To assess the attitudes of the households towards existing SWM systems.
3. To assess levels of knowledge and practices of handling of solid-waste by households and the local-authorities.

1.5 Hypotheses

1. H_0 : There is no significant influence of age on attitudes associated with SWM activities
 H_1 : There is a significant influence of age on attitudes associated with SWM activities
2. H_0 : There is no significant influence of the level of education on the SWM practices.
 H_1 : There is a significant influence of the level of education on the SWM practices.

1.6 Study justification

The study aimed to review the-levels of KAP on SWM of both the residents and authorities in Nakuru County. The study also investigated the socio-demographic factors of the residents of Nakuru on how they influenced their KAP. From existing literature and studies on SWM it is important to observe that there is minimal public participation in the formulation and implementation of proper SWM strategies (Henry *et al.*, 2006). Governance of household waste involves various stakeholders who monitor and evaluate how waste is handled from its source to disposal (Lawal, 2010). It's a system that relies on financial support from the government, policy formulation, collaboration with private sector, public participation and use of technology (Kazungu, 2010). This governance can only be successful if the authorities understand the knowledge and attitudes of the residents towards SWM and how these ultimately influences their practise.

This study recommended interventions that stakeholders would design to improve SWM in Nakuru County. The study recommendations will generate knowledge that may influence the KAP of urban communities on handling solid waste at the household level to its disposal facilities.

1.7 Scope and limitations

Study limitations included limited time for comprehensive and comparative studies on SWM. Study was also limited to households in a part of Nakuru-County due to available resources and thus not all types of waste could be covered. Another limitation was that only households were targeted and other sources of waste like from other land uses such as commercial and industrial present in the area of study were not covered. It is noted that waste generated could be affected by weather aspects but seasonality aspects were not covered.

1.8 Operational definitions

Attitude: The opinion about SWM activities by the residents that influence their behaviour. Attitudes in this study involved the residents' concerns towards SW handling at the household-level up to disposal, perception of risks associated with poor SWM and level of trust towards the SWM authorities.

Household: Dwelling with one or more persons who share meals or living accommodation with a single family multiple groupings of people. Head of household in this study was the person who was responsible in making decisions and earning money for the rest of the members in the household unit.

Knowledge: Facts, skills or information acquired through experience or education on SWM practices by both the residents and the local authorities; familiarity, awareness or understanding of the SWM laws and regulations and individual perception of risks associated with poor SWM.

Practice: SWM activities that are regularly conducted by the residents or authorities of Nakuru as a routine.

Solid waste: The items from residential households following domestic activities.

Solid waste management: Taking charge of how solid waste is managed, stored, collected, transferred and processed from generation to disposal, by considering the best guidelines to public health, the economy, conservation, aesthetics and the environment.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Chandrappa & Das (2012) describe waste as unwanted items that are abandoned or discarded. Waste can also be classified as either hazardous or general waste. There are many types of waste; solid, liquid, raw, e-waste and the list continues. This document is purely focused on solid waste. SW can be stated as organic and inorganic materials originating from human activities that are no longer needed since they lose their value to the user. Solid-waste can be classified as industrial-waste, residential/household-waste, commercial-waste and agricultural-waste. Residential wastes may comprise of food leftovers, rubbish, cardboard, metals and plastics. The current work will follow the definition of solid waste as the discarded organic and inorganic items from residential households following domestic activities.

Problems with the SWM have been put forward throughout the history of humankind. Various documents report the practice of throwing rubbish recklessly in undesignated places by different generations over time (Chakrabarty, 1992; DeLong, 1993; Lehmann, 2015; Oelofse, 2017). Present literature on SWM reveal concepts that aim to frame ways of handling SW from the source of generation until final disposal. SWM is described by Tchobanoglous *et al.* (1993) as taking charge of how solid waste is managed, stored, collected, transferred and processed from generation to disposal, by considering the best guidelines to public health, the economy, conservation, aesthetics and environment. Many scholars like Winkler and Bilitewski (2007), Zhang *et al.*, (2010); and Karak (2012) regard SWM as actions linked to waste classification, waste selection, storage and transportation, treatment until final disposal.

2.2 Solid waste management

Every day people throw away items that are no longer valuable to them. As stated by Tchobanoglous *et al.*, (1993) generation of waste is not easily controllable since different groups of stakeholders and actors are involved. Separating of waste at the source has proven to be economical and facilitates for recycling processes especially in the developed world where solid waste is segregated at the household levels. Globally homeowners have begun to realize the importance of sorting out household rubbish. At the households, solid waste can be stored

in sacks, plastic bins, bags, baskets and open pits. Appropriate segregation of solid-waste at the source responds to aesthetics value of a place besides cutting on costs.

Solid waste collection involves processes special collection equipment, trained personnel and proper access routes to landfills. These processes should be extended to contracted private-companies and other informal setups in developing-countries. Frequency of solid-waste collection in Kenya ranges from daily to weekly and monthly. There are various forms of collections including door-to-door collection, block collection, municipal containers, backyards and open dumping grounds. The transportation of solid waste is an expensive process both for planning and physical mobility (Bilitewski, 1994). Waste is usually transported using the best means available in terms of the economic and financial implications. In Kenya most solid waste is transported using handcarts and county government trucks to the dumpsites or landfills.

Solid waste disposal involves biological and thermal treatments as well as landfills. Composting is a natural process which can convert organic waste into humus to boost soil quality and ensure healthier plants. According to Hoornweg (1999), composting is a cheap process used in developing countries and handles more than 50% of total city waste and it also reduces greenhouse-gases. Thermal treatments include incineration where waste is disposed through high temperature generating energy, gases and solid residues. Landfilling is a widely preferred method which involves burying waste in a series of layers by reusing the soil removed during the excavation (Wheeler, 2004).

Globally, there are issues that overwhelm the SWM sector as noted by Allen and Bassey (2012). These include the lack of review and awareness of laws, regulations and policies on environmental issues. In developing-countries, it apparent that there's minimal public participation in formulation laws while planning for SWM (Henry *et al.*, 2006). This is emphasized by Lawal (2010) who states that governance of waste in Africa is a serious problem and the governments should be keen in monitoring and evaluating the activities of waste in order to maintain healthy environment (Odufuwa *et al.*, 2012). There are various stakeholders in SWM. The residents have a major role in SWM. According to Sreenivasan *et al.*, (2012) the SWM hierarchy emphasises the Rs that include reduce, reuse, remove, redesign and recycle. In Kenya effective SWM is still a major challenge facing most county governments across the

country. This peril is particularly a major concern in areas where rate of generation of SW surpasses the ability of the local-authorities to cope with (Kimani, 2013).

In Nakuru County the major challenges associated with SWM include unwillingness to pay for the SWM services by some households. They often feel that refuse collection should be free and is solely the county job, open dumping of solid waste which often leads to unsightliness, spread of diseases, clogging of drainage systems, poor access roads to low-income settlements and filled up Giotto refuse disposal site (Gakungu, 2012; GoK, 2015; June, 2016; Oyake-Ombis, 2017). According to Owuor (2006), the existing waste disposal systems are in a semi-permanent state, especially in the high-density low-income settlements of Nakuru where the four wards under study are situated. Findings in his study on multi-spatial livelihoods in Nakuru town show that estates such as Kwa Rhonda, Kaptembwo and Mwariki have very poor SWM infrastructure despite that the houses were being leased by the Nakuru Municipal Council.

2.3 Knowledge on solid waste management

In order to understand the environment and its associated problems, a good knowledge base is indispensable. Knowledge includes the information, facts, descriptions, as well as skills, acquired through education or experience (Schratz, 2016). Knowledge can change the attitudes, values, norms as well as awareness and beliefs towards a friendly environment. Knowledge pertains to a positive attitude towards SWM while attitudes refer to the acquisition of positive values and concern about the environment (Momoh & Oladebeye, 2010).

The level of knowledge on SWM may influence the environmental perception and behaviour of people towards solid waste systems. Knowledge influences their trust and acceptance of SWM authorities and their perception of environmental risk such as floods and spread of diseases. Perception of risk reflects the level of trust in the institutions and authorities managing solid waste (Ormerod & Scott, 2012). Public trust in SWM authorities is considered as one of the principal factors shaping public acceptance in relation to solid waste disposal and management (Hummer, 2017). Effective public outreach by the local authorities is therefore very important in-order to increase knowledge and awareness among residents. Public

participation and involvement in SWM projects is also important in increasing the level of knowledge. De Feo & De Gisi (2010) as well as Ibrahim & Babayemi (2010) further emphasize that encouraging and educating citizens in taking part in SWM processes is a cheaper and more efficient way of reducing household waste. Socio-demographic elements such as education, levels of the residents, age, occupation and gender may influence the level of knowledge and ultimately the behaviour towards SWM.

Lack of awareness and education contributes to ineffective SWM in developing countries as this is crippled with negative attitudes towards waste management (Ehrampoush, 2005; Yadavannavar MC, 2010; Tartiu, 2011; McAllister, 2015). For example, in Ghana awareness and education in SWM has been cited as the leading factor towards residents shifting blame to the government when there is improper SWM (Addo, *et al.*, 2017). According to McAllister (2015) lack of enthusiasm in environmental issues leads to minimal participation in important processes that could transform the society to become more responsible towards SWM. Education and awareness can turn improve SWM and increase a sense of ownership in waste management by promoting environmental citizenship. Aini *et al.* (2002) in Malaysia, argued that in order to overcome the SWM problem there was need to influence the conscience of individuals through environmental awareness and concerns by having educational campaigns. Inculcations of environmental awareness and education can positively influence attitudes towards waste disposals thereby easing the collection and enhancing public knowledge.

2.4 Attitudes on solid waste management

Schultz & Zeleny (2000) defined attitude as putting at the forefront environmental concerns rooted notion of a person with a focus on how they bond with the environment. Attitude is an important element to the aim of a behaviour, expounded as a ranked assessment of how favourable a behaviour could be (Ajzen, 1991). It is a crucial predictor of intentions/behaviour towards SWM and the relationship is significantly high (Ifegbesan, 2010; Kumar, 2012).

Negative attitudes and behaviour that influence SWM in developing countries' urban areas include littering, minimal social intervention to prevent the behaviour, imposed penalties or enforcement measures to halt this behaviour. The attitude and behaviour of SWM are also

caused by lack of waste collection or inappropriately located bins. An attitude of indifference by the residents towards SWM reduces their responsibility for the environment since they are rarely involved in making of decisions (McAllister, 2015). However attitudes towards SWM differ across socio-economic groups. This can be explained by the attention of the large proportion of residents in urban areas in developing countries being absorbed by requirements for basic food and shelter. Residents who are satisfied with the basic needs are more environmentally conscious and hence are sensitive to SWM. This implies that KAP on SWM differs across socio-economic classes in urban areas.

Favourable attitude towards SWM can be encouraged by holding fair communication between SW actors in order to create better understanding of different perspectives. Information and education about waste should be disseminated to everyone in the society. The authorities should also endeavour to develop improved facilities throughout the SWM processes from collection to disposal. Such arrangements help to regulate or benchmark for socially acceptable SWM attitude and behaviour (Davies, 2005).

2.5 Practices on solid waste management

Globally, irregular collection of domestic waste often causes incidences of sicknesses like diarrhoea and respiratory infections compared to neighbourhoods where waste is collected regularly (UN-Habitat, 2010). In urban areas garbage is often dumped in low lying areas and adjacent areas such as slums. This threatens the environment and is hazardous to the residents (Bhada-Tata & Hoornweg, 2012). SWM practices especially in developing countries emphasise the old hierarchy systems of relying on dumpsites which pose harm to public health and the environment. Poor SW disposal methods such as indiscriminate dumping, burying and open burning of solid waste were reported in Nigeria (Adeoul *et al.*, 2014). Ifegbesan (2010) also noted that secondary school students in Ogun State, Nigeria had poor SWM practices despite their awareness on waste problems, attributed by their negative attitudes towards SWM.

Solid waste is a vital municipality responsibility whose mandate is to maintain the public health of cities, protect the environment throughout the SWM chain and resource management through the Rs (UN-Habitat, 2010). Municipalities are the legal actors to facilitate

for SW collection and this can be dated back from the 19th century when poor sanitation and uncollected rubbish was first linked to infectious diseases. This pushed most global cities to establish SWM services. For instance in 1994, Surat in India experienced a major flood that displaced 1000 people and killed 56 people. This was as a result of blocked drains due to uncollected solid waste. This mobilised their city towards effective SWM resulting to almost 95% of their solid waste being collected daily making Surat one of the cleanest cities around its region (Lopez, 2012).

The County government of Nakuru is responsible for all SWM to ensure that it is safe, cost-effective and reliable. This requires financial resources which is a constraint to county governments that have limited resources and management issues. The ineffectiveness of waste management compounds the government to address the issue of SWM. The effective governance to address SWM problems lies with adequate managerial and organizational structure as well as an informed and environmentally conscious population (Bhada-Tata and Hoornweg, 2012).

A proper and sound institutional framework is indispensable for good governance in the sector. UN-Habitat World Urban Forum of 2001 contended that indicators of good governance of cities is in how clean the cities are and how they manage their SW (Wilson *et al.*, 2012). Such governance targets a system that is inclusive, financially stable institutions and active policies. Stakeholders in the SWM often contribute as service providers, financiers, users and enablers which make the services affordable to city residents. Such organizations manage monetary services efficiently and with integrity by involving the communities (UN-Habitat, 2010).

Copenhagen in Denmark and Kyoto in Japan are cities which are regarded as the world's icon for good SWM practices and their services are sustainable and affordable (United Nations Human Settlements Programme (UNHSP), 2010). Such cities rely on a synergy of technology, proper functioning institutions and clear policies. According to Kumar (2016) in developing countries SWM is still a mammoth task and institutions are still trying to adopt the modern applications in-order to provide suitable SWM services in their cities. UN-Habitat often encourages the cities in developing world to innovate their own models that can best work for each individual city.

Sound institutional frameworks governing SWM in Kenya show that the constitutional actors are the County governments. In some cases, policies, plans, strategies and legislation are managed by both levels of Governments. Besides having plans counties have legislations on SWM Acts while the national government has several policies and laws that foster sound SWM. The Constitution of Kenya (GoK, 2010), Vision 2030 and National Environment Policy (GoK, 2013) play key roles in legislation. Other important Acts include the Environmental Management and Coordination Act [EMCA] (GoK, 1999), Public Health Act (GoK, 2012) and the County Government Act (GoK, 2012) (Oyake-Ombis, 2017).

Domestic solid waste in Nakuru town before devolution was managed by the Municipal Department of Environment (MDE). By 2015, the Nakuru municipality provided waste collection and disposal services before the County developed a Department of Environment in the new county (Practical Action & Municipal Council of Nakuru, 2010). Unfortunately, SWM services then served the Central Business District (CBD) and more affluent neighbourhoods only. In contrast solid waste was often dumped indiscriminately or collected by some unregulated entrepreneurs in the less affluent settlements. According to Owuor (2006), some local residents living close to the Gioto dumpsite often make a living out of the waste. They usually collect valuable types of waste that could be recycled, clean it and sell it to recycling companies. Illegally dumped garbage finds its way into drainage channels, leading to blockage which often result in flooding these lower-lying areas. Attempts to change this situation in the low-income settlements by construction of collection chambers was done but they were not sufficient to hold all the waste. This was caused by irregularly collection which brought unsightliness of the area and a health hazard (Kimani and Mwanzia, 2013).

Currently the Department of Environment of Nakuru County Government is responsible for SWM in the county. The department creates policies and focuses on strategy development, supervision of licenses and contracts, regulates waste collection-charges. According to Oyake-Ombis (2017), the county has lobbied for a Draft Environment Conservation Bill to regulate SWM roles in the county as stated in Schedule 4 of the Constitution of Kenya (GoK, 2010). The draft Bill advocates for waste segregation from source. SWM responsibilities are allocated to all sub-counties. Moreover, waste collection from the households is outsourced to private companies and community based sectors.

Arrangements were organised such that environment officers were assigned to manage solid waste in each sub-county and later report to the Director of Environment. The County mainly focuses on waste collection within the CBD. Away from the city centre, the operations are managed by contracted community based organizations (CBOs) who are yet to be licensed by National Environment Management Authority according to SWM regulations. Nakuru County has about forty CBOs who have been appointed and contracted to help in the SWM process (Oyake-Ombis, 2017). These CBOs are registered under NASWAMA which harmonizes interests and also engages with the County on challenges they face. Some individuals and entrepreneurs still engaged in value-addition ventures on waste.

2.6 Research gaps

There have been few studies on the importance of public participation in formulation of policies or in implementation of SWM projects. In Nakuru most studies revolve around documentation of challenges facing the SWM sector, effects of population growth on sanitation and need for expansion of existing SWM infrastructure. A broader study on multi-spatial livelihoods in Nakuru by (Owuor, 2006) highlights the state of SWM infrastructure in most estates in Nakuru. Other important documentation on the challenges in SWM in Nakuru and the negative impacts to the people and the environment is available. However, very little emphasis is given to the communities' perspective towards achieving solutions in the SWM sector. By reviewing the KAP levels of the community, the authorities will understand the value of residents in individual capacity.

By reviewing the 11th SustainableDevelopmentGoal (SDG) on the *Sustainable-cities-and-communities* there are over 2 billion people without access to proper SWM and over 3 billion people who need access to waste disposal facilities (United Nations Economic and Social Council (ECOSOC), 2019). The rise in urban population and rapid urbanization in the world is estimated to cause double generation of total waste from approximately 2 billion tonnes in 2016 to nearly 4 billion tonnes by 2050. In the period between 2010 to 2018 the proportion of total solid waste collected was estimated at 81 per cent globally, in sub-Saharan Africa only 52 per cent was collected (ECOSOC, 2019). This study seeks to fill that gap by recommending solutions aimed at achieving proper SWM in Nakuru.

2.7 Theoretical and conceptual frameworks

2.7.1 Theoretical framework

This study is based on the theory of planned behaviour (TPB). This theory formulates a framework for understanding human action (Ajzen, 2002). TPB is a theory that links one's beliefs and behaviour. According to Ajzen (2002), there are three conceptually independent predictors of human behaviour namely behavioural beliefs, normative beliefs and control beliefs. Behavioural beliefs are beliefs about the likely outcomes of the behaviour and the evaluations of these outcomes. Normative beliefs constitute beliefs about the normative expectations of others and motivation to comply with these expectations. Beliefs about the presence of factors that may facilitate or impede performance of the behaviour, subjective norms and perception of behaviour make up control beliefs. This study predicts the practices of the respondents based on behavioural and control beliefs.

Gross (2017) expounds on this theory stating that there is a relationship between attitudes and behaviour of people. Knowledge is one of the influences of the person's attitude. Therefore TPB portrays that behaviour or practice of people in SWM is a result of beliefs shaped by their knowledge and attitude. Contextually this study infers that SWM practices in Nakuru are inferred to be shaped by the individual's levels of knowledge and attitude toward SWM operations. Previous studies that have adopted this theory have shown that there are positive behavioural changes after intervention (Hardeman *et al.*, 2002).

2.7.2 Conceptual framework

The study adopts the conceptual framework to fit the ecological model that assumes that SWM is influenced by factors; personal experiences, family backgrounds, community-level factors as well as institutional-policies (Figure 2.1).

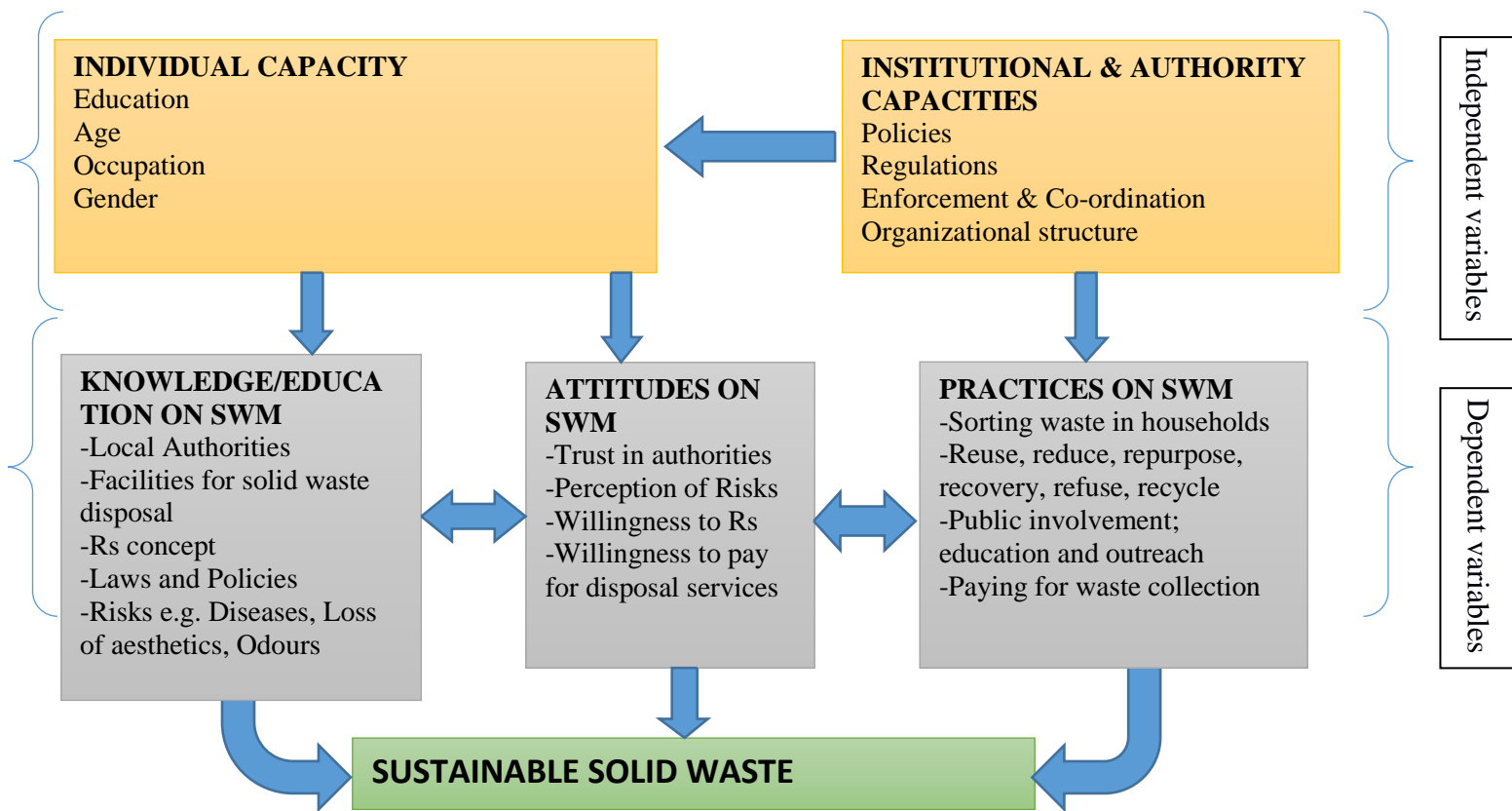


Figure 2.1: Conceptual framework on knowledge, attitudes and practices on SWM

Source: Researcher, 2019

Socio-demographic factors of the residents which include; age, gender, education level and occupation, are independent variables which are inputs from the individual capacity. Policies, laws, regulations and enforcement and coordination of these laws are inputs from the authorities and other SWM institutions. Levels of KAP are the dependent-variables. They rely on inputs from the independent variables. For instance, socio demographic factors and inputs from the SWM institutions are inferred to create influence on the levels of KAP of the residents. Ultimate output expected from positive influence of the KAP by the individuals and institutional inputs is achieving suitable SWM practices in Nakuru.

To achieve sustainable SWM, there need to be deliberate efforts and high levels of cooperation between the residents of Nakuru and the responsible authorities. The local authorities must understand the community's concerns and should endeavour to promote public acceptance of their services. The authorities should maximise their capacity by enforcing and

coordinating the policies and regulations in place. For instance, public trust in SWM authorities could be considered one of the principal factors shaping public acceptance in regards to proper SWM. The authorities can build this trust and acceptance by involving the community in projects, through education and outreach. On the other hand, the residents' perception of SWM is determined by demographic factors. These factors influence their attitudes and ultimately model their daily practices which could either lead to proper or poor SWM in their households.

Level of education may be correlated with acceptance to existing SWM systems; whereby the lack of it may attribute to poor waste handling and disposal and a lower perception of risks. Age is one of the most unpredictable variables, but it also influences the attitudes and ultimately the practices of SWM. For instance, older individuals are more likely to be aware of the existing SWM infrastructure; are more likely to conform to the regulations and are also more likely to express satisfaction and higher levels of trust in authorities than the younger residents. In the case of gender; women are more likely to express concerns related to health risks associated with poor SWM than men.

Attitudes to SWM are therefore influenced by both the levels of knowledge and socio-demographic factors of the individual. Positive attitudes by the residents will ultimately lead to better practices of SWM. Attitudes can be expressed by their willingness to sort the solid waste before disposal, through recycling, reducing and reusing solid waste and also their compensation for the disposal services to relevant authorities. To achieve suitable SWM in Nakuru there is the need for the individuals and the relevant institutions to adopt higher levels of knowledge, positive attitudes and proper practices of SWM as illustrated in Figure 2.1.

CHAPTER THREE: STUDY AREA

3.1 Background information

Nakuru County is among the 47 counties found in Kenya. The county borders eight other counties which include Laikipia, Nyandarua, Kericho, Bomet, Baringo, Narok, Kajiado and Kiambu. It covers an area estimated at 7,495.1 Km² and is located between Longitude 35 ° 28` and 35° 36` East and Latitude 0 ° 13 and 1° 10` south. According to the Kenya National Population and Housing Census of 2009 (Kenya National Bureau of Statistics, 2009) the county had a total population of 1,756,950 in 2012, comprising of 881,674 males and 875,276 females. The county headquarter is Nakuru municipality/town which was previously the headquarters of Rift Valley Province provided for in the old constitution until 4th August 2010 (GoK, 2013).

3.2 Nakuru town review and inventory

3.2.1 Location, population and context

Nakuru County consists of 11 sub-counties. They include; Naivasha, Njoro, Rongai, Subukia, Gilgil, Kuresoi North, Kuresoi South, Bahati, Molo, Nakuru Town East and Nakuru Town West. Nakuru municipality/town is the 4th largest city in Kenya after Nairobi, Mombasa and Kisumu cities (KenyaTravelTips, 2018). The municipality is within Nakuru County, one of 47 devolved county governments. It has a higher rural population estimated to be 65%, with the remaining 35% of the population live in urban centers of 2,000 inhabitants and over (County Assembly of Nakuru, 2013).

The town (former municipality) is split to form the two sub-counties; Nakuru town East and West (Figure 3.1). The town comprises of the Nakuru CBD and Lake Nakuru National Park. The park is a major tourist attraction site in the country which boosts the economic value since Lake Nakuru is one of the largest bird sanctuaries in the world with pink flamingos and pelican bird species lining its shores (The Treasureblog, 2013). Nakuru Town East sub-county covers an area of 74.3 sq.km with an estimated population of 152,167 persons and is split into 5 wards; Biashara, Menengai, Kivumbini, East and Flamingo/Langalanga. Nakuru Town West sub-county covers an area of 251 sq.km with an estimated population of 152,257 persons and is split into 6 wards; Kapkures, London, Rhoda, Barut, Kaptembwo, and Shabaab (County Assembly of Nakuru, 2013).

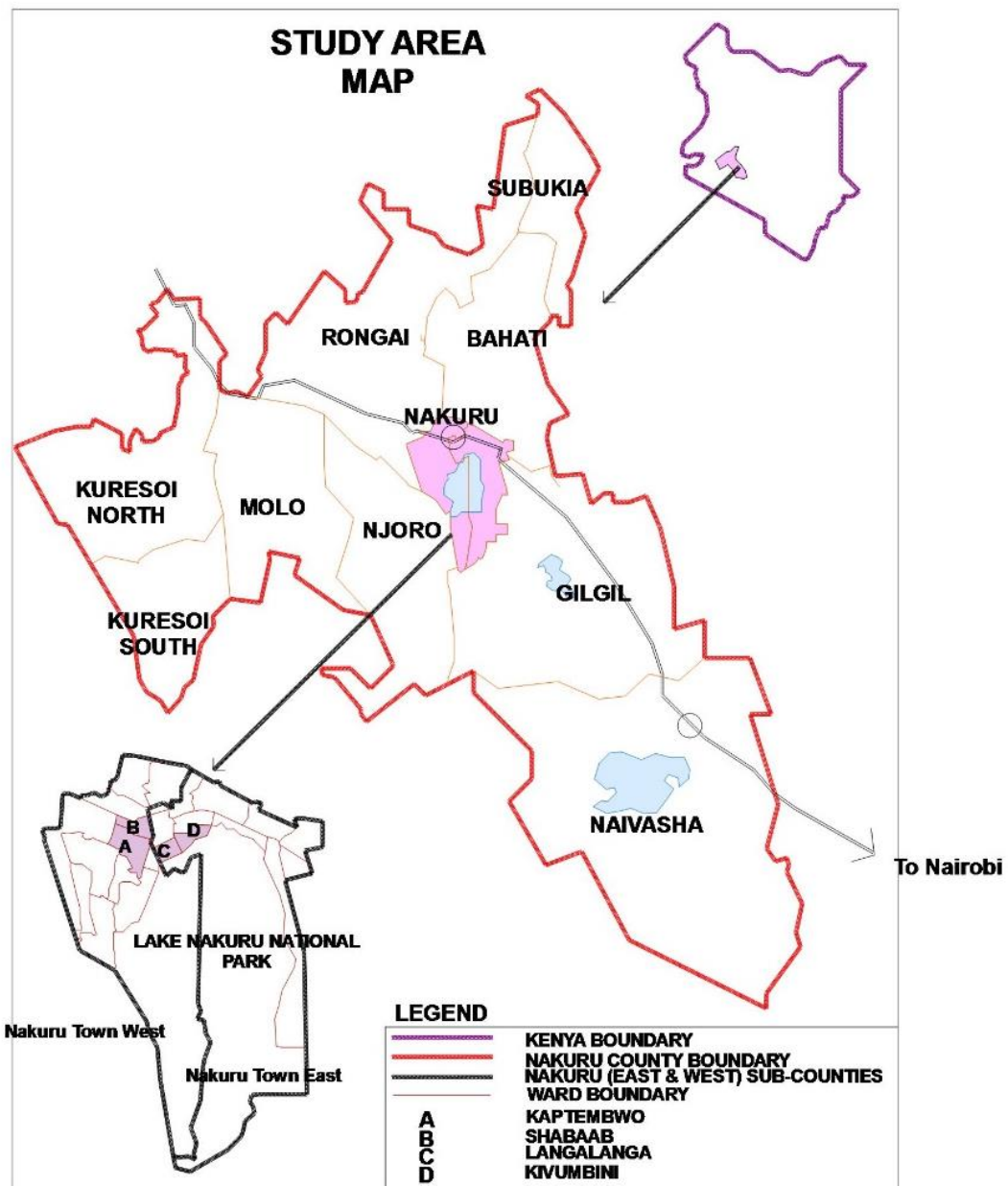


Figure 3.1: Nakuru County showing the location of Nakuru town and the specific study areas.

Source: Researcher, 2019

From the two sub-counties forming Nakuru Town (former municipality), two wards/locations were selected randomly to draw the sample; Kaptembwo and Shabaab in the West and Kivumbini and Langalanga (Flamingo) in the East. These four locations have a common attribute in that they all comprise of high-density residential housing estates where it

is expected that solid waste disposal increases exponentially with the increasing population of the areas.

3.2.2 Physical and topographical features

Features within and around Nakuru town provide a good niche for research and tourism. The area's economy heavily relies on the presence of these physical features to boost its tourism sector. The area receives millions of both local and international tourists annually. Nakuru town is home to Lake Nakuru, popular for its myriads of flamingos lining the shores. Two permanent rivers; Njoro and Makalia drain into the lake. Menengai Crater, a volcanic crater which is 2,490m (8,167 ft.) high is also an interesting site to visit. The crater has a depth of 483 m and the area around the crater is surrounded by a natural reserve. From these high vantage points, vistas towards the countryside are magnificent.

3.2.3 Climate

The presence of Lake Nakuru has a significant effect on the weather patterns in the area. This is attributed by the hydrological cycle prior to the presence of the large water masses when water evaporates and later causes conventional rainfall. Climate change and global warming have also played a part in the weather components of the town (GoK, 2013). The town experiences a bimodal rainfall pattern, whereby the long rains fall in April-August whereas short rains between October-December. The average annual rainfall is 850 mm. According to (Climate-data.org, 2014) there is a 110 mm difference in precipitation with the driest month being January at 23mm and the wettest month being April with 133mm of rainfall. Farming is also favoured by the presence of loam soil in the area (AllAboutKenya, 2012). Estimated altitude is 1850 m above sealevel. Temperature ranges between 10-20 degrees Celsius, with the cold season being experienced in July & August while the hot season occurs between January & March.

3.2.4 Soils

The soil patterns in the town are influenced by the area's climate, volcanic activities and the rock bed, and are classified as follows: Latosolic volcanic soils; are common in Njoro and in Nakuru Central with fertility ranging from moderate to high since they are well-drained

and rich in minerals. They support growth of various crops (GoK, 2013). Planosolic soils are fertile and are found in parts of Njoro but they are also poorly drained, dark brown in colour with clayish conditions with highly developed textured top soils with dark brown sub soils. They also support agricultural activities. Deposits found in the Rift Valley bed in Lake Nakuru and the Menengai Crater are shallow alluvial soils resulting from volcanic ash sediments with low to moderate fertility, hence the people here only do livestock keeping. (GoK, 2013).

3.2.5 Land uses

The three main land uses in the municipality are conservation, agriculture and housing. Much of the land (45%) in the municipality is under conservancy (GoK, 2013). This land is under the Lake Nakuru National Park and the Menengai Crater. This land is not available for urban development but offers opportunities for recreation and as a carbon sink within the town (GoK, 2013). The other major land use is agriculture, accounting for 34.9% whereas a significant amount of land in the municipality is under housing; 15.7% of the total land cover. Besides tourism, agriculture is another backbone of Nakuru County's economy. It is largely favoured by the temperatures and rainfall patterns in the area. Farmers grow both cash crops and subsistent crops and others keep beef and dairy cattle. There are several manufacturing industries in the county to help process food such as milk processing plants and flour making industries (AllAboutKenya, 2012). Land use trends within the peri-urban areas are rapidly changing from the original agricultural use to urban land uses such as commercial and residential. The unregulated urban growth poses a challenge to development, provision of services and environmental sustainability resulting from phenomena such as urban sprawl (GoK, 2013).

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents various techniques that were applied in conducting this research. It covers research design, study population, sampling procedure, sample size, instrumentation, data collection, data analysis and ethical consideration.

4.2 Research design

The research design is a cross-sectional design that applied both qualitative and quantitative approaches (Azorin & Cameron, 2010). The study employed a descriptive survey design, which targeted high density residential estates of Nakuru town as the population. They included Kaptembwo ward, Shabaab ward, Flamingo/Langalanga ward and Kivumbini ward in Nakuru County. The unit of analysis was the head of household. The study is a descriptive cross-section study of the households' KAP about SWM within the town.

4.3 Data Sources

Primary and secondary data were both collected in this study. Observation method by the researcher, questionnaire survey on the sample population and key informant interviews that targeted SWM authorities were used to obtain primary data. Secondary data was obtained through assessment of existing scholarly works on SWM issues encountered in other places and documented by various authors, review of existing academic journals, blogs, maps and books.

4.4 Sample size

The study adopted the total population of four randomly selected high-density residential estates of Nakuru town namely; Kaptembwo, Shabaab, Kivumbini and Flamingo wards. The other high-density populated wards are London and Rhonda in Nakuru town west sub-county and East and Biashara wards of Nakuru town east sub-county. This target population is approximately 141,271 residents according to Independent Electoral and Boundaries Commission (IEBC) population projections of 2012. The study utilised a formula invented by Krejcie and Morgan (1970) to estimate sample size which was distributed accordingly in the four regions.

$$s = \frac{X^2 NP(1 - P)}{d^2 (N - 1) + X^2 P(1 - P)}$$

S = Sample size

χ^2 = from the chi-square table for 1 degree of freedom at the 95% confidence level (3.841)

N = Population size (141,271) Source: Kenya National Bureau of Statistics

P = Population proportion (Assumed to be 0.5 since it will provide a maximum sample size)

d = degree of accuracy expressed as a proportion (0.05)

From the equation the sample size for the equation is;

$$S = [3.841 \times 141,271 \times 0.5(1-0.5)] \div [0.05^2(141,271-1) + 3.841 \times 0.5(1-0.5)]$$

$$S = 383.06$$

Required sample size = 383

383 residents were sampled out of the total population of 141,271 residents of the study area. This sample was distributed among the four residential estates using proportionate distribution where the sample from each ward was proportionate to its overall population size (Table 4.1). In this case, Kaptembwo ward had the highest population size (49.8%) and therefore had the highest proportion of the sample as follows;

Table 4.1: Sample distribution in the study area

WARD	POPULATION	% OF TOTAL	SAMPLE DISTRIBUTION
Kaptembwo	70,352	49.8%	191
Shabaab	17,989	12.7%	49
Kivumbini	20,574	14.6%	56
Flamingo	32,356	22.9%	87
TOTAL	141,271	100%	383

Source: Researcher, 2019

4.5 Sampling strategy

Residents for the quantitative inquiry were selected via a systematic random sampling method that involved selecting every 10th household in four regions until sample size of 383 was realized. Following the land use development regulations in the study area, the area is characterised of houses in linear plots, in high-rise flats and a few single dwelling units. A common sampling interval for the four regions was used, following sample distribution of households described in Table 4.1.

4.6 Data collection instruments

Qualitative and quantitative data was collected in relevance with the research objectives. Questionnaires were used in the field survey to obtain quantitative data whereas KIIs were used to acquire qualitative data.

4.6.1 Questionnaires

The quantitative research method employed both close-ended and open-ended questions in the survey-distributed structured questionnaires to obtain numerical data. The close-ended questions were tabulated and required static responses whereas the open-ended questions required more explanation from the respondents. They were to 'agree', 'disagree' or show 'no opinion' of the given close-ended questions for the knowledge and attitudes options. The practices were scored with either 'yes' or 'no' options for the tabulated closed-ended questions. Four enumerators were trained and they assisted to collect data in the four regions respectively; following the sample distribution. Training of the enumerators took four days and a pilot study was conducted in twelve households in Majengo area in Nakuru; which was not part of the study area, in the first field visit by the researcher. Data collection using questionnaires took place on weekends. This is because most of the respondents were present in their households on weekends, as they were busy during weekdays at workplaces and pursuing other forms of livelihoods. The data collection period using questionnaires lasted a month in between October and November 2018. The researcher and the enumerators took advantage of weekends to collect the data when most heads of households were present. During the pre-test study in Majengo, it was established that some respondents were willing to give answers to the questionnaires but they were not willing to write the answers in the questionnaires provided. The enumerators were therefore ready to fill in the answers provided by the respondents on the main field study.

4.6.2 Key informant interviews

The in-depth interviews were conducted in order to acquire a profound context of quantitative data. They were conducted to obtain first-hand information from experts and leaders of the community who had better understanding of the issues of SWM in Nakuru and were familiar with the livelihoods of the local residents. The County Director of Environment of Nakuru County, Chiefs of Kaptembwo and Flamingo wards, three NASWAMA workers from private SWM companies and two Giotto landfill workers were the key informants on qualitative data. Appointments were made prior to the interview at the County offices. Research license and authorization letter were presented by the researcher on the day of appointment for the interviews. The KIIs were conducted in November 2018 after the researcher had received information from the residents in the survey. Questions were brief but probing, and the answers were recorded in brief notes by the researcher.

4.7 Data analysis

Descriptive statistics were applied to describe and summarize data. Descriptive statistics were used to summarize and describe data which made it possible to make comparisons between different data sets, to spot key values and to set trends or changes over a period of time. The quantitative data was subjected to descriptive statistics such as measures of central tendency of mean and median, and the findings were presented in frequency tables, pie charts, bar graphs and line graphs. Thematic analysis was applied in the analysis of qualitative data which was reported in themes. Themes developed from this analysis helped create understanding of the authorities' perception on how the residents handle their solid waste, the engagement of private sector, CBOs and the government in SWM operations in the county. Understanding the themes within the analysed qualitative data helped to achieve the objective of exploring opportunities for improving SWM in Nakuru town.

Inferential statistics were used to make inferences and conclusions about target population from the selected sampled population. As such, confidence levels (CI) were determined and data was subjected to hypothesis testing where relationships between different data sets were tested. Cross-tabulation analysis was used where Chi-square tested relationships and level of differences in different categories of data in hypothesis 1 and 2. This test was chosen so as to test relationships between the socio-demographic attributes of the respondents

with their levels of KAP. The purpose of the test was to evaluate how likely the observations that were made would be, assuming the null hypothesis was true. The Chi-square formula applied is as follows; O is the observed value and E is the expected value:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

4.8 Ethical issues and considerations

While conducting this research, approval to conduct the survey and the interviews was obtained from the National Council for Science and Technology (NACOSTI), permit number; NACOSTI/P/18/69573. Free consent from the respondents and the key informants was sort prior to the survey. The researcher ensured anonymity of the respondents and assured them that this was an academic study that would eventually benefit their community. They were given several opportunities to ask their own questions. The researcher ensured that confidentiality of the respondents was adhered to and they reserved the right to fully or partially participate in the survey. Justice and fairness were exercised by the researcher in the data collection process when selecting participants by following appropriate sampling procedures.

CHAPTER 5: RESULTS AND DISCUSSIONS

5.1 Introduction

Knowledge, attitudes and practices (KAP) surveys are now becoming popular in assessment of a community's perception and practices related to environmental issues (Launiala, 2009). The levels of KAP on SWM of the residents of the sampled population were assessed and the associations among these attributes have been described and analysed. The findings also include analysis of household characteristics of the respondents influence their KAP. In-depth information from the key informants has been synthesized to give insight of the situational analysis of SWM from the respondents and the capacity, challenges and practices of the institutions and authorities mandated with SWM in Nakuru County.

5.2 Household characteristics

Out of the 383 intended sample size, 380 respondents from the four wards in Nakuru County participated in the survey (Figure 5.1). This is equivalent to 99.2% of response rate. Shabaab ward had the majority number of respondents at 28.4%, followed by Flamingo ward with 25.3%. Kaptembwo ward had 23.7% and Kivumbini had least number of respondents at 22.6%.

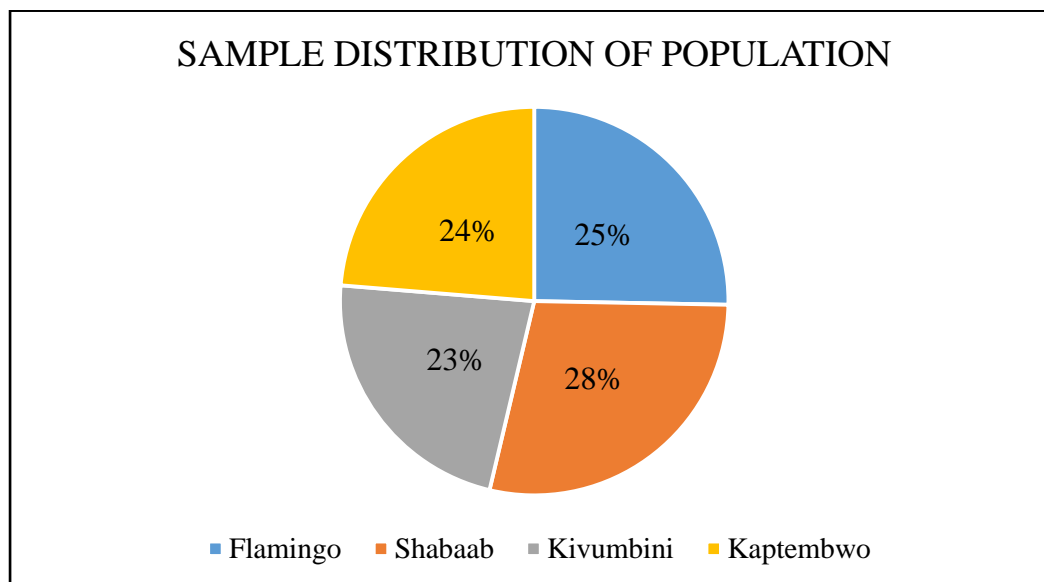


Figure 5.1: Distribution of the sample population of the four wards.

Source: Researcher, 2019

The survey targeted the heads of households, with majority of the respondents being female at 52.1% while male were at 47.9%. More females contributing with information on SWM indicates they are more conscious on the cleanliness of their neighbourhoods than men. This was consistent with (Mapa, 1997) who argued that unlike men, women were more empathetic about the environment. However, Barloa (2016) advocates that it is important for local governments to conduct campaigns, programs and projects that are fair to both genders when addressing environmental/conservation issues in order to foster gender equity. Findings revealed that 2.6% of the respondents were less than 20 years, the majority 62.4% were within the 21-40 years age bracket; whereas 35% were within 41-60 years. There were no respondents above >60 years of age (Figure 5.2).

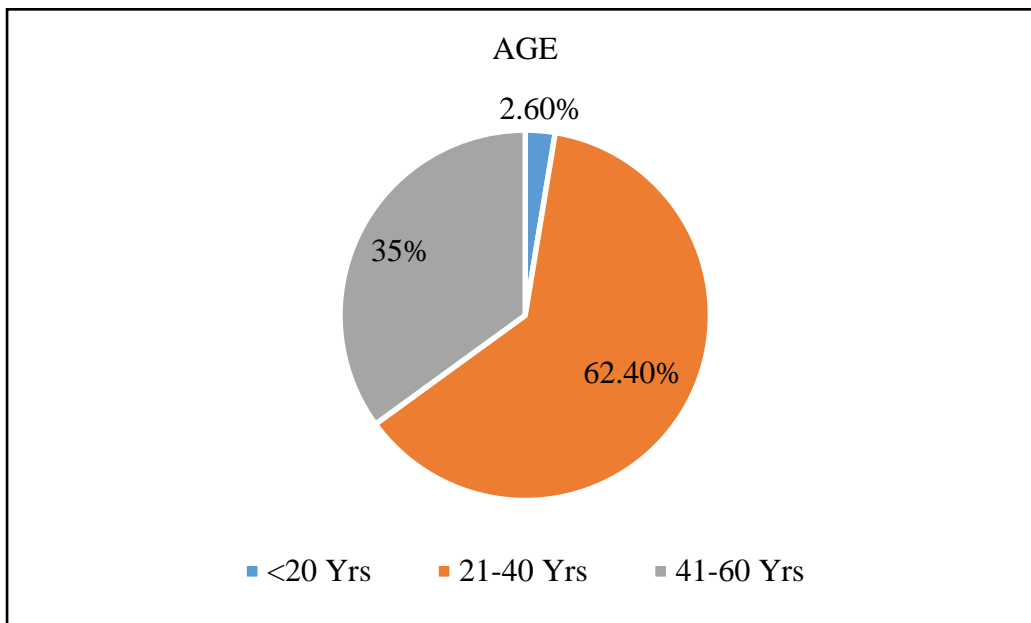


Figure 5.2: Age of the respondents

Source: Researcher, 2019

It was apparent that all respondents had some formal education as follows; 2.6% had primary level education, and 10% had secondary level education whereas the majority 87.4% had tertiary/higher education qualifications (Figure 5.3). The fact that the majority of the household heads had formal education is a good indication that the community would be having knowledge of basic information concerning SWM operations within their neighbourhood. The indication of the majority of the residents having tertiary education is also a good indication that the community is more likely to be more receptive to reforms in the SWM sector; such as introduction of new facilities or technologies in case they were introduced.

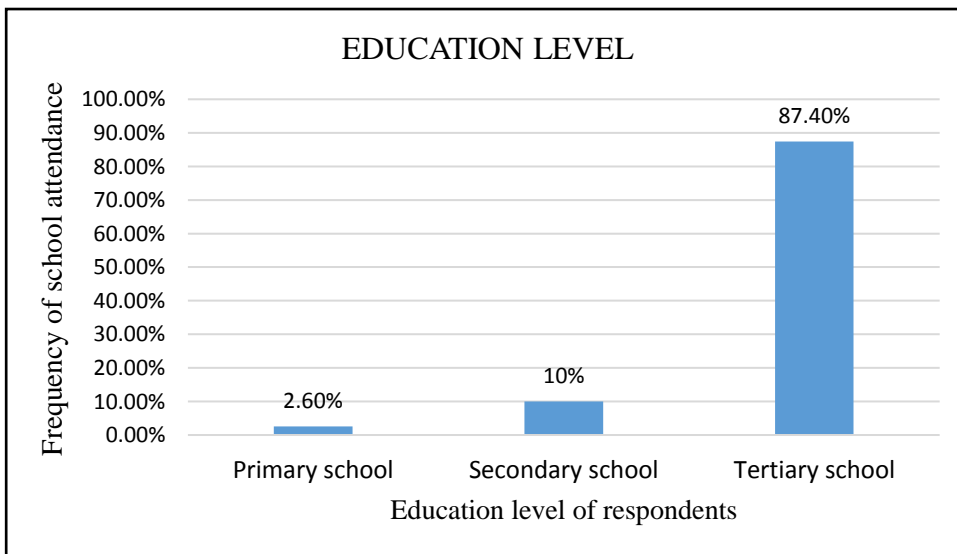


Figure 5.3: Education level of the respondents

Source: Researcher, 2019

Results portrayed that 77% of the households comprised of 1-4 members and a majority of the respondents at 80% cumulatively were employed, either in government organizations or in self-employment (Figure 5.4). The rest 20% of the respondents were unemployed. Since the majority (80%) were employed, it is an indication that the level of consumption could be higher in these households compared to the households whose heads were unemployed (20%); leading to more disposal of household wastes in the former.

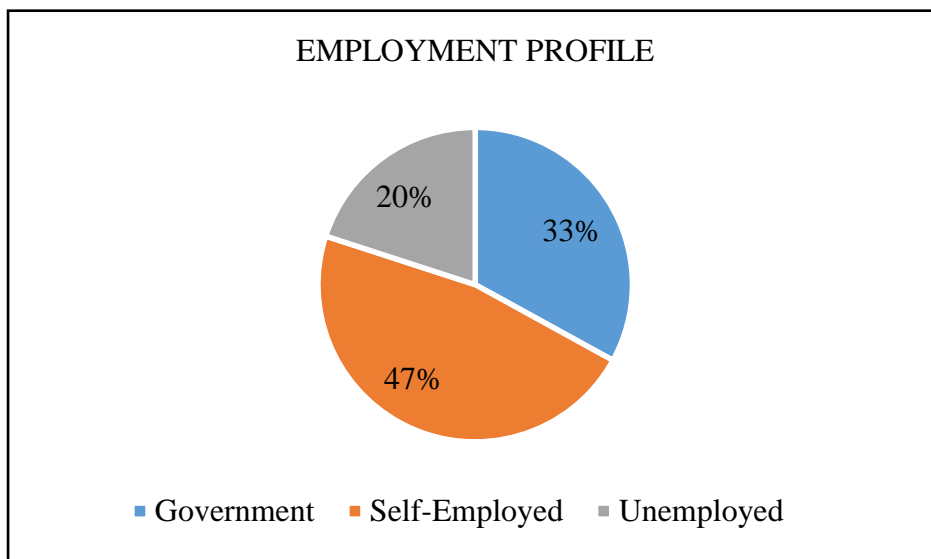


Figure 5.4: Employment profile of the respondents

Source: Researcher, 2019

5.3 Types of solid waste generated at the household level

Two main categories of solid waste are often disposed in area under study and they include organic waste and inorganic waste. Food leftovers was the most disposed type of organic waste at 51.8%, followed by degradable paper/cartons/timber at 28.2%, vegetable and fruit peelings comprised of 17.6%, whereas the garden waste was the least with 2.4% (Figure 5.5). Some respondents showed efforts of recycling their organic waste by feeding their cattle with left over fruits and vegetables peelings. Some used the leftovers and garden waste to make farm manure by mixing them with soil and cow dung. The rest of the respondents just disposed the leftovers away with the rest of the waste.

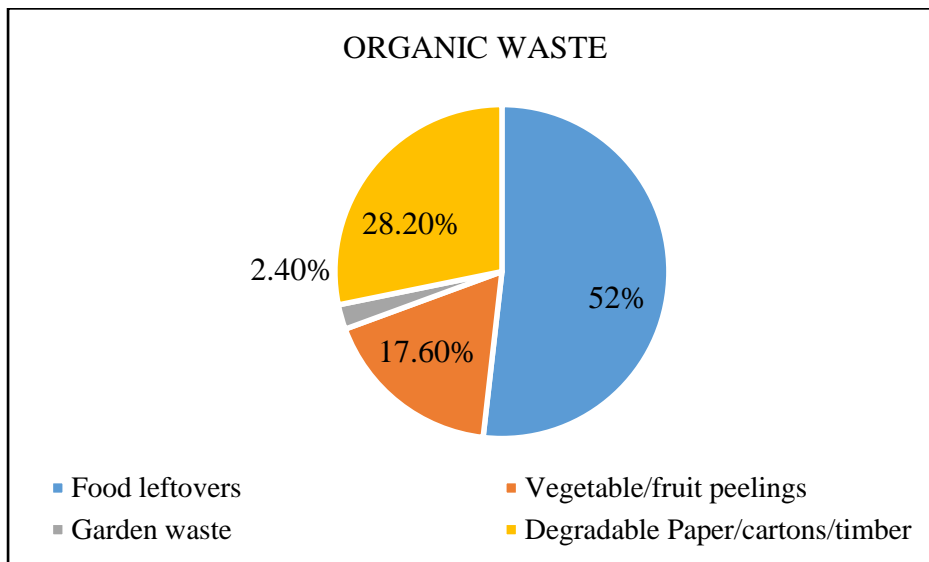


Figure 5.5: Organic waste from the households

Source: Researcher, 2019

Out of the total inorganic waste from the households, non-biodegradable paper was the most disposed at 22%, followed by plastics at 17%, old medicine at 13.4%, shoe polish at 10%, old spray cans from aerosols and body sprays at 8.4%, whereas glass followed at 7.4%. Old bulbs comprised of 7% of the total inorganic waste, followed by metals at 5%, fertilizers at 4.7%, batteries at 2.6% and the least was paint with 2.4% (Figure 5.6).

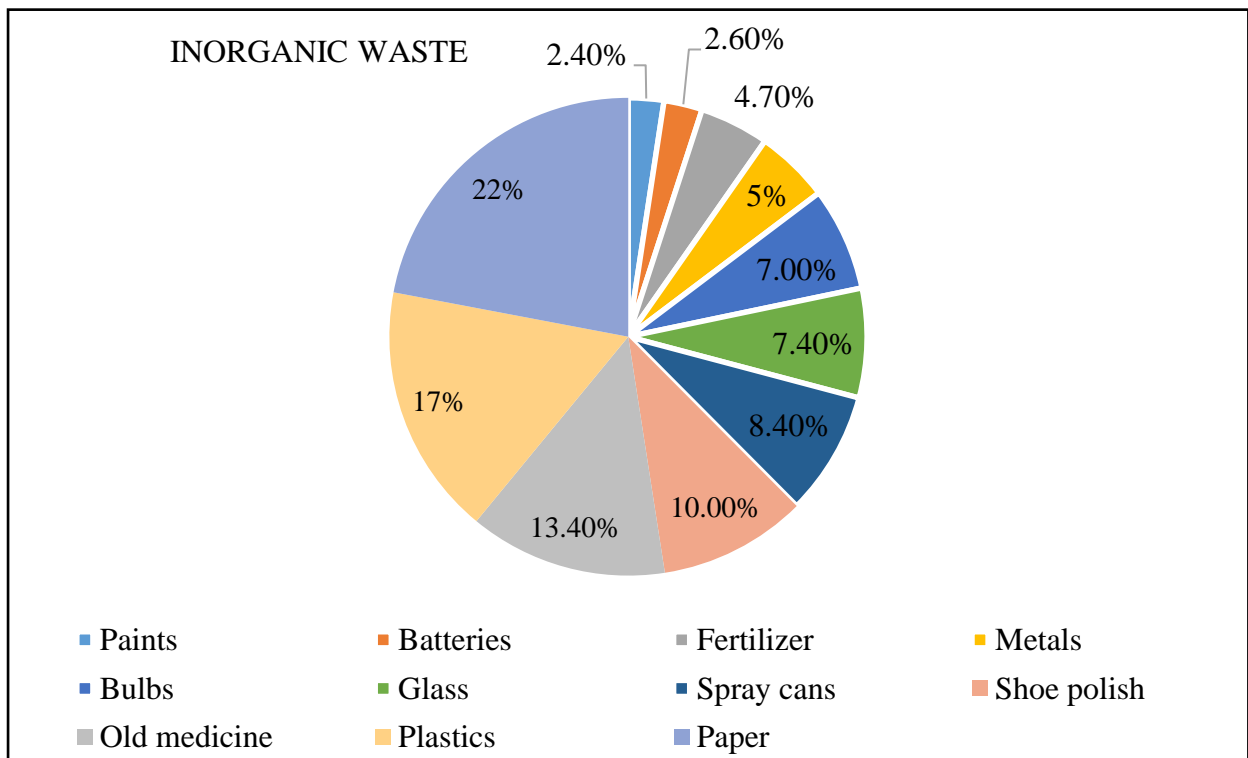


Figure 5.6: Inorganic waste from the households

Source: Researcher, 2019

It was estimated by a World Bank feasibility study done in Nakuru County in 2017 that organic waste and recyclable waste collectively comprised of 80% of total collected waste daily; with the toxic and non-biodegradable waste comprising of 20% (World Bank, 2017). This is an indication that with proper sorting of household waste there is 80% chance of the county improving disposal of the solid waste through recycling; to promote the Rs effort of reuse, reduce, recycle, refuse, recovery and repurpose. Following this context, the researcher made a third category for the recyclable household waste in order to get the specific amounts that can be potentially recycled from the study area. The results revealed that paper was the most disposed of all recyclable waste at 49.2%. Plastics comprised of 38.2% of the recyclable waste, followed by 7.4% which was glass and lastly, 5.3% of recyclable waste from the survey was metals (Figure 5.7).

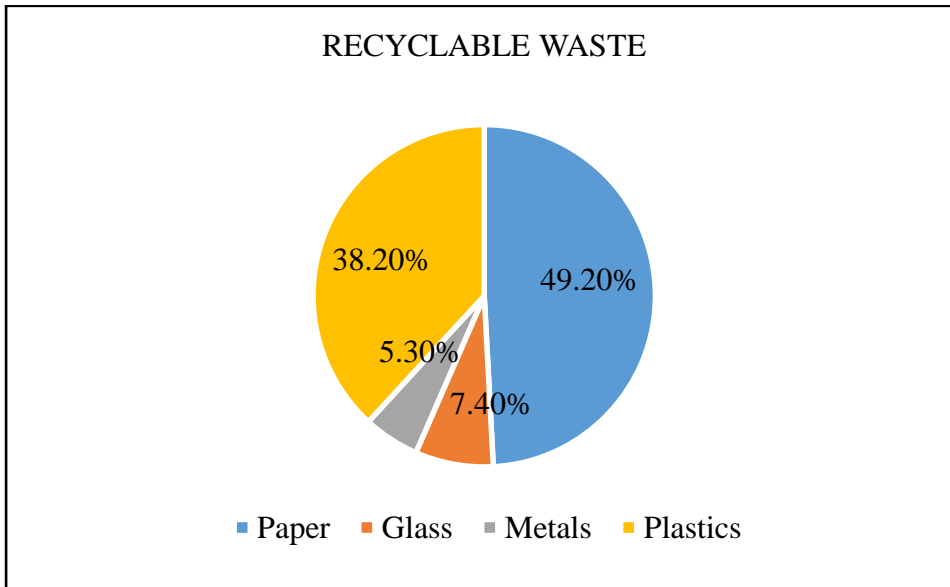


Figure 5.7: Recyclable waste from the households

Source: Researcher, 2019

The solid waste from the household is then stored as follows; 51% in sacks, 23% in plastic bags, 12% in rubbish bins, 8% in cardboard boxes and 6% in no storage at all before disposal (Figure 5.8). There was no evidence of sorting of household waste before it was taken to collection points. Sorting was mostly done by waste pickers at the collection points or at the dumpsite. Respondents cited lack of capacity to sort the waste at the household level.

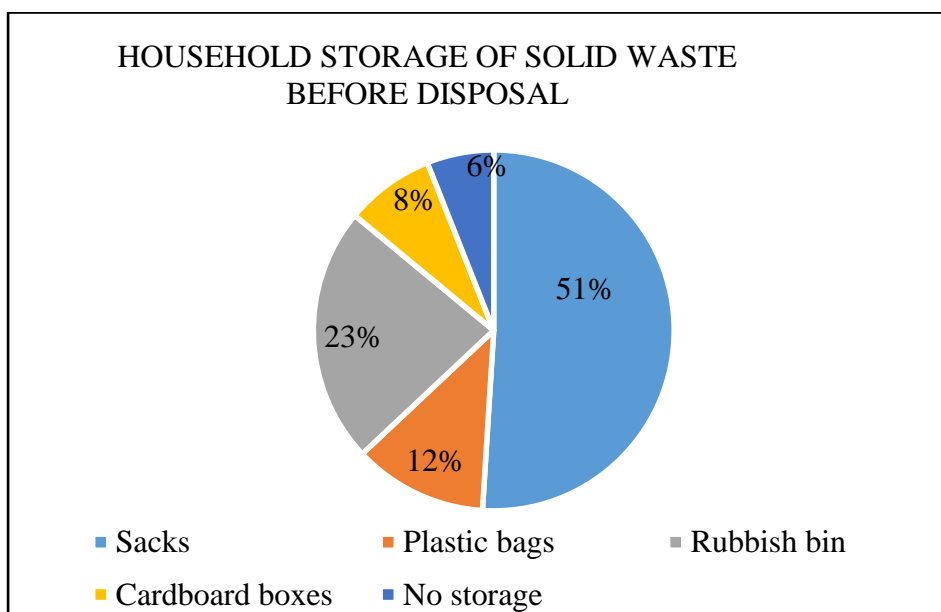


Figure 5.8: Composition of household solid waste storage before disposal

Source: Researcher, 2019

Sacks were the most preferred form of storage since they are the next cheaper option after the plastic bags were banned in September 2017. Most of the respondents also claimed that they reuse the sacks used to package food products and agro-chemical products. Sacks with rubbish are often placed outside for the collection service workers to pick (Plate 5.1).



Plate 5.1: Sacks are the most preferred form of household waste storage before disposal.

Source: Researcher, 2019

5.4 Level of knowledge toward SWM in the study area.

There was overall expression of good levels of knowledge on SWM matters as most respondents seemed to be aware of negative effects of managing solid waste poorly within their neighbourhoods (Table 5.1). Study findings from the responses from the open-ended questions indicated that 37.6% of the residents' solid waste is collected by the County Council of Nakuru officers whereas the remaining 62.4% said it was collected by private companies belonging to (CBOs) and (NGOs). Some of the private companies mentioned included; Black knight global services, Desh hygiene services, St Joseph's environmental community enterprise, among others. 61.8% believe that the County government needs to enhance the awareness of SWM in

their area noting further that their children rarely talk about these issues and therefore more public outreach and education needs to be fostered by the government. A majority; 58.2% feel that the television is the most effective mass media component to enhance SWM awareness, 32.1% vouched for radio whereas the remaining 9.7% believed social media to be effective enough to spread the awareness. Good levels of knowledge on SWM by the residents is a great starting point towards achieving sustainable SWM in the county. Other concerns not described in the table, but were mentioned included odours and loss of aesthetics due to poor SW disposal.

The results indicated that the majority of households (87%) are aware that open burning of waste causes health risks especially respiratory diseases such as asthma and bronchitis. 90% also cited that diarrhoea and dysentery and other water-borne diseases were as a result of illicit dumping of waste. Besides health risk, 81% of the residents are aware that poor dumping of SW leads to odours & unsightliness; and that flooding in their town has mainly been because of blocked drains and gullies. However, only a few (32%) are aware of the designated collection points. 95% of the residents approved the plastic bags ban effected by the government in September 2017 citing better impacts to the environment and reduced littering (Table 5.1). Perhaps the Government of Kenya would eventually sign into law the ban on plastic bottles as well as they did on the bags so as to improve SWM significantly in the future.

Table 5.1: Knowledge towards solidwastemanagement

A: KNOWLEDGE ON SOLID WASTE MANAGEMENT		Agree	Disagree	No opinion
<i>Ai</i>	Burning waste causes health risks such as bronchitis and asthma	87%	13%	-
<i>Aii</i>	Poor dumping of waste can eventually lead to polluting of rivers, the lake and wells	92%	6%	2%
<i>Aiii</i>	Illegal dumping of solid waste causes bad smells, loss of aesthetics in this area.	81%	11%	8%
<i>Aiv</i>	Solid waste should be dumped in the designated areas for later collection by the authorities	32%	68%	-
<i>Av</i>	The Nakuru County government is responsible for SW collection in the neighborhood	49%	40%	11%

Avi	Flooding in town is due to solid waste blocking drains and gullies	88%	12%	-
Avii	Since the plastic ban was effected by the government, solid waste management in our area has greatly improved.	95%	5%	-
Aviii	Untreated waste dumped in streams and lakes results in pollution	88%	6%	6%
Aix	Occurrence of dysentery and diarrhoea is because of a dirty environment	90%	6%	4%

Source: Researcher, 2019

The good levels of knowledge by respondents as in this study, was also reported by Ehrampoush (2005) and Yadavannavar *et al.*, (2010) which showed that the knowledge of more than 65% of their respondents was better than moderate. A similar study by Barloa (2016) found out that majority of his respondents had good knowledge and attitude; however, less than half of them less appealing practice-level such as on recycling and participation in SWM programs. The good knowledge levels was also reported by Rahmaddin *et al.*, (2015) in Indonesia. They portrayed high levels of knowledge and attitudes but their actions were poor as they dumped most of their waste into the river. The gap between knowledge and practices was also reported by Licy *et al.*, (2013), in a KAP study done in Thrissur City, India.

5.5 Attitudes towards solid waste management.

From responses of the open ended questions, the study revealed that 59% of residents were unsatisfied with the solid waste collection while the rest 41.1% were satisfied. 33% of the residents cited cost as the main reason for their dissatisfaction, whereas 22.9% expressed unreliability as the reason for dissatisfaction and 25.8% expressed improper collection by the authorities as their main dissatisfaction. The remaining 17.6% felt that the collection services were both reliable and cooperative. 82% did not sort or separate their household SW before disposal whereas remaining minority of 17% endeavoured to sort their waste. Table 5.2 indicates that 68% were conscious of open burning of waste could harm their health but only a few (39%) felt that it was their individual responsibility to manage the waste around the community.

Favourable attitude of the need to sort the household waste was expressed by 66.1% of the residents who expressed willingness to do so if asked to by the authorities and if given the

right facilities to sort the waste. The county government should consider this commendable figure so as to promote the 3Rs initiative since sorting of household waste makes recycling easier and cheaper. Another positive attitude expressed was the willingness to give charges for the SWM services, with the majority at 77% of the residents willing to do so. The remaining 23% cited costs and dissatisfaction of the collection services as their reason for their unwillingness to pay. Majority of the residents (87%) expressed favourable attitude towards education about SWM as one way to fix the solid waste crisis in their community. This could be achieved by conducting of public campaigns by the County government and involving the community in projects so as to create awareness on SWM challenges and solutions.

Negative attitudes expressed by the community included lack of individual responsibility capacity to voluntary take part in picking of solid waste that is already poorly disposed in the open spaces. They expressed that it is the responsibility of the collection service providers and other relevant authorities to collect the poorly disposed waste (table 5.3). Through public outreach by the authorities, this could be improved by encouraging the residents to take individual responsibility to ensure that the environment is clean. Combined efforts from all members of the community and the authorities could lead to a significant improvement of SWM in Nakuru. Negative attitudes were reported by Ibrahim & Babayemi, (2010) whose respondents scored very low on the attitude rankings, which is contrary to the findings of this study.

Table 5.2: Attitudes towards solid waste management

B: ATTITUDES ON SOLID WASTE MANAGEMENT		Agree	Disagree	No opinion
<i>Bi</i>	Open burning waste could bring harm to human health	68%	30%	2%
<i>Bii</i>	It is wrong to trash on streets and in drainage channels	41%	39%	20%
<i>Biii</i>	Individuals play key roles SWM in their communities	89%	11%	-
<i>Biv</i>	County government of Nakuru is dispensing their work in SWM exemplarily	51%	49%	-
<i>Bv</i>	Locals should compensate for the SW collection services	77%	23%	-
<i>Bvi</i>	County government of Nakuru should activate recycling programs and laws	72%	12%	16%

<i>Bvii</i>	Picking up of waste shows good responsibility in the community.	39%	60%	1%
<i>Bviii</i>	A waste-free community is as important as employment and living cost.	47%	30%	23%
<i>Bix</i>	Public education could help to fix the solid waste crisis.	87%	13%	-
<i>Bx</i>	The plastic ban issued by the Government last year has led to better solid waste management in our area	95%	5%	-

Source: Researcher, 2019

5.6 Practices towards solid waste management.

Responses from open-ended questions revealed majority of the respondents (57.9%) claimed that they had regular solid waste collection services, with most stating that the waste was collected once a week. 59.7% of them disposed their waste in nearby containers or dumpsites, 14.7% disposed their solid waste in open spaces and 10.5% in thickets near home. The mean charge per month of the collection services was Kshs 170 ± 117 . It was observed that most respondents (60.3%) dumped their solid waste outside the provided garbage bins. A majority at 31.8% did not give their opinion why that happens but the rest felt that perhaps it was due to the height of the bins and presence of stray animals around the bins that scared the people away from disposing well their waste.

Despite the good levels of knowledge (78%) and favourable attitudes (67%) expressed by the residents about the need for sorting of solid waste and recycling of waste; their levels of practices were relatively low. Only 17% and 19% of the community practiced sorting of waste and applied the Rs concept of reuse, reduce, recycling, refuse, recovery and repurpose of their waste, respectively. A majority of the sampled population still practiced dumping of refuse in open spaces at 69% and along the road sides and streets at 92%, contrary to the laid-out regulations. Majority of the respondents still practiced openburning of the solidwaste and burying it in pits at 97% and 88% respectively (Table 5.3). The poor practices of illegal dumping often lead to odours, loss of aesthetics, clogging of the drainage systems in the town, flooding and spread of airborne and waterborne diseases.

Poor SW disposal methods such as opendumping, burying and openburning of SW as in this study finding, were also reported in Nigeria by Adeoulu *et al.*, (2014) and also Ifegbesan (2010), who noted poor SWM practices despite their respondents' awareness on waste

problems. Such findings are essential to attain in SWM systems of recycling, sorting and composting, as well as on implementing programs to address lack of awareness on environmental issues and other conservation strategies (Tartiu, 2011). A study done by (Tatlonghari & Jamias, 2010) in the Philippines, revealed that the residents surveyed portrayed high awareness, favourable attitudes on waste-related issues and topics and also engaged in favourable and exemplary practices; especially on solid waste segregation before disposal. This is proof that it is possible for a community to exhibit exemplary KAP ratings.

Table 5.3: Practices on solid waste management

C: PRACTICES ON SOLID WASTE MANAGEMENT		Yes	No
<i>Ci</i>	Dumping waste in open spaces	69%	31%
<i>Cii</i>	Dumping refuse in designated dumpsites	57%	43%
<i>Ciii</i>	Use of refuse bins	31%	69%
<i>Civ</i>	Disposal of refuse by the road sides and major streets.	92%	8%
<i>Cv</i>	Disposal of refuse into the drains and gutters	54%	46%
<i>Cvi</i>	Burying of refuse in pits	88%	12%
<i>Cvii</i>	Sorting and separation of refuse at the household	17%	83%
<i>Cviii</i>	Dumping of solid waste in nearby rivers	24%	76
<i>Cix</i>	Burning of refuse waste	97%	3%
<i>Cx</i>	Application of the Rs concept of reducing, reusing and recycling of household waste	19%	81%
<i>Cxi</i>	Disposal of organic household waste instead of recycle	67%	33%
<i>Cxii</i>	Involvement in SWM projects by the authorities	4%	96%

Source: Researcher, 2019

The poor practices of illegal dumping (Plate 5.2 a,b,c) often lead to odours, loss of aesthetics, clogging of the drainage systems in the town, flooding and spread of airborne and waterborne diseases. Buried refuse especially of toxic waste can ultimately lead to soil poisoning and contamination of ground water resources. Plate a and c show unsightliness on open spaces as a consequence of illegal-dumping of solid waste whereas Plate b shows a clogged drainage with solid waste.



Plates 5.2 a,b,c: Illegal dumping and other poor practices of SWM often lead to unsightliness and clogged drainage channels in area of study.

Source: Researcher, 2019

5.7 Influence of age of respondents on their level of attitudes

This study sought to find out if there is any significant influence of age of respondents on their level of attitudes at 0.05 confidence level. Cross-tabulation analysis was used to test the statistical significant influence of age of respondents on their levels of attitude. The values of average attitude were determined as the average attitude value per question in Table 5.2. At 95% Confidence level, the calculated $X^2=138.521$ at degree of freedom =18, and the value of $P < 0.001$. The value of P is proof that the level of significance is very high. Thus, the H_0 was rejected and the H_1 was adopted that; *there is a significant influence of age on attitudes associated to SWM activities*

The results indicate that as people grow older, they become more conscious of their environment. This could mean that the older individuals were more likely to express favourable attitudes towards SWM activities, and were more likely to comply with the set laws and regulations by the authorities. They tend to portray better attitudes towards SWM activities and recognize and support the efforts of authorities in their SWM operations. The findings also highlight the need to educate younger people on environmental issues such as conservation. Introducing the topic of SWM in school curricula and creating projects that involve the younger people in the society is one way of creating awareness, so that their attitudes improve

significantly. A similar study obtained by Adeolu *et al.*, (2014) in Oyo State, Nigeria, portrayed similar positive correlation between age and respondent's knowledge and practices. Contrary to these findings, a study done by (Tatlonghari & Jamias, 2010), indicated a weak and negative relationship between the two attributes. The younger respondents portrayed better knowledge levels than the elderly respondents.

5.8 Influence of education level of the respondents on their level of practice

This study seeks to find out if there is any significant influence of the education level of the respondents on their level of practice at 0.05 confidence level. As illustrated in Figure 5.2 above all the respondents had formal education. The bar graph in figure 5.9 represents the association between the education level of the respondents and their level of practice.

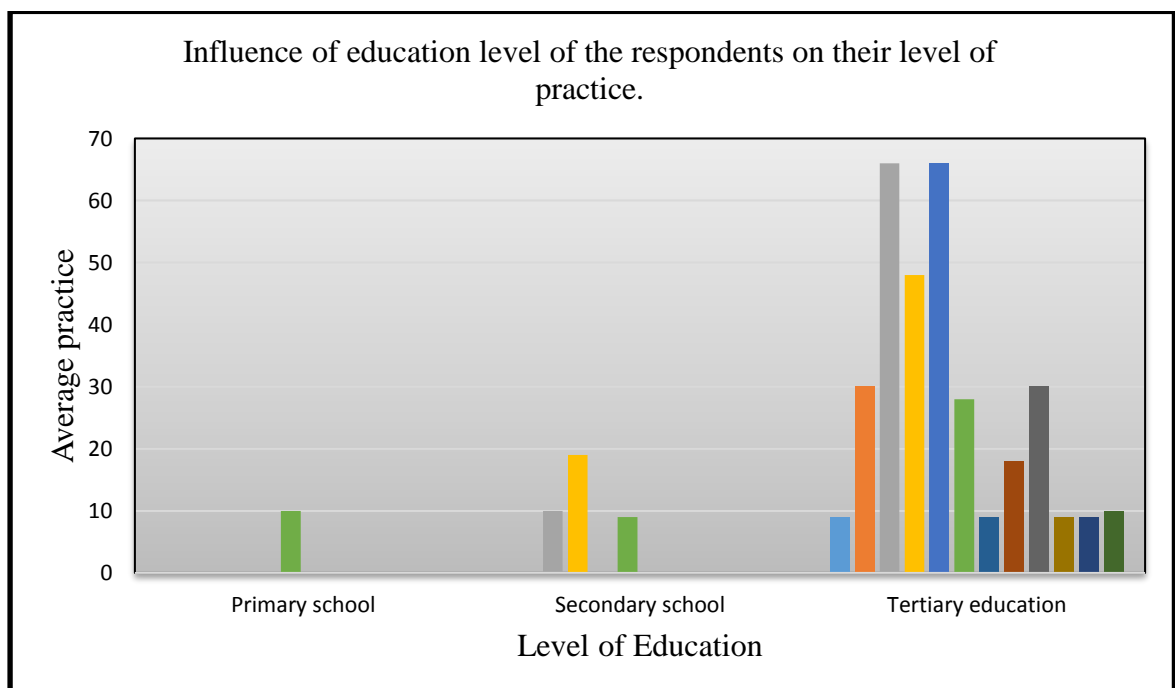


Figure 5.9: The association between education level of the respondents and their level of practice.

Source: Researcher, 2019

Cross-tabulation analysis using the Chi-square tests was used to test the statistical significant influence of education level of the respondents on their level of practice. From the results (Table 5.3), it was apparent that open burning (97%), burying of waste (88%) and illegal

dumping (69%) were poor practices conducted. Very few respondents sorted their waste at the household level (17%) and only a few applied the Rs concept (19%). To explore the relationship between education level of the respondents and their average practices on SWM, a cross-tabulation analysis of the two variables was conducted. The values of average practices were determined as the average practice value per question. At 95% Confidence level, the calculated $X^2=126.648$ at degree of freedom =22, and the value of $P < 0.001$. The value of P is proof that the level of significance is very high. Thus, the H_0 was rejected and the H_1 was adopted that; *there is a significant influence of the level of education on the SWM practices.*

This means that those residents who possessed tertiary level education were more likely to have better practices than those with primary and secondary-school levels. Study findings were similar to those of (Tatlonghari & Jamias, 2010) and (Barloa, 2016) whose reports indicated that the respondents with higher education levels were inclined to exhibiting good practices of SWM. However, contrasting findings were indicated by (Ahmad, 2015) in Malaysia and by (Ifegbesan, 2010) in Ogun State, Nigeria whose respondents showed satisfactory levels of knowledge and attitudes but possessed poor practices on SWM. However, the same study showed good attitude ratings on SWM issues.

5.9 KII review: Capacity of the SWM authorities in Nakuru County

Various stakeholders in the SWM sector presented their opinions through the key informant interviews (KIIs) conducted by the researcher. They included the County Director of Environment of Nakuru County, chiefs of Kaptembwo and Flamingo wards, three NASWAMA workers from private SWM companies (Desh hygiene services, Black knight global services and St Joseph environment group) and two Giotto landfill workers. They raised challenges encountered in SWM operations, presented their efforts and emphasized on the need for improvement in the sector. According to the County Director of Environment of Nakuru County is the one responsible for SWM processes in the county. The institutional capacities, challenges and efforts of SWM authorities in Nakuru County were discussed in the KIIs the informants indicated the following issues:

5.9.1 Inadequate infrastructure to handle solid waste in Nakuru

According to the County Director of Environment, daily waste generation is approximated to be 600 tonnes with a collection efficiency of about 50%. Poor infrastructure, poor access roads to the Giotto dumpsite and lack of proper machinery and equipment to

effectively transport and dispose the waste often limit the county's capacity to be effective in SWM. However, there are plans and budgets proposed by the county government to procure land and construct a new landfill site. If realized, this new landfill would also incorporate activities by the informal entrepreneurs too. Proper city planning is needed to be able to establish the most suitable location and facilities needed to set up new landfill adequate to handle all the solid waste from the town.

Besides waste management, the department of Environment also conducts street cleaning services, stakeholder involvement and enforcement operating issuance of contracts, supervision, and landfill operations. However there are only two trucks serving the county and 140 staff only. This is an indication that the county needs to procure more trucks to facilitate adequate and timely transportation of solid waste and employ more staff.

5.9.2 Collaboration with the private sector and the challenges encountered.

From the interviews, it was clear that SWM operations in Nakuru is outsourced to private companies. So far, 40 CBOs have been appointed, licensed and contracted to help manage waste especially in regions away from the CBD. There have been reported conflicts by some CBOs who have no formal contracts and are said to be operating illegally. They complain that they are not allowed to access the county designated disposal site. The private companies also cited delayed and little payments from the County government; hence the lack of sufficient logistics to enable them to be fully efficient.

5.9.3 Lack of awareness on proper SWM practices and household waste separation

Some consumers were uncooperative in issuing costs for SWM. Lack of waste separation at the household was cited to cause potential harm to the waste handlers. The Giotto landfill workers complained that instances of hazardous waste had potential to harm and cause diseases to them. Initiatives to fast-track sustainable SWM system including waste recovery, sorting at the household level, recycling, value addition of waste resources and stopping of open dumpsites would help to ensure better services are implemented. Kenya's resolve towards better SWM operations begun with the ban on plastics bags which took effect from September 2017.

5.9.4 Waste disposal challenges in Nakuru

The chiefs and the Giotto landfill workers both stated that the County needed a proper and new landfill system. Giotto dumpsite, the only disposal site in the town did not any

weighbridge and the access road to the dumpsite was also observed to be of low standard. Approximately 200 tonnes of waste per day were dropped at the Giotto landfill even though only 3 garbage trucks were available which forced most of the contracted CBOs to rely on handcarts and donkeys to transport waste.

Following the KII review, the local authorities that deal with SWM need to invest in this sector so as to ensure a cleaner environment for all. The local government should hire more staff and better equipment to handle waste so as to ensure a faster, safer, convenient and affordable SWM in the county. Adoption of technology to safely handle waste from collection to disposal points should be an agenda for all local authorities (Urban Africa Risk Knowledge, 2016). The County Government of Nakuru should strengthen the institutions concerned with SWM by fostering collaboration between all sectors involved for easier way of interpretation and execution of the set laws and policies. As advocated by Addis Continental Institute of Public Health & USAID (2013), public-private collaboration provision of urban SWM should be encouraged in developing countries to solve current urban waste problems. The need to harmonize agency roles and rework on all SWM policies was also emphasized by Urban Africa Risk Knowledge, (2016). Proper city planning also needs to be done so as to set up a new sustainable landfill that will cater for the current waste streams and consider future expansion.

CHAPTER 6: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter provides a summary of the research findings and the conclusion which were discussed based on insights gained from study findings. The first two set of recommendations is directed toward management of SWM and policy makers in the counties. Last set of recommendations is given for professionals interested in pursuing additional research that exceeds the scope and findings of this study.

6.1 Summary of findings

As per the first objective, results from the study indicated that there are three types of household waste disposed at the area of study. They include, organic waste, inorganic waste and recyclable waste. As part of promoting the Rs effort of recycling, reuse, reduce, refuse, and repurpose the study recommends that the residents could endeavour to sort waste at the household and to recycle most of its household waste if possible.

In regard to objective two; the study findings indicated the respondents had relatively satisfactory level of knowledge. They proved to be aware of the consequences of illicit waste handling. 95% of the respondents approved the plastic ban effected by the Government since September 2017 citing decreased littering of the environment.

The third objective established that favourable attitudes towards SWM were expressed by majority of the respondents. However, their level of practice was generally poor. The respondents were aware that diseases, flooding, odours and loss of aesthetics occurred as a result of illegal handling of SW. Majority expressed their willingness to sort their household waste at 66% before disposal and were also willing to compensate for the SWM collection at 77%.

The fourth objective revealed that besides good ratings of knowledge and attitudes levels, the respondents' practices were below average standards due to lack of proper facilities and limited options that would allow them to sort or to recycle their household solid waste. Poor practices documented included discriminate dumping of waste in open spaces and in drainage channels, burning and burying of solid waste in pits.

6.2 Conclusion

Following the study findings and data analysis, it was concluded that; The theory of planned behaviour helps to expound on how levels of knowledge and the attitudes directed towards an issue can significantly determine the behaviour or practices of people. To achieve sustainable SWM in Nakuru, it shall take both the efforts of the individuals and the authorities as explained in the conceptual framework. The review of literature gave insight that it is possible for a population to exhibit proper SWM practices. The cities whose systems are robust and are setting good examples of functional SWM, also display that their citizens are aware of proper ways of handling waste and that they generally display positive attitude towards the SWM regulations. However, their high KAP ratings are supported by the fact that in these cities, there is a synergy of technology, proper functioning institutions and clear policies. The study was limited to high-density residential wards in Nakuru County. Both qualitative and quantitative research approaches were applied where key interviews and questionnaire survey, respectively were used in data collection.

6.3 Recommendations

6.3.1. Management recommendations

The institutions concerned with SWM operations such as the County governments and Ministry of Environment should strive to achieve the following:

1. Invest in proper infrastructure for sustainable SWM. These include improving of access roads that lead to the landfills, plan and build adequate dumpsites to cater for all solid waste generated per county, purchase enough equipment such as garbage trucks and safety wear for the SWM staff.
2. Adoption of technology to safely manage waste. Introduce solid waste re-use strategies like composting and biomass fuel production
3. Create awareness to the people through public outreach and involving the populace in projects and campaigns. Encourage people through incentives and wages for all waste management activities conducted. Introduce waste management courses in all levels of education.

4. Harmonize all waste handling sectors for better collaboration so as to achieve wholesome results. Private companies should be fully facilitated through reasonable and timely wages and supplied with necessary licensing.

6.3.2. Policy recommendations

1. Develop legal Bills to encourage waste separation from the source. This could be made possible by availing facilities that encourage household waste separation which makes the process to be cheaper, safer, faster and efficient.
2. Harmonize different sectoral roles and rebrand existing policies for better communication and sharing of resources.
3. Relentless enforcement by authorities to ensure that all vices in SWM are curbed.

6.3.3. Research recommendations

1. Determine if different land-uses in a town lead to different attitudes and practices on how people handle their solid waste.
2. Find out more strategies to be applied by local governments to increase public participation in SWM projects

REFERENCES

- Abdullahi, K., & Tuna, F. (2014). Nigerian Students' Knowledge and Perceptions about Environmental Problems and Management: A case study of Kano State. *International Journal of Scientific Knowledge* 4, 26-34.
- Addis Continental Institute of Public Health & USAID. (2013). *Situational Analysis of Urban Sanitation and Waste Management: "The Structural, Socio-Economic, Institutional, Organizational,.* Addis Ababa, Ethiopia: John Snow Inc.
- Addo, H., Dun-Dery, E., Afoakwa, E., Elizabeth, A., Ellen, A., & Rebecca, M. (2017). Correlates of domestic waste management and related health outcomes in Sunyani, Ghana; a protocol towards enhancing policy. *BMC public health*, 17(1), 615.
- Adeolu, A., Enesi, D., & Adeolu, M. (2014). Assessment of Secondary school Students' Knowledge, Attitude and Practices toward Waste Management in Ibadan, Oyo State, Nigeria. *Journal of Reserach in Environmental Science and Toxicology* 3, 187-194.
- Ahmad, J., Nor, S., & Ismail, N. (2015). Investigating Students' Environmenatl Knowledge, Attitude, Practice and Communication. *Asian Social Science* 11, 284-293.
- Ahmed, S., & Ali, S. (2006). People as partners: Facilitating people's participation in public-private partnerships for solid waste management. *Habitat International* 30, 781-796.
- Aini, M., Razi, A., Lau, S., & Hashim, A. (2002). Practices, attitudes and motives for domestic waste recycling. *International Journal of Sustainable Development and World Ecology*, 9(3), 232.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decison processes*, 50(2), 179-211.
- Ajzen, I. (2002). Perceived behavioral control, self-efficient, locus of control, and the theory of planned behavior. *Journal of Applied Sicial Psychology*, 32, 665-683. DOI: 10.1111/j.1559-1816.2002.tb00236.x.
- All About Kenya. (2012, April 22). *Nakuru County*.
- Allen, F., & Bassegy, N. (2012). *Making Policies Work: Between Environmental Policies and Environmental Protection*. Nigeria: Oilwatch.
- Azorin, J., & Cameron, R. (2010). The application of mixed methods in organisational research: A literature review. *Electronic Journal of Business Research Methods*, 8(2), 95-105. <https://doi.org/10.4236/jis.2012.33026>.
- Babaei, A., Alavi, N., Goudarzi, G., Teymouri, P., Ahmadi, K., & Rafiee, M. (2015). Household recycling knowledge, attitudes and pracices towards solid waste management. *Resources, Conservation and Recycling*, 94-100.
- Barloa, P., Lustina, P., Lapie, J., & Christian, P. (2016). Knowledge, attitudes and Practices on Solid Waste Management among undergraduate students in a Philippine State Univeristy. *Journal of Environment and Earth Science Vol.6, No.6, 2016*, 146-153.

- Bhada-tata, P., & Hoornweg, D. (2012). What a Waste: A Global Review of Solid Waste Management. Urban Development series; knowledge papers no.15, World Bank. Washington, DC: Worldbank. <https://openknowledge.worldbank.org/handle/10986/17388> License: CC BY 3.0 IGO.
- Bilitewski, B., Hardtle, G., & Marek, K. (1994). Waste Management. In A. B. Weissbach, *Title of the German edition: Abfallwirtschaft Eine Einfuhrung* (p. 204). Berlin Heidelberg: Springer-Verlag.
- Chakrabarty, D. (1992, 11 27). Of Garbage, Modernity and the Citizen's Gaze. . *Economic and Political Weekly*, pp. 541-547 <http://www.jstor.org/stable/4397699>.
- Chandrappa, R., & Das, D. (2012). Solid waste management. Berlin. *Environment Science and Engineering*, doi: 10.1007/978-3-642-28681-0_1.
- Creswell, J., & Clark, V. (2011). The Nature of Mixed Methods Research. *Designing and Conducting Mixed Methods Research*, 1-7.
- Davies, A., Taylor, D., Fahy, F., Meade, H., & O'Callaghan-Platt, A. (2005). *Environmental attitudes and behaviour: values, actions and waste management (2001-MS-SE2-M1)*. Environemntal RTDI Programme 200-2006.
- DECS Order No. 46, s. (1983). Revised System of Rating and Reporting of Pupil Progress.
- DeLong, J. (1993). Public policy toward Municipal solid waste. *Annual Review of Public Health*, pp. 14:137-57.
- Ehrampoush, M., & Moghadan, H. (2005). Survey of Knowledge, Attitude and Practice of Yazd University of Medical Sciences about Solid waste Disposal and Recycling. *Iranian J Env Health Sci Eng.*, 26-30.
- Feo, D., & Gisi, D. (2010). Public opinion and awareness towards MSW and separate collection programmes: a sociological procedure for selecting areas and citizens with a low level of knowledge. *Waste management* 30, 958-976.
- Fishbein, M. (1980). A theory of reasoned action: some applications and implications. *Nebraska Symposium on Motivation*. (p. 65). Nebraska: Symposium on Motivation Vol. 27.
- Gakungu, N. (2012). Solid waste management in Kenya: A case study of public technical training institutions. *ICASTOR Journal of Engineering Vol. 5, No. 3*, 127-138.
- GoK. (2013). *Nakuru County Intergrated Development Plan 2013-2017*.
- GoK. (2013). *Nakuru County Intergrated Development Plan 2013-2017*.
- GoK. (2013). *The Constitution of Kenya 2010*. Chief Registrar of the Judiciary.
- GoK. (2015). *The National Solid Waste Management Strategy*. National Environmental Management Authority (NEMA).
- GoK. (2010). The Constitution of Kenya. *Kenya Law reports*. Nairobi, Kenya: National Council for Law Reporting with the Authority of the Attorney General.

- Gross, M. (2017). *Planned behavior: The relationship between Human thought and action*. Taylor & Francis.
- Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. (2002). Application of the theory of planned behaviour in behaviour change interventions: A systematic review. *Psychology and health*, 17(2), 123-158.
- Henry, R., Yongsheng, Z., & Jun, D. (2006). Municipal solid waste management challenges in developing countries – Kenyan case study. *Waste Management*, 26(1), 92-100. doi: 10.1016/j.wasman.2005.03.007.
- Hoornweg, D., Thomas, L., & Otten, L. (1999). *Composting and its applicability in developing countries*. Washington: World Bank, Urban Development Division.
- Hove, M., Ngwerume, E., & Muchemwa, C. (2013). The Urban Crisis in Sub-Saharan Africa: A Threat to Human Security and Sustainable Development. Stability. *International Journal of Security and Development*, 2(1), 7. doi: 10.5334/sta.ap.
- Hummer, C. (2017). An examination of San Francisco State University students' perception of potable reuse. San Francisco, California: Unpublished Thesis.
- Ibrahim, F., & Babayemi, O. (2010). Knowledge and attitude of a group of Nigerian undergraduates towards environmentalism. *Global Journal of Environmental Research*, 4(1), 47-53.
- Ifegbesan, A. (2010). Exploring secondary school students' understanding and practices of waste management in Ogun State, Nigeria. *International Journal of Environmental and Science Education*, 5(2), 201-215. .
- Ivankova, N. (2015). Applying Mixed Methods in Action Research. *Mixed Methods Applications in Action Research*, 50–83.
- June, C. (2016). Assessment of sustainability of solid waste management- case study of kaptemwo informal settlement in Nakuru town, kenya. *MMARAU Institutional Repository*, [Http://Hdl.Handle.Net/123456789/4554](http://hdl.handle.net/123456789/4554).
- Kazungu, R.K. 2010. "Improving governance for sustainable waste management in Nairobi." *46th ISOCARP Congress*. 1-8.
- Kenya National Bureau of Statistics. (2009). *Kenya National Population and Housing Census*.
- Keramitsoglou, K., & Tsagarakis, K. (2013). Public participation in designing a recycling scheme towards maximum public acceptance. *Resources, Conservation and Recycling* 70, 55-67.
- Kimani, S., & Mwanzia, P. (2013). Intergrated solid waste management: Decentralized service delivery Case study of Nakuru Municipality, Kenya. *36th WEDC International Conference, Nakuru, Kenya, 2013*, (p. 1). Nakuru, Kenya.
- Krejcie, R., & Morgan, D. (1970). Determing Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, 607-610.

- Krook, J., Martensson, A., & Eklund, M. (2007). Evaluating waste management strategies- a case of metal-contaminated waste wood. *Resources, Conservation and Recycling* 52, 103-118.
- Kumar, B. (2012). *A theory of planned behavior approach to understand the purchasing behavior for environmentally sustainable products. Working Paper, 2012-12-08.* Ahmedabad, Indian Institute of Management.
- Kumar, S. (2016). *Municipal Solid Waste Management in Developing Countries.* CRC Press, 2016.
- Launiala, A. (2009). How much can a KAP survey tell us about people's knowledge, attitudes and practices? Some observations from medical anthropology research on malaria in pregnancy in Malawi. *Anthropology Matters*, 11(1) https://www.anthropologymatters.com/index.php/anth_matters/article/view/31/53.
- Lawal, A. (2010). *Knowledge, attitudes and practices of traders towards solid waste management in major markets within Ibadan metropolis of Oyo state.* .
- Lehmann, V. (2015). The Garbage Project Revisited: From a 20th Century Archaeology of Food Waste to a Contemporary Study of Food Packaging Waste. *Sustainability* 2015, 7(6), 6994-7010: <https://doi.org/10.3390/su/7066994>.
- Licy, C., Vivek, R., Saritha, K., Anies, T., & Josphina, C. (2013). Awareness, Attitude, and Practice of School students towards Household Waste Management. *Journal of Environment*, 147-150.
- Lopez, A. (2012). Understanding Flood Hazard. In A. B. Jha, *Cities and flooding: a guide to integrated urban flood risk management for the 21st century* (pp. 51-129 ISBN 9780821388662). Washington, USA: The World bank.
- Mapa, J. (1997). Effectiveness of Some Communication Channels on Environmental Conservation in Laguna de Bay, Philippines. *Unpublished M.S. Thesis (Development Communication). University of the Philippines Los Banos, Laguna*, 157.
- McAllister, J. (2015). *Factors influencing solid-waste management in the developing world.* All Graduate Plan B and other Reports. 528 <https://digitalcommons.usu.edu/gradreports/528>.
- Momoh, J., & Oladebeye, D. (2010). Assessment of awareness of attitude and willingness of people to participate in household solid waste recycling programme in Abo-Eketi, Nigeria. *Journal of Applied Science in Environmental Sanitation*, 14, 1-12.
- Nasrabadi, T., Bidhendi, G., yavari, A., & Mohammadnejad, S. (2008). Evaluating citizen attitudes and participation in solid waste management in Tehran, Iran. *Journal of Environmental Health* 71, 30-33, 9-40.
- National Planning Commission. (2013). *National development plan Vision 2030.*
- NEMA. (2005). *State of Environment report, Kenya.* Nairobi: NEMA, Kenya.
- NEMA. (2010). *State of the Environment and Outlook .* Nairobi: NEMA 2011.

- Neuman, L. (2012). Designing the face-to-face survey. . In *Handbook of Survey Methodology for the Social Sciences* (pp. (pp. 227–248) https://doi.org/10.1007/978-1-4614-3876-2_14). New York: Springer.
- Odufuwa, B., Ediale, O., & Oriola, S. (2012). Household Participation in Waste Disposal and Management in Ijebu-Ode, Nigeria. *Journal of Human Ecology*, 40(3), pp.247-254.
- Oelofse, G. (2017). Historical Review of Waste Management and Recycling in South Africa. *Resources.*, 6(4):57.
- Ormerod, K., & Scott, C. (2012). Drining wastewater: public trust in potable reuse. *Science, Technology & Human Values*, 38(3), 351-373.
- Owuor, S. (2006). *Bridging the urban-rural divide: Multi-spatial livelihoods in Nakuru town, Kenya (Doctoral dissertation)*. African Studies Centre.
- Oyake-Ombis, L. (2017). *Awereness on Enviromentally sound solid waste management by communities and municipalities in Kenya*. Nairobi, Kenya.
- Practical Action and MCN. (2010). *Strategic Environmental saniation plan Report (SESP) for Nakuru*.
- Reyes, P., & Furto, M. (2013). Greening of the solid waste management in Batangas City. *Journal of Energy Technologies and Policy* 3, 187-194.
- Schratz, M. (2016). Austria: Overcoming a bureaucratic heritage as a trigger for research on leadership in Austria. . In H. D. Anlesing, *A Decade of Research on School Principals: Cases from 24 Countries*. (pp. 307-329). Dordrecht, Netherlands: Springer.
- Schultz, P., & Zeleny, L. (2000). Promoting Environmentalism. *The Journal of Social Issues*, 56, 443-457.
- Sreenivasan, J., Govidan, M., Chinnasami, H., & Kadiresu, M. (2012). Solid Waste Management in Malaysia: A Move towards Sustainability. *Intech*, 3: 55-70. Students towards Household Waste Management. *Journal of Environment*, 2: 147-150.
- Tanmoy, K., Bhagat, J., Bhattacharyya, S., & Pradip, R. (2012). Municipal solid waste generation, composition, and management: the world scenario. *Critical Reviews in Environmental Science and Technology* 42, 1509-1630.
- Tartiu, V. (2011). Evaluation of Attitudes and Knowledge regarding Municipal Waste among Students. Case study: Bucharest Academy of Economics Studies. *Economia Seria Management* 14, 263-267.
- Tatlonghari, R., & Jamias, S. (2010). Village Level Knowledge, Attitudes, and Practices on Solid Waste Management in Sta. Rosa City, Laguna,, Phillipines. *Journal of Environmental Science and Management* 13, 35-51.
- Tchobanoglous, G., & Theisen, V. (1993). *Integrated solid waste management: Engineering principles and management issues*. New York: Toronto: McGraw-Hill Handbooks.
- UN-Habitat. (2010). *Solid waste management in the world cities. Water and Sanitation in the world cities*.

- United Nations Economic and Social Council. (2019). *Report of the Secretary-General: Special edition: progress towards the Sustainable Development Goals*.
- United Nations Human Settlements Programme (UNHSP). (2010). *Solid Waste Management in the World's Cities: Water and Sanitation in the World's Cities 2010*. Earthscan, 1849711690, 9781849711692.
- Urban Africa Risk Knowledge. (2016). *Solid Waste Management and Risks to Health in Urban Africa: A Study of Nairobi and Mombasa Cities in Kenya*. African Population and Health Research Center.
- Warner, W. (2006). Cultural influences that affect the acceptance of compost toilets, psychology, religion and gender. *Norway: Jordforsk Centre for Soil and Environmental Research*.
- Wheeler, B. (2004). Health-related environmental indices and environmental equity in England and Wales. *Environment and Planning A* 36(5), 803-822.
- Wilson, K., Rodic, V., Scheinberg, H., Velis, J., & Alabaster, B. (2012). Comparative analysis of solid waste management in 20 cities. *Waste Management & Research*, 30(3), 237-254 <https://doi.org/10.1177/0734242X12437569>.
- Winkler, J., & Bilitewski, B. (2007). Comparative evaluation of life cycle assessment models for solid waste management. *Waste Management* 27 (8), 1021-1031.
- World Bank. (2017). *The solid waste collection in Nakuru, Kenya has improved. Accelerating WASH through an intergated financial approach!*
- Yadavannavar, B., Berad, S., Aditya, K., & Jagirdar, C. (2010). Biomedical Waste Management: A study of Knowledge, Attitudes, and Practices in a Tertiary Health Care Institution in Bijapur, India. *Indian Journal of Community Med.* 2010:35(1), 170-171.
- Zhang, T., Dong, S., Soon, C., Gersberg, S., & Richard, O. (2010). Municipal solid waste management in China: Status, problems and challenges. *Joournal of Environmental Management* 91, 1623-1633.
- Zohrabi, M. (2013). Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings. . *Theory and Practice in Language Studies*, 3(2), 254-262. <https://doi.org/10.4304/tpls.3.2.254-262> .

WEBSITES

- County Assembly of Nakuru. (2013, August 27). Nakuru County Assembly Background. *Nakuru County Assembly blog*.
- Damary, R. (2013, November 20). Solid waste polluting Lake Nakuru. *The Star, Kenya*, pp. http://www.the-star.co.ke/news/2013/11/20/solid-waste-polluting-lake-nakuru_c860166.

Godfley, B. (2016, January 10). *Plastic pollution finding its way into Lake Nakuru in Kenya via watercourses.* Retrieved from <https://twitter.com/breandangodley/status/686120484652605440>

KenyaTravel Tips.com . (2018). Retrieved from *Cities in Kenya:* <https://www.kenyatraveltips.com/cities-in-kenya/>

Appendix I: Letter of introduction



UNIVERSITY OF NAIROBI

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

Telephone: +254 2 318262
Extension: 28016
Fax: +254 2 245566
Email-geography@uonbi.ac.ke

P.O. BOX 30197-00100
NAIROBI
KENYA

September 10, 2018

The Director,
National Commission for Science & Technology
Nairobi
Kenya.


Dear Sir/Madam,

RESEARCH PERMIT: GRACE NYAGUTHII KAMWERU

This is to confirm that the above named is a Master of Arts student (Registration Number – C50/84004/2016) at the Department of Geography and Environmental Studies, University of Nairobi registered .

Mr. Kamweru is currently undertaking research on a topic titled: **Assessment of Knowledge Attitude and Practices of Solid Waste Management in Nakuru County.**

Any assistance accorded to her will be highly appreciated.


CHAIRMAN
Department Of Geography
and Environmental Studies
UNIVERSITY OF NAIROBI

Dr. Boniface Wambua
Chairman, Department of Geography & Environmental Studies

Appendix II: Research license

THIS IS TO CERTIFY THAT:
MS. GRACE NYAGUTHII KAMWERU
of UNIVERSITY OF NAIROBI, 52428-200
Nairobi, has been permitted to conduct
research in Nakuru County
on the topic: ASSESSMENT OF
KNOWLEDGE, ATTITUDES AND
PRACTICES ON SOLID WASTE
MANAGEMENT IN NAKURU COUNTY
for the period ending:
11th October, 2019

Permit No : NACOSTI/P/18/69573/25524
Date Of Issue : 13th October, 2018
Fee Received :Ksh 1000



Palawa
Director General
National Commission for Science,
Technology & Innovation

Appendix III: Research authorization letter



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/18/69573/25524**

Date: **13th October, 2018**

Grace Nyaguthii Kamweru
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*Assessment of knowledge, attitudes and practices on solid waste management in Nakuru County*" I am pleased to inform you that you have been authorized to undertake research in **Nakuru County** for the period ending **11th October, 2019.**

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

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a **copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

**GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner
Nakuru County.

The County Director of Education
Nakuru County.

National Commission for Science, Technology and Innovation is ISO9001:2008 Certified

Appendix IV: Survey questionnaire

Name of Researcher: Grace Nyaguthii Kamweru

Institution: University of Nairobi

Department: Geography and Environmental Studies

Registration Number: C50/84004/2016

This questionnaire is made to you to undertake a research for the partial fulfilment of the award of M.A. degree in Environmental Planning & Management. I would like to assess how you manage the solid waste at the Household level in Nakuru. Your response will help policy makers to formulate an informed policy about improved solid waste management. The survey will take a few minutes and the answers will be completely confidential and strictly for academic purpose. Thus, please answer the questions honestly and as truthfully as you can. You reserve the right to quit completing the survey if feel you compelled to.

PART I

SECTION A: HOUSEHOLD CHARACTERISTICS

1. Name of the Head of the Household (Optional):
2. Ward:
3. Age: <20.....20-40.....41-60.....>60.....
4. Gender: Male.....Female.....
5. Total members of the Household
6. Highest education among the members of the Household.....
No Formal Education () Primary Sch () Secondary Sch () Tertiary/Higher Education ()
7. Total number of HH who are employed.....
8. Average monthly income of the head of household (Optional)

SECTION B

PART I

A. KNOWLEDGE ON SOLID WASTE MANAGEMENT

1. What types of solid waste do you dispose from your household often
 - a) Organic waste: kitchen waste, vegetables, flowers, leaves, fruits.
 - b) Toxic waste: old medicines, paints, chemicals, bulbs, spray cans, fertilizer and pesticide containers, batteries, shoe polish.
 - c) Recyclable: paper, glass, metals, plastics
2. Who is responsible of collecting and disposing solid waste in your neighbourhood.....
3. In your opinion which of these is a priority concern about poor solid waste disposal in your area
 - a) Effect on human health such as Diarrhoea, Asthma
 - b) Effect on environment such as flooding
 - c) Odours
 - d) Loss of aesthetics
 - e) Others (Specify)
4. Do you think that the County government has enhanced enough awareness about Solid Waste management in your area? Yes () No ()
5. What type of mass media component is more effective in generating your awareness on SWM ? Radio () Television () Newspaper () Social media ()
6. Are there any large bins or open dumpsites in your area where you and your neighbours dispose your solid waste? Yes () No ()
7. If Yes, are these bins and dumpsites often accessible to you?
8. What is the distance between your house and the dumping site? Meters

9. The recent plastic ban effected by the Government has greatly improved the solid waste management in our area. Yes () No ()

PART II				
A: KNOWLEDGE ON SOLID WASTE MANAGEMENT				
<i>Knowledge</i>		1	2	3
<i>Ai</i>	I am aware that burning waste causes health risks such as bronchitis and asthma			
<i>Aii</i>	Poor dumping of waste can eventually lead to polluting of rivers, the lake and wells			
<i>Aiii</i>	Illegal dumping of solid waste causes bad smells, loss of aesthetics in this area.			
<i>Aiv</i>	It is my responsibility to ensure that I dispose solid waste in the designated areas for later collection by the authorities			
<i>Av</i>	The Nakuru County Council is responsible for collecting solid waste from our neighborhood and I should adhere to set regulations of solid waste management			
<i>Avi</i>	Flooding in our town is due to solid waste blocking drains and gullies			
<i>Avii</i>	Since the plastic ban was effected by the government, solid waste management in our area has greatly improved.			
<i>Aviii</i>	Direct dumping of untreated waste into rivers, seas and lakes results in accumulation of toxic substances in food chain through the plant and animal that feed on it.			
<i>Aix</i>	Dirty environment breeds flies which precipitates the occurrence of dysentery and diarrhoea			
Score: 1 = Agree, 2 = Disagree, 3 = No Opinion				

B. ATTITUDES ON SOLID WASTE MANAGEMENT

10. Are you satisfied with your current waste collection service? Yes () No ()
11. If No, What do you think should be done to improve the services?

12. What is the main reason for your level of satisfaction/dissatisfaction with the collection services?
- a) Costs.....

- b) Unreliability.....
- c) Improper collection.....
- d) Reliable.....
- e) Cooperative.....
- f) Others

13. Do you sort or separate different types of waste at your home? Yes () No ()

14. Would you do so if you are told by your collection service provider? Yes () No ()

15. Are you willing to pay for the solid waste collection services? Yes () No ()

16. If NO, Why Not?

- a) You are satisfied with existing service
- b) You cannot afford
- c) You don't want to pay
- d) Others:

B: ATTITUDES ON SOLID WASTE MANAGEMENT				
<i>Attitudes</i>		1	2	3
<i>Bi</i>	Open burning waste can be bad for my health and the health of others.			
<i>Bii</i>	People should not throw waste on the streets and in the drains and gullies because they have no other means of getting rid of (disposing of) their waste.			
<i>Biii</i>	I play an important role in the management of waste in my community.			
<i>Biv</i>	The County council of Nakuru is doing enough to fix the solid waste problem.			
<i>Bv</i>	I am willing to pay for the services of solid waste disposal from my home			
<i>Bvi</i>	It is very important that the Nakuru County council put recycling laws and programs in place.			
<i>Bvii</i>	Picking up waste around my community is my responsibility.			
<i>Bviii</i>	Other personal issues (like unemployment, and cost of living) are as important to me as a waste-free community			
<i>Bix</i>	Regular collection of waste is the only solution to the waste problem			

<i>Bx</i>	Public education about proper waste management is one way to fix the solid waste crisis.			
<i>Bxi</i>	The plastic ban issued by the Government last year has led to better solid waste management in our area			
Score: 1 = Agree, 2 = Disagree, 3 = No Opinion				

C. PRACTICES ON SOLID WASTE MANAGEMENT

17. What do you store your household rubbish in? For each storage method write down the number of each used in a week. No. /Days

- a) Plastic bags.....
- b) Cardboard boxes.....
- c) Rubbish bin/ drum.....
- d) Others
- e) No storage—direct disposal to dump.....

18. Where do you dispose your generated waste?

Nearby container () Open spaces () Near home () Others Specify.....

19. Do you have regular garbage collection in your area and do you use it?
.....

20. How often do you use the collection service? Once a week.....Other.....

21. Which collection service do you use? Public() Private() Other-specify

22. How much do they charge per month? Kshs: per month

23. Do people dump their waste alongside the garbage bins instead of putting it inside those? Yes () No ()

24. If Yes, Why, in your opinion, do people behave like this?

- a) Difficult to put waste inside the bin due to height of the bin
- b) Difficult to put waste inside the bin due to waste and litter spread around the bin
- c) Stray animals (dogs, mouse and birds etc.
- d) Any other reason

C: PRACTICES ON SOLID WASTE MANAGEMENT			
<i>Practices</i>		1	2
<i>Ci</i>	I dump my refuse in an open space.		
<i>Cii</i>	I use refuse dump provided by the county government only		
<i>Ciii</i>	I make use of refuse bin		
<i>Civ</i>	I dispose my refuse by the road sides and major streets.		
<i>Cv</i>	I usually dispose my refuse into the drains and gutters		
<i>Cvi</i>	I bury my refuse in pits		
<i>Cvii</i>	I sort and separate my household waste before dumping it		
<i>Cvii</i>	I dump my household waste in nearby river		
<i>Cix</i>	I usually burn my household refuse with fire		
<i>Cx</i>	I often dump my household refuse at any open space		
<i>Cxi</i>	I apply the Rs concept of reducing, reusing and recycling of solid waste in my household		
Score: 1 = Yes, 2 = No			

THANK YOU FOR YOUR RESPONSE.

Appendix V: Interview schedule for Nakuru County environment officers

Name of Researcher: Grace Nyaguthii Kamweru

Institution: University of Nairobi

Department: Geography and Environmental Studies

Registration Number: C50/84004/2016

This Key-Informant Interview is made to you to undertake a research for the partial fulfilment of the award of M.A. degree in Environmental Planning & Management. Your response will help in documenting key problems in Solid Waste Management practices in Nakuru and what you feel should be the sustainable solutions. The survey will take a few minutes and the answers will be completely confidential and strictly for academic purpose.

Date of the Interview.....

General information of Key Informant

Name of key informant:

Title of key informant:

Address of key informant:

Email:Contact Phone:

1. What type of waste do you handle from the residential areas? Do you support waste separation at the household level by the residents?
2. Who is responsible for collection, transportation and disposal of solid waste in Nakuru? Is the County Government in collaboration with other agencies to handle waste in Nakuru?
3. Are there enough designated waste collection points in Kaptembwo, Shabaab, Kivumbini and Langalanga wards? How frequently is waste collected?
4. Where is the solid waste taken and how is it disposed? Are there any locations with uncontrolled dumping of wastes?
5. What is the County Government doing to foster positive attitudes among the residents towards proper solid waste management?
6. What are the current solid waste management related beliefs and practices? How are people sensitized to adopt sustainable solid waste management in their households?

7. What do you feel are the biggest challenges and hazards in ensuring that the community is free from poor solid waste disposal?
8. What do you feel are the long-term solutions to proper solid waste management in Nakuru?
9. Giotto dumpsite is the lone landfill for waste disposal in Nakuru currently. Are there plans to expand it or is there sufficient space for a new landfill?
10. What activities are being undertaken to reduce, recycle or reuse solid wastes? Are there any recycling companies? Is composting of organic wastes being undertaken?
11. What national or local legislation exists for solid waste management and environmental protection?

THANK YOU FOR YOUR RESPONSE.