

# DETERMINANTS OF SOLID WASTE MANAGEMENT IN URBAN CENTRES: CASE OF NAROK TOWN, NAROK COUNTY KENYA

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**Abstract:** In a developing country like Kenya, the problems associated with solid waste management are more acute than in a developed country (Zerbock, 2013). Lack of financial resources and infrastructure to deal with solid waste creates a vicious cycle; lack of resources leads to low quality of service provision which leads to fewer people willing to pay for the services, which in turn further erodes the resource base and so on. Despite the Local County Government effort to clean up the Town of Narok, the solid waste accumulation situation in the residential and entire town continues to worsen day after day. The purpose of the study is to determine factors influencing good practices in solid waste management in urban centers in reference to Narok Town, Narok County. The objectives of the study are; to assess the influence of Technical factors on solid waste management in Narok Town, Narok County, to explore resources available for solid waste management in Narok Town, Narok County, to investigate the influence of enforcement of county by-laws on solid waste management in Narok Town, Narok County, and to establish the influence of public participation on solid waste management in Narok Town, Narok County and The target population was employees working in Narok Town, County offices and businessmen in the town. A sampling 95 out of the total number of 120 employees was picked. Primary data was collected using semi-structured questionnaires and secondary data from research projects, internet, journals and books. The study found out that majority of the respondents 72% were in agreement that resource availability influenced solid waste management while 28% were not in. The study also concludes that majority of the respondents 68% were in agreement that technical skills influence solid waste management while minority 32% disagreed. Additionally, the study concludes that majority of the respondents 68% were in agreement that county by-laws influenced solid waste management practice while 32% were not in agreement. The study recommends that national government should ensure ample budgetary allocation of funds for the purpose of waste management and put up an appropriate structure to guide the activities of each county in the management of solid wastes. Narok County needs to improve waste collection system by providing man power, enough vehicles to ease garbage collection. This research recommends that existing by laws should be strictly enforced in all areas of the municipality and new ones formulated to cope with changing times for example formulation of municipal policy. The study recommends that Narok County should provide financial and physical capacity county agencies and other players involved in waste collection for effective and efficient waste management practices in county, the research recommends that existing by laws should be strictly enforced in all areas of the municipality and new ones formulated to cope with changing times for example formulation of municipal policy.

**Keywords:** Determinants of Solid Waste Management in Urban Centres.

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## ACRONYMS:

SWM	Solid waste management
UN	United Nations

<b>MDGs</b>	Millennium Development Goals
<b>EMCA</b>	Environmental Management and Coordination Act
<b>NC</b>	Narok County
<b>UNEP</b>	United Nations Environmental Program
<b>WMT</b>	Waste Management Theory
<b>RBT</b>	Resource Based Theory
<b>SOPs</b>	Standard operating procedures
<b>WHO</b>	World Health Organization
<b>NGOs</b>	Non-Governmental organizations
<b>SPSS</b>	Special Package for Social Statistics

## 1. INTRODUCTION

### Background of the Study:

Waste is described as objects or substances which are disposed of because the initial user has no further use for them (Williams, 2014). Urban centre's spend increasing resources to improve their practice. Afon, (2012) asserts that while the industrialized nations of the world are progressively solving their solid waste management problems, little progress is being recorded in most third world urban centre's. There has always been the need for man to dispose of the waste generated in the course of his daily activities, and medical waste is part of the total waste streams generated in the built environment (Williams, 2014)..

Zoboli (2008) postulates that generation of waste is linked to population growth, economic prosperity and urbanization. Waste generation is positively correlated to economic growth and development. This implies that as nations grow economically, the more they generate waste. Both developed and developing countries are in pursuit of economic growth. This is because; it is through economic growth that socio-economic welfare of citizenry can be enhanced (Areba, 2010).

According to Giegrich and Vogt (2015), during the Industrial Revolution, Europe and the United States were experiencing rapid development that created greater amounts of waste. Waste started to become a concern and this "Age of Sanitation" began. Communities began to organize waste collection and disposal to help maintain public health.

Globally, 0.49 billion tons of SWM was generated in 1997 with an estimated annual growth rate of 3.2–4.5% in developed nations and 2–3% in developing nations (Suocheng 2011). World Bank (2012) estimated that 1.3 billion tonnes of waste are produced each year which is expected to increase to approximately 2.2 billion tonnes per year by 2025. SWM is influenced by the level of economic development, population demographics, industrialization, public habits and local climate. Petts&Edulijee (2014) agreed that the state of the economy influences waste generation.

Beukerung & Kumar (2010) points out that due to combined influence of poverty, population growth and rapid urbanization in Sub-Saharan Africa it has worsen the situation. The gravity of this problem is perhaps best reflected in the level of attention given to it in the United Nations (UN) Millennium Declaration. Three of the eight Millennium Development Goals (MDGs) outlined in the declaration have waste or resource efficiency implications. In response to the waste challenge many developed countries have embarked upon ambitious environmental reforms, recording remarkable advances in best practices and sustainable management of their Municipal Solid Waste (MSW).

For instance, waste management in South Africa has in the past been uncoordinated and poorly funded. According to (Nahman& Godfrey, 2011) key issues include inadequate waste collection services for a large portion of the population, illegal dumping, unlicensed waste management activities (including unpermitted disposal facilities), a lack of airspace at permitted landfills, insufficient waste minimization and recycling initiatives, a lack of waste information, lack of regulation and enforcement of legislation, and, indeed, limited waste-related legislation in the first place. Waste is a visible concern in Zanzibar (Ngoc and Schnitzer 2010). As part of the developing countries and East Africa in particular,

Zanzibar experiences difficulty in waste management. With population growth due to rural-urban migration and being economic center, the generation of wastes in the Zanzibar Municipality has increased (Gauff, 2005; SEZM, 2005).

In spite of these challenges, it can be mentioned that some African countries have set themselves ambitious goals and targets that seek to implement effective waste management Techniques and strategies in order to promote proper management and disposal of waste.

These include recycling, composting and anaerobic digestion. Progress made so far on these areas and technologies and the methods adopted are encouraging.

In Kenya, the challenge of Solid Waste Management is real (Gakungu, 2011). Collection systems are inefficient and disposal systems are not environmentally friendly. 30 to 40 per cent of all solid waste generated in urban areas is uncollected and less than 50 per cent of the population is served (Otieno, 2010). He states that up to 80 per cent of collection transport is out of service or in need of repair and argues that if the issue of sustainable solid waste management in Kenya is not considered urgently, all the towns in Kenya will be engulfed in waste

In many regions and countries, national and international targets have been set for solid waste recycling, recovery and diversion from landfill (Ali, 2009). To develop and implement effective strategies to meet these targets requires reliable information on the composition of all parts of household waste stream. It is therefore necessary to examine the nature and quality of waste generated in order to contribute to improvement actions at the source. To respond to the environmental challenges, the country reviewed its laws and related policies and enacted the Environmental Management and Coordination Act (EMCA) of 1999. The Act gives rights and confers duties to individuals to safeguard and enhance the environment. It guarantees every Kenyan a clean and healthy environment. These provisions also envisage protection of the environment for the benefit of the present and future generations. This is also envisaged in Kenyan Vision 2030. The Constitution of Kenya under section 42 provides the right of every person to a clean and healthy environment which includes the right to have the environment protected for the benefit of present and future generations. Section 69(2) confers duties on every person to cooperate with state organs and other persons to conserve and protect the environment and ensure ecologically sustainable development and use of natural resources.

Narok Town is the headquarter of Narok County and according to the official website of Municipal Council of Narok (2013). The Maasai Mara National Park, an important tourist destination, is located in Narok County. This is the largest contributor to the county's economy as it hosts the Maasai Mara National Reserve famously known as the seventh wonder of the world for the annual wildebeest migration. It hosts a number of luxurious hotels, lodges, clubs and camp sites. Despite Narok County being tourist site, the management of municipal solid waste has become a problem in Narok town. This is easily identified by the persistent heaps of uncollected waste found on the street sides or ubiquitous illegal dumps. For instance, Narok River has turned to be a wet discharge disposal area from within the Town. Despite being the only source of water for human, livestock and wildlife population all the way from Moriyo in Narok, through Mosiro, Inkurman and into Tanzania, the Narok River Waters have continually been polluted through directing of waste from hotels, and residential houses which direct waste to trenches that discharge to the river. The purpose of the study will be to determine the factors influencing solid waste management in Municipal Council of Narok. In order to improve the strategy for managing solid waste, a better understanding of both technological and managerial aspects is needed.

#### **Statement of the problem:**

Solid waste disposal in urban areas has remained a great menace to municipalities despite various measures being put in place. Solid waste production is relative to population size, location, and income level, proper waste management techniques hence participatory management is vital for efficacy (Ngoc and Schnitzer 2010). By engaging the public in the source sorting, reduce, re-use and recycle of their solid waste, the efficiency of waste collections is attained while this technique has not been forthcoming, Grijalva & Jarkus (2012).

In developing countries, the problems associated with solid waste management are more acute than in a developed country (Zerbock, 2013). Lack of financial resources and infrastructure to deal with solid waste creates a vicious cycle; lack of resources leads to low quality of service provision which leads to fewer people willing to pay for the services, which in turn further erodes the resource base and so on (Kuniya *et al.*, 2008; Zerbock, 2013).

Gitau & Kimani (2013) assert that Kenya including many other countries in the world is experiencing challenges in waste management. The challenges that both developed and developing nations are facing in disposal of waste as a waste management practice (Gitau, & Kimani, 2013). This suggests that solid waste management is a problem which needs to be addressed due to the fact that the population within urban areas in Kenya is increasing tremendously. For instance, the management of municipal solid waste has become a problem in Narok town. This is easily identified by the persistent heaps of uncollected waste found on the street sides or ubiquitous illegal dumps. Narok River has turned to be a wet discharge disposal area from within the town that has occasionally floods and bursts its banks wreaking havoc to the town (Kazungu, 2013). Despite being the only source of water for human, livestock and wildlife population all the way from Morijo in Narok, through Mosiro, Inkurman and into Tanzania, the Narok River Waters have continually been polluted through directing of waste from hotels, and residential houses which direct waste to trenches that discharge to the river.

To my understanding, there are only a few research studies Otiato (2010), Henry (2006), Sira (2010) and Gitau, and Kimani (2012) that have been carried out in Kenya with reference to solid waste management activities. Henry (2006) conducted a research study which sought to examine the overview of the municipal solid waste management activities of local authorities in Kenya. The study indicates that recent social and economic changes over the last 20 to 45 years have resulted in increased rural-urban migration. However, increased rural-urban migration has been at the expense of solid waste management within urban centers. Otiato (2010) argue that increased globalization and industrialization have resulted in increased solid waste.

The central government, county governments and local authorities which carry out solid waste management activities face a number of challenges as they perform their duties (UNEP, 2014). The challenges are numerous and that is why Kenya is faced with solid waste management problems and inadequacies. This study seeks to fill this empirical literature gap by providing current data on the solid waste management practices within urban centers in Kenya.

This study hopes to address measures on solid waste within urban centers with reference to Narok town, Narok County that must be urgently put in place to ensure the better livelihoods within urban areas.

#### **Purpose of the study:**

The purpose of the study was to explore determinants of solid waste management in urban centers with reference to Narok Town, Narok County Kenya.

#### **Research objectives:**

This study was guided by the following objectives:

1. To establish the influence of technical skills on solid waste management in Narok Town, Narok County
2. To explore resources available for solid waste management in Narok Town, Narok County
3. To establish the influence of the enforcement of county by-laws on solid waste management and environmental preservation in Narok Town, Narok County.
4. To establish the influence of Public Participation on solid waste management in Narok Town, Narok County

#### **Research questions**

This research was guided by the following research question:

1. To what extent does technical skill influence solid waste management in Narok Town, Narok County?
2. To what extent does availability of resources influence solid waste management in Narok Town, Narok County?
3. How does enforcement of county by-laws influence solid waste management in Narok Town, Narok County?
4. To what extent does public participation influence solid waste management in Narok Town, Narok County?

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### Significance of the study:

The study hoped to be of significance to the County of Narok and also to the existing body of waste management in Kenya. This study sought to fill gap and could furthermore be used as a foundation for future research in this area. The study was used as a secondary source of literature as much as the study made recommendations on the measures that should be implemented in order to overcome the identified challenges. By so doing, waste management would be more effective and efficient. In addition, the study was of significance to the household of Narok Town- Narok County.

### Limitations of the study:

The employees at Narok County and Businessmen in Narok could be of the thought that the study would result in victimization. They might thus be reluctant to give information. As a result, the validity of the study was adversely affected. In order to overcome this challenge, the researcher assured the respondents that their responses was anonymous and was only used for study purposes.

This enabled the respondents to be free when responding to the questions raised by the researcher. Some respondents were unwilling to cooperate due to their busy schedules. To overcome the limitation, the researcher visited the County management earlier to be given a convenient time, to allow for data collection process.

Cases of respondents lacking interest in filling the questionnaire were also anticipated. A brief interview was conducted (with the respondents) to avoid lack of cooperation. The instrument was structured in a user-friendly simplified manner.

### Delimitations of the study:

The study was confined to the factors influencing the solid waste management in Narok Town, Narok County.

Narok Town was used as the case for the research process. This was because; the town was responsible for waste management in Narok County. Its employees thus understand the challenges of waste management in the town. They are the best persons to recommend measures that should be implemented in order to ensure waste management systems and procedures in Narok Town. By so doing, the researcher collected the right information that enabled them answer the research questions of this study.

### Basic assumptions of the study:

It was assumed in the study that sample, be representative of the target population in its major characteristics. Data collected was valid and reliable in measuring the intended outcome and that respondents willing to give information honestly and objectively.

### Definition of significant terms as used in this study:

**Determinant:** factor which decisively affects the nature or outcome of something.

**Technical skills:** Knowledge and abilities needed to accomplish specific tasks

**Resources:** Something that one uses to achieve objective e.g. raw materials, Capital or personnel.

**County by-laws:** It is a rule or law established by the count government to regulate itself, as allowed or provided for by some higher authority

**Public Participation:** Any process that directly engages the public in decision-making and gives full consideration to public input in making that decision.

**Waste:** According to Gourlay (2012), waste is matter thrown away or something which is no longer useful and it has been discarded.

**Waste management-** According to Tanaka (2009), waste management nowadays is about waste reduction, reuse and recycling.

**Solid waste Management-** Solid waste management is the collection, transportation, processing, recycling and/or disposal of solid waste

**County governments:** are the largest political subdivisions within a state and mostly function to administer state laws.

**Organization of the study:**

This proposal was organized into five chapters. Chapter one presented background of the study, statement of the problem, purpose of the study and objective of the study. Chapter two focused on review of literature against backdrop of the key variables. It also featured theoretical framework and conceptual of the study. Chapter three presented research methodology, research design, target population, sample size and sample selection. It also dealt with data collection instruments, instruments' pretesting, and instruments' validity and instruments' reliability. Chapter four presented data analysis, interpretation and presentation which detailed the introduction of the chapter, response rate, demographic information of the respondents, age, gender, level of education and answers to the study questions. Chapter five dealt with summary of the findings, conclusions and recommendations.

**2. LITERATURE REVIEW****Theoretical Review:**

A theoretical framework refers to how the researcher develops thoughts on what the possible answers could be, these thought and theories are then clustered into themes that frame the subject.

Theories can be considered milestones of scientific development. Theories are usually introduced when previous study of a class of phenomena has revealed a system of uniformities. The purpose of theory is then to explain systems of regularities that cannot be explained with scientific laws (Hempel 1966). Formally, a scientific theory may be considered as a set of sentences expressed in terms of a specific vocabulary. Theory will always be thought of as formulated within a linguistic framework of a clear specified logical structure, which determines, in particular, the rules of deductive inference. (Hempel, 1965) The basic proposal of WMT is that it is able to define waste unambiguously. This study is based on two major theories namely: Waste Management Theory (WMT) and Resource Based Theory (RBT)

**Waste Management Theory (WMT):**

Waste Management Theory (WMT) has been introduced to channel environmental sciences into engineering design. WMT is a unified body of knowledge about waste and waste management. It is an effort to organize the diverse variables of the waste management system as it stands today (Schübeler, 2014). WMT is considered within the paradigm of Industrial Ecology, and built side-by-side with other relevant theories, most notably Design Theory. Design Theory is a relatively new discipline, still under development. Following its development offers valuable insights about evolving technical theories. According to Love (2002), it is crucial to theory development to integrate theories from other bodies of knowledge, as well as the clarification of the definitions of core concepts, and mapping out key issues, such as domains, epistemologies and ontologies. At the present stage of WMT development, scientific definitions of key concepts have been offered, and evolving of WMT under the paradigm of Industrial Ecology is in progress.

The function of science is to build up systems of explanatory techniques; a variety of representative devices, including models, diagrams and theories (Toulmin 1953).

This theory will be used in this study to determine factors influencing solid waste management in urban centers in reference to Narok Town, Narok County

**Resource Based Theory (RBT):**

This Resource Based Theory (RBT) is an economic tool used to determine the strategic resources available to a firm. The main principle of the RBT is that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of the valuable resources at the firm's disposal (Wernerfelt, 1984; Rumelt, 1984). To transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogeneous in nature and not perfectly mobile (Peteraf, 1993). Effectively, this translates into valuable resources that are neither perfectly imitable nor substitutable without great effort (Hoopes, 2003). If these conditions hold, the firm's bundle of resources can assist the firm in sustaining the above average returns (Kazungu, 2013).

The currently dominant view of resource based theory or resource base (RB) of firms is based on the concept of economic rent and the view of the organization as a collection of capabilities. Resources available in this sub-theme include assessment reports of wastewater treatment plants, national strategies for sewage disposal, land filling and municipal

waste combustion (incineration), which may employ conventional techniques or a "waste-to-energy" approach, standard operating procedures (SOPs), waste transporting machinery, sorting and segregation equipment and materials, finance and human resource development among other resources that support sustainable waste management (Vigso and Dorte, 2004).

This theory will be used in this study to explore resources available for solid waste management in Narok Town, Narok County.

#### **Concept of Solid waste management:**

Solid waste management is one among the basic essential services provided by municipal authorities in the country to keep urban centres clean. However, it is among the most poorly rendered services in the basket-the systems applied are unscientific, outdated and inefficient; population coverage is low; and the poor are marginalized. According to Giegrich and Vogt (2015) waste is littered all over leading to insanitary living conditions. Municipal laws governing the urban local bodies do not have adequate provisions to deal effectively with the ever-growing problem of solid waste management (Ngoc and Schnitzer 2010). With rapid urbanization, the situation is becoming critical. The urban population has grown fivefold in the last six decades with 285.35 million people living in urban areas as per the 2010 Census.

It is therefore impossible to de-link waste generation from economic drivers like gross domestic product. Most of the developing and developed nations experiencing rapid urbanization, population growth and prosperity are facing major challenges in waste management (Kessides, 2009). Municipalities found in these jurisdictions are charged with the responsibility of collecting, recycling, treating and disposing the increasing amounts of wastes that are continually churned by the household and industries in this nation.

Unsustainable patterns of production and consumption are increasingly generating large quantities and a variety of wastes at unprecedented rates in Narok Town. High population increase and urbanization has led to high consumption of natural resources and generation of substantial wastes. The municipal council has been unable to cope with collection, treatment and disposal of wastes due to inadequate capacity and financial constraints. In regard to this, available data reveals that 80% of the residents dispose their waste by burning. 10.9% at a public garbage heap and 7% at a garbage pit. Solid waste disposal systems have seriously deteriorated and remedial measures are urgently required, bearing in mind that waste management has serious implications on public health and welfare. Due to this scenario coupled with lack of proper communication and education on the part of the local authority, there seems to be a certain level of laxity by the residents to support the county on solid waste management.

#### **Factors that influence waste management:**

Martin & Boyer (2009) points out that all over the country solid waste is ultimately disposed of in both authorized and unauthorized waste dumps. All kinds of wastes, regardless of their nature, are being dumped indiscriminately into depressions, sand pits, old quarries, drains and even in certain areas, along streets, without due regard to the nuisance and harm caused to the environment

The process of waste management is a step-by-step approach that aims to reduce waste and its impact on the environment and human health. In both developed and developing countries, waste materials originate mainly from domestic activities.

In solid waste production, primarily the amount of waste produced should be reduced. Moreover, the need for awareness rising in households for separation of waste at the source, to make it ready for collection, should be encouraged. There is a need for countries and societies to develop effective and efficient waste management systems to deal with the menace of waste material. Effective waste management strategies are central to economic development and improvement of quality of life.

#### **Technical factors and solid waste management good practices:**

Technical factors are the knowledge and capabilities to perform specialized tasks. There are various technical factors that can be implemented in recycling of solid waste as claimed by Foster and Clark, B. (2011). In order to collect waste to be recycled, waste bins, garbage bags and containers are usually used. Trucks, trains or even ships are used for transporting the waste to the required processing units for recycling. The waste processing technologies vary (Vigso and Dorte, 2004).

From literature it is evident that poor technical skills impact negatively the technical factors influencing SWM. There have been many deaths of unqualified personnel as a result their poor technical skills in SWM systems as found out by Odegi (2011). Alcott (2013) claims that county authorities fail to employ qualified personnel in the numerous docket of SWM like planning and operational docket. According to Odegi (2011) developing countries have less personnel with the right technical know-how of performing SWM planning and operational activities. Most of the officers hired in order to help in solid waste recycling activities have no any training regarding technical know-how in any institution (Ngoc and Schnitzer 2010). It is important for the county governments to understand that adequate trained personnel are key in ensuring the sustainability and efficiency of solid waste recycling activities. Loss of funding is another problem which has been attributed to collapse of majority of the solid waste recycling initiatives.

Also, Alcott (2005) did a study in developing countries to ascertain how availability of qualified personnel impacted recycling of solid wastes. From his study he concluded that most projects regarding solid waste recycling failed due to unqualified personnel and also inadequate funding. This makes it difficult to undertake solid waste recycling projects in many of the parts in these countries

Namilyango college in Kampala Uganda conducted a study to know what caused failure of most of the projects regarding solid waste recycling. They did research in Kampala (the capital city) and other major Ugandan cities. They concluded that most initiatives for recycling solid waste failed as a result of unqualified manpower and also insufficient funding. Kironde (2011) realized that human labor in Dar es Salaam in Tanzania was much inadequate. There are less personnel in the SWM which has been the reason for failure of many of the solid waste recycling activities in the city. Additionally, Kironde(2011) notes that most of the employees in the SWM are paid poorly and also have poor conditions. This has discouraged many qualified employees from joining the SWM sector. Even with the current unemployment levels in the country most people are shunning from joining the SWM sector due to low pay as found out by Onibokun (2009).

#### **Resources availability and solid waste management practices:**

According to WHO (2010), poor waste disposal practices are responsible for a significant proportion of the world's infectious disease burden. In many areas, municipal sewage is often mixed with industrial waste and in some regions very little wastewater receives treatment before it is discharged into the environment (Mc. Garity 2005). Resources available in this sub-theme include assessment reports of wastewater treatment plants, national strategies for sewage disposal, land filling and municipal waste combustion (incineration), which may employ conventional techniques or a "waste-to-energy" approach, standard operating procedures (SOPs), waste transporting machinery, sorting and segregation equipment and materials, finance and human resource development among other resources that support sustainable waste management. Each of these activities requires careful planning, financing, collection, and transport. Meeting the financial demands of MSW management will continue to be a problem in the cities of developing countries. In areas where residents are assessed fees for waste removal, the rate of collection can be quite poor (Schiibeler, 2014).

#### **Enforcement of sub county by-laws and solid waste management practices:**

According Grijalva & Jarkus (2012) stringent enforcement of municipal by-laws help in countries like the United States of America and Sweden facilitated in solving deep waste management problems in the cities. However, Kenya has made strides in enforcement of municipal by-laws a lot need to be done in harmonization and coordination of local government by-laws and waste management laws (Kazungu, 2013).

Nairobi County by laws Section 8(9) requires the occupiers of domestic and trade premises to separate waste which can be recycled and place in a different container provided by County or the waste operator. This provision ensures that every generator of solid waste separates wastes which can then be recycled and put in separate containers. This has not been applied by the households and commercial enterprises as the County does not offer separate bins for 19 recyclables and therefore they put all the waste together (Nairobi County by law, 2010).

Narok County Government Act and by extension most of the County By-Laws are traditional in nature and therefore not consistent with Waste Management regulations 2006. Most of council By-laws are disposal oriented, while the Environmental Management and Coordination (Waste Management) regulations 2006 are prevention oriented. These inconsistencies make it difficult for enforcement.

#### **Public Participation and solid waste management practices:**

Public support can only be manifested by the levels of public participation in the project. Public Participation may be broadly defined as the involvement of citizens in governmental decision-making processes. This ranges from being given



notice of public hearings to being actively included in decisions that affect communities. It is generally a process of engaging stakeholders so that those most likely to be impacted by a particular activity can influence the outcome. Public refers not only to private citizens but institutions, civil society, labor unions, the Government, public officials, industrial, agricultural and trade associations, scientific and professional societies, environmental, educational and Health associations and other minority Groups (EPA 2005). There are many publics as “the public” is not a monolithic entity (Mc. Garity 2005) and the relevant publics would have to be identified to ensure that their rights are not compromised. Public Participation is a dialogue which enables the public to understand and influence decision-making. It is necessary to establish the Public Involvement Framework and identify participants or stakeholders and determine their legitimacy by social analysis (UNEP 2009).

Environmentally sound management of waste was highlighted as a major environmental issue in Chapter 21 of Agenda 21 that was adopted at the Rio Conference which reaffirmed the Declaration of the United Nations Conference on Human Environment that was adopted in Stockholm in June 1972. Principle 10 of the Rio Declaration states: “Environmental issues are best handled with the participation of all concerned citizens, on a relevant level. On a national basis, each individual should have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States should facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy should be provided. This laid the basis for the participatory planning of SWMPs in SIDS, including the Caribbean. However, public participation in SWM was not well planned or coordinated and at times was in conflict with good environmental management. Squires, C.O. (2010)

According to Ikiara, *et al* (2008), partnerships between government and other agents (the private sector, NGOs and communities) to facilitate sharing of SWM responsibilities and financial burden, were only beginning to emerge in Nairobi. There were hardly any deliberate and active processes of collaborative action between stakeholders and relationships were largely informal. Effective coordination among the numerous actors in the city’s SWM sector was absent. Private garbage collection firms largely operated in an environment of open competition, with little or no cooperation from the municipal authority.

### 3. RESEARCH METHODOLOGY

#### Introduction:

The chapter discussed research design, the location of the study area, population, sample size, data collection instruments, their reliability and validity of the responses, and data analysis procedures that was used in the study.

#### Research design:

The design proposed for this study was descriptive survey research design. This design was used because it explored the independent variables that determined solid waste management in Narok Town. This design was chosen because it was descriptive in nature and explained events or phenomena as they occurred in the study.

#### Target population:

Nesbit and Enthistle (2012) define target population as any group of people of observation or test in which researchers happen to be interested. The target population in the study was 120 this included the employees working at the county and business owners in Narok Town, Narok County

**Table 3.1: Target population**

Category	Target
managers	13
Mid-level Managers	17
Employees	40
Businessmen	50
<b>Total</b>	<b>120</b>

**Sample Size:**

Sampling according to Orodho and Kombo (2012) is a process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group.

According to Mugenda & Mugenda (2013), when the study population is less than 10,000, a sample size of between 10% and 30% is a good representation of the target population. For this study, a sample size of 77% was considered under all the categories. This totaled to a sample size of 95 respondents.

$$n = \frac{N}{1 + N(e)^2}$$

Where n=sample size

N= sample population

e=precision

**Table 3.2: Sample Size**

	Population	Sample
managers	13	10
Mid-level Managers	17	15
Employees	40	30
Businessmen	50	40
<b>Total</b>	<b>120</b>	<b>95</b>

**Pilot Study:**

In any study where data collection from the field is involved, testing the instruments for comprehension and efficacy is essential. The pre-test or the pilot test mirrors the main task and the exercise is used to verify suitability of research instruments before carrying out the actual research. Dikko (2016) argues that a pilot study is a mini version of the main research, and according to Simon (2011) the purpose of piloting is to resolve reliability and validity of the instruments and to check for ambiguities that would prevent respondent’s comprehension. Simon (2011) reiterates the importance of pilot study as giving advance warning regarding weaknesses in a proposed study. E.g. where research instruments are inappropriate or too complicated.

A pilot study was carried out to improve the instruments before they were finally distributed; time limit was given to respondents to fill the questionnaire (two weeks) after which the researcher went round to collect them although some questionnaire were not filled and ready for collection. Pilot tests sometimes experience challenges, such as not getting targeted respondents. The pilot test in this study targeted twelve but only managed to get six respondents in one hotel because the second hotel declined to participate in the exercise without giving any reason. The test result was a turn up of 50%. Although the number of participants was small, Simon (2011) contends that administering the survey personally and individually to a small group of respondents is a good way to proceed with your pilot study. Respondents in the pilot study were excluded from the actual study.

**4. DATA ANALYSIS AND INTERPRETATION**

**Introduction:**

This chapter presents the findings of the study as per questionnaires distributed for data collection. It shows the response rate and further presents the analyzed data using the SPSS 20 software. Correlation was used to investigate solid waste management in urban centers a case of Narok County. Solid waste management (dependent variable) is explained by technical skills, resources available, county by-laws and Public Participation (independent variables). The data was gathered exclusively from the questionnaire as the research instrument. The questionnaire was designed in line with the objectives of the study. It also presents the response rate, respondents’ characteristics and preliminary findings.

### Reliability Test:

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda & Mugenda, 2013). During the pilot study, two repeat mailings of the instrument were carried in Narok Town to improve the overall response rate before sending the actual instrument to allow for pre-testing of the research instrument.

Cronbach's alpha for each value was established by the SPSS application and gauged against each other at a cut off value of 0.7 which is acceptable according to Cooper and Schindler (2008). According to table 4.1 all the values were above 0.7 which concludes that the data collection instrument was reliable.

**Table 4.1: Reliability test**

Variable	Cronbach's Alpha	No of Items
technical skills	.7045	5
resources available	.7168	5
county by-laws	.7263	5
Public Participation	.7177	5

### Response Rate:

The sample of the study comprised of 95 respondents. The research instruments were administered to the respondents who later on returned all duly filled instruments. Out of 95 questionnaires that were administered, 78 were duly filled and returned. This was a response rate of 82% as displayed in table 4.2. A response rate of above 60% is acceptable (Kothari, 2014). This commendable response rate was made a reality after the researcher made personal visits to remind the respondent to fill-in and return the questionnaires.

**Table 4.2: Response Rate**

Response	Frequency	Percentage
Responded	78	82
Not responded	17	18
<b>Total</b>	<b>95</b>	<b>100</b>

### General Information:

As part of the general information, the research requested the respondents to indicate their gender, age, Job Level and duration of working. The analysis relied on this information of the respondents so as to categorize the different results according to their acquaintance and responses.

### Gender Distribution:

The gender of the respondent was sought. A simple majority of 61% of the respondents were male while the rest 39% were female as shown in table 4.1. This is a good distribution which depicts a fair balance of gender. Since majority of the responses for this study relies on the perceptual measures of the respondents, this gender distribution is expected to accommodate the opinions and views from both sides of the gender divide. Nevertheless, the balance in gender in public service may also be an evidence of successful efforts of various gender mainstreaming campaigns.

**Table 4.3: Distribution of Respondents by Gender**

Gender	Frequency	Percentage (%)
Male	48	61
Female	30	39
<b>Total</b>	<b>78</b>	<b>100</b>

### Age of the Respondents:

The respondents were required to indicate their age where the study findings indicated that majority 35% indicated that their age bracket was between 41 and 50 years. Analysis of findings also indicated that 32% of the respondents were between 31 and 40 years of age. The findings further indicated that 18% were above 50 years of age while 10% were aged between 20 – 30 Years.

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The finding therefore implies that the respondents were old enough to provide valuable responses that pertain solid waste management in urban centers with reference to Narok Town, Narok County Kenya. The findings of the study are illustrated in table 4:4

**Table 4.4: Respondents Age**

Age	Frequency	Percent (%)
20 – 30 Years	8	10
31 - 40 years	25	32
41 – 50 years	27	35
above 50 years	18	23
<b>Total</b>	<b>78</b>	<b>100</b>

**Education level:**

Education is paramount in enabling the respondents to conceptualize issues related to solid waste management. It was established from the study that 40.9% of the respondents had College certificate, 31.8 % had Bachelors’ degree, 18.2%had post graduate, 4.5% of the respondents had Primary and Secondary while 4.6% had other specifications in the level of education. This is shown in table 4.5

**Table 4.5: Level of Education of Respondents**

Age	Frequency	Percent (%)
Primary and Secondary	3	4.5
College	32	40.9
Bachelors’ degree	25	31.8
Post graduate	14	18.2
Others-specify	4	4.6
<b>Total</b>	<b>78</b>	<b>100</b>

Apparently from the above findings it shows that majority of respondents within Narok County had collage qualifications. This implies that they are capable to conceptualize and respond on issues of solid waste management. This finding was contrary to Katz (2012) finding that those with higher education are more successful as they have more knowledge and have modern managerial skills making them more conscious of the reality of waste management.

**Working Experience of Respondents:**

The question sought to investigate the number of years each respondent has worked with within the county. Majority (48%) of the respondents have a working experience between 1 to 5 years, 32% have 6 to 10 years, 16% have over 10 years and a few (4%) have less than 1years’ experience as shown in table 4.6. This means that the respondents have adequate working experience within the county and therefore possess the necessary knowledge and information which was considered useful for this study.

**Table 4.6: Working Experience of Respondents**

Experience in years	Percentage
Less than 1years	4%
1 to 5 years	48%
6 to 10 years	32%
Over 10 years	16%
<b>Total</b>	<b>100%</b>

**Descriptive Analysis:**

The purpose of descriptive statistics is to enable the researcher, to meaningfully describe a distribution of scores or measurements using indices or statistics. The type of statistics or indices used depends on the types of variables in the study and the scale of measurements. Measures of central tendency are used to determine the typical or expected score or measure from a staple of measurements or a group of scores in a study. Measures of central tendency are used to give

expected summary statistics of variables being studied. The commonly used measures of central tendency are mode, mean and median and standard deviation. The researcher in this study used mean average and percentages and standard deviation to present the study findings on determinants of solid waste management in urban centers with reference to Narok Town, Narok County Kenya

**Technical skills:**

Technical factors are the knowledge and capabilities to perform specialized tasks. There are various technical factors that can be implemented in recycling of solid waste as claimed by Foster and Clark, B. (2011). In order to collect waste to be recycled, waste bins, garbage bags and containers are usually used. This section sought to determine how technical skills influence solid waste management in Narok Town. Based on the findings in table 4.7 Majority of respondents 68% were in agreement that technical skills influence solid waste management while minority 32% disagreed

**Table 4.7: Gender Composition**

Opinion	Frequency	Percentage
Yes	53	68
No	24	32
<b>Total</b>	<b>78</b>	<b>100</b>

**Extent to which technical skills influenced solid waste management in Narok town:**

On the extent to which technical skills influenced the determinants of solid waste management in urban center with reference to Narok Town, Narok County Kenya, the study asked the respondents to indicate the extent to which technical skills were used within the county. A- Likert Scale of 1 to 4) (1 =not at all, 2= low extent, 3=moderate extent, 4= great extent) was used. The findings were presented in table 4.8 On the extent to which technical skills influenced solid waste management in Narok Town, majority of respondents 45% agreed to a great extent that technical skills influenced solid waste management, 30% agreed to a moderate extent, 15% agreed to low extent while minority 10% were not in agreement if technical skills influenced solid waste management in Narok Town.

This finding echoed findings by (Alcott 2005) on technical skills and solid waste management in developing countries ascertaining how availability of qualified personnel impacted recycling of solid wastes. From his study he concluded that most projects regarding solid waste recycling failed due to unqualified personnel and also inadequate funding.

**Table 4.8: extent to which technical skills influenced solid waste management in Narok town**

Statement	Frequency	Percentage
To a great extent	35	45
To some extent	23	30
To low extent	12	15
Not at all	8	10
<b>Total</b>	<b>78</b>	<b>100</b>

**Resources availability:**

Resource Availability specifies how many resources are available at any one time to do a job. This section sought to determine the influence of resource availability on solid waste management in Narok Town.

**Effects of resource availability on solid waste management:**

The study also sought it important to find out the level of agreement on recourse availability on solid waste management practices, based on the findings majority of the respondents 72% were in agreement that resource availability influenced solid waste management while 28% were not in agreement as displayed in figure 4.9

**Table 4.9: Resources availability**

Resources availability	Frequency	Percent
yes	56	72
No	22	28
<b>Total</b>	<b>78</b>	<b>100</b>

**Extent of agreement with the following statements regarding to Resources availability on solid waste management:**

On the extent of agreement with statements relating to resources availability on solid waste management practice, majority of the respondents indicated that Poor waste disposal practices are responsible for a significance proportion of the world's infectious disease burden as shown by a mean score of 2.626, Resources available in this sub-theme include assessment reports of wastewater treatment plants, national strategies for sewage disposal as shown by a mean score of 2.529, and finally Each of these activities requires careful planning, financing, collection, and transport as shown by a mean score of 2.5131. The findings are indicated in table 4.10.

**Table 4.10: Extent of agreement on Resources availability**

Statements	Mean	Std Dev.
Poor waste disposal practices are responsible for a significance proportion of the world's infectious disease burden	2.626	1.387
Resources available in this sub-theme include assessment reports of wastewater treatment plants, national strategies for sewage disposal	2.5279	1.350
Each of these activities requires careful planning, financing, collection, and transport	2.5131	1.252

\*means of the above 2.5 indicate a very strong significance of the statements to the statements. It means most respondents agreed with the statements. The insignificant deviation from the mean confirms the validity of the statements.

**Extent to which finance, personnel, technology tools and equipment influence solid waste management:**

Further the study sought to find out extent to which finance, personnel, technology tools and equipment influence solid waste management in Narok County. Based on the findings, majority of the respondents 38% agreed to very large extent finance influenced solid wastes management, 27% agreed large extent personnel influenced solid wastes management, 20 % of respondents agreed to a moderate extent that technology influenced solid waste management, while 15% of respondent agreed to small extent that tools and equipment influenced solid waste management in Narok County. These findings are in line with that of (Schiibeler, 2014) who found out that meeting the financial demands of MSW management will continue to be a problem in the cities of developing countries. In areas where residents are assessed fees for waste removal, the rate of collection can be quite poor. The findings are indicated in table 4.11

**Table 4.11: extent to which finance, personnel, technology tools and equipment influence solid waste management**

Statement	Frequency	Percentage
To a great extent	35	38
To some extent	23	27
To low extent	12	20
Not at all	8	15
<b>Total</b>	<b>78</b>	<b>100</b>

**County by-laws:**

According Grijalva & Jarkus (2012) stringent enforcement of municipal by-laws help in countries like the United States of America and Sweden facilitated in solving deep waste management problems in the cities. However, Kenya has made strides in enforcement of municipal by-laws a lot need to be done in harmonization and coordination of local government by-laws and waste management laws (Kazungu, 2013). This section sought to investigate how enforcement of sub county by-laws affects solid waste management practice.

**Effects of County by-lawson solid waste management:**

Further the study sought it important to find out the level of agreement on the effects of enforcement of sub county by-laws on solid waste management, based on the findings majority of the respondents 68% were in agreement that county by-laws influenced solid waste management practice while 32% were not in agreement as displayed in figure 4.12. These findings were supported by Boston Consulting Group, (2011) who argued that enforcement of municipal by-laws help in countries like the United States of America and Sweden facilitated in solving deep waste management problems in the cities

**Table 4.12: County by-laws**

County by-laws	Frequency	Percent
yes	53	68
No	25	22
<b>Total</b>	<b>78</b>	<b>100</b>

**Extent of agreement with the following statements regarding to county by-laws on solid waste management:**

On the extent of agreement on county by-laws and solid waste management, majority of the respondents indicated that cultural transformation can be measured in terms of changes in perceptions regarding roles and responsibilities concerning waste and the environment in general as shown by a mean score of 4.09 that premature introduction of SWM reforms could result in adverse effects such as “illegal dumping, burning of household etc sufficient to justify the cost of achieving straight through processing as shown by a mean score of 3.98, that community participation, incentives and legislation must be based on citizens understanding environmental issues as shown by a mean score of 3.71 and finally culture has profound indirect effects on many societal, jurisdictional, and organizational aspects characteristics which affect SWM. The findings are indicated in table 4.13

**Table 4.13: Extent of agreement on county by-laws on solid waste management practise**

Statement	Mean	St dev
Culture has profound indirect effects on many societal, jurisdictional, and organizational aspects characteristics which affect SWM.	3.45	0.816
Premature introduction of SWM reforms could result in adverse effects such as “illegal dumping, burning of household etc. sufficient to justify the cost of achieving straight through processing	3.98	0.808
Cultural transformation can be measured in terms of changes in perceptions regarding roles and responsibilities concerning waste and the environment in general	4.09	1.025
Community participation, incentives and legislation must be based on citizens understanding environmental issues.	3.71	1.03

\*means of above 2.5 indicate a very strong significance of the statements to the statements. It means most respondents agreed with the statements. The insignificant deviation from the mean confirms the validity of the statements.

**Public Participation:**

Public Participation may be broadly defined as the involvement of citizens in governmental decision-making processes. This ranges from being given notice of public hearings to being actively included in decisions that affect communities (Rolson, 2014). This section sought to investigate how public participation affects supplier selection criteria.

**Effect of public participation on solid waste management:**

The study also sought it important to find out the level of agreement on public participation on solid waste management based on the findings, majority of the respondents 65% were in agreement while 35% disagreed. The findings are displayed in table4.14

**Table 4.14: Public Participation**

Public Participation	Frequency	Percent
yes	33	65
No	14	35
<b>Total</b>	<b>78</b>	<b>100</b>

**Extent of agreement with the following statements regarding to public participation on solid waste management:**

On the extent of agreement with statements relating to public participation on good practice of solid waste management., majority of the respondents indicated that Public support can only be manifested by the levels of public participation in the project as shown by a mean score of 3.326, that Public Participation is the involvement of citizens in governmental decision-making processes as shown by a mean score of 2.824, that Public Participation is a dialogue which enables the public to understand and influence decision-making.as shown by a mean score of 2.773 and On a national basis, each individual should have appropriate access to information concerning the environment that is held by public authorities as shown by a mean score of 2.613.

The findings are indicated in table 4.15.

**Table 4.15: Extent of agreement on Public Participation**

Statements	Mean	Std Dev.
Public support can only be manifested by the levels of public participation in the project	3.326	1.487
Public Participation is the involvement of citizens in governmental decision-making processes	2.824	1.450
Public Participation is a dialogue which enables the public to understand and influence decision-making.	2.773	1.352
On a national basis, each individual should have appropriate access to information concerning the environment that is held by public authorities	2.613	1.264

\*means of above 2.5 indicate a very strong significance of the statements to the statements. It means most respondents agreed with the statements. The insignificant deviation from the mean confirms the validity of the statements.

**Correlation Analysis Results:**

Correlation analysis was carried out in this study to examine the nature of association between technical skills, availability resources, county by-laws and Public Participation and solid waste management in Narok County. To carry out the test, solid waste management was used as the dependent variable while the four were the independent variables. The test was conducted at the 5% level of significance in a 2 – tailed test. This shows that the critical value was set at 0.025 during the test, beyond which the association between the variables was concluded to be not significant hence cannot be relied on in making conclusions regarding the association between the variables being tested. The strength of the association was based on the Pearson’s Correlation scale where a correlation value of between: 0.0 to 0.29 (0.0 to -0.29) indicates a no correlation; 0.3 to 0.49 (-0.3 to -0.49) shows a weak positive (negative) correlation and a correlation coefficient in the interval of 0.5 to 0.69 (-0.5 to -0.69) indicate a moderate positive (negative) correlation whereas a correlation coefficient of 0.7 and above (-0.7 to -1) indicates a strong positive /negative correlation. A result on the association between the dependent variable and the independent variable was done.

According to the findings as illustrated in Table 4.16.All the independent variables had a positive and significant correlation with solid waste management. Solid waste management and Resource availability were weak but positively correlated,  $r(78) = .405, p < .01$ . Also, solid waste management and Technical skills were strong and positively correlated,  $r(78) = .784, p < .01$ . Solid waste management and County by-laws were also weakly correlated,  $r(78) = .330, p < .01$ . Solid waste management and Public participation were weak but positively correlated,  $r(78) = .480, p < .01$ . Table 4.16 shows correlation matrix of the study.

**Table 4.16: Correlation Matrix**

		Solid waste management	Technical skills	Resource availability	County by-laws	Public participation
Solid waste management	Pearson Correlation	1	.784**	.405**	.330**	.480**
	Sig. (2-tailed)		.000	.000	.001	.000
	N	78	78	78	78	78
Technical skills	Pearson Correlation	.784**	1	.308**	.110	.356**
	Sig. (2-tailed)	.000		.001	.265	.000
	N	78	78	78	78	78
Resource availability	Pearson Correlation	.405**	.308**	1	-.046	-.147



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	Sig. (2-tailed)	.000	.001		.638	.135
	N	78	78	78	78	78
County by-laws	Pearson Correlation	.330**	.110	-.046	1	.590**
	Sig. (2-tailed)	.001	.265	.638		.000
	N	78	78	78	78	78
Public participation	Pearson Correlation	.480**	.356**	-.147	.590**	1
	Sig. (2-tailed)	.000	.000	.135	.000	
	N	78	78	78	78	78

\*\* . Correlation is significant at the 0.01 level (2-tailed).

## 5. SUMMARY OF FINDINGS CONCLUSIONS AND RECOMMENDATIONS

### Introduction:

This chapter provides the summary of the findings from chapter four, and also it gives the conclusions and recommendations of the study based on the objectives of the study.

### Summary of the findings:

The objective of the study was to establish factors influencing solid waste management in urban centers with reference to Narok County Kenya. This study, adopted both descriptive and inferential study design. The population of this study comprised of staffs working in the ministry of environment and business men, in Narok County

The findings showed that there was a significant relationship between each of the four independent variables and factors influencing solid waste management.

Based on the findings, majority (49%) of the respondents had over 10 years of experience while 32% had between 6-10 years. It was also revealed that 12% of the respondents had an experience of 1-5 years while 7% had an experience of less than 1 year

The study found out that majority of the respondents 68% were in agreement that technical skills influence solid waste management while minority 32% disagreed

Moreover, the study found out that majority of the respondents 72% were in agreement that resource availability influenced solid waste management while 28% were not in agreement

Additionally, the study found out that majority of the respondents 68% were in agreement that county by-laws influenced solid waste management practice while 32% were not in agreement

Finally, the study found out that majority of the respondents 65% were in agreement that Public Participation influenced solid waste management in Narok Town, while 35% disagreed

### Conclusions:

For effective solid waste management in Narok Town, the common factors as discussed in section four should be adequately addressed and improvements should be made where applicable. It is also important to note that all the common factors discussed may or may not be applicable to certain locations, although they are the challenges generally experienced and reported.

The study concludes that there was a significant relationship between each of the four independent variables and solid waste management in Narok Town

The study also concludes that majority of the respondents 68% were in agreement that technical skills influence solid waste management while minority 32% disagreed

Moreover, the study concludes that majority of the respondents 72% were in agreement that resource availability influenced solid waste management while 28% were not in agreement

Additionally, the study concludes that majority of the respondents 68% were in agreement that county by-laws influenced solid waste management practice while 32% were not in agreement

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Finally the study concludes that's majority of the respondents 65% were in agreement that public participation influenced solid waste management practice while 35% disagreed

### Recommendation:

The following recommendations are made to address these issues:

The national government should ensure ample budgetary allocation of funds for the purpose of waste management and put up an appropriate structure to guide the activities of each county in the management of solid wastes.

Private sector participation in solid waste management should be encouraged by each state to improve the efficiency of the process

This research recommends that existing by laws should be strictly enforced in all areas of the municipality and new ones formulated to cope with changing times for example formulation of municipal policy.

The study recommends that Narok County should provide financial and physical capacity county agencies and other players involved in waste collection for effective and efficient waste management practices in county.

From literature it is evident that poor technical skills impact negatively the technical factors influencing SWM. There have been many deaths of unqualified personnel as a result their poor technical skills in SWM systems hence the study recommends for qualified personnel's

### Suggestion for Further Research:

Since this study explored determinants of solid waste management in urban centers in reference to Narok Town in Narok County as a case study, the study recommends that; Similar research should be done in other Towns of Counties in Kenya for comparison purposes and to allow for generalization of findings on determinant of solid waste management in urban centers in Kenya.

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